PURSE2026

Peradeniya University International Research Symposium and Exposition

Transformative Synergies:

Integrating Knowledge Across Borders for Tomorrow



PROCEEDINGS
Volume 27

20th and 21st August 2026

doi.org/10.63967/HPHM9374

UNIVERSITY OF PERADENIYA

SRI LANKA

"Transformative Synergies: Integrating Knowledge Across Borders for Tomorrow"

PROCEEDINGS

PERADENIYA UNIVERSITY INTERNATIONAL RESEARCH SYMPOSIUM AND EXPOSITION (iPURSE) 2026

Volume 27

20th & 21st August 2026

Hosted by

University Research Council

University of Peradeniya, Sri Lanka.

©UNIVERSITY OF PERADENIYA

Proceedings of the PERADENIYA UNIVERSITY INTERNATIONAL RESEARCH SYMPOSIUM AND EXPOSITION (iPURSE) 2026

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted in any form or by any means-electronic, mechanical, photocopying, recording or otherwise- without the permission of the publisher. The Publication Committee of iPURSE 2026 and the University of Peradeniya are not responsible for the concepts, ideas and views reflected in the abstracts published in the Proceedings or for any instances of duplication caused by the abstracts having been published elsewhere, if any.

E-ISSN 1391-4111

Digital Object Identifier: https://site.pdn.ac.lk/ipurse/2026/landing.html

Published by

University of Peradeniya, Peradeniya, Sri Lanka

Design by

Publication Committee of iPURSE 2026

Cover Page Design by

Mr. Tajith Wishva Wijesooriya

Department of Statistics and Computer Science

Faculty of Science

University of Peradeniya

CONTENT

Message from the Vice-Chancellor	iv
Message from the Chief Guest	v
Message from the Guest of Honour	vi
Message from General Chair, iPURSE 2026	vii
Editorial Note	viii
Keynote Speeches	ix
Engineering Education Plenary Speaker	xiv
List of Abstracts	1
Abstracts	41
1. Building Adaptive, Equitable, and Proactive Health Ecosystems	41
2. Engineering Resilient, Productive, and Sustainable Bio-Economies	149
3. Engineering Intelligent, Sustainable, and Human-Centric Systems	194
4. Human Frameworks for Shaping Equitable and Meaningful Futures	254
5. Designing Adaptive and Purpose-Driven Architectures for Tomorrow	323
6. Unlocking Complexity and Engineering Novel Solutions	343
7. Special Session on Engineering Education	446
Main Organizing Committee	452
Subcommittees	453
List of reviewers	456

MESSAGE FROM THE VICE-CHANCELLOR



It gives me great pleasure to extend my warm greetings to all contributors, participants, reviewers, and readers of the *Proceedings of the Peradeniya University International Research Symposium and Exposition (iPURSE) 2026*.

The University of Peradeniya has long been recognized as a leading institution dedicated to excellence in teaching, research, and innovation. iPURSE has become one of the University's flagship academic events, providing an important platform for researchers from diverse disciplines to present their work, exchange ideas, and foster meaningful collaborations that contribute to the advancement of knowledge and national development.

The publication of these proceedings reflects the University's strong commitment to promoting high-quality research and disseminating scholarly findings to the wider academic community. The research presented in this volume demonstrates the creativity, dedication, and intellectual excellence of our academics, researchers, and students in addressing contemporary challenges through multidisciplinary inquiry and innovation.

I commend all authors for their valuable contributions and express my sincere appreciation to the reviewers, editors, session chairs, organizing committee, and all those who worked tirelessly to ensure the successful organization of iPURSE 2026 and the timely publication of these proceedings. Their commitment and professionalism have been instrumental in maintaining the high academic standards of this symposium.

I am confident that the research findings presented in this volume will inspire further scholarly engagement, strengthen interdisciplinary collaboration, and contribute meaningfully to scientific advancement, evidence-based policymaking, and sustainable development both in Sri Lanka and internationally.

I congratulate everyone involved in the successful organization of iPURSE 2026 and trust that these proceedings will serve as a valuable resource for researchers, academics, practitioners, and students for years to come.

I wish the *Peradeniya University International Research Symposium and Exposition (iPURSE) 2026* every success.

Prof. Terrence Madhujith

Vice-Chancellor | University of Peradeniya

MESSAGE FROM THE CHIEF GUEST



It is a wonderful honour and a privilege to serve as Chief Guest at iPURSE 2026 and I sincerely thank the Vice Chancellor, Professor Madhujith, and the Organising Committee for this distinction. For me, each return to Peradeniya is deeply moving. As above all, I remain a son of this University—where I learnt my craft in dentistry before venturing into an uncharted field of clinical microbiology.

What began then as a simple curiosity about microbes, after graduation grew into more than four decades of scholarship, mentorship, and leadership across all continents. Among other things I have been privileged to mentor over 30 Sri Lankan academics who now serve universities around the world. My journey has taken me to lecture halls, laboratories, editorial offices, and executive deanships globally. Yet whatever I have achieved rests firmly upon the foundations laid by my teachers and by this great institution.

When I was recently honoured with the SACTD-UNESCO Honorary Endowed Chair by the Honourable Prime Minister, I reflected that such recognition signifies not arrival, but return. I remain a grateful beneficiary of Sri Lanka's visionary commitment to free education. That priceless gift carries an enduring responsibility—the duty of giving back. The *Lakshman Samaranayake Endowed Professorship* at the University of Peradeniya is a modest expression of that obligation. Established through our personal endowment and strengthened by the University's support, it is sustained in perpetuity to recognise and empower outstanding scholars. I warmly congratulate Professor Rohana Chandrajith in Geology, the inaugural recipient of this Professorship. This is indeed a landmark moment in our University's history.

Excellence in research does not arise by chance; it must be nurtured, recognised, and sustained. It is my hope that this initiative will inspire a stronger culture of alumni engagement and philanthropy in support of research and teacher development.

In closing, I extend my heartfelt congratulations to all awardees and participants of iPURSE 2026. Your work forms the foundation upon which we will build a future defined by transformative synergies.

May this symposium continue to catalyse innovation, collaboration, and global impact!

Lakshman Samaranayake
Hon DSc (Pera U\| Hon PhD (Thailand) \| Hon Doctorate (Armenia)
SACTD UNESCO Endowed Professor in Teacher Education
High Potential Professor, Chulalongkon University, Thailand; Professor Emeritus, & Former Dean of Dentistry, University of Hong Kong & University of Queensland, Australia

MESSAGE FROM THE GUEST OF HONOUR



It is a great honor to contribute this message to the programme book of iPURSE 2026, and to join this year's symposium as both keynote speaker and Guest of Honour. The conference theme, “Transformative Synergies: Integrating Knowledge across Borders for Tomorrow,” speaks directly to the work I have devoted my career to understanding how health is shaped not only by biology, but by the conditions, systems, and relationships that connect communities across every border.

As a global health scholar and practitioner, I have learned that the most durable solutions to health inequity are rarely imported; they are co-created, standing shoulder to shoulder with the communities and institutions that understand their own conditions best. Across the Caribbean, South America, North America, Sub-Saharan Africa, Southeast Asia, and now Sri Lanka, I have watched nursing, public health, and community leadership form the connective infrastructure of health equity, long after any single program or partnership concludes.

This invitation represents a meaningful milestone in the growing partnership between the University of Illinois Chicago College of Nursing and our colleagues at the University of Peradeniya. With its distinguished history of scholarship and its recent investment in advanced nursing education and cross-border research collaboration, Peradeniya is already living the spirit of this year's theme. I am grateful for what our institutions have built together so far, and for the opportunity iPURSE 2026 offers to build further.

I extend my warmest congratulations to the organizing committee for convening iPURSE 2026, and my sincere thanks to all who will gather to share their work. I look forward to learning alongside you and to meeting the Peradeniya community in person this August.

Rohan D. Jeremiah, PhD, MPH

Associate Dean, Global Health

Professor, Human Development Nursing Science

University of Illinois

MESSAGE FROM THE GENERAL CHAIR



On behalf of the Organising Committee, it is my distinct privilege to welcome researchers, postgraduate scholars, academics, industry professionals, and distinguished guests to the Peradeniya University International Research Symposium and Exposition (iPURSE) 2026. We are honoured by your presence at this annual celebration of intellectual curiosity, innovation, and scholarly excellence.

Every meaningful discovery begins with a question, but its true value is realised only when knowledge is translated into understanding, innovation, and service to society. Research challenges us to explore beyond the boundaries of current knowledge, address complex global and local challenges, and contribute to sustainable human development. It is both an intellectual pursuit and a responsibility to future generations.

Over the years, iPURSE has evolved into a premier forum where emerging researchers and established scholars exchange ideas, foster multidisciplinary collaborations, and present research spanning science, technology, medicine, agriculture, engineering, the humanities, and the social sciences. This year's programme reflects the diversity and excellence of postgraduate research at the University of Peradeniya and beyond. We received over 680 abstract submissions, a testament to the growing reputation and academic standing of iPURSE. Owing to programme and venue limitations, approximately two-thirds of these submissions have been selected for oral and poster presentations through a rigorous review process. The conference also features keynote lectures by internationally renowned scholars, exhibitions, networking opportunities, and discussions designed to stimulate collaboration and inspire new research directions. I encourage all participants to engage actively, exchange ideas across disciplines, and build partnerships that extend well beyond the symposium.

The success of iPURSE 2026 reflects the dedication of many individuals. I sincerely thank our keynote speakers, authors, reviewers, session chairs, sponsors, exhibitors, iPURSE committee members, volunteers, and the University administration for their invaluable contributions and unwavering support.

I hope iPURSE 2026 provides an inspiring and rewarding experience for all participants and serves as a catalyst for innovative ideas, enduring collaborations, and impactful research that advances knowledge and benefits society.

I wish you a productive symposium and a memorable stay at the beautiful University of Peradeniya.

Prof R. S. Rajakaruna | Conference Chair, iPURSE 2026

EDITORIAL NOTE

As Publication Committee Co-Chairs, we are pleased to present this volume of proceedings for iPURSE 2026, which highlights the breadth of research conducted predominantly at the University of Peradeniya. This annual symposium serves as our intellectual rallying point - designed to bridge diverse expertise, catalyze novel discoveries, and confront complex challenges that transcend disciplinary boundaries. By uniting researchers, academics, professionals, and students, this gathering fosters a vital exchange of recent breakthroughs and emerging perspectives that will shape the future of our fields.

This year's symposium theme is *Transformative Synergies: Integrating Knowledge Across Borders for Tomorrow*. Abstracts were called under six themes:

Theme 1: Building Adaptive, Equitable, and Proactive Health Ecosystems
Theme 2: Engineering Resilient, Productive, and Sustainable Bio-Economies
Theme 3: Engineering Intelligent, Sustainable, and Human-Centric Systems
Theme 4: Human Frameworks for Shaping Equitable and Meaningful Futures
Theme 5: Designing Adaptive and Purpose-Driven Architectures for Tomorrow
Theme 6: Unlocking Complexity and Engineering Novel Solutions

We received a total of 695 abstracts covering all themes and areas, from healthcare and agriculture to engineering, basic sciences, social sciences, and governance. Following a rigorous peer-review process managed by our Track Chairs, 306 abstracts were selected for oral presentations and 98 abstracts for poster presentations. This selection reflects the high level of interest in iPURSE and our commitment to maintaining high standards of research quality. The proceedings are organized according to the above themes, with an additional session on Engineering Education.

This volume is the result of the hard work and dedication of many individuals. We extend our sincere gratitude to the entire organizing committee for their leadership and support. We are also deeply grateful to our colleagues on the Publications Committee for their hard work in compiling and editing this volume on time. Special thanks go to Mr. Tajith Wishva Wijesooriya for creating an excellent cover design for this year's proceeding book, and to Dr. Pavithra Basnayake from the Department of Statistics and Computer Science for compiling the abstracts.

These proceedings stand as a testament to the caliber of research cultivated within and beyond the University of Peradeniya. We trust that their contents will provide a meaningful reference point for ongoing inquiry and interdisciplinary dialogue. On behalf of the organizing committee, we extend our sincere gratitude and best wishes to all presenters and participants for their contributions to the success of iPURSE 2026.

Prof. V. Sivakumar & Dr. Jayampathi Herath
Co-Chairs | Publication Committee, iPURSE 2026

KEYNOTE SPEECH I

Title: *Healing Across Borders: From Determinants to Determination to Durability in Global Health Equity*

Synopsis: Global health needs frameworks that convert social determinants awareness into durable, locally rooted equity infrastructure rather than externally dependent programs. This talk introduces a three-part framework—Determinants, Determination, Durability—moving from describing health inequity to structural accountability and workforce-anchored solutions. Drawing on case synthesis from Grenada (domestic violence as a health determinant), Rohingya resettlement health in Chicago, and Sri Lanka's 2022 economic crisis, alongside its Public Health Midwife system and nursing education investments, findings show health vulnerability stems from structural conditions, not individual behaviour. Sri Lanka's midwife-led model exemplifies homegrown durability. Nursing emerges as critical infrastructure linking policy, systems, and lived experience, requiring co-created, cross-border partnerships.

Keynote Speaker:



Dr. Rohan D. Jeremiah is a distinguished global public health scholar who serves as the Associate Dean for Global Health at the University Of Illinois Chicago College Of Nursing. He holds a professorship in Human Development Nursing Science and is a faculty affiliate with the University of Illinois Cancer Center and the PAHO/WHO Collaborating Centre in Nurse Leadership and Primary Health Care.

With a PhD from the University of South Florida and an MPH from the University of Michigan, Dr. Jeremiah is trained in applied medical anthropology and global public health. Guided by a vision of inclusive, just, and people-centered health systems, his studies have covered critical topics such as intimate partner violence, trauma, HIV/AIDS, cancer disparities, minority men, LGBT, and refugee health. His global health experience includes serving as a Peace Corps volunteer in Cameroon and South Africa, as well as developing and managing health programs in Sub-Saharan Africa, South Asia, Latin America, the Eastern Caribbean, and the United States. His work has impacted communities in at least 20 countries.

Dr. Jeremiah has provided technical expertise to prestigious organizations, including the United Nations, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), the Inter-American Development Bank, and the U.S. Agency for International Development (USAID).

KEYNOTE SPEECH II

Title: *Thinking outside the 'Computer' box*

Synopsis: What if technology felt less like a tool we operate and more like a part of who we are? The overarching theme of this keynote is the design and development of intelligent human–computer interfaces that extend the limits of our perceptual, physical, and cognitive capabilities — a research vision we call "Assistive Augmentation." Rather than treating assistive technology and human augmentation as separate endeavours, this perspective views them as one continuous design space: an interface that empowers a blind user can transform how anyone accesses information.

Drawing on over a decade of research at the Augmented Human Lab (www.ahlab.org), the keynote presents a series of proof-of-concept Assistive Augmentations spanning sensory substitution, novel input strategies, and smart health and well-being. Examples include HapticChair, a full-body vibration interface that has enabled deaf students in Sri Lanka to experience music daily for more than fifteen years, and AiSee, a conversational AI wearable that lets users simply point at the world and ask questions.

The keynote concludes by exploring how emerging AI capabilities open a new chapter for Assistive Augmentation — and the design principles we must embrace to ensure these technologies become natural, empowering extensions of the human body, mind, and identity.

Keynote Speaker:



Suranga Nanayakkara is an Associate Professor in the Department of Computer Science, School of Computing, National University of Singapore (NUS). Before joining NUS, Suranga worked as an Associate Professor at the Auckland Bioengineering Institute, University of Auckland. Prior to that, he was with the Singapore University of Technology and Design (SUTD) as an Assistant Professor and was also a Postdoctoral Associate at the MIT Media Lab.

He received his Ph.D. in 2010 and B.Eng. in 2005 from the National University of Singapore. In 2011, he founded the "Augmented Human Lab" to explore ways of designing intelligent human-computer interfaces that extend the limits of our perceptual and cognitive capabilities.

Suranga's work is most important to the people whose lives it directly impacts: those who face challenges functioning in our world due to sensory deficits in hearing or vision. More importantly, the technologies that Suranga has developed are not only applicable to those specific communities but potentially have a broader range of applications, due to his emphasis on “enabling,” rather than “fixing.”

Suranga is a Senior Member of ACM and has taken on a number of roles, including General Chair of the Augmented Human Conference in 2015. He has also served on many review and

program committees, including SIGCHI, TEI, and UIST. With publications in prestigious conferences, demonstrations, patents, media coverage, and real-world deployments, Suranga has demonstrated the potential of advancing state-of-the-art technology in assistive human-computer interfaces. For the totality and breadth of his achievements, he has won many awards, including MIT Tech Review's Young Inventor Under 35 Award (TR35) in the Asia Pacific region, the Outstanding Young Persons of Sri Lanka (TOYP) Award, and the INK Fellowship 2016.

KEYNOTE SPEECH III

Title: *Bridging Mind and Machine: Advances in Neuroengineering, Artificial Intelligence, and Human-Centered Robotics for Healthcare and Rehabilitation*

Synopsis: Brain–machine interfaces (BMIs) enable assistive robotics and rehabilitation, but struggle with the complexity and variability of human signals. This research uses synergy-based models to capture the low-dimensional structure of motor control, integrating multimodal sensing (EEG, EMG, wearables, in-ear ultrasound, eye-tracking) via machine and deep learning to infer intent, cognitive state, and impairment. Validated in VR, physical robotics, and stroke/spinal cord injury rehab, synergy-informed decoders improve robustness and generalizability for prosthetics and exoskeletons. The framework also extends to neuroadaptive mental-health tools for real-time stress and emotion monitoring. Supported by NSF, NIH, and industry partners, this work advances biomimetic, human-centered BMIs for rehabilitation and wellness technologies.

Keynote Speaker:



Dr. Ramana Vinjamuri is an Associate Professor in the Department of Computer Science and Electrical Engineering at the University of Maryland, Baltimore County and serves as the UMBC Site Director of the NSF IUCRC BRAIN Center. He directs the Sensorimotor Control Laboratory (Vinjamuri Lab), where his research focuses on brain–computer interfaces, rehabilitation robotics, exoskeletons, human–robot collaboration, and neurotechnologies for rehabilitation and mental health. His work has been supported by the National Science Foundation, National Institute on Disability, Independent Living, and Rehabilitation Research, and other innovation programs, and has been recognized through honors including the NSF CAREER Award and selection to Technical.ly RealLIST Innovators 2025. He also serves as Director of the Cyber & AI Core at the UMB–UMBC Institute for Clinical and Translational Research and as a Visiting Scientist at the National Institute on Drug Abuse, advancing interdisciplinary and global collaborations in neuroengineering and translational health research.

ENGINEERING EDUCATION PLENARY SPEAKER

Title: *Assistive augmentations to support learning*

Synopsis: Assistive augmentations to support learning is about using technology not to replace human potential, but to amplify it. From AI-powered tutors and adaptive learning platforms to speech, vision, and communication tools, assistive technologies can help learners overcome barriers, learn at their own pace, and engage with knowledge in ways that suit their individual strengths. The real opportunity is to move beyond a one-size-fits-all model of education and create learning environments where every student is empowered to understand, create, collaborate, and thrive. The future of education is not simply about smarter machines—it is about using those machines to make human learning more accessible, inclusive, and meaningful.

Plenary Speaker:



Suranga Nanayakkara is an Associate Professor in the Department of Computer Science, School of Computing, National University of Singapore (NUS). Before joining NUS, Suranga worked as an Associate Professor at the Auckland Bioengineering Institute, University of Auckland. Prior to that, he was with the Singapore University of Technology and Design (SUTD) as an Assistant Professor and was also a Postdoctoral Associate at the MIT Media Lab. He received his Ph.D. in 2010 and B.Eng. in 2005 from the National University of Singapore. In 2011, he founded the "Augmented Human Lab" to explore ways of designing intelligent human-computer interfaces that extend the limits of our perceptual and cognitive capabilities.

Suranga's work is most important to the people whose lives it directly impacts: those who face challenges functioning in our world due to sensory deficits in hearing or vision. More importantly, the technologies that Suranga has developed are not only applicable to those specific communities but potentially have a broader range of applications, due to his emphasis on “enabling,” rather than “fixing.”

Suranga is a Senior Member of ACM and has taken on a number of roles, including General Chair of the Augmented Human Conference in 2015. He has also served on many review and program committees, including SIGCHI, TEI, and UIST. With publications in prestigious conferences, demonstrations, patents, media coverage, and real-world deployments, Suranga has demonstrated the potential of advancing state-of-the-art technology in assistive human-computer interfaces. For the totality and breadth of his achievements, he has won many awards, including MIT Tech Review’s Young Inventor Under 35 Award (TR35) in the Asia Pacific region, the Outstanding Young Persons of Sri Lanka (TOYP) Award, and the INK Fellowship 2016.

LIST OF ABSTRACTS

Theme 1: Building Adaptive, Equitable, and Proactive Health Ecosystems

Title	Page No.
Age and Gender Distribution of First-Presentation St-Elevation Myocardial Infarction (STEMI) in Tertiary Care Hospitals in Kandy District, Sri Lanka *K.D.L.S. Wickramasinghe, N.K. Jayathilake, A. Rathnayake*	42
Allergy, Atopy, and Eosinophilia in Asthma: Evaluating Clinical Associations Among Patients Attending the Respiratory Clinics in Kandy *H. R. Sanchala, R.M.I.U.K. Ratnayake, G. Bowatte, B.M.G.D. Yasaratne*	43
A Machine Learning Approach to Differentiate Glioblastoma from Anaplastic Astrocytoma Using MRI *S. Rabeelashini, S. Mohideen, M.R. Sahra, M.L. Jayatilake, B. Hewavithana*	44
An Additional Component of Quadriceps Femoris Muscle Group Detected During Dissection *C.K.M. Rajapaksha, H.G.M. Gunawardhana, H.T.S.D.H. Sooriyabandara, S.B. Adikari*	45
An Integrated Web Based Machine Learning Platform for Non-Communicable Disease Risk Prediction *N.S. Jayaweera, S. Chandramowleeswaran, K.G.I. Enuka, H.H.A.I. Hettiarachchi, R.M.P.S. Rathnayaka*	46
Analyzing Expression Patterns of *COL1A1* and *MMP1* Genes in Oral Submucous Fibrosis and Oral Squamous Cell Carcinoma Patients *S. Adsaya, N. Piyarathne, S.I. Karunarathne*	47
Application of Clinical Pharmacology in Critical Care: A Retrospective Study in a Level 3 Intensive Care Unit in Sri Lanka *V.G. Pinto, A.B. Abeysundara, D.G.H. Warnasuriya, W.M.G.L.S. Weerakoon, W.T.D. Kularatne, D.G.V.S.K. Dharmasena*	48
A Retrospective Analysis of Clinicodemographic Characteristics and Habit Profile of Oropharyngeal Squamous Cell Carcinoma *I.A.S. Jayasinghe, P.R. Jayasooriya, C.N.R.A. Alles, N.S. Soysa, P.N. Amarabandu*	49
Association of *Candida albicans* with Severe vs Mild-to-Moderate Early Childhood Caries – A Molecular Epidemiological Study on a Cohort of Sri Lankan Preschool Children *K.M.S. Bandara, L.K.D.N. Wijewardhana, N.H. Senarath, L.K.N. Premathilaka, E.M.U.C.K. Herath, M.G.B. Gangadhara, M.P.C.S. Dhanapala, M.P. Paranagama*	50

Assessment of Cardiovascular Risk Factors at University Entry and Development of a Risk Predictive Model for Young Adults at the University of Peradeniya 51
L.H.G.N. Bandara, M.S. Atapattu, C.G.K. Amiyangoda

Assessment of Factors Affecting Dosimetry in High-Dose-Rate Intra-Cavitary Brachytherapy for Cervical Cancer 52
H.G.S.D. Amarathunga, L.P.G. Sherminie, S. Weerasinghe

Assessment of Perineal Pain in the Immediate Postpartum Period, Associated Factors and its Impact Among Women Undergoing Vaginal Delivery at a National Tertiary Care Hospital in Sri Lanka 53
S. Sayini, A.Y.R. Athukorala

Assessment of Plasma Hsa-mir-144-5p Expression Levels and Their Association with Glycemic Control in Type 2 Diabetes Mellitus Patients Attended at National Hospital, Colombo, Sri Lanka 54
R.A.D. Erandika, P.A.D.S. Palihaderu, B.D.D.T. Ranathunga, D.A. Satharasinghe

Assessment of Prevalence, Species and Genotypic Diversity of Oral *Candida* Associated with Dental Caries Biofilm 55
C. Gunasena1, O.W. Amarasinghe, M.P. Paranagama, S.S.S. De. S. Jagoda, J.A.M.S. Jayatilake

Assessment of the Oral Hygiene and Oral Hygiene Practices Among Patients Undergoing Fixed Orthodontic Treatment Attending Orthodontic Clinics in Dental Hospital (Teaching), Peradeniya and National Hospital, Kandy 56
B.G.M.C.S. Bandara, P.V.D.N.H. Saparamadu, G.A.S. Chandimala, D.S.A.J. Bandara, H.S.K. Ratnatilake, S.P. Abeysundara

Assessment of the Selected Small RNA Expressions as a Biomarkers in Patients with Type 2 Diabetes Mellitus Present to General Medicine Ward, National Hospital of Sri Lanka, Colombo 57
D.A. Satharasinghe, S. Satheesh, P.A.D.S. Palihaderu, M.M. Govinna

Association between Muscle Mass and Serum Creatinine to Body Weight Ratio in Patients with Diabetes Mellitus: Cross - Sectional Study from the National Hospital Kandy, Sri Lanka 58
P.A.U. Chathurani, W.A.P.P. de Silva, R.D.P. Jayawardana, C. Antonypillai, S. Gunatilake

Association between Shoulder Range of Motion and Fat Mass with Vertical Jump Performance in Volleyball Players 59
P.M.S.P. Polhengoda, A. Ariyasinghe, H.C.W. Jayasekara, S.W.B. Konara, A. Kariyawasam

Association between Sociodemographic Factors, Menopausal Stage, and Knowledge of Menopause among Women in the Nallur MOH Area 60
S. Piraveena, D. Sharmila, L. Kamalarupan, K. Nivetha

Association between the Berg Balance Scale and the Biodex Stability System's Balance Evaluation in Stroke Patients at Teaching Hospital, Jaffna 61
U. Theleepan, K. Ajantha, S. Thiruvarangan

Association of Pregnancy, Hormonal Contraceptive Use, and Substance Use with Disease Severity in Chronic Venous Insufficiency Using VCSS in a Tertiary Care Setting in Sri Lanka 62
R.M.J.B.S. Rathnayaka, K.G.D. Perera, C.A.H.M.D.A. Chandrasekara, M.M.M.A. Mansoor, V.D.P. Liyanage, S. Narampanawa

Association of Preoperative Modified Glasgow Prognostic Score with Length of Hospital Stay and Postoperative Outcomes in Hepatobiliary and Pancreatic Surgery: A Pilot Study from Sri Lanka 63
S.U.D. Samarasinghe, R.I.S. Rajapaksha, L. Weerakoon, G. Vaikunthan

Association of Sociodemographic and Clinical Factors with Nutritional Status in Chronic Kidney Disease Patients 64
D.T.M. Ariyaratne, M.S. Sagunthala, J.W.K.M.A. Jayasundara, M.I. Zainab, G.K. Nagasinghe, K.N. Nilmini

Audit of Histopathology Reporting of Oral Potentially Malignant Disorders: Compliance with Reporting Standards 65
S.M. Range, P.R. Jayasooriya

Awareness, Knowledge, Perception, and Practices Related to Digital Dentistry (DD) of The Pre-Clinical and Clinical Dental Undergraduates at the FDS, UOP 66
V.S. Walawage, A.E. Wickramasinghe, H.N.W. Wijayawardana, R.M. Jayasinghe, R.M.S.G.K. Rasnayaka, S.P. Abeysundara

Bacterial Contaminants and Antimicrobial Susceptibility Patterns on Canteen Dining Table Surfaces in a Medical Faculty, Sri Lanka 67
M.F.M. Zinhath, K.G.R.A. Kumara, G.M.T.M. Herath, U.P.R.U. Dissanayake, M.G.C.M. Muthuwaththa, M.A.A.S. Sharafa, H.D.W.S. Kudagammana

Childhood and Adolescent Cancers in Sri Lanka: A Population-Based Study from 2005 to 2022 68
A.G.A.N. Wijerathne, W.M.O.V.K. Weerasekara, S.L. Jayakody, N.S. Soysa

Clinical and Behavioral Predictors of Epithelial Dysplasia Severity in Oral Leukoplakia: A Cross-Sectional Study from a Tertiary Care Centre in Sri Lanka 69
M.N.F. Rukshana, H.N.S. Soysa, P.R. Jayasooriya, R.D. Jayasinghe

Clinical and Laboratory Profile of Chikungunya during the 2025 Outbreak in Central Sri Lanka: A Cross-Sectional Study 70
K.S. Thabrew, D.W.A. Shantha, S.R. Waidyatilleke, S.S. Senarathne, T. Manoshan, N.M.T. Anupama, L.P.M.M.K. Pathirage

Colorectal Cancer Incidence Trends in Sri Lanka from 2006 to 2022: A Join Point Regression Analysis of National Cancer Registry Data 71
K.H. Lakshitha, S.L. Jayakody, S. Jinujaan , C.N.R.A. Alles, N.S. Soysa

Comparative Dosimetric Analysis of Lung Exposure in Breast Cancer Radiotherapy with and without Supraclavicular Fossa Irradiation Using Three-Dimensional Conformal Radiotherapy 72
S. Thanusiya, L. Thasanthan, S. Gunasekara

Comparative Fitness Profiles of Sri Lankan Male Field Hockey and Football Players: A Retrospective Study 73
W.M.S.L. Wijesooriya, S.C. Manawaduge, A.S. Ariyasinghe, A. Mallawaarachchi, A. Kariyawasam

Comparison of Cooking and Non-Cooking Indoor $PM_{2.5}$ Levels and Their Association with Respiratory Symptoms among Pregnant Women in Sri Lankan Households 74
O.K.D.V.T Kumarasiri, M.R.F. Rishadha, P.N.D. Kumaranathunga, W.A.D.H.M. Wijayasinghe, C.M.J.C. Chandrasekara, K.A.N Manomi, J.M.D.C. Jayasinghe, C.B. Karunarathne, K.H.A.Y. Kariyawasam, H.M.C.R.K. Thilakaratna, C. Lin4, J. Schwarze, P. Dissanayake, T. Amarasekara, G. Bowatte, R.M.D. Madegedara, C.S.E. Goonewardena, S.W. Wimalasekara, B.M.G.D. Yasaratne

Competence in Basic Surgical Skills Among Medical Graduates Immediately After Graduation: A Self-Assessment Study 75
R.M.J.B.S. Rathnayake, S. Narampanawa, V.D.P. Liyanage, M.M.M.A. Mansoor, H. Narampanawa

Congenital Facial Nerve Palsy with Co-existing Multiple Dental Problems: A Case Report 76
N.S. Narasinghe, E.M.U.C.K. Herath

Descriptive Epidemiology of Lightning Events in Sri Lanka, 2010–2025: A Secondary Analysis of National Disaster Data 77
S.R. Waidyatilleke, T.H. Hettiarachchi, S.D. Dharmaratne

Detection of Antibiotic-Resistant Bacteria in Street-Vended Kola Kenda in Selected Locations in the Colombo District, Sri Lanka: A Preliminary Study 78
F.N. Nawas, K.D.B.M. Wijeratne

Development and Translational Evaluation of a *Garcinia cambogia*–based Nutraceutical for Urolithiasis Prevention 79
D.D.H.C. Thilakasiri, G.M. Somaratne, A.G.K. Chamodini, A. Chandrasekara, A. Bandara, A.G.K.C. Didulanga, M.A.J.N. Wijayarathna

Digital Health Systems for Improving Infectious Disease Surveillance in Developing Countries (Sri Lankan Perspective) 80
M.M.D.R. Bandara, A.N. Buddhapriya

Digitalizing CPR Skills Training: A Low-Cost Smart Manikin System with Real-Time Feedback 81
S. Ganathipan, S. Kavishanthan, V.G. Amirsha, K. Kartheepan, M.S. Peeris, H.D.W.T.D. Dassanayake, Y. Vimukthi, I.B. Nawinne

Duodenal Lipoma at D3 Presenting with Suspected Intussusception and Gastric Outlet Obstruction 82
U.V. Jayalath, B. Dassanayake, C. Dalugama

Early Budding Rete Morphology as a Histopathological Indicator of Fibrosis Progression in Oral Submucous Fibrosis: A Pilot Study 83
D.W.A. Shantha, W.J.B.S.M.S. Jayawardana, S.R. Waidyatilleke, R.D. Gallage, I.K.M.S.S. Jayathilaka, D. Yasaratne, M. Pathirage

Evaluating Daytime Sleepiness Among Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Study 84
D.W.A. Shantha, W.J.B.S.M.S. Jayawardana, S.R. Waidyatilleke, R.D. Gallage, I.K.M.S.S. Jayathilaka, D. Yasaratne1, M. Pathirage

Evaluation of Facial Asymmetry Based on CT-Axial Skull Images and Development of a CT-Based Asymmetry Index for Mandibular, Zygomatic and Maxillary Sinus Deviations across Age Groups 85
W.S.H. Nandasiri, K.L.S.S. Madhubhashini, J.A.I.N. Perera, A.L. Jayasinghe, M.G.R.S. Perera

Evaluation of the Success of Endotracheal Extubation Following Weaning from Mechanical Ventilation in a Level 3 ICU 86
V.G. Pinto, A.B. Abeysundara, P.G.D.A.P. Weerasinghe, P. Pieris, W.T.D. Kularatne, D.G.H. Warnasuriya, D.G.V.S.K. Dharmasena, W.M.G.L.S. Weerakoon

Exploration of ARID2 Gene Mutations in Oral Squamous Cell Carcinoma (OSCC): A Study of the Sri Lankan Cohort 87
K.S.N. Wijewardhana, R.D. Jayasinghe, N.M.T. Anupama, D.G.P.K. Senevirathna, R.G.S.C. Rajapakse

Factors Affecting the Applicator Geometry and the Dosimetric Variation in High Dose-Rate-Intra-Cavitary Brachytherapy for Cervical Cancer 88
S.D. Panditha, P. Abeysinghe, L. Thasanthan

Family Planning Education in Postpartum Care in Sri Lankan Hospitals 89
H.N.P. Hettiarachchi, T.H. Hettiarachchi, N.P. Jayasena, D.M.S.N. Dewagiri, D. Ranathunga, W. Abeykoon

Fatty Liver Index as a Predictor of Acute Coronary Syndrome: Evidence from a Tertiary Care Cohort at Teaching Hospital Peradeniya, Sri Lanka 90
M.R.C.L. Kularathna, D.M.P.U.K. Ralapanawa, J. Udupihille, S.U.B. Tennakoon

Fluoride Content and Antibacterial Activity of Fluoride-Containing Commercial Mouthwashes in Sri Lanka against *Streptococcus mutans* 91
A.S. Thevathasan, T.A.N.R. Thibbutumunuwa, K.H. Thilakarathne, K.S.N.D. Gunawardhana

Functional Characterization of Autologous Platelet-Rich Plasma (PRP): A Novel Therapeutic Approach for Oral Submucous Fibrosis 92
T.M.B.C. Tennakoon1, N.S. Piyarathne, S.I. Karunarathne

Histopathological Patterns of Non-Malignant Liver Diseases: A Five-Year Retrospective Study from a Tertiary Care Centre in Sri Lanka 93
K.M.K.N. Kangara, P.K.S. Tissera, T.M.A.H. Tennakoon

Holding Mothers, Not Just Babies: Social Support Mediates Breastfeeding Stress and Postpartum Well-Being in First-Time Mothers 94
M.F.F. Afrah, N.D. Selvaratnam

Household Fuel Use and Airway Inflammation in Pregnant Mothers: A Comparative Analysis of FeNO Levels in Kandy District 95
O.K.D.V.T. Kumarasiri, M.R.F. Rishadha, P.N.D. Kumaranathunga, W.A.D.H.M. Wijayasinghe, C.M.J.C. Chandrasekara, P. Priyanga, J.M.D.C. Jayasinghe, C.B. Karunarathne, K.H.A.Y. Kariyawasam, H.M.C.R.K. Thilakaratna, C. Lin, J. Schwarze, P. Dissanayake, T. Amarasekara, G. Bowatte, R.M.D. Madegedara, C.S.E. Goonewardena, S.W. Wimalasekara, B.M.G.D. Yasaratne

How Accurate is the Manual Palpation in Comparison to the Ultrasonography Confirmation of the Identification of the Cricoid Cartilage and Cricothyroid Membrane? 96
M.N.F. Najla1, V. Pinto, I.A.N.P. Abeyrathne, C.N.U. Perera, R.D.W.M.N.J. Wadimuna, D.G.H. Warnasuriya

Impact of Care Dependency on the Quality of Life of Caregivers of Children with Special Needs, Jaffna, Sri Lanka 97
S. Sasrubi, L.B.T.C. Lokubalasuriya, S. Kumaran

Incidence and Mortality Trends of Male Reproductive System Cancers in Sri Lanka: A Population-Based Study 98
W.M.O.V.K. Weerasekara, A.G.A.N. Wijerathne, S.L. Jayakody, N.S. Soysa

Incidental Dural-Based Masses Detected During a Routine Cadaveric Dissection 99
G.M.T. Dasun, W.A.M.S. Wickremasinghe, S. Sumanasekara, H.M.R.W. Angammana

Influence of Manual Dexterity and Self-Perceived Skills on Dental Skill Performance. 100
L.G.N.H. Wadasinghe, I.A. Thoradeniya, R.M.S.G.K. Rasnyaka, I.P. Thilakumara

INKIND: Analysing Psychological and Developmental Markers in Children's Drawings Through Multimodal Artificial Intelligence 101
S.N. Vidanagama, M.A.L.E.D.Z.G. Rajapaksha, E.D.S.Y. Dhanuge, K. Ratneswaran, R.M.P.S. Rathnayake

Interplay of Food Cravings, Dietary Patterns and Psychological Well-Being among Postmenopausal Women in Kandy District, Sri Lanka: A Cross-Sectional Study 102
W.P.G.A.D. Wickramasinghe, N.K. Weerasekara, A. Chandrasekara, K.I.C. Kandauda, R.P.N.P. Rajapakse, B.E.P. Mendis

Introduction to Lead Optimization of Gut Microbiota-Derived Tryptamine for Reduced Hallucinogenic and Enhanced Antidiabetic Potential 103
S.K. Malaviarachchi, U. Bandaranayake

Investigating the Prevalence of *p53* Gene Exon 4 Mutations in Oral Submucous Fibrosis and Oral Squamous Cell Carcinoma Patients 104
R.U. Jayakody, R.M.R.U. Chandrasekara, N.S. Piyarathne, S.I. Karunarathne

In Vitro Anti-*Candida* Activity of *Vateria Copallifera* Stem Bark Extract 105
S. Jayaweera, M.R.D.M. Senanayake, C. Gunasena, S. Seneweera, J.A.M.S. Jayatilake

In Vitro Anticandidal Activity of Commonly Used Commercial Mouthwashes in Sri Lanka against *Candida albicans* 106
M.A.I. Banu, T.V.M.T. Somarathna, M.P. Paranagama, K.S.N.D. Gunawardhana

Knowledge and Perceptions on Palliative Care in Adult Non-Malignant Advanced Respiratory Diseases among Medical Officers in a Sri Lankan Teaching Hospital: A Cross-Sectional Study 107
D.L. Chandima, W.A.P.H. Jayarathna, B.M.G.D. Yasaratne

Knowledge and Practices on Rational Antibiotic Use among a Selected Sample of Undergraduates at the University of Peradeniya 108
M.M.M.A. Mansoor, S.C. Manawaduge, W.W. Madubashana, N.P.P. Madusara, H.D. Manamendra, W.M.S.N.K. Navaratna

Knowledge and Practices towards Alendronate Therapy among Postmenopausal Women Treated with Alendronate at National Hospital, Galle 109
E.H.M.D. Gunawardhana, H.W.A.S. Subasinghe, K.I.M. De Silva, L.C.P.T. Liyanaarachchie

Knowledge, Attitudes, and Practice of Lifestyle Modifications Recommended for Hypertension Management among Adult Hypertensive Patients in a Tertiary Care Hospital in Sri Lanka 110
U.V. Jayalath, P. Iroshima, P. Jagathsiri, S. Jayalath, P. Januban

Knowledge, Attitudes, and Practices Regarding Dental Caries and Its Prevention Among First-Year Undergraduates at the University of Peradeniya 111
P.A. Hewage, R.M.S.G.K. Rasnayaka, H.N.F. Rimasha, M.N.F. Riska, E.D. Rupasingha

Knowledge, Attitudes, and Self-Medication Practices Regarding Over-the-Counter Drugs and Antibiotics among University Undergraduates: A Cross-Sectional Study 112
N.K. Hewanayaka, T.M.I.U.K. Tennakoon, S.P. Abeysundara

Lipid Profile Patterns in Newly Diagnosed Type 2 Diabetes Mellitus Patients: A Cross-Sectional Study from the National Hospital Kandy, Sri Lanka 113
S.H.R.A. Sarathchandra, W.A.P.P. De Silva, R.D.P. Jayawardana, C. Antonypillai, S. Gunatilake

Long-Term Physical and Psychological Outcomes in ICU Survivors: A Prospective Cohort Study 114
A.B. Abeysundara, M.D.K.I. Wickramaratne, W.T.D. Kularatne, S.U.B. Tennakoon, S. De Silva, A. Ratnayake, S.U.D. Samarasinghe, J. Udupihille, S.D.V. Abeygunawardena, P.G.D.A.P. Weerasinghe, D.G.H. Warnasooriya, P.S.K. Nanayakkara, V.G. Pinto, S.N. Abeysundara, W.M.G.L.S. Weerakoon, D.G.V.S.K. Dharmasena

Mapping "Pockets of Susceptibility": A Community Case Report on Geographic Clustering of Vaccine Hesitancy in Kandy District, Sri Lanka 115
D.M. Perera, W.M.S.N.K. Navaratna

Maternal Delivery Characteristics and Neonatal Outcomes of Teenage Deliveries Occurred in Teaching Hospital Jaffna, Sri Lanka 116
T.P.G.A.N. Nanayakkara, J. Saumya, K.A.H.S. Kumarasinghe, R. Vaanmathy, S. Raguraman, S. Sasrubi

Maternal Working Status and Psychological Quality of Life as Determinants of Antenatal Depression in Kandy District 117
W.A.D.H.M. Wijayasinghe, O.K.D.V.T Kumarasiri, M.R.F. Rishadha, P.N.D. Kumaranathunga, C.M.J.C. Chandrasekara, J.M.D.C. Jayasinghe, C.B. Karunarathna, K.H.A.Y. Kariyawasam, H.M.C.R.K. Thilakarathna, C. Lin, J. Schwarze, P. Dissanayake, T. Amarasekara, G. Bowatte, D. Madegedara, C.S.E. Goonawardena, S.W. Wimalasekara, D. Yasaratne

Molecular Detection and Genotyping of *Candida albicans* in Dental Caries Lesions of a Cohort of Sri Lankan Adults 118
V.D. Keerthithilaka, J.A.C.K. Dahampath, L.K.D.N. Wijewardhana, U.S.S. Udagedara, G.K. Edirisinghe, P.A. Hewage, M.P.C.S. Dhanapala, M.P. Paranagama

Molecular Detection of *Streptococcus sobrinus* in the Supragingival Microbiome in a Cohort of Sri Lankan Pre-School Children 119
J.A.C.K. Dahampath, V.D. Keerthithilaka, L.K.D.N. Wijewardhana, U.S.S. Udagedara, L.K.N.Prematilaka, E.M.U.C.K. Herath, B.G.T.L. Nandasena, C.S. Dhanapala, M.P. Paranagama

Multifactorial Determinants of Long-Term Glycemic Control in Type 2 Diabetes: An Institutional Study from a Tertiary Care Endocrine Clinic in Sri Lanka 120
H.H. Mathangaweera, A. Withanaarachchi, E.M.S. Ekanayake

Nutritional Status and Dietary Patterns among Hospitality Industry Employees in Sri Lanka: A Case Study of an Internationally Affiliated Hotel and a Resort 121
R.H. Gamaethige, D.M.S.S. Daundasekara, C.Y. Bandara, L.M. Rankoth

Opioid Sparing Laparoscopic Guided TAP Block in Laparoscopic Hernia Repair: A Case Series 122
S. Samarasinghe, A.S. Samarasinghe, K. Jayalath

Out-of-pocket Expenses on Outpatient Care among Patients with Diabetes during an Economic Crisis: A Single-Centre Study in Northern Sri Lanka 123
V. Sureskumar, R. Kumar

Physical Function, Pain, Depressive Symptoms, and Health-Related Quality of Life among Institutionalized Older Adults in Central Province, Sri Lanka: Preliminary Findings of a Cross-sectional Survey 124
E.M.J.S.K. Ekanayaka, I. Liyanage, E. Liyanage, D.A.R.K, Dassanayake, S.R.M.W.M. Samaranayaka, S. Rathnayake

Preliminary Identification of Phytochemicals in a Polyherbal Formulation for Oral Health Care Using LC–MS 125
L.K.D.N. Wijewardhana, K.S.N.D. Gunawardhana, P.A. Paranagama, G. Dias, L. Jayasinghe, B.M.H.S.K. Banneheka, M.P. Paranagama

Polymorphonuclear Neutrophil Counts Among Adolescents at Different Stages of Fixed Orthodontic Treatment: A Cross-Sectional Study 126
S. Ravikkumar, W.B.M.C.R.D. Weerasekera, B.S.M.S. Siriwardana

Poor Sleep Quality among Hemodialysis Patients in Sri Lanka: A Pittsburgh Sleep Quality Index Analysis 127
D.C.R. Weerakoon, I.W.S.N. Wijayawardhana, U.S.S. Ekanayake, W.M.S.P. Weerakoon, H.D.W.T. Damayanthi, J.M.K.B. Jayasekara

Position- Specific Anthropometric and Physical Fitness Characteristics of Forwards and Backs in Sri Lankan Army Rugby Players 128
S.C. Manawaduge, W.M.S.L. Wijesooriya, A.S. Ariyasinghe, S.W.B. Konara, A. Kariyawasam

Prevalence and Awareness of Thalassemia Among a Selected Cohort of Students of the Faculty of Allied Health Sciences, University of Peradeniya 129
S.A.S. Dewindi, S. Thilakarathne

Prevalence of Musculoskeletal Disorders and Their Impact on Quality of Life, and Functional Performance among Provincial School Teachers in Gangawata Korala Division in Kandy District, Sri Lanka 130
S.S. Roobini, S. Rajeswaran, M.K.N. Samadi, E. Liyanage, M.M.J.P. Manchanayake

Probable Wilson's Disease with Normal Ceruloplasmin Diagnosed Using Leipzig Criteria in a Resource-limited Setting 131
U.V. Jayalath, S.S. Wattuehwa, C. Dalugama

Radiation Exposure from Repeated Paediatric Upper Extremity Plain Radiography: A Retrospective Analysis of Dose-Area Product Values 132
S.A.G.L. Gunawardana, V. Sivakumar, H.A.S. Seram

Readiness For Self-Directed Learning Among Dental Undergraduates of University of Peradeniya, Sri Lanka 133
L.C. Dalugoda, A.W.A.Y.P. Abeysekara, N.U.I. Wijesingha, H.M.R.W. Angammana

Rising Burden of Strong Wind Events in Sri Lanka, 2010–2025: A Descriptive Secondary Analysis of National Disaster Data 134
S.R. Waidyatilleke, T.H. Hettiarachchi, S.D. Dharmaratne

Root Crown Ratios of Permanent Teeth in Patients Attending University Dental Hospital, Peradeniya 135
B.M.C.A. Bandaranayake, T. Suwathijah, M.S. Loyidcy, R.D. Jayasinghe

Salivary Hyalinizing Clear Cell Carcinoma of Minor Salivary Glands of the Palate and Clear Cell Odontogenic Carcinoma of the Maxilla - A Case Series and a Literature Review Comparing Clinicopathological Presentation 136
A.M. Fernando1, S.M. Range, P.R. Jayasooriya

Sero-Prevalence of Hepatitis A and Hepatitis E Virus Infections in Selected Urban and Estate Populations in the Kandy District of Sri Lanka 137
G.G.K.T. Thilakarathne, R.A.S.B. Randeni, M.G.C.M. Muthuwaththa, U.V. Kalansooriya, G. Bowatte, F. Noordeen

Smoking Cessation Behavior and Factors Associated with Motivation to Quit among COPD Patients at Teaching Hospital Peradeniya: A Cross-Sectional Study 138
S.M.Y. Serasinghe, W.A.P.H. Jayarathna, B.M.G.D. Yasaratne

Sociodemographic Characteristics of Patients Admitted with Heart Failure to a Tertiary Care Hospital in Sri Lanka 139
B.G.S.S.R. Jayathissa, D.M.P.U.K. Ralapanawa, K.R.N.U. Kekulawala

Socio-Demographic Factors Affecting Self-Care Practices among Hypertensive Patients Attending a Tertiary Care Hospital in Sri Lanka 140
P.M.S.P. Polhengoda, N.S.W. Ranasinghe, T.K. Weerasinghe, U.K. Ralapanawa, A. Kariyawasam

Spatial Characterization of Luminal Tapering in the Abdominal Aorta Using *In Vivo* CT Imaging 141
K. Thilakshana, E.M.M.S. Thilakarathna, M. Vaksala, L.R.S. Liyanage, M.A.J.C. Marasinghe

Spatial Epidemiology of Dengue and Leptospirosis in Sri Lanka: A Geospatial Analysis of Disease Clustering and Hotspots 142
W.A.T.W. Wijesooriya, R. Punchimanage, R. Siyambalapitiya

Statistical Assessment of Cardiovascular Health Trends among Indian Patients: Insights from Medical Records 143
N.W.I.M.S. Sewwandi, L.S. Nawarathna

Stress Factors and Coping Mechanisms among Final Year Undergraduate Students of University of Peradeniya 144
J.A.D.I. Jayakody1, D. Iddawela

Temporal Trends and Epidemiological Patterns of Non-HIV Sexually Transmitted Infections in Kandy, Sri Lanka from 2015 to 2025 145
W.M.S.N.K. Navaratna, P.H.I.M. De Silva, T.H. Hettiarachchi, W.K.N.R Chandrasiri, R.M.B.I. Rathnayake

Temporal Trends of Major Gynecological Cancers in Sri Lanka: An Ecological Study 146
R.M.B.S. Weerasooriya, S.L. Jayakody, C.N.R.A Alles, N.S. Soysa

Trends and Age-Specific Patterns of Childhood and Adolescent Cancer Incidence in Sri Lanka: A National Registry Analysis (2005–2022) 147
J.H.A.B.N. Jayathilake, V.D.P. Liyanage

Trends in Incidence and Mortality of Oesophageal Cancer in Sri Lanka: A Population-Based Analysis by Age, Sex, and Histology. 2006–2022 148
S. Jinujaan, K. H. Lakshitha, S.L. Jayakody, C.N.R.A. Alles, N.S. Soysa

Theme 2: Engineering Resilient, Productive, and Sustainable Bio-Economies

Title	Page No.
Application of Essential Oil-Infused Biopolymer Films for Post-Harvest Quality Improvement of Sour Banana (*Musa* spp.) *S.U.M. Kumarasiri, K.D.C. Pamalka, G.S.G. Liyanage*	150
Association Between Farm Management Practices and *Enterocytozoon hepatopenaei* (EHP) Occurrence in *Litopenaeus vannamei* Grow-out Farms in Chilaw, Sri Lanka *H.A.R.W. Kotuwegedara, K.K.P.R.B. Adhikaram, T.A. Gunawardana, S.H.N.P. de Silva, N.M.T. Anupama, S.S. de S. Jagoda*	151
Bioactive Properties and Heavy Metal Composition of Wild and Cultivated Morphotypes of *Kappaphycus alvarezii*: A Comparison of Raw and Cooked Forms *P.A.R. Yasawardhana, B.C. Jayawardana, R. Liyanage, H.W.S.S. Subasinghe, M. Dhamsara, P. Weththasinghe*	152
Bowen Ratio Dynamics Over the Western Indian Ocean as an Early Warning Signal for Extreme Rainfall Events in the Central Province of Sri Lanka *E.T.S. Madhubhashini*	153
Can $MgCl_2$-Modified Biochar-Based Urea Fertilizers Mitigate Nitrogen Losses? *E.M.A.Y. Hathnagoda, R.S. Dharmakeerthi*	154
Characterization of ZnO, MgO, and S Nanoparticles Synthesis via Green Synthesis from *Azadirachta indica* *W.K.D.T. Waththage, G.R.D.P. Menike, M.J.M.S. Kurera, K.M. Mewan, R.D.A.A. Rajapaksha, I.P.T.N. Gunasingha, W.M.K.T. Wickramasinghe*	155
Comparative Evaluation of Nutrient, Bioactive and Toxicological Profiles of Raw and Cooked Forms of *Sargassum polycystum* and *Padina antillarum* *S.A.I.S. Subasinghe, B.C. Jayawardana, R. Liyanage, H.W.S.S. Subhasinghe, P. Weththasinghe*	156
Comparative Evaluation of Oral Infection Methods for *Enterocytozoon hepatopenaei* (EHP) in *Litopenaeus vannamei* *H.A.R.W. Kotuwegedara, K.K.P.R.B. Adhikaram, T.A. Gunawardana, N.M.T. Anupama, S.S. de S. Jagoda*	157
Detection of *Enterocytozoon hepatopenaei* (EHP) in Pond Water and Soil: Implications for Environmental Transmission in Shrimp Aquaculture Systems of Sri Lanka *K.K.P.R.B. Adhikaram, R. Kottuwegedara, A.W. Kalupahana, T.A. Gunawardana, N.M.T. Anupama, S.S.S. de S. Jagoda*	158

Detection of Methicillin-Resistant *Staphylococcus aureus* and Extended-Spectrum Beta-Lactamase Producing Enterobacteriaceae Among Cattle and Farm Workers in Central Province, Sri Lanka 159
S. Branavan, M. Atapattu, R.N. Jinadasa, L.V.C. Liyanapathirana, W.R.P. Wijesinghe

Development and Evaluation of a Beetroot-Based Functional Sports Drink: Nitrate Standardization, Sensory Acceptability, and Ergogenic Effects on Cardiovascular Fitness in University Athletes 160
S.M.N.S. Bandara, A. Chandrasekara, N.K Weerasekara, R.P.N.P Rajapakse, B.E.P Mendis

Development of Fibre-Enriched Cookies Incorporating Psyllium Husk and Selected Underutilized Flours and Evaluation of Physicochemical and Sensory Properties 161
S.J.A. Punsarani, E.R.J. Samarakoon, K.A.D. Kalahinayake, T.P.K.M. Nanayakkara

Economic Impact of Climate Change on Paddy in Sri Lanka: A Ricardian Analysis with Future Projections 162
S.A.K.U. Sooriyaarachchi, S.N. Dissanayake

Effect of Reduced Urea Application on Rhizosphere Chemical Properties and Abundance of Nitrogen-Fixing Bacteria in a Maize-Stylo Intercropping System 163
G.D.N.M. Gammanpila, W.S. Dandeniya, K.M. Devindi, K.A.K.S. Perera, S. Edirisinghe, M.B.P.K. Mahipala

Effects of Dietary Inclusion of Tubifex (*Tubifex tubifex*) Worm Meal on Growth Performance, Stress Tolerance, and Economic Efficiency of Mrigal (*Cirrhinus mrigala*) Fry During the Fry-to-Fingerling Stage 164
B.A.D.L. Madushanka, M. Dhamsara, P. Weththasinghe

Empirical Foundations for a Spatially Cointegrated Retail Fish Price Index in Sri Lanka 165
W.A.A.H. Wijepala, E.M.E.K. Ekanayake, C. Withanage, A.M.A.S.M. Bandara, P. H. Abeysundara

Enzyme Supplementation in Rice Bran-Based Diets for Broiler Chickens: Effects on Growth Performance and Nutrient Utilization 166
W.V.G.D.L. Gamage, B.C. Jayawardana, R. Samarakoon, L.M. Rankoth, N.D. Karunaratne, P. Weththasinghe

Evaluating the Impact of Ecological and Remote Sensing Variables on Mangrove Carbon Stock Prediction Using Machine Learning 167
Y. Mathivathanan, V. Abishethvarman, K.D.N. Kumari

Evaluation of Antioxidant Activities and Phytochemicals of Edible *Kappaphycus alvarezii* Under Controlled Fermentation 168
M.A.N.F.Z. Shanfara, C.M. Peries, A.P. Henagamage, B.V.A.S.M. Bambaranda

Evaluation of Nutritional Profile and Antioxidant Activity of *Nymphaea nouchali* Seeds Grown in Sri Lanka 169
G.A.D.B.S. Dharmaprema, I.D. Weerarathna, R.W.M.M. Gunarathna, B.M.A.B. Basnayake, R. Liyanage, D.R. Uduwela, E.R.J. Samarakoon

Evaluation of the FAMACHA© System for Use in Goat Production Systems in Sri Lanka 170
I.P. Nambuge, W.S.N. Gunawardana, H.M.H.J. De Silva, N.M.T. Anupama. R.P.V.J. Rajapakse, D.S. Thilakarathne

Evaluation of the Knowledge and Adoption Level of Biosecurity Practices among Small and Medium Scale Poultry Farmers in Kandy District of Sri Lanka 171
N.M. Hettipathirana, H.M.R.P. Bandara, L. Udayanga

Gene Cassettes of Class 1 Integrons and Antimicrobial Resistance Profiles of Multidrug-Resistant *Aeromonas veronii* and *Aeromonas hydrophila* Isolated from Municipal Tap Water in the Central Province of Sri Lanka 172
Y.P. Thuduwage, R.M.P.A. Bandara, S.S.S.de S. Jagoda

High Occurrence of Extended Spectrum β-lactamase Producing and Carbapenem Resistant *Escherichia coli* Among Free Roaming Dogs in Sri Lanka 173
R. Prasanya, D.R.A. Dissanayake, K.A.V. Manaram, H.M.T.G. Alagalla, K.K.V. Fernando, W.A.P.M. Dewasmika

Human-Monkey Conflict in Contrasting Landscapes: A Questionnaire-Based Comparison Between a Managed Horticultural Estate and a Rural Village in Dambewatana, Sri Lanka 174
T.D.D. Heshan, A. Dangolla, K.B. Ranawana, H.E.M.K. Bandaranayake, B.G.S.S. Gamage

***In-situ* Morphological Characterization of a Collection of Coffee (*Coffea* spp.) Germplasm Grown in Home Gardens in Sri Lanka** 175
J.A.J.P. Jayasooriya, R.M.S.D.L. Abeyrathne, K.I.S. Thamali, S.A.C.N. Perera

***In Vitro* Evaluation of Antagonistic Potential of Native *Trichoderma asperellum* Against *Colletotrichum lindemuthianum* Causing Anthracnose in Common Bean** 176
N.M.S.D. Nawarathna, M.L.M.C. Dissanayake

Isolation and Preliminary Characterization of Phosphate-Solubilizing Rhizobacteria Associated with *Annona muricata* and *Phyllanthus emblica* Rhizospheres in North Central Province of Sri Lanka 177
H.W.W.M.U.S. Thalgodapitiya, L.H.M.T. Bandara, M.M.K. Bandara, R.G.P.T. Jayasooriya

Leveraging Voluntary Food Standards to Enhance Export Competitiveness: Evidence from Sri Lanka's Coconut-Based Processed Food Industry 178
S.P.S. Senarathna, B.E.P. Mendis, M. De Alwis, M.A.S. Swarnamali

Mangrove Conservation in Coastal Jaffna: Evidence from a Household Willingness to Pay Study 179
S. Yasintha, S.N. Dissanayake

Morphological Evaluation of Selected Vegetative Traits of Sorghum (*Sorghum bicolor* (L.) Moench) Landraces in Sri Lanka 180
B.N.D. Bogahapitiya, M.J.M.S. Kurera, D.R. Gimhani, A.L.J. Bandara, V.H.B.S. Somasiri,U.G.D.S. Gunawardhana, P.G.S.C. Ariyarathne

Occurrence of *Salmonella* spp. and *Escherichia coli* in Retail Broiler Chicken Manually Processed in Live Bird Handling Shops and Their Hygienic Practices Within Colombo Municipality – Preliminary Findings 181
A.P.V. Kavidya, P.A.U. Sewwandi, I.A. Perera, K. Thananjayan, Y.D. Gunasekara, A.W. Kalupahana, R.S. Kalupahana

One Health Insights into *Staphylococcus aureus* in Live Bird Handling Meat Shops of Colombo Municipality – Preliminary Findings 182
P.A.U. Sewwandi, I.A. Perera, Y.D. Gunasekara, U.P.R.U. Dissanayake, E.G.W. Gunawardena, K.S.A. Kottawatta, H.M.T.K. Karunarathna, L.V.C. Liyanapathirana, R.S. Kalupahana

Prevalence and Minimum Inhibitory Concentration Profiling of Amoxicillin-Resistant Bacteria in Coastal Waters of the Northern and Southern Provinces of Sri Lanka 183
U.B.K. Silva, J.A.G.V. Sewmi, G.Y. Liyanage, A.K.M.M.K. Meddage, P.A.A.S. Adhikari, P.M. Sadupama, P.M. Manage

Role of AWD in Compensating the Climate-Induced Paddy Productivity Losses in Sri Lanka 184
E.M.N. Manjula, S. Dissanayake, J. Weerahewa

Role of Macrofauna in Farm-Level Prevalence of *Enterocytozoon hepatopenaei* (EHP) in Shrimp Aquaculture Systems in North Western Province of Sri Lanka 185
K.K.P.R.B. Adhikaram, H.A.R.W. Kotuwegedara, A.W. Kalupahana, T.A. Gunawardana, N.M.T. Anupama, S.S.S. de S. Jagoda

Sensor-Integrated Tracking System for Food Waste Management: A Cost-Effective Mitigation Strategy for the Sri Lankan Hospitality Sector 186
D.M.N. Jesika, G.M. Somaratne, N.S. Dharmaratne, D.W.N. Sandanika, T.P.G.K. Upathissa, M.A. Samarasekera

Structural and Functional Insights into *Rc* Allelic Variation Governing Pericarp Pigmentation in Sri Lankan Traditional Rice Germplasm 187
W.K.K.I.K. Rathnayaka, D.R. Gimhani, D.S. Liyanage, L.P.M. Kumarasiri

Structural Characterization of Salinity-Responsive *OsSWEET15* Allelic Variants in Sri Lankan Traditional Rice Germplasm 188
U.J. Nishshanka, D.R. Gimhani, D.S. Liyanage, A.M. Kariyawasam, L.P.M. Kumarasiri, U.D.G.S. Gunawardana

Supplementation of Yeast Fractions (Safmannan®) in Broiler Diets: Effects on Growth Performance and Nutrient Digestibility Under High Stocking Density 189
V.S.A. Vidanapathirana, B.C. Jayawardana, R. Samarakoon, N.D. Karunaratne, L.P.I.N.P. Jayawardene, S. Singh, K.H.M.N.B. Konthasinghe, J. Guluwattha, W.V.G.D.L. Gamage, P. Weththasinghe

Synergistic Enhancement of Oxacillin Efficacy Against MRSA Using Green Synthesized Silver Nanoparticles from *Syzygium cumini* Leaf Extract 190
V.Janarthani, T.P. Gamagedara

Temporal Infection Dynamics of *Enterocytozoon hepatopenaei* (EHP) and its Association with Shrimp Growth Performance in Commercial *Litopenaeus vannamei* Farms in Chilaw, Sri Lanka 191
H.A.R.W. Kotuwegedara, K.K.P.R.B. Adhikaram, T.A. Gunawardana, S.H.N.P. de Silva, N.M.T. Anupama, S.S. de S. Jagoda

The Effect of Two Fungal Species Isolated from Sporocarps of *Marsilea minuta* on Paddy Seed Germination and Early Seedling Growth 192
K.P.A.S. Pathirana, N.S. Gama-Arachchige

Traditional Sweetener to Functional Food: Improving the Bioactive Profile of Kithul Treacle through *Tabernaemontana divaricata* Nectar-Microbiome Fermentation 193
K. Ravi, U.B.K. Silva, A.H.A. Samarakkody, E.W.B.K. Perera, T.L. Jayasuriya, P.A. Sewwandi, R.B.N. Dharmasiri

Theme 3: Engineering Intelligent, Sustainable, and Human-Centric Systems

Title	Page No.
A Clamp-On Magnetic Field Energy Harvester for Self-Powered Dynamic Line Rating Sensor Nodes *H.M.D.D. Nawarathne, A.S. Bandara, S.J. Siriwardena, T.M.T.N. Thennakoon, J.B. Ekanayake*	195
A Cloud-Native Dynamic Pricing Engine for Shared Parking Using Demand Forecasting *T.P.H. Nethmin, S. Nishankar*	196
A Comparative Analysis of the Energy Demands and Runtime of Large Language Models when Deployed on User-Side Devices *H.U. Ahamed, A.L.A.D.T.T. Aturusinghe, D.M.K.N. Dewmini, M.G.S.K. Jayarathne*	197
A Multi-Agent AI Framework for Real-Time Flood Disaster Response Using Satellite Imagery and Geospatial Analysis *M.B. Abeywardena, R.W.V. Imansha Dilshan, A.L. Supun Tharaka, I.H.R.P. Iddamalgoda*	198
A Regenerative Braking System for an Open Wheeled Single Seater Rear Wheel Drive Formula-Type Race Car *P.K.W.R.M.T.R.B. Pilapitiya, W.A.T.A. Wedisinghe, M.T.M.M. Thajudeeen, W.M.A.A.B. Weerakoon, A.T.G.S.K. Ampitithanne, H.M.D. Illankoon, H.M.A.D.K. Herath*	199
A Unified Comparative Analysis of Attention Mechanisms for Pneumonia Detection in Chest X-Ray Images *T. Selvarasa, A. Ramanan*	200
A Wireless Soft PLC Architecture for Scalable and Cost-Efficient Intelligent Automation Platform for Precision Agriculture *S.J. Siriwardena, A.S. Bandara, J.B. Ekanayake, B.G.L.T. Samaranayake*	201
Accuracy Comparison of Lightweight Vision-Language Models for Multimodal Fake News Detection *E.M.C.P. Ekanayake, D. Herath*	202
Accuracy Comparison of Machine Learning and Statistical Methods for Daily Rainfall Estimation in the Kelani River Basin, Sri Lanka *S.W. Kamburugamuwa, M.M.G.T. De Silva, H.M.D.K. Herath, N.G.P.B. Neluwala*	203
An Integrated Computer Vision Framework for Structural Defect Identification, Quantification, and Multi-Parameter Severity Assessment in Reinforced Concrete Beams *U.L.N.T. Bandara, H.M.P.B. Ariyaratne, J.A.S.C. Jayasinghe, U. Jayasinghe*	204

An Integrated Machine Learning and Geospatial Framework for Predicting Residential Solar Yield and Financial Return Forecasting in Sri Lanka 205
R.S.P.S. Uthsara, D.G.S. Akalanka, O.K.D.T. Sulakshani, P.W.G. Harshitha, R.M.P.S. Rathnayaka

Autonomous Stakeholder Conflict Resolution in Requirements Engineering Using an LLM-Based Negotiator Agent 206
M.Z.I.A.A.S. Ibrahim, V. Abishethvarman, B.T.G.S. Kumara

Cognishift: A Multimodal Deep Learning Framework for Real-Time Cognitive Load Detection and Adaptive Human-Computer Interaction Optimization 207
S.H.C. Indeewaree, G.K.S. Jayalath

Computational Fluid Dynamic Investigation of Wind Interference Effects and Structural Adequacy of Tall Chimney Structures 208
D.N. Liyanage, J.A.S.C. Jayasinghe, A.J. Dammika

Cost-Effective 3D Localization of RFID-Tagged Inventory Using SAR with a Moveable RFID Reader 209
P.D.B.S. Nayanachandra, D.A.A. De Silva, P.B.M.M.N.B. Basnayaka

Data-Driven Indoor Localization and Mobility Tracking Using LSTM-Based Feature Learning 210
L.P.S.S. Dissanayake, M.B. Dissanayake, S.A.H.A. Suraweera, M.W.P. Maduranga

Design and Development of a Performance Improved Cost Effective Open-Wheel Single Seater Race Car 211
G.G.K.T. Galpokuna, R.M.C.N. Rajapaksha, K.G.T.D. Karunarathne, A.G.S. Mishali, P.L.R.S. Nissanka, M.F.M. Razmy, M.Z. Usman, S.S.R.P.P.M.J.C. Abeyrathne, K.D. Pathiraja, H.M.A.D.K. Herath, H.M.D. Ilankoon, J.M.A.N. Jayathilake

Design and Digital Control of a Full-Bridge LLC Resonant Converter for a 1kW Off-Grid Solar Microinverter 212
T.M.T.N. Thennakoon, J.B. Ekanayake

Design and Evaluation of a Web Application for Improved Allergen Control in Large-Scale Catering Operations 213
S.D. Tharangani, G.M. Somaratane, N.K.B.L.M. Bandara, K.A.P.N. Rathnasekara, Y.B.M.D.C.Y. Bandara, C.P.K. Lekamalage, D. Samarakoon

Design and Evaluation of Sustainable PLA-Based Composite Filaments Using Local Bio-Waste for 3D Printing 214
R.A.R.S. Jayasekara, A. Ratnaweera

Developing Culturally-Sensitive, Adaptive Text-Based Pedagogical Agents to Enhance User Experience in E-Learning Platforms 215
W.A.E.M. Weerasinghe, K.P.P.S. Pathirana, E.M.U.W.J.B. Ekanayake, H.M.S.N. Ariyadasa

Development and Validation of a Low-Cost, Wearable Piezoelectric Digital Stethoscope for Phonocardiogram Signal Acquisition 216
A.J.A. Naim, A.L.A. Haathi, R.D.B. Ranaweera, J.V. Wijayakulasooriya, D. Nandadeva, A. Ratnayake, K.B. Divulwewa

Development of a Custom Embedded Control Architecture for Wireless Electro-Hydraulic Operation of an Omni-Directional Diesel Forklift 217
M.G.C.N. Ranasinghe, A.N.B. Jayathilaka, H.M.D. Ilankoon

Development of a High-Fidelity 3D Dataset for Automated Construction and Demolition Waste Sorting 218
S.A.R.R. Suraweeraarachchi, U.G.U.P. Samarasekara, H.D.S.M. Jayawardhana, J.A.S.C. Jayasinghe, U. Jayasinghe, C.S. Bandara

Development of an Ultra High Performance Fibre Reinforced Concrete (UHPFRC) Retrofitting Framework for Reinforced Concrete Beams 219
R.S.S.A. Wijesundara, I. Abeykoon, N.M.S.H. Bandara, K.K. Wijesundara

Digitalizing Natural Rubber Metrology: A Multi-Parameter IoT Terminal for First-Principles DRC Measurement and Fraud Detection 220
H.D. Suriyapperuma, N.C. Manilgama, A.D. Rukshan, K.A.P.M. Perera, Y. Vimukthi

Dynamic Simulation and Control of a Wind Powered Chlor-Alkali Electrolysis System 221
R.B.G.D.N. Rajapaksha, N. Fernando

Effect of TiO_2 Nanofiller Particle Size on the Performance of Cellulose Acetate-Based Quasi-Solid-State Electrolytes for Dye-Sensitized Solar Cells (DSSCs) 222
P.U. Sandunika, M.A.K.L. Dissanayake, G.K.R. Senadeera, J.M.K.W. Kumari

Enhancing Developer Productivity through Hybrid Knowledge Graph–LLM Integration in Software Engineering Environments 223
M. Vaishaly, S. Vasanthapriyan, T.D. Rubasinghe

Enhancing Stock Price Simulation: A Case Study on Long Short Term Memory Network Model for Geometric Brownian Motion Based Colombo Stock Exchange Price Simulation 224
R.A.A.U. Amarasinghe

Evaluating Out-of-Domain Performance Prediction Methods Under Domain Shifts 225
P. Weerasinghe, R. Tennakoon, J. Thangarajah, D. Herath

Experimental Investigation of Local Heat Transfer Coefficients of a Minichannel Evaporator with Propane as the Refrigerant 226
H.A. Malshani, W.P.D. Fernando

Explainable AI-Driven Zero-Trust Anomaly Detection for Encrypted Traffic 227
J.K. Wanasinghe, M.C.S.J. Perera, A.R.S.S. Wijewardhana, S.N. Karunarathna, U. Jayasinghe

Feasibility Study and Implementation of Electric Vehicle Conversions for Motorcycles in Sri Lanka 228
H.D.S.M. Jayawardhana, K.U. Ranathunge, L.U. Bakmeedeniya, T. Wickramarathna

Federated Agentic Defense for Zero-Day Attacks: A Three Agent IDS with a Federated to RAG Bridge 229
G.S. Seneviratne, B.G.L. Niroshan, B.V.R.R. Jaysinghe, S.N. Karunarathna, U. Jayasinghe

From Policy to Practice: A Comparison Data Mining Study of Blended Learning Adoption at the Faculty Level Using LMS Log Data 230
I.P. Ratnapala

Graphene Oxide-Modified Epoxy Coatings for Mitigating Corrosion in Concrete Sewers 231
P.R.T. De Silva, P.W.G.R.S. Wijeratne, S. Yadav, K.C. Chandrasiri, B.K. Pramanik, K.G.N. Nanayakkara

Hybrid Deep Learning Framework for Unsupervised Anomaly Detection in DOGE/USD Cryptocurrency Price Movements 232
H.W.S. Kaushalya, N.A.D.N. Napagoda

Hybrid Deep Learning-Based Classification of Type-1 and Type-2 Code Clones Across Multiple Programming Languages 233
H.K.G.S. Prabodhani, S. Vasanthapriyan, T.D. Rubasinghe

Impact of Progressive Corrosion on Nonlinear Damping Behavior in Reinforced Concrete Elements 234
G.B. Dissanayake, A.J. Dammika, C.S. Bandara, J.A.S.C. Jayasinghe

Influence of Graphene Quantum Dot Integration Strategies on Charge Transport and Efficiency in TiO_2-Based DSSCs 235
G.G.S. Sewwandi, M.A.K.L. Dissanayake, G.K.R. Senadeera, J.M.K.W. Kumari, P.U. Sandunika

Integrated RGB-Thermographic and Machine Learning Approaches for Crack Depth Evaluation in Concrete 236
M.D.C.A. Karunarathna, G.A.R.H.S. Rathnayake, A.J. Dammika, J.A.S.C. Jayasinghe

Machine Learning-Based Approach for Classifying Damaged Characters in Early Brahmi Sri Lankan Inscriptions 237
G.C.J.I. Guruge, U.D.R.S. Thilakarathna, M.B. Dissanayake, A.J. Pinidiyaarachchi, W.I. Malsiri, M. Niranjan

MESH: A Multi-Stage Benchmark for Mockery, Extremism, Sarcasm, and Hate Speech Jailbreak Vulnerabilities in Open-Source LLMs 238
S. Mithushika, S. Sweshthika, T. Kayalvizhy

Modelling and Simulation of Low Temperature Oxidation Process of Iron Powder 239
W.M.S.N. Wahala, N. Fernando

Monocular Dense 3D Reconstruction of Construction and Demolition Waste on Conveyor Systems Using Motion Stereo 240
U.G.U.P. Samarasekara, S.A.R.R. Suraweeraarachchi, H.M.P.B. Ariyaratne, J.A.S.C. Jayasinghe, U. Jayasinghe, C.S. Bandara

Multi Disease Detection in Tomato Leaves Using Deep Learning with Explainable AI (XAI) Techniques 241
A. Thiviyaraj, D.M.A.P.S. Dissanayaka, V. Vinoharan

Nonlinear Stability and Structural Resilience of Interlocking Jetty Systems for Bridge Support 242
D.H. Gallehewa, D.M.A.G.B Dissanayake, J.A.S.C. Jayasinghe

Real-Time Grid Characteristics Estimating using Large Scale Solar PV Plants to Provide Dynamic Ancillary Services 243
G.A.R. Virajitha, R.A.H.B. Dharmadasa, H.M.N.M. Herath

Sensitivity-Based Coordinated P–Q Allocation for Active Power Maximization in Ring Microgrids 244
H.M.M.N. Herath, H.M.L.D. Herath, E.M.T.L.K. Ekanayake, S.G. Abeyratne, K.S. Walgama, H.M.N.M. Herath

SinhSafe: A Deep Learning Approach to Sinhala Harassment Detection 245
P.D. Thilakasiri, D. Herath, S. Deegalla

Smart AR Trainer: Personalized Real-Time Posture Correction and Augmented Reality Feedback Framework for Home Workout Activities 246
S. Kamsala, S. Sangavan, T. Nivethiha, R. Priyatharsan, J. Thayanithi, K.A.S.H. Kulathilake

Stearic Acid Functionalized Biomass Fly Ash-Epoxy Composite Coating with Enhanced Hydrophobicity and Self-Cleaning Properties 247
P.W.G.R.S. Wijeratne, P.R.T. De Silva, S. Yadav, K.C. Chandrasiri, B.K. Pramanik, K.G.N. Nanayakkara

Time-History-Based Evaluation of Wind-Induced Serviceability Response in High-Rise Buildings 248
R.M.T.D. Wijayarathne, K.M.S.M. Jayarathna, K.K. Wijesundara

Towards Affective-Aware Online Teaching: An AI-Enabled Decision-Support Framework for Synchronous Learning Environments 249
A.A.H.V. Athauda, R.G. Ragel, U. Jayasinghe

Two-Dimensional Hydrodynamic Modelling for Flood Inundation Mapping in the Upper Kelani River Basin: A Focus on the Ruwanwella Tributary Confluence Zone, Sri Lanka 250
S.A.A.N. Abeywickrama, P. Neluwala

Urban Growth and Forest Change in the Kandy-Mahaweli Corridor: A Satellite Image Processing Study 251
C. Tharun

Valorization of Biomass Fly Ash for Magnesium Silicate Hydrate Synthesis 252
R.M.M.S.M. Rajapaksha, S.K. Weragoda, G.B.B. Herath, B.K. Pramanik, V. Jegatheesan, D.S.B. Navaratna

Valorization of Water Treatment Sludge as a Sustainable Wall Putty: Characterization, Formulation, and Performance Evaluation 253
M. Senanayake, P.S.S. Perera, L.U. Rathnayake, A.J. Dhammika, R.M.L.D. Rathnayake

Theme 4: Human Frameworks for Shaping Equitable and Meaningful Futures

Title	Page No.
A Critical Study of Literary Insights into Post-Humanist Characteristics in Modern Cinema (Based on the Films Her, The Matrix, And Blade Runner 2049) *U.J.M.R.S.B. Jayasinghe*	255
Addressing the Ecological Paradox: Utilizing the Taoist Concept of Yin-Yang Balance as a Philosophical Basis for Modern Global Environmental Crises *Rev. Wanduramba Suseela*	256
AI-Generated Crime and Gaps in Criminal Liability: A Sri Lankan Perspective on Emerging Legal Challenges *D.N.Y. Weerakoon*	257
An Analysis of Chanting as a Mechanism for Disciplinary Knowledge Preservation and Identity Formation (5th-century Sri Lanka) with Special Reference to the Brahmajala Sutta and its Commentary *Ven. P. Gnanalakkhana*	258
Analysis of Community Perceptions on the Challenges and Potential for the Redevelopment of the Kantale Sugar Factory *J.M.S.K. Chandrasiri, N.W.S. Nanayakkara*	259
Applying Theatre and Play-Based Psychosocial Interventions in Disaster Relief Camps: Behavioral Observations from Kandy District of Sri Lanka *I.M.L.K. Gunasena, E.M.Y.I. Ekanayake*	260
Awareness and Usage of Digital Extension Tools among Agricultural Extension Officers of Western Province, Sri Lanka *R.A.N.D. Amarasinghe, U.I. Dissanayeke, G.A. Gow, S.B.A.M.A.M. Gunawardena*	261
Barriers to Inclusive Education for Children with Autism Spectrum Disorders in Sri Lanka: A Rights-Based Analysis from Parents' and Teachers' Perspectives *A.H.M.S.A.K. Abeyrathne, H.D.P. Premarathne*	262
Between Tradition and Justice: Examining Legal Barriers and Judicial Protection of Women's Property Rights Under the Tesawalamai Law in Sri Lanka *S.T.D. Sandanayaka*	263
Code-Switching Patterns among Multilingual Higher Education Students in Sri Lanka: A Study of Sinhala-Tamil-English Trilingual Discourse *S.M.T.D. Sarathchandra, C.G.H.S.D. Chandrasekara*	264
Coffee Culture in a Sacred Heritage City: An Ethnography of Cafés in Kandy, Sri Lanka *W.A.M.S. Wijesuriya*	265

Compulsory Licensing for Climate Emergencies: Reimagining Sri Lanka's Patent Law for Green Technology Access 266
Y.T. Pitawala

Constitutional Safeguards Against the Challenges of Artificial Intelligence: A Comparative Study of Sri Lanka and India 267
L.P.P.P. Liyanapathirana, B.S.R. Fernando

Crowdsourced Tourism Mapping for Sustainable Destination Management in Sri Lanka 268
P.G.R.A. Nayanthima, P.G.T. Poornika, R.M.K. Kumarihamy, T. Kithsiri

Demographic Moderation of Adaptation Challenges in the Adoption of Sri Lanka's Digital National Identity System: A Multi-Group Analysis 269
M.A. Sarathchandra, A. Gamage

Developing Students' Mathematical Problem-Solving Skills through Strengthening Conceptual Understanding: An Action Research Conducted in the Matale Education Zone 270
K. Wijethunga, S. Wijesundera

Development and Evaluation of a Digital Learning Repository for Agricultural Higher Education: An Action Research Approach 271
W.R.M.R.L.K. Wickramasinghe, S.K. Satharasinghe, A. Angammana, U. Dissanayeke

Digital Platforms and Women's Economic Empowerment: A Study of Socioeconomic Transformation in Southern Sri Lanka 272
G.G.D. Sewwandi

Environmental Meditation among Youth: Awareness, Perceptions, and Practices 273
J.M.S.S. Jayawardhana, S.I.W. Gunasekara

Environmental Protection as a Fundamental Right: A Pathway to Sustainable and Equitable Futures 274
G.M.K.S.K. Ganegama

Ethical Concerns in Television News Reporting of Male Deaths in Sri Lanka: A Case Study Approach 275
K.H.E. Gunasingha, E.A.D.A. Edirisinghe

Ethics Behind the Screen: A Social Scientific Analysis of Advertising Practices in Contemporary Sri Lanka 276
M.A.G.M. Munaweera

Evaluating Fiscal Policy Reforms in Sri Lanka through a Multi- Sector, Multi-Household Computable General Equilibrium (CGE) Model 277
A.G.S.N. Karunarathne, S.A. Weerasooriya

Examining the Effects of Conflicts Among Teachers on Teachers' Psychological Behavior 278
S. Madhusara, A. Gamage

Examining the Impact of Social Capital on Quality of Life: An Empirical Study Using Structural Equation Modeling 279
M.K.N. Pabasara, E.M.S. Ekanayake, S.K. Naradda Gamage, S.D.A. Sumanapala, R.P.I.R. Prasanna

Exploring Freshers' Participation in Self-Learning Activities in an English Intensive Program: Towards Human-Centered and Equitable Learning 280
W.S.A. Fernando

Exploring the Integration of Hindustani Classical Music in Promoting Sinhala Buddhist National Identity Among the Sinhalese 281
M.L.N.P. Meddegoda

Exploring the Professional and Ethical Challenges of Government Counsellors in Sri Lanka 282
S. Dickmadugoda, S.I.W. Gunasekara

Exploring the School Students' Awareness, Perception, and Demand for Technical and Vocational Education and Training (TVET) in Sri Lanka 283
T.N. Kannangara, H.D. Premarathne

Exploring the *Vīṇā* through the Buddhist Preaching Texts in Sri Lanka 284
I.B.K. Dehideniya

Factors Affecting the Science Achievement Level of Junior Secondary Students in Sri Lanka 285
D.M.K.M. Dissanayake

Forum Theatre as a Pedagogical Tool for Fostering Creative Thinking among Middle School Students in an International School 286
L.B.R.W.A.M.R.U. Lankathilaka, S.L P. Fonseka

From Colonial Heritage to Tourism Asset: A Case Study of the Historic Pink Post Office Building in Nuwara Eliya 287
R. Vijay

From Knowledge to Action: Transformative Environmental Sustainability Learning in the Junior Science Classroom 288
T.I.S.S. Liyanage, S.Y. Ekanayake, P.M.C.S. De. Silva

Gender Differences in Behavioral Intentions to Adopt Seaweed Farming in Northern Sri Lanka 289
P.E. Madhuranga, K.P.P. Kopiyawattage, P. Weththasinghe

Governing Climate Change for Sustainable Futures: Integrating Environmental Policy and Legal Frameworks 290
S.S.S. Vitharana

Human Frameworks for Shaping Equitable and Meaningful Futures: A Systematic Review of Inequality, Marginalization, and Mental Health in Sustainability Transitions 291
K.P.D.S. Kandangamuwa

Human Security Issues among Sri Lankan Refugee Returnees from India Resettled in the Kilinochchi District 292
S. Sivakanthan, A. Sayanthiny

Impact of Integrating Artificial Intelligence and Digital Tools on Enhancing Student Motivation and Learning Achievement in Science Education 293
H.A.P. Chandimal, T.M.S.S.K. Yatigammana

Impact of Integrating Intercultural Communicative Competence (ICC) into Undergraduate English for Academic Purposes (EAP) Classrooms 294
G.G.K. Vindika, P.K. Karunarathne

Impact of Wild Animals on Chena Cultivation in Sri Lanka: A Case Study of Buttala DSD 295
A.M.I. Dilshani, N.W.S. Nanayakkara

Impacts of Frequent Flooding on Small-Scale Agriculture in the Nilwala River Basin: A Case Study in Bandaththara-Deeyagaha 296
S.W.J. Chathurangani

Intimidation and Strategic Shielding: Exploring the Role of English as "Kaduwa" in the Professional Experiences of a Selected Group of Sri Lankan Lawyers 297
W.M.C.A. Wickramasinghe, R. Rassool

Maqasid al Shari'ah and Contemporary Social Justice Discourse: An Analysis of Muslim Community Perceptions in Sri Lanka 298
K.M.M. Azam, A.R.I. Rauff

Narrating Empire and its Afterlives: Predacity, Moral and Structural Violence in Heart of Darkness 299
A.M.J.H. Amandakoon, L.B. Nelundeniya

Navigating Pressure and Performance: Stress and Job Satisfaction Among Sri Lankan Insurance Agents 300
C.C. Senevirathne, P.M. Edirisinghe

Perceptions on the Effectiveness of Zakat and Waqf for Poverty Alleviation among Sri Lankan Muslims 301
K.M.M. Azam

Piloting the Feasibility of the Mentalization-Based Psychological Intervention Program Among Young Male Offenders in Sri Lanka 302
J. Janushiya, K. Hettigoda

Prevalence of Psychological Distress Among Undergraduate Students in State Universities in Sri Lanka 303
H. Liyadipita, S. Herath

Problematic Dimensions in the Philosophy of the *Bhagavad Gitā* 304
W. M. S. K. Wijesundara

Remote Work Experiences and Employee Well-Being: Evidence from Three Software Development Companies in Sri Lanka 305
D.M.P.T. Jayawardhane, S.A.S. Dasun

Role of Women in Agricultural Decision-Making: A Case Study of the North Central Province of Sri Lanka 306
T. Weerasinghe, B.U.I. Prabhavi, K.P.P. Kopiyawattage

Spatial and Temporal Dynamics of Agricultural Resilience: A Multivariate Analysis of Paddy Productivity in Sri Lanka (2024/2025 Maha Season) 307
J.M.J. Nipunika

Spatial Validation of MSME Location Choices in Kandy Grid City: A GIS-Based Analysis of Accessibility, Visibility, and Commercial Centrality 308
I.A.K. Wickramapala, U.N. Jinadasa, S. Subasinghe, S. Maheswaran, M.T.M. Dewasurendra

Spatio-Temporal Analysis of Land Use Transformation in the Haputale DS Division Using Remote Sensing and GIS 309
A. Pradeepa

Teacher Awareness and Use of AI-Assisted Tools in Secondary Classrooms: A Study of the Mathugama Educational Zone, Sri Lanka 310
V. Lindakumbura, S.M.K.S.M. Samarakoon

The Body Remembers What the Recipe Cannot: Embodied Knowledge and Cooking as Performance 311
*T. Gunasekara**

The Coconut-Shell *Vīṇā* and the Colonial Gaze: Representations of String Instruments in Colonial Sri Lanka 312
I.B.K. Dehideniya

The Contribution of Jean-Jacques Rousseau to the Development of Modern Educational Thought 313
M.L.L. Rosin, M.S.M. Jayeeth

The Impact of Karma Theory on Disability Identity in *Kusa Jatakaya*: An Intermedial Study of a Sinhala Jataka Story 314
W.N.D.N. Wijesiri

The Impact of Tourism on Village Economy: A Case Study of Heritage Tourism in Sigiriya 315
D.H.K. Dasanayake

The Role of Islamic Inheritance Law in Reducing Wealth Inequality: A Socio Economic Analysis 316
A.M.R. Farwin

The Role of Livelihood Diversification in Enhancing Household Food Security: A Case Study of Tea Plantation Communities in Loolkandura, Sri Lanka 317
E.G.T.P. Jayathilake

Towards Sustainable Coexistence: An Ethical Evaluation of Technological Solutions to Human-Elephant Conflict 318
R.S.P.H.M.R.B.V. Meedeniya

Traditional Medical Practices and Folklore in Sri Lanka: A Historical and Cultural Analysis of 'Kem' Rituals and Mantras in the Benthara Region 319
K. Karunathilaka

Trends, Causes and Socio-Economic Issues of Divorce Among Muslims in Batticaloa District 320
M.H.F. Haseeba, S. Sivakanthan

Wellbeing, Burnout, and Stigma among Tamil Mental Health Professionals in Post-War Sri Lanka: A Qualitative Inquiry 321
G. Sarveswaran, N.D. Selvaratnam

Wheel-Praxis: Negotiating Identity, Faith, and Status on the Sri Lankan Roads 322
T. Kithsiri, M. Wijesuriya

Theme 5: Designing Adaptive and Purpose-Driven Architectures for Tomorrow

Title	Page No.
An Analysis of Factors Driving Psychological Pricing Strategies: A Case Study of the Apparel Retail Industry in Sri Lanka *S.A.K.K. Satharasinghe, D.V.P. Prasada*	324
Building Entrepreneurial Resilience under Polycrisis: A Multiple Case Study of SMEs in Kandy, Sri Lanka *G.P.K. Priyadarshani, K.A.S.S. Kodithuwakku*	325
'Consumer Sovereignty' in the Healthcare Marketplace: Detours and Companions in Navigating the Healthcare Journey of Subsistence Rural Sri Lanka *W.M.H.U. Wijethunga, S. Gallage, P. Sanchez- Compos*	326
Employer-Perceived Gen Z Graduate Career Skills Driving Sustainable Employability in Industry 5.0: Evidence from Sri Lanka *W.P.R Wickramaratne*	327
Exploring Eco-Innovation Practices in the Coffee Industry: A Multiple Case Study in Central Province, Sri Lanka *K.P.I.I. Weerasinghe, S. Maheswaran*	328
Exploring the Adoption of Digital Twin Technology in the Sri Lankan Apparel Industry *K.K.N. Pushpakumara, A.M.A.S.M. Bandara*	329
Factors Affecting the Employability of Indigenous Medicine Graduates in Tourism and Hospitality Industries *W.A.K.B. Wettasinghe, D.V.P. Prasada*	330
Factors Affecting the Low Adoption of Government Online Services: Special Reference to Uva Province, Sri Lanka *R.M.M.D. Ranmula, T.S.S. Fernando*	331
Feeling the Brand: How Sensory Experiences Build Equity Through Customer Affective Commitment in Young Consumers *R. Dayaleni, R.M.U.R.K. Rathnayake*	332
From Classrooms to Capital Markets: How Financial Literacy Shapes Investment Decisions Among Management Undergraduates at the University of Peradeniya, Sri Lanka *M.S.F. Jaisha, S. Yamuna*	333
Gender Inequality and Labor Exploitation among Women Plantation Communities: A Sociological Study in Loolkandura Estate, Deltota Divisional Secretariat *R. Surendran*	334

Impact of Green Organizational Culture on Organization Citizenship Behaviour for the Environment (Special Reference to the Sri Lankan Hotel Industry) 335
T.M.N.S. Dissanayaka, U.W.G.Y.E. Jayawickrama

Management of Frugal Innovation and Traditional Ecological Knowledge in Sri Lankan Homestays: Enhancing Sustainability and Backpacker Tourism 336
B.A.N. Eranda, R.H. Kuruppuge, D.M.S.M. Dasanayake, H.R.D.A. Priyantha

Motivations for Starting Additional Businesses Among Pluriactive Farmers: Evidence from Imaduwa, Galle 337
S. Kariyawasam, K.A.S.S. Kodithuwakku, N.B. Kandangama

Perspective of Bank Employees on The Impact of Green Process Innovation on Green Finance of Sri Lankan Banks 338
N. Kogularamanan, S. Kishok Chandrakumar, P. Kuhaparan, G. Thaarani

Study on Drivers Affecting Sustainable Consumption Behaviour with the Mediating Effect of Minimalism: Evidence from Millennials Referring to the Sustainable Fashion Industry 339
P.G.J. Sithma, H.W.R. Niwarthana

Study on Explore the Minimalist Consumption Behavior Among Sri Lankan Millennials 340
P.G.S. Jithma, W.M.H.U. Wijethunga

The Exploration of the Potential Benefits of Implementing E-Procurement for the Procurement of Medicines in the Sri Lankan Public Health Sector 341
D.M.B.K. Jayasundara, D.M.S.M. Dasanayake

Wallets or Values: A Qualitative Exploration of Price Sensitivity and Environmental Consciousness of Consumers in the Context of Sri Lanka's Single-Use Plastic Bag Levy 342
R.M.T.D. Rathnayaka, A.M.A.S.M. Bandara

Theme 6: Unlocking Complexity and Engineering Novel Solutions

Title	Page No.
A Cross-sectional Survey of Gastrointestinal Parasites in Dairy Cattle in Sri Lanka *K.M.A.I.A. Kumarasinghe, P.K. Perera, N.U.K. Pathirana, R.S. Rajakaruna*	344
A Gaussian-Integer-Enhanced Hybrid Cryptosystem Integrating the Rivest-Shamir-Adleman Algorithm, Elliptic Curve Cryptography, and the Chinese Remainder Theorem *K.H.K. Madhuwanthi, P.G.R.S. Ranasinghe*	345
Analysis of Microplastic Accumulation in Goat Kidney Tissues *N.K. Jayasundara, W.S.S. Gunathilake, P. Abhishek, K.K. Wijesundera, A.U. Rajapaksha*	346
An Interpretable Machine Learning Framework for Predicting Boating Accident Severity *S.R. Aryarathna, S.R. Kodituwakku, L.S. Nawarathna*	347
An Optimization Model for Cost-Effective Personalized Diet Planning in Patients with Non-Communicable Diseases and Associated Risk Factors *S.P.C.D. Ilangarathna, W.B. Daundasekera*	348
A Novel Cryptosystem Integrating Cayley Graphs and Gaussian Integers within the ElGamal Framework *S.C. Aryarathna, P.G.R.S. Ranasinghe*	349
Antibacterial Activity of Propolis and Honey of the Stingless Bee *Tetragonula Praeterita* on Biofilm Forming *Staphylococcus Aureus* *B.H.O.M. Peiris, A.D.S.N.P. Athukorala, D.R. Uduwela, W.A.I.P. Karunaratne*	350
Antifungal Activity of Propolis and Honey from Stingless Bees, *Lisotrigona Cacciae* and *Tetragonula Iridipennis* Against Candida Albicans, the Causative Agent of Oral Candidiasis *V.G.P.A. Nissanka, A.D.S.N.P. Athukorala, D.R. Uduwela, W.A.I.P. Karunaratne*	351
A Processable UIO-66–Chitosan–Activated Carbon Composite for Scalable Pb(II) Removal from Aqueous Solutions *R.M.H.Y. Rajapaksha, T.M.M. Marso, N.P. Liyanage, N.P.W. Rathuwadu, S.B. Alahakoon*	352
Association Between Midgut Microbiota and Pyrethroid Resistance in Dengue Vector Mosquitoes *Aedes albopictus* *P.B. Athukorala, W.A.P.P. de Silva*	353
A Study on Optimizing Duration and Cost Management in a Housing Construction Using Critical Path and Multi-Period Cash Flow Methods *M.N. Fathima, W.B. Daundasekera*	354

A Time-Frequency Framework for Adaptive Spectral Representation of Music Signals 355
K.H.K. Madhuwanthi, P.G.R.S. Ranasinghe, V.R.M. Vinodya, K.D.K. Egodawele

A Topological Data Analysis Assisted Machine Learning Pipeline for Analysing Financial Time Series 356
D.G.J.N. Dinanjalee, J.K. Ratnayake, S. Abeysundara, A.K. Amarasinghe

Avian and Plant Diversity of the Blue-Green Space around Kandy Lake, Sri Lanka 357
D.M.C.C. Jayawardena, A.M.T.A Gunaratne, D.R.G.W.B. Ellepola, M.M.B. Dehideniya, H.D.P. Premarathne

Barcode-Encoded Paper-Based Analytical Device for Ascorbic Acid Quantification 358
R.P.A. Wijesinghe, M.N. Kaumal

Benzylation-Modified *Tephrosia purpurea* as a Natural Stationary Phase for Packed Column Chromatographic Applications 359
P.P.G.I.P. Bandara, T.C. Ariyasena

Biodegradability and Hemocompatibility of Polycaprolactone/ Curcumin/ Chitosan-Hydroxyapatite Electrospun Nanofibers for Vascular Graft Fabrication 360
S.P.P.M. Perera, K.M.N. de Silva, R.M. de Silva

Bioprospecting Epiphytic Yeasts from Lovi (*Flacourtia inermis*) for Sustainable Medicinal Alcohol Production 361
G.J.B. Arachchi, H.M. Shafqat, L.M. Vincet, T.C. Serasinghe, S.A. Mummullage, O.V. Hettithanthrige, S.N. Fernando, D.T. Suriyaarachchi, P.A. Sewwandi, R.B.N. Dharmasiri

Climatic Predictors of Cutaneous Leishmaniasis risk in Sri Lanka: A Multi-Model Assessment at the Pradeshiya Sabha Level 362
I.L. Jayasekara, H. Rajakaruna, W.A.P.P. de Silva, A. Dangolla, N.D. Karunaweera, R. Dewasurendra, I.E. Gunaratna, P. Chulasiri, R.S. Rajakaruna

Comparative Dietary Ecology of Two Sympatric Shrub Frog Species, *Pseudophilautus Rus* and *Pseudophilautus Popularis* in Lower Hanthana, Sri Lanka 363
D.M.T.M.K. Disanayaka, W.M.K.B. Wijesooriya, D.R.G.W.B. Ellepola

Comparative First-Principle and Experimental Study of Properties of FAU Zeolite Synthesized Using Rice Husk Ash and Waste Beer Cans 364
B.M.M.D. Basnayake, C.N.R Ratnaweera, W.W.P. De Silva

Comparative Performance Analysis of Parameter Estimation Methods for Some Discrete Models 365
K.S.D. Fernando, H.T.K. Abeysundara

Competitive Adsorption of Ciprofloxacin, Tetracycline, and Sulfamethoxazole Antibiotics in Fe-rich Soils 366
U.S.T. Sachintha, N.H. Koralegedara, K.G.N. Nanayakkara

Development of a Low-Cost Hardware and Software Framework for a Near-Infrared Spectrometer 367
M.S. Wanniarachchi, P. Samarasekara

Development of a Machine Learning-Based Early Warning System for the Survival of Micro-Enterprises in Sri Lanka 368
N. Athukorala, R.K. Ravindradasan, S.G.J. Senarathne, R.D. Yapa

Development of a Wireless Chemiluminescence Detector for Reducible Analytes Using Bipolar Electrochemistry 369
H.M.R.R. Wijeweera, M.B. Wijesinghe, H.P.G.N. Lakmini

Development of Controlled Release Formulation from the Extracts of *Gymnema Sylvestre* to Mitigate Rapid Blood Glucose Reduction 370
J.M.S. Jayasinghe, E.A.S.P. Ekanayake

Development of Porous Fired Clay Bricks Incorporating Rice Husk Additives 371
H.F.V.I. Fonseka, P.W.S.K. Bandaranayake

Development of Phosphorus Doped ZnO-Loaded Zeolite Materials for Enhanced Gas Sensing Performance 372
H.M.B.A. Lakmal, M.B. Wijesinghe, A. Bandara, L. Jayarathne, J.M.S.G.B Navarathne

Development of Polymer-Based Hydrogels for Controlled Curcumin Release 373
K.R.R.I. Sandanayake, V.U. Godakanda, K.M.N. De Siva, W.R.M. De Silva

Does Handling Time of Solitary Buzzing Bees Indicate Pollen Amount in Solanaceae Flowers? 374
W.M.L.W. Bandara, W.A.I.P. Karunaratne

Eco-Friendly Textile Dyeing Using Natural Dyes Extracted from Selected Sri Lankan Plants: Characterization and Performance Evaluation 375
A.H.G.S.N. Kumari, V.N. Senevirathne, O.A. Ileperuma

Effect of Activated Carbon Electrode Thickness on the Performance of Counter Electrodes in Dye-Sensitized Solar Cells 376
M.D.D.S. Senevirathna, J.M.K.W. Kumari, M.A.K.L. Dissanayake, G.K.R. Senadeera

Effects of Human Disturbance on Biodiversity and Community Structure in Two Rocky Reef Habitats, Galle, Sri Lanka 377
P.P. Premasinghe, C.S. Munasinghe, D.R.G.W.B. Ellepola, Y.R. Epa

Effect of Interlayer Environment of Mg-Al Ldh on Corrosion Inhibition 378
H.G.W.M. Bhaddrathilake, H.M.D.N. Priyantha, S.C. Abeyweera, H. Dilshan

Effect of Interlayer Environment Toward Electrocatalytic Activity of Ni–Fe Layered Double Hydroxides 379
A.A.H.P. Dilshan, S.C. Abeyweera

Effect of ZnO Nanoparticle on the Sensitivity of Cellulose Acetate/Polyethylene Oxide/Bromothymol Blue (CA/PEO/BTB)-Based Electrospun Colorimetric Sensor Mats toward Gaseous Ammonia 380
W.S.M. Witharama, S.P.P.M. Perera, K.M.N.D. Silva, W.R.M.D. Silva

Electrical, Mechanical and Piezoresistive Properties of Natural Rubber Composites Incorporating Sri Lankan Vein Graphite 381
A.K.S. De Zoysa, P.W.S.K. Bandaranayake

Electrospun Cassava Starch/Poly(ethylene oxide) Nanofibers as a Corrosion Inhibitor for Mild Steel in HCl Environment 382
H.H.M.H.B. Hapukotuwa, W.S.S. Gunathilake, N. Priyantha

Enhanced Photoelectrochemical Water Splitting Using WO_3/$CaWO_4$ Heterojunction Photoanode 383
S.M.P.M.K. Sanganayaka, E.G.O.D. Egodawaththa, H.N.M. Sarangika, C. Bhattacharya, H.S. Sahoo

Enhanced UV Absorption through Molecular Interactions in a Natural Sunscreen Formulation Using Tea Leaf Extract and Carrot Seed Oil 384
P. Dinoosha, N.L. Dasanayake

Essential Oil-Loaded Zeolite for Sustained Mosquito Repellency Against *Aedes albopictus* 385
A.V.B.H.K. Jayasekara, K.C. Madhusanka, T.C. Weeraratne, L. Jayarathna, S.K. Rodrigo

Evaluation of Antibacterial Activity of *Atalantia ceylanica* 386
M.M. HewaMarambage, K.M.S.M.K. Senavirathne, A.P. Jayasooriya

Evaluation of Bioactivity and Mineralization of Zinc Oxide-Hydroxyapatite Composites Modified with Aloe Vera in Simulated Body Fluid 387
I.F. Zamhara, T.P. Gamagedara

Evaluation of Quality Parameters and Heavy Metal Contamination in Selected Skincare Products Available in the Sri Lankan Market 388
G.D.K. Weerasinghe, K.A.D.D. Sakunthala, W.P.R.T. Perera, J.A. Liyanage, W.A.P.J. Premaratne

Extraction, Characterization, and Evaluation of Bioactive Potentials of Yellow Pigment Extracted from Soil Bacterial Isolate HGY2 389
M.H.F. Hafna, C.S.K. Rajapakse, A.P. Halmillawewa

Fabrication of Dye-Sensitized Solar Cells Based on Natural Pigments Extracted from the American Black Nightshade (*Solanum americanum* Mill.) Fruit 390
H.M.G.K.B. Herath, R.M.G. Rajapakse, G.R.A. Kumara

Fish Community Structure and the Emerging Threat of Exotic Ornamental Fishes in Bolgoda Lake, Sri Lanka 391
P.S.L. Madawala, K.B. Wijesooriya, L.N. Rathnayake, G. Ellepola

Floral Constancy of *Tetragonula iridipennis* and *Tetragonula praeterita* in a Tropical Agro-natural Landscape in Panadura, Sri Lanka 392
W.S.K.D. Soysa, W.A.I.P. Karunaratne

Gastrointestinal and Ectoparasites in Feral Horses (*Equus caballus*) of Delft Island, Sri Lanka 393
W.H.I.S. Wijayarathne, P.K. Perera, N.U.K. Pathirana, A. Dangolla, P. Gajavathany, R.S. Rajakaruna

GeoAI-Based Flood Extraction Using Sentinel Satellite Imagery and DEM: A Case Study of Cyclone Dithwa in The Attanagalu Oya River Basin, Sri Lanka 394
P.D. Sellahewa, J.K. Gunatilake, P.M.P.C. Gunathilake

Halloysite Clay-based Electrospun Fiber Meshes as Hemostatic Wound Dressings 395
M.H.H.H Bandara, V.U. Godakanda, K.M.N. De Silva, W.R.M de Silva

Hidden Burden of Asymptomatic Fungal Colonization: The Role of Footwear as a Potential Reservoir of Fungi 396
M.S. Sheriffdeen, W.A.M. Daundasekera, S.H. Boyagoda

Impact of Age on Pyrethroid and Organochlorine Resistance and Glutathion- S -Transferase Activity in *Culex Quinquefasciatus* 397
P.W.A.D.K.Weerasinghe, T.C.Weeraratne

Impact of Common Household Water Treatment Methods on Microplastics in Drinking Water 398
R.M.P. Abeywickrama, B.A.P.C. Premathilake, R.S. Rajakaruna

Impact of Fermentation on Plant-Based Serum Bioactivity and Stability 399
H.M.D. Nayomi, A.S.D. Boteju

Impact of Tourism and Demographic Factors on Sri Lanka's GDP: A Statistical and Machine Learning Approach 400
S.Gajane, N.Varathan, R.Tharshan, M.A.M. Mohamed

Insecticide Susceptibility of *Trichoplusia ni* (Cabbage Looper) to Etofenprox: A Comparison Between Badulla and Nuwara Eliya District Populations, Sri Lanka 401
R.A.T.K. Rupasingha, W.A.P.P. de Silva, S.K. Rodrigo, T.C. Weeraratne

In Silico Evaluation of *Justicia adhatoda* Phytochemicals as Potential Dual Inhibitors of TGF-β Receptors in Oral Submucous Fibrosis 402
G.W.S. Priyangani, B.T.K. Perera, R.U. Jayakody, A.I. Jayawardhana, S. Adsaya, T.M.C.B. Tennakoon, S.I. Karunarathna, L. Ranathunga

Interactive Effects of Time of the Day and Wind Speed on a Raptor Species Assemblage: A Study from a Windfarm in Mannar, Sri Lanka 403
S.N. Rathnasiri, S.M.D. Suriyabandara, W.M.C.S. Wijesundara

In Vitro Assessment of Trypsin Inhibitors from *Phaseolus lunatus* 404
I.H.M. Ilesinghe, R.G.S.C. Rajapakse

k-Shifted Antimagic Labeling of Regular Triangular Grid Graphs 405
H.A.P. Lakmuthu, W.M.C.K. Wijekoon, M.D.D.H. Mallikarachchi, M.A.D. Priyadarshani, K.D.E. Dhananjaya

Larvicidal Effect of White Bird's Eye Chilli (*Capsicum frutescens*) and Garlic (*Allium sativum*) Encapsulated Chitosan Nanoparticles Against *Aedes spp.* Mosquito Larvae 406
M.D.M.N. Reshani, J.M.S. Jayasinghe, W.A.P.P. de Silva, I.K.A.P.K. Premarathne

Ligand-Stabilized Hydrothermal Synthesis of Tio_2 Nanoparticles: A Precision Approach to Morphological Control 407
K.M.M.K. Dissanayake, P.G. Mantilaka

Matrix Interference of Arrack to the Ethyl Alcohol Strength and Obscuration: A Comparative Study of Alcolizer System and Manual Techniques 408
W.S.H.K. Jayawansha, I.J. Ambepitiya, S. Kulali, T. Kirudchayini, Y.B. Wickramasingha, B.W.V. Vidya

Modeling Flight Data: A Statistical Analysis Across Major Airports, Airlines and Aircraft Types 409
K.S.D. Ravihari, S.P. Abeysundara

Molecular Detection and Genetic Characterization of *Rickettsia* in *Rhipicephalus Linnaei* (Brown Dog Tick) from the Central Province of Sri Lanka 410
H.B. Abayakoon, M.M. Eremeeva, P.K. Perera, S. Ariyaratne, R.S. Rajakaruna

Molecular Screening for Wolbachia Endosymbionts in Phlebotomine Sand Flies within North Central Province, Sri Lanka 411
F.B.R.P. Kumara, D.K. Hettiarachchi, N.D.A.D. Wijegunawardana

Morphological and Molecular Analysis of Ecto and Endoparasites of Captive Elephants in Sri Lanka 412
S.A. Hapuarachchi, A. Dangolla, S.K. Piyadasa, M.R.C.K. Mallawa, R.S. Rajakaruna

Morphological and Molecular Characterization of *Marsilea minuta* L. Collected from Sri Lanka 413
K.A.I. Lakshani, N.S. Gama-Arachchige, A.D.S.N.P. Athukorala

Naturally Derived Carbon Quantum Dots from Yam Starch (*Dioscorea alata*) as a Nanoplatform for Metformin Conjugation 414
K.M.K.S. Dissanayake, P. Perera, V.U. Godakanda, K.M.N. de Silva, W. R. M. de Silva

Natural Radioactivity Along the Coastal Areas in Jaffna: Measurement, Analysis and Implications 415
N. Vithushan, T.P. Ranawaka

Numerical Approximation of Caputo Fractional Derivative Using Hypercomplex-Step Method 416
A.K.H. Sifa, W.A. Gunarathna

Occurrence and Parasitization of *Plutella xylostella* by *Cotesia vestalis* Across Major Cabbage-Growing Regions of Sri Lanka 417
B.G.M.P. Bogahawatta, W.A.P.P. de Silva, S.K. Rodrigo, T.C. Weeraratne

Optimization and Characterization of *Cinnamomum Verum* (Sri Lanka) Bark Extract Mediated Green Synthesized Silver Nanoparticles 418
K. Thanoshka, M.P.N. Thilakarathna, W.M.M.D. Bandara, B.A.S.O. Perera

Palladium Impregnated Boron-Modified ZSM-5 Zeolite for Selective Oxidation of Benzyl Alcohol 419
D.L.M. Bandara, W.M.A.T. Bandara, L. Jayarathne

Phytochemical and Physicochemical Evaluation of Natural Plant Extract-infused Soap from Lotus, Cinnamon and Mung Beans for Safe Skin Application 420
D. Rajithan, V.C. L. Hewage, K.R.W.M.M.K Karunathilaka, W. Weerasinghe

Phytochemical Screening and *In-vitro* Antioxidant, Anti-obesity, and Anti-diabetic Properties of the Latex of *Garcinia zeylanica* 421
T.K.S.P Abeygunawardhana, T.M.T.D. Thennakoon, J.M.S. Jayasinghe

Potential Biostimulatory Effect of *Mikania micrantha* Leaf Powder and Aqueous Extract on Chilli (*Capsicum annuum*) Variety MI-2 Seed Germination and Seedling Growth 422
W.M.A.H. Wanninayake, A.D.S.N.P. Athukorala, J.W. Damunupola

Predicting Monthly Coconut Price in Kurunegala District: A Hybrid SARIMAX-ARCH Modelling Approach 423
P.W.M.S.N. Bandara, N. Satkunanathan, A. Laheetharan

Preliminary Functional Assessment of Leaf and Fruit Extracts of *Coccinia grandis* (Kowakka) on Glucose Metabolism 424
H.M.S. Lochana, M.P.C.S. Dhanapala

Preliminary Functional Assessment of the Antidiabetic Activity and Genotypic Diversity of Selected *Costus* Species 425
U.N. Kumarage, M.P.C.S Dhanapala

Preliminary Study on Identification and Comparison of Potential Allergenic Protein Profiles in Four Banana Varieties (*Musa* spp.) Available in Sri Lanka 426
N. Kumaresan, C.K. Premachandre, L.J.P.A.P. Jayasooriya

Relationship Between Physicochemical Parameters and Microbial Contamination in Major Tributaries Connected to the Mahaweli River in the Kandy District, Sri Lanka 427
F. Fareed, T.R.G.S.D. Thoradeniya, P.T.A. Thilakarathna, H.W.T.N. Rathnaweera, H.R.N. Jinadasa, S.H.P.P. Karunaratne

Resonance Classification of the Proton-Proton Collision at Large Hadron Collider Using Machine Learning and Deep Learning Models 428
K. Sajuran, H.T.K. Abeysundara, R. Mendis

Seasonal Shift of Transport Pathways and Potential Source Regions of $PM_{2.5}$ in Colombo, Sri Lanka (2023 - 2025) 429
B.R.N.P. Senarathna, M.P. Rambukkange

Silica-Rich Rice Husk Ash in Mortar: A Sustainable Approach for Mortar Production 430
N.A.A.N.D. Gunawardhane, V.N. Seneviratne, O.A. Ileperuma

Source-Specific Toxic Metal Bioaccumulation and Health Risk Assessment in Edible Aquatic Organisms from Freshwater and Estuarine Systems; A Study in Sri Lanka 431
W.P.R.T. Perera, M.A.U. Dias2, W.A.S. Fernando, K.A.D.D. Sakunthala, P.A.D.H.J Gunathilaka, J.A. Liyanage

Stability and Reusability of Metatitanic Acid-Based Photocatalysts in Continuous Flow Water Treatment Systems 432
A.V.H.H. Amarathunga, A.H.J. Sampath, K.M.N. de Silva, W.R.M. de Silva

Statistical Analysis and Risk Classification of Chronic Kidney Disease of Unknown Etiology (CKDu) in Sri Lanka: Integration of Clinical and Environmental Factors 433
L.P.D. De Silva1, Y.P.R.D. Yapa, N. Nanayakkara

Sustainable Inkjet Ink from Waste Human Hair: Melanin-Based Waterborne Formulation 434
S.B. Alahakoon, B.B.T. Madhubhasini

Synergistic Effect of Solar Irradiation and Phytochemical Corona on the Photocatalytic Degradation of Methylene Blue Using Green-Synthesized Copper Nanoparticles 435
H.K.S. Madusanka, J.A.M.S. Jayasuriya, A.G.B Aruggoda, J.A.S Chathurika, S.R Weerakoon

Synthesis and Characterization of Aluminium Vanadate ($ALVO_4$): Structural, Morphological, and Optical Properties 436
U.N. Nisansala, H.M.B.I. Gunathilaka, R.C.L. De Silva, K.A. Nimasha, H.N.M. Sarangika, P.K.D.D.P. Pitigala, W.W.P. De Silva

Synthesis, Characterization, and In Vitro Bio-evaluation of a Schiff Base and Its Cu(II), Ni(II), and Mn(II) Complexes: Potentiating Antimicrobial and Antioxidant Efficacy via Metal Coordination 437
P.H.S.S. Karunarathna, B.S. Nanayakkara, M.Y.U. Ganehenege

Synthesis of Chitosan Nanoparticles Loaded with Methanolic Extract of *Chrysophyllum cainito* Bark and Drug Release Studies 438
P.D.R. Pathirana, V.N. Seneviratne

Synthesis of Eugenol Derivatives as Potential Antibacterial Agents Against *Streptococcus mutans* 439
L.B.W.W. Wickramasooriya, J.M.S. Jayasinghe, K.S.N.D. Gunawardhana

Temporal Variation of Groundwater Quality in Shallow Aquifers in the CKDU Hotspot of Wilgamuwa 440
P.M. Wijethunga, C. Chandrarathna, R. Chandrajith

Toxicity and Repellency of *Olax zeylanica* Leaf Extract on the Stored Product Pest *Sitophilus zeamais* (Coleoptera: Curculionidae) 441
S.D.C.D. Munasinghe, T.C. Weeraratne

Unveiling the Diversity of Haemoparasites in Chickens in Kandy District, Sri Lanka: Evidence for the First Record of *Plasmodium Homopolare* 442
M.S. Malshani, S.S. Iddamaldeniya, D. Abeykoon, P.K. Perera

Urban–Suburban Contrasts in Particulate Matter Dynamics in and North of Kandy: A Statistical Analysis of Topographical and Meteorological Influences 443
R.K. Ravindradasan, S.G.J. Senarathne, L.M. Zubair

Water Quality Analysis of Groundwater Around the Seethawaka Export Processing Zone, Sri Lanka 444
A.S.Thalangama, K.A.D.D. Sakunthala, W.P.R.T. Perera, J.A. Liyanage, W.A.P.J. Premaratne

WO_3 Based Electrochromic Devices for Integrated Energy Storage Applications 445
B.L.P. Dineshi, S.M.P.M.K. Sanganayaka, E.G.O.D. Egodawaththa, H.N.M. Sarangika

Special Session on Engineering Education

Title	Page No.
Acceptance of Generative Artificial Intelligence (Gen AI) Among Undergraduate Students: A Case Study *D. Herath, D. Dissanayake, R. Ragel*	447
A Hybrid Quantum Framework for Managing High-Volume Missing Data in Engineering Education Analytics *B.V. Lakshman, J.V. Wijayakulasooriya, T.M.S.S.K. Yatigammana*	448
Industry-Driven Telecommunication Curriculum Design Using the ADDIE Model *U. S. Premarathne*	449
Mapping Learning Styles to Assessment Effectiveness: Adaptive Assessment Framework *D. Premasiri, R. Ragel, I. Nawinne*	450
Towards a Pedagogically Aligned Blended Learning Framework for Foundation Computing Education: Evidence from Behavioural Learning Analytics of Engineering Undergraduates *I. P. Ratnapala*	451

Theme 1



Building Adaptive, Equitable and Proactive Health Ecosystems

Medical & Health Sciences

Age and Gender Distribution of First-Presentation St-Elevation Myocardial Infarction (STEMI) in Tertiary Care Hospitals in Kandy District, Sri Lanka

K.D.L.S. Wickramasinghe*, N.K. Jayathilake, A. Rathnayake

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**sandeepanilakshika870@gmail.com*

STEMI is a life-threatening emergency requiring rapid diagnosis and management remains a leading cause of morbidity and mortality worldwide, with increasing burden in low- and middle-income countries such as Sri Lanka. Emerging evidence suggest that understanding age and gender patterns over time may influence early diagnosis and risk stratification in MI. Limited regional data are available regarding age and gender distribution of first-presentation STEMI in Sri Lanka. This study aimed to assess the association between age and gender among patients presenting with first-time STEMI in tertiary care hospitals in the Kandy district, Sri Lanka. A retrospective cohort study was conducted using medical records of patients diagnosed with STEMI at National Hospital Kandy and Teaching Hospital Peradeniya from August to December 2024. A total of 237 patients were identified, of whom 180 met inclusion criteria for first presentation. Data on age and gender were analyzed using descriptive statistics and inferential tests including Chi-square and independent t-tests. The mean age of first-presentation STEMI patients was 59.3 ± 13.3 years. The highest incidence was observed in the 53–67-year age group, accounting for nearly 44% of cases. Males predominated significantly, representing 79.4% of first presentations ($p < 0.031$). Younger age groups showed fewer cases, while the frequency of first STEMI presentations increased in middle-aged adults before gradually declining in the older age groups. Statistical analysis demonstrated a significant association between gender and first presentation of STEMI ($p = 0.031$), with males accounting for 79.4% ($n = 143$) of first-time STEMI presentations compared with 20.6% ($n = 37$) among females. Overall, males represented 80.2% ($n = 190$) of all STEMI cases, indicating a marked male predominance across all age categories. These findings indicate that middle-aged males represent the highest-risk group for first-time STEMI in the Kandy district. The study highlights the importance of targeted screening, risk factor modification, and public health interventions focusing on this demographic group to reduce the burden of acute myocardial infarction in Sri Lanka.

Keywords: STEMI, first presentation, age distribution, gender differences

***Acknowledgement**: Our heartfelt gratitude goes to all the staff members of Faculty of Allied Health Sciences, University of Peradeniya, and the National Hospital, Kandy and Teaching Hospital, Peradeniya for their immense support throughout this study.*

No Show Abstract

Allergy, Atopy, and Eosinophilia in Asthma: Evaluating Clinical Associations Among Patients Attending the Respiratory Clinics in Kandy

H. R. Sanchala[1]*, R.M.I.U.K. Ratnayake[2], G. Bowatte[3], B.M.G.D. Yasaratne[2]

[1]*Department of Medical Laboratory Sciences, Faculty of Allied Health Sciences, University of Peradeniya, 20400, Sri Lanka*
[2]*Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Basic Sciences, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**ahs20mls026@ahs.pdn.ac.lk*

Asthma is a heterogeneous, chronic inflammatory disease, and Type 2 (T2) biomarkers such as fractional exhaled nitric oxide (FeNO) and blood eosinophils are increasingly used to describe inflammatory phenotypes and guide patient management. However, there is a lack of scientific literature on their use among adult asthma patients in Sri Lanka. This study aims to determine the prevalence of allergy, atopy, eosinophilia, and elevated FeNO, and to examine their associations with asthma control, exacerbation frequency, and disease severity among adult asthma patients attending respiratory clinics in Kandy. A hospital-based cross-sectional study was conducted among adult asthma patients attending the respiratory clinics at Teaching Hospital, Peradeniya and District Chest Clinic, Kandy. Data on sociodemographic characteristics, allergy history, atopic features, and exacerbation history were collected using a structured questionnaire. Asthma control was categorized (well-controlled, partially controlled, or uncontrolled) via the Asthma Control Test (ACT). Peripheral blood eosinophil count ($\geq 300\ cells/\mu L$) and FeNO ($\geq 25ppb$) were measured as T2 inflammatory biomarkers. Data were analyzed using Jamovi 2.7.24.0 with descriptive statistics, chi-square tests, Kruskal-Wallis tests, and correlation analysis. The total sample contained 272 adult asthma patients. The mean age was 51.5 years, while 65.1% of the study population were females. Significant environmental exposures included biomass fuel (71.3%), dust (68.8%), and general allergens (80.5%), with a history of passive (11.4%) and active smoking (4.4%). Allergy (49.3%), eosinophilia (48.5%), and elevated FeNO (45.6%) were prevalent in the study group. Only 50.4% of patients had well-controlled asthma. Categorized eosinophilia was significantly associated with poorer asthma control ($p = 0.039$). FeNO showed a weak negative correlation with ACT scores ($p = 0.006$) but varied significantly across control groups ($p = 0.008$). Poor asthma control strongly predicted frequent exacerbations and hospitalizations ($p = 0.002$). Allergy and atopy alone were not strong predictors of control or exacerbation risk. Findings indicate that systemic eosinophilia and elevated FeNO levels are closely linked to suboptimal asthma control. Integrating these biomarkers with ACT scoring would refine clinical phenotyping, facilitating more individualized and effective asthma management within the Sri Lankan healthcare context.

Keywords: asthma, FeNO, eosinophilia, allergy, atopy, ACT

A Machine Learning Approach to Differentiate Glioblastoma from Anaplastic Astrocytoma Using MRI

S. Rabeelashini[1]*, S. Mohideen[1], M.R. Sahra[1], M.L. Jayatilake[1], B. Hewavithana[2]

[1]*Department of Radiography/Radiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

[2]*Department of Radiology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

**rabeelashini.22@gmail.com*

Glioblastoma (GBM) and anaplastic astrocytoma (AA) represent high-grade brain tumors that pose significant diagnostic challenges due to overlapping imaging characteristics despite distinct prognostic and therapeutic implications. Accurate differentiation is crucial for treatment planning and prognostic assessment. This study developed a machine learning framework to distinguish GBM from AA using non-contrast magnetic resonance imaging (MRI), specifically T2-FLAIR sequences. Custom MATLAB-based tools for semi-automated tumor segmentation under consultant radiologist supervision and radiomic feature extraction were developed. Data were sourced from The Cancer Imaging Archive (TCIA), specifically the University of California San Francisco Preoperative Diffuse Glioma MRI (UCSF-PDGM) dataset. Our segmentation tool employed Fuzzy C-Means (FCM) clustering with manual refinement capabilities, enabling precise delineation of hyperintense lesions across the T2 FLAIR MRI sequence. A comprehensive set of 139 radiomic features was extracted from each tumor region, encompassing shape descriptors, first-order statistics, and texture features. One-way ANOVA with F-score ranking identified 69 highly significant discriminative features ($p < 0.001$). The dataset was partitioned into training (70%, n=701), testing (25%, n=250), and validation (5%, n=51) subsets to minimize data leakage. For radiomics-based classification, ten machine learning algorithms such as, Logistic Regression, Support Vector Machine (SVM), Random Forest (RF), K-Nearest Neighbors (KNN), Gradient Boosting, XG Boost (Extreme Gradient Boosting), Decision Tree, LDA, Gaussian Naive Bayes and AdaBoost (Adaptive Boosting) were evaluated with hyperparameter optimization via grid search and 10-fold cross-validation. After hyperparameter tuning, KNN achieved the highest performance with a CV score of 90.59%, test accuracy of 93.20%, F1-score of 0.9382, and AUC of 0.9631. The optimized KNN model demonstrated a precision of 92.81%, recall of 94.85%, and maintained an excellent balance between sensitivity and specificity. The development of user-friendly MATLAB graphical interfaces for clinical implementation and comprehensive evaluation using multiple performance metrics strengthens the clinical translational potential of this work. These findings support the feasibility of radiomics-based machine learning systems as decision support tools for pre-operative glioma characterization, potentially improving diagnostic accuracy, treatment planning, and patient outcomes. Future multi-institutional validation studies and integration with molecular biomarkers will further advance precision neuro-oncology approaches for personalized glioma management.

Keywords: glioblastoma, anaplastic astrocytoma, radiomics, machine learning, T2 FLAIR MRI

An Additional Component of Quadriceps Femoris Muscle Group Detected During Dissection

C.K.M. Rajapaksha[1], H.G.M. Gunawardhana[1]*, H.T.S.D.H. Sooriyabandara[2], S.B. Adikari[1]

[1]*Department of Anatomy, Faculty of Medicine, University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Faculty of Medicine, University of Peradeniya, Peradeniya,20400, Sri Lanka*
**hasineeg@gmail.com*

Quadriceps femoris is the principal muscle group of the anterior compartment of the thigh which functions primarily as the main extensor of the knee joint. Classical anatomical descriptions recognize four constituent muscles: the rectus femoris, vastus lateralis, vastus medialis, and vastus intermedius. However, in 2016, a novel muscle named the tensor vastus intermedius (TVI) was identified as a fifth component of the quadriceps femoris group. Although multiple anatomical studies have supported the view that the TVI represents a discrete muscle rather than a simple anatomical variation, reports regarding its bilateral occurrence remain inconsistent. We report a rare case of bilateral tensor vastus intermedius muscles identified during anatomical dissection. The muscles were symmetrically present in both thighs, situated between the vastus intermedius and vastus lateralis muscles, and were clearly demarcated by distinct fascial planes. The bilateral muscles demonstrated comparable morphology and dimensions supporting the concept of a reproducible anatomical entity. To the best of our knowledge, this is the first documented report of bilateral tensor vastus intermedius muscles from Sri Lanka. Recognition of the TVI has important implications in clinical anatomy, orthopaedic surgery, radiological interpretation, and the understanding of knee joint biomechanics. Failure to recognize this muscle may lead to misinterpretation during imaging or surgical procedures involving the anterior thigh and knee region. Given its potential clinical relevance and increasing recognition in contemporary anatomical literature, incorporation of the TVI into medical education and anatomical descriptions is warranted.

Keywords: tensor vastus intermedius, quadriceps femoris, anatomical variation, vastus lateralis, TVI

An Integrated Web Based Machine Learning Platform for Non-Communicable Disease Risk Prediction

N.S. Jayaweera*, S. Chandramowleeswaran, K.G.I. Enuka, H.H.A.I. Hettiarachchi, R.M.P.S. Rathnayaka

Informatics Institute of Technology, Colombo, 00300, Sri Lanka
**neeleshjayaweera@gmail.com*

Non-communicable diseases (NCDs) account for over 75% of deaths globally and 83% in Sri Lanka. Despite advances in predictive analytics, a significant gap persists between clinical-grade models and tools accessible to the general public, limiting opportunities for early, self-directed risk identification. This study designs, develops and evaluates an integrated web-based NCD risk screening platform targeting heart disease, chronic kidney disease (CKD), diabetes, and osteoporosis for non-clinical end users. The platform deploys ten disease-specific machine learning (ML) models, each trained on publicly available Kaggle datasets, with distinct feature sets tailored per disease. Heart disease screening uses cardiovascular indicators including chest pain type, resting blood pressure, cholesterol, fasting blood sugar, Electrocardiogram (ECG) findings, maximum heart rate, and ST depression. CKD screening employs renal biomarkers such as serum creatinine, blood urea nitrogen, urine albumin, serum albumin, and uric acid alongside blood pressure and anthropometric data. Diabetes uses lifestyle and metabolic variables including blood glucose, Body Mass Index (BMI), physical activity, diet quality, sleep, hydration, stress level, and medication adherence. Osteoporosis uses demographic and lifestyle risk factors including age, hormonal status, family history, calcium and vitamin D intake, physical activity, smoking, alcohol consumption, and prior fracture history. Notably, the majority of inputs are self-reportable or obtainable from routine tests, minimising reliance on specialist prescriptions. An input interface dynamically maps user-submitted variables to each model's feature requirements. Algorithms evaluated include CatBoost, Gradient Boosting, AdaBoost, Random Forest, Extra Trees, Bagging, Stacking, and Support Vector Machine (SVM). Top-performing models achieved 100% accuracy for heart disease (CatBoost), 96.48% for CKD (Bagging), 98.60% for diabetes (SVM and Gradient Boosting), and 92.78% for osteoporosis (Random Forest, Male). This platform democratises professional-grade NCD screening, empowering underserved communities toward proactive health management.

Keywords: non-communicable diseases, machine learning models, risk assessment, algorithms, predictive analytics

Analyzing Expression Patterns of *COL1A1* and *MMP1* Genes in Oral Submucous Fibrosis and Oral Squamous Cell Carcinoma Patients

S. Adsaya[1]*, N. Piyarathne[2], S.I. Karunarathne[1]

[1]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Center for Research in Oral Cancer, Faculty of Dental Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**adsayas@sci.pdn.ac.lk*

Oral Squamous Cell Carcinoma (OSCC) represents a severe health burden in Sri Lanka, frequently arising from Oral Submucous Fibrosis (OSMF), a progressive, potentially malignant disorder with a 2-7% malignant transformation rate. OSMF pathogenesis is characterized by a transition from a collagen-driven fibrosis to malignant invasion via extracellular matrix degradation. Platelet-Rich Plasma (PRP) has emerged as a safe treatment for mild-to-moderate OSMF, yielding a 60% improvement in mouth opening and a 100% reduction in burning sensation; however, its underlying molecular mechanisms remain poorly understood. This study addresses this gap by simultaneously evaluating salivary *COL1A1* (collagen type I subunit) and *MMP1* (collagen-cleaving enzyme) gene expression to explore PRP's therapeutic impact at the molecular level. This exploratory pilot study used a longitudinal follow-up subset derived from our prospective clinical trial cohort who had undergone PRP infiltrations. Unstimulated whole saliva was collected at a standardized, fixed follow-up interval from four age and sex-matched cohorts (n=5 per group): disease-free healthy controls, histopathologically confirmed untreated OSMF, PRP-treated OSMF and OSCC. Following total RNA extraction and cDNA synthesis, salivary transcript levels were quantified via RT-qPCR. Inter-group variations were evaluated using Kruskal-Wallis tests followed by post-hoc Dunn's comparisons. Upregulation of *COL1A1* (6-fold) and *MMP1* (13.7-fold) was observed in OSCC compared to healthy controls ($p>0.05$). Untreated OSMF patients exhibited over-expression of *COL1A1*, reaching a median fold change of 45.73 ($p<0.05$). Conversely, the PRP-treated cohort exhibited downregulation of both *COL1A1* and *MMP1* transcripts to levels statistically indistinguishable from healthy baseline ($p>0.05$). The results indicate a possible attenuation of the hyperactive fibrotic machinery observed in untreated OSMF toward a near-healthy transcriptional profile, a finding constrained by the limited sample size. This suggests PRP's potential to alter the fibrotic microenvironment, promoting tissue regeneration and a potential reversal of fibrosis that correlates with clinical symptom relief. Identifying these transcriptomic shifts within a salivary medium demonstrates the feasibility of a non-invasive, patient-friendly tool for monitoring PRP efficacy. Given current resource constraints and the small cohort size, future high-powered, multi-center longitudinal trials with larger patient cohorts are imperative to validate these preliminary molecular signatures and confirm PRP's long-term efficacy.

Keywords: collagen, matrix metalloproteinase, oral cancer, platelet-rich plasma, salivary diagnostics

Acknowledgement: *Financial assistance from URG/2025/36/S is acknowledged.*

Application of Clinical Pharmacology in Critical Care: A Retrospective Study in a Level 3 Intensive Care Unit in Sri Lanka.

V.G. Pinto, A.B. Abeysundara, D.G.H. Warnasuriya, W.M.G.L.S. Weerakoon, W.T.D. Kularatne*, D.G.V.S.K. Dharmasena

Department of Anaesthesiology and Critical Care, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**tharanidakshika457@gmail.com*

Clinical pharmacology is the study of the action of drugs within the human body and its application in clinical practice. This involves pharmacokinetics which describes how the drug is absorbed, distributed, metabolized and excreted and pharmacodynamics which describes how the drug affects the body. Drug prescription in critically ill patients is a challenge because factors such as organ dysfunction, physiological variations and the use of multiple medications affect their pharmacokinetics. Thus, our objective was to evaluate the appropriateness of prescription of antibiotics, analgesics and sedatives in relation to age, estimated/actual patient weight, presence of organ dysfunction like liver failure and renal failure and the possibility of drug interactions due to polypharmacy in patients managed in the Intensive Care unit (ICU). This was a retrospective observational study conducted at the Teaching Hospital, Peradeniya, that included the medical records of 60 adult patients, who had been admitted to the intensive care unit within a duration of two months. Descriptive statistics were used for analysis. The mean age was 58.7 years with 43% being over 65 years of age, highlighting the importance of dose adjustment for the elderly in the ICU. The cohort mainly had hypertension and diabetes as comorbidities. The main conditions that required dose adjustment of drugs were identified to be hypoalbuminemia (95%), liver failure (15%), and renal failure (30%). Dose adjustment of antibiotics for the conditions afore-mentioned was satisfactory (≥70% for all three) while dose adjustment for sedatives was not seen in any record. Dose adjustment for analgesics was satisfactory in the case of hypoalbuminemia (100%) however it was unsatisfactory for liver and renal failure (<50%). Weight-based dosing was only seen for 5 types of drugs which is an area requiring improvement. Additionally, polypharmacy was seen in 100% of the cohort. This study highlights the errors in drug dose adjustment which seem to be commonly encountered in the ICU that should be remedied in future practice. Involvement of the clinical pharmacologist in the ICU may improve the outcome as factors affecting drug dosage and polypharmacy are prevalent in the ICU patient population.

Keywords: intensive care unit, drug dose adjustment

A Retrospective Analysis of Clinicodemographic Characteristics and Habit Profile of Oropharyngeal Squamous Cell Carcinoma

I.A.S. Jayasinghe[1]*, P.R. Jayasooriya[2], C.N.R.A. Alles[3], N.S. Soysa[1,4], P.N. Amarabandu[5]

[1]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Biochemistry, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Oral medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[5]*National Cancer Institute, Maharagama, 10280, Sri Lanka*
**anjanaj@dental.pdn.ac.lk*

Oropharyngeal squamous cell carcinoma (OPSCC) is a major head and neck malignancy strongly associated with lifestyle related risk habits. However, limited data are available regarding the clinicodemographic and habit profile of OPSCC patients in Sri Lanka. This study aimed to assess the demographic characteristics, lesion distribution among oropharyngeal sites, and associated habit patterns among OPSCC cases reported at Apeksha Hospital, Sri Lanka, between 2023 and 2025. A retrospective descriptive and analytical study was conducted using 176 biopsy-proven OPSCC cases retrieved from hospital records. Demographic characteristics, lesion sites, pathological categories, and habit history including betel quid chewing, smoking, and alcohol consumption were analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics, Chi-square tests, and binary logistic regression were performed. The majority of patients belonged to the 50–65-year age group (54.9%), followed by the >65-year category (36.4%). A marked male predominance was observed, with males accounting for 85.8% of cases. Most patients were Sinhalese (93.8%). Tonsils were identified as the most commonly affected oropharyngeal site (33.0%), followed by the base of tongue (26.7%) and soft palate (14.2%). Habit positivity was observed in 81.3% of patients and alcohol consumption was the most frequently reported habit (75.0%), followed by smoking (50.6%) and betel quid chewing (38.1%). Moderately differentiated SCC was the predominant histopathological subtype, accounting for 49.4% of OPSCC cases. Histopathological evidence suggestive of HPV infection was observed in 6.3% of cases, while 93.8% showed no HPV-associated pathological features. Bivariate analysis demonstrated a significant association between HPV-associated lesion categories and age group distribution (χ^2, $p = 0.003$). No significant associations were observed between HPV-associated lesion categories and habit-related variables or habit positivity ($p > 0.05$). Binary logistic regression showed significantly higher odds of HPV-associated pathological features among patients aged 50–65 years following adjustment for demographic, site-related, and habit-related variables ($p = 0.032$; Exp(B)=9.939). The findings highlight the substantial burden of OPSCC among older male patients with high exposure to alcohol consumption, smoking, and combined habit use, emphasizing the importance of targeted awareness and early detection strategies in Sri Lanka.

Keywords: OPSCC, betel quid chewing, smoking, alcohol consumption

Acknowledgement: *The authors gratefully acknowledge the Multidisciplinary Research Grant from the University Research Council, University of Peradeniya, awarded to NSS (Grant No. 04).*

Association of *Candida albicans* with Severe vs Mild-to-Moderate Early Childhood Caries – A Molecular Epidemiological Study on a Cohort of Sri Lankan Preschool Children

K.M.S. Bandara[1]*, L.K.D.N. Wijewardhana[2], N.H. Senarath[3], L.K.N. Premathilaka[3], E.M.U.C.K. Herath[3], M.G.B. Gangadhara[2], M.P.C.S. Dhanapala[1], M.P. Paranagama[2]

[1]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya,20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, 20400, Sri Lanka*
[3]*Department of Community Dental Health, Faculty of Dental Sciences, University of Peradeniya, 20400, Sri Lanka*
**surangab@sci.pdn.ac.lk*

Early Childhood Caries (ECC) is a significant public health problem globally. Dysbiosis of the oral microbiome is central to its pathogenesis. *C. albicans* is an opportunistic fungal pathogen commonly found in the eubiotic oral microbiome, and has been recently recognized as a risk factor for ECC. Despite a very high prevalence of this disease in Sri Lanka, occurrence of *C. albicans* in affected children or its association with the disease remains unexplored in the local context. Therefore, the present study aimed to investigate the prevalence and the association of *C. albicans* with the severity of ECC in a cohort of Sri Lankan children. A total of 135 preschool children aged 2–5 years were enrolled and allocated into three groups based on their decayed, missing, and filled teeth (dmft) scores: severe ECC (n=50), mild-to-moderate ECC (n=35), and caries-free (n=50). Supragingival plaque samples were collected using sterile cotton swabs—from carious lesions in children with ECC and from sound tooth surfaces from caries-free children—and cultured on CHROMAgar Candida medium for presumptive identification of *C. albicans*. Five presumptively identified *C. albicans* colonies randomly selected from each positive sample were subcultured on Sabouraud Dextrose Agar. Fungal DNA was extracted using a chemical method, and precisely identified using PCR targeting *C. albicans*-specific *KER1* gene. *C. albicans* was detected in 56.0%, 14.3%, and 6.0% in the severe ECC, mild-to-moderate ECC, and caries-free groups, respectively. Fisher's exact test revealed a strong association of *C. albicans* with severe ECC compared to the caries-free group (OR 19.9; 95% CI 6.2–89.8; $p<0.001$), but not with mild-to-moderate ECC (OR 2.6; 95% CI 0.6–13.5; $p=0.21$). Binary logistic regression yielded the same results. Even after adjusting for age and sex as potential confounders, the association with severe ECC remained highly significant ($OR_{adjusted}$ 22.6; 95% CI 6.8–105.1; $p<0.001$), whereas the association with mild-to-moderate ECC remained non-significant (OR 3.0; 95% CI 0.7–15.7; $p=0.116$). These findings, based on the selected study cohort, indicate that *C. albicans* is specifically associated with severe ECC rather than mild-to-moderate ECC. This highlights the importance of controlling *C. albicans* for effective ECC management and its potential use as a biological marker for predicting the risk of developing severe ECC.

Keywords: *C.albicans*, ECC, PCR, preschool children

Acknowledgement: *Financial assistance from Peradeniya University Research Grant (URG/2025/16/D) is gratefully acknowledged.*

Assessment of Cardiovascular Risk Factors at University Entry and Development of a Risk Predictive Model for Young Adults at the University of Peradeniya

L.H.G.N. Bandara[1]*, M.S. Atapattu[1], C.G.K. Amiyangoda[2]

[1] *Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2] *Department of Pharmacology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**gayannimesh0605@gmail.com*

Cardiovascular diseases are increasingly prevalent among young adults, highlighting the importance of early risk identification among undergraduate students entering university, where cardiovascular risk factors often remain undetected. Early detection is essential to prevent long-term complications and to support timely intervention strategies. This study aimed to develop a statistical model to predict cardiovascular risk among undergraduates at the University of Peradeniya and to identify significant factors associated with lipid profiles and overall risk. A secondary dataset of de-identified health records from 1,140 undergraduate students at the University of Peradeniya was analyzed, including lipid profiles, blood pressure, anthropometric measures, fasting blood sugar, and lifestyle-related variables. Male and female students were analyzed together, with gender included as a predictor in the logistic regression model. Associations were examined using Chi-square tests, Fisher's Exact tests, independent t-tests, and one-way ANOVA, while multiple linear regression was used to identify determinants of LDL cholesterol. In the absence of a predefined outcome variable, a composite risk score was constructed using seven clinically established criteria: body mass index (BMI > 23 kg/m²), LDL cholesterol (>130 mg/dL), low HDL cholesterol (<40 mg/dL for males and <50 mg/dL for females), total cholesterol (>200 mg/dL), fasting blood sugar (>100 mg/dL), elevated blood pressure (>130/80 mmHg), and increased waist circumference (>90 cm for males and >80 cm for females). Each criterion contributed one point, and scores ≥4 were classified as high risk. This binary outcome was modeled using logistic regression. The model demonstrated strong predictive performance, with accuracy of 97.3%, sensitivity of 71.8%, specificity of 99.0%, AUC of 0.99, and McFadden's R^2 of 0.74. Significant predictors included gender, BMI, LDL cholesterol, triglycerides, fasting blood sugar, waist circumference, total cholesterol, and HDL cholesterol. K-means clustering identified three distinct health profiles: a metabolically healthy group, an overweight group with unfavorable lipid profiles, and a normal-weight group with elevated cholesterol levels. These findings demonstrate that integrating composite risk scoring with statistical modeling and clustering provides an effective framework for early cardiovascular risk identification, supporting targeted prevention and improved health monitoring among young adults.

Keywords: cardiovascular risk, cluster analysis, LDL cholesterol, logistic regression, young adults

Assessment of Factors Affecting Dosimetry in High-Dose-Rate Intra-Cavitary Brachytherapy for Cervical Cancer

H.G.S.D. Amarathunga[1]*, L.P.G. Sherminie[1], S. Weerasinghe[2]

[1]*Department of Radiography/ Radiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*National Cancer Institute Maharagama, 10280, Sri Lanka*
**sudara@ahs.pdn.ac.lk*

High-dose rate (HDR) Intra-cavitary brachytherapy (ICBT) is an essential component of multi-modality treatment for cervical cancer. Accurate dose distribution is crucial for effective tumor control while minimizing radiation exposure to organs-at-risk and may be influenced by patient and disease-related factors. This study evaluated the association between patient-and disease-related factors, including body mass index (BMI), Initial Federation of Gynecology and Obstetrics (FIGO) tumor stage, and pelvic dose distribution during HDR ICBT as well as variations in dose distribution between the first and second treatment fractions. A prospective study was conducted among 59 patients with cervical cancer receiving HDR ICBT at the National Cancer Institute Maharagama between September and December 2024. Dose-volume histograms were used to evaluate radiation doses to Manchester Point A, the rectum and the bladder in two treatment fractions. Associations between patient characteristics and dose distribution, and differences between treatment fractions, were analyzed using non-parametric tests. A marginally significant positive relationship was observed between BMI and bladder dose during the first treatment fraction ($r = 0.248$, $p = 0.058$). There were no significant associations between FIGO stage and dose distributions to Point A, the bladder, or the rectum in both fractions (all $p > 0.05$). No statistically significant differences were observed among dose distributions between the first and second treatment fractions for Point A ($Z = -0.339$, $p = 0.735$), rectal dose ($Z = -1.094$, $p = 0.274$), and bladder dose ($Z = -1.008$, $p = 0.314$). Overall, the patient-related factors evaluated in this study were not significantly associated with pelvic dose distribution during HDR ICBT. Although BMI showed a weak positive trend with bladder dose, further studies with larger sample sizes and improved imaging techniques are needed to confirm these findings.

Keywords: cervical cancer, high-dose-rate intra-cavitary brachytherapy, body mass index, FIGO stage, dose-volume histogram

Assessment of Perineal Pain in the Immediate Postpartum Period, Associated Factors and its Impact Among Women Undergoing Vaginal Delivery at a National Tertiary Care Hospital in Sri Lanka

S. Sayini*, A.Y.R. Athukorala

Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**ahs19nur030@ahs.pdn.ac.lk*

Postpartum perineal pain is a common morbidity experienced by women following vaginal delivery that adversely affects women's overall quality of life and their ability to care for their newborns particularly during the immediate postpartum period. Despite its high prevalence, it is often under assessed and inadequately managed. Therefore, this study aimed to assess the post-partum perineal pain prevalence, severity, associated factors, its impact and pain management practices within first 24 hours among women undergoing vaginal deliveries. A Quantitative descriptive cross-sectional study was conducted among a consecutive convenience sample of 128 postpartum mothers who underwent vaginal deliveries including assisted vaginal deliveries across three maternity wards in National Hospital, Kandy, Sri Lanka. Data was collected using interviewer-administered questionnaire comprising five sections including socio-demographic, obstetric, pain assessment and pain management information, impacts of pain on Activities of Daily living and new-born care. Perineal pain intensity was assessed at four time points at 2, 6, 12, and 24 hours postpartum using Numeric Rating Scale (NRS). Data was analysed using SPSS version 26.0 utilizing descriptive statistics to summarize sample characteristics and Chi-square tests to determine the relationships between demographic and clinical variables and pain severity. The mean age of the participants was 27.8±5.2years and the majority of the participants were married (n=125,97.7%), primiparous (n=79,61.7%) and 96.1%(n=123) underwent normal vaginal deliveries. The prevalence of perineal pain was highest at 2 hours postpartum (n=128,100%) and gradually decreased over 24 hours (n=8,6.25%) with the pain management strategies. Primiparous mothers and those who had episiotomy (n=95,74.2%) reported higher pain scores compared to multiparous mothers (n=44,34.4%) and those without episiotomy (n=33,25.8%) at 2 hours postpartum. There was a significant relationship between parity, episiotomy, prolonged second stage of labour, higher neonatal birth weight and perineal pain severity at 2 hours postpartum ($p<0.05$). But there was no significant relationship between the socio-demographic and obstetric characteristics with perineal pain severity at 6,12,24 hours postpartum. Perineal pain is highly prevalent in the immediate postpartum period and significantly affects maternal functional recovery and new-born care. Early identification of mothers at risk and timely pain management interventions should be individualized to optimize postpartum outcomes.

Keywords: perineal pain, postpartum period, pain assessment, pain management, ADLs, new-born care

Assessment of Plasma Hsa-mir-144-5p Expression Levels and Their Association with Glycemic Control in Type 2 Diabetes Mellitus Patients Attended at National Hospital, Colombo, Sri Lanka

R.A.D. Erandika[1], P.A.D.S. Palihaderu[2], B.D.D.T. Ranathunga[2], D.A. Satharasinghe[2*]

[1] *Department of Medical Laboratory Science, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2] *Department of Basic Veterinary Science, Faculty of Veterinary Medicine and Animal Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**dilansatharasinghe@vet.pdn.ac.lk*

Insulin resistance and/or impaired insulin secretion are the main causes of type 2 diabetes mellitus (T2DM), the most prevalent type of diabetes worldwide. Insulin resistance has been linked to microRNAs (miRNAs), which are important modulators of insulin signaling. Among these, hsa-miR-144-5p is well known for its role in the insulin signaling pathway, as well as its potential as a therapeutic target and a biomarker. This study was conducted to assess the expression of plasma miR-144-5p of T2DM patients and evaluate its relative expression against the corresponding HbA1c and fasting blood sugar (FBS) levels. Thirty patients with T2DM admitted to the General Medicine Ward at the National Hospital of Colombo, Sri Lanka, participated in a cross-sectional analytical study. Plasma was separated from whole blood samples, and miRNA was extracted, followed by complementary DNA(cDNA) synthesis using the manufacturer's protocols. SYBR-green-based Quantitative PCR (qPCR) was performed using previously optimized primers targeting hsa-miR-144-5p. Relative miRNA expression of hsa-miR-144-5p was calculated using the combined delta Cq method. Previously validated hsa-miR-425-5p and hsa-miR-22-5p were used as reference microRNAs. The resulting relative miRNA expression data were correlated with HbA1c and FBS levels. The mean combined relative miRNA expression value was 0.0294± 0.0223. Data on relative gene expression, age, pulse rate, and blood pressure were approximately normally distributed, while HbA1c and FBS showed non-normal distributions. HbA1c ($r= 0.236$, $P= 0.210$), FBS ($r= 0.113$, $P=0.551$), and pulse rate ($r= 0.202$, $P=0.284$) all showed positive correlations with miR-144-5p relative expression, according to Spearman's correlation analysis. Systolic and diastolic blood pressure showed negative correlations. However, all correlations were statistically non-significant($P>0.05$). This study observed trends between miR-144-5p expression and glycemic markers, consistent with previous significant findings. Further studies with larger cohorts and comprehensive evaluation of lifestyle factors are needed to confirm miR-144-5p as a biomarker or therapeutic target in T2DM.

Keywords: type 2 diabetes mellitus, microRNA, miR-144-5p, relative miRNA expression, biomarker

Assessment of Prevalence, Species and Genotypic Diversity of Oral *Candida* Associated with Dental Caries Biofilm

C. Gunasena[1*], O.W. Amarasinghe[3], M.P. Paranagama[2], S.S.S. De. S. Jagoda[3], J.A.M.S. Jayatilake[1]

[1]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Sciences, University of, Peradeniya, Peradeniya, 20400, Sri Lanka*
**chandirag@dental.pdn.ac.lk*

Dental caries has long been conceptualized as a bacterial infection. Recently it has been suggested that *Candida*, the commonest oral commensal fungus, also contributes to dental caries. Even though *Candida* in the oral cavity has been studied by many investigators, investigations on *Candida* in the dental caries biofilm are scarce. The objective of the current study was to delineate the prevalence, species distribution, and genotypic diversity of *Candida* in the active dental caries lesions and to compare those with oral cavities of a group of children with dental caries. A cohort of 60 children (6–12 years; dmft/DMFT >2), with no recent antimicrobial exposure or systemic illness, who visited the Dental Teaching Hospital, Peradeniya was recruited as study participants upon informed assent. Paired sample collection was performed in the same patient cohort using concentrated oral rinse sampling and aseptic excavation of active occlusal dentine lesions. Samples were cultured on Sabouraud Dextrose Agar and identified both phenotypically using Gram staining, germ tube test, CHROMagar™ *Candida* and genotypically using species-specific PCR for *Candida albicans*, ABC genotyping, and partial Sanger sequencing for non albicans *Candida* (NAC) confirmation. Prevalence of *Candida* in the oral cavity and in dental caries biofilm was 76.6% and 58.3% respectively, and the difference was significantly different ($\chi^2 = 5.33$, $p = 0.021$). The oral cavity was dominated by *Candida albicans* (84.8%), whereas carious lesions demonstrated a relative enrichment of NAC (54.1%), indicating a possible niche-specific fungal species shift. Genotypic analysis revealed a striking predominance of *C. albicans* genotype A in dental caries biofilms (93.33%), contrasting with a more heterogeneous distribution in oral isolates (A: 51.28%, B: 41.02%, C: 7.68%). Sequencing of NAC identified *Candida stellatoidea*, *Candida krusei*, and *Candida orthopsilosis* in both oral cavity and caries biofilm. Notably, one caries biofilm contained a rare opportunistic yeast *Kodamaea ohmeri*, highlighting previously unrecognized fungal diversity. This study provides compelling evidence that dental caries represents a distinct fungal ecological niche characterized by reduced overall *Candida* prevalence but increased species diversity and genotypic selection. The dominance of *C. albicans* genotype A within carious dentine and the identification of NAC including *Kodamaea ohmeri* underscore a potential paradigm shift in understanding caries as a polymicrobial including mycological disease. These findings warrant deeper exploration of fungal mycobiome in cariogenesis.

Keywords: Candida, dental caries, Kodamaea ohmeri, non- albicans candida, PCR

Acknowledgement: *Financial assistance from the University Research Grant (URG/2024/09/D) is gratefully acknowledged.*

Assessment of the Oral Hygiene and Oral Hygiene Practices Among Patients Undergoing Fixed Orthodontic Treatment Attending Orthodontic Clinics in Dental Hospital (Teaching), Peradeniya and National Hospital, Kandy

B.G.M.C.S. Bandara[1], P.V.D.N.H. Saparamadu[1], G.A.S. Chandimala[1], D.S.A.J. Bandara[1]*, H.S.K. Ratnatilake[1], S.P. Abeysundara[2]

[1]*Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Statistics and Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**dahamishilpani@gmail.com*

Fixed orthodontic appliances create plaque-retentive areas that complicate oral hygiene maintenance and increase the risk of gingivitis, enamel demineralization, and white spot lesions during treatment. Understanding patients' oral hygiene practices and the factors influencing plaque accumulation is important for improving preventive care and treatment outcomes in orthodontics. This study aimed to assess oral hygiene status, evaluate oral hygiene practices, and identify barriers affecting plaque control among patients undergoing fixed orthodontic treatment at two major government dental hospitals in Sri Lanka. A descriptive cross-sectional study was conducted among 121 patients receiving fixed orthodontic treatment for at least six months at Dental Hospital (Teaching), Peradeniya and National Hospital, Kandy. Data regarding socio-demographic characteristics, appliance-related factors, oral hygiene practices, and perceived barriers were collected using a structured interviewer-administered questionnaire. Plaque accumulation was assessed following disclosing using a modified Silness and Löe plaque index. Data were analysed using descriptive and inferential statistical methods. The majority of participants were females (70%) and was aged 18–24 years (48%). Overall, 66% of participants demonstrated poor oral hygiene. Higher plaque scores were observed among participants with only secondary education (71%) and monthly household income <Rs. 25,000 (80%). Oral hygiene status progressively deteriorated with increasing duration of appliance wear, with the poorest outcomes observed among patients undergoing treatment for more than three years (54%). Participants who received both verbal and written oral hygiene instructions (8%) demonstrated higher percentage of excellent oral hygiene. Brushing once daily showed the poorest plaque control (77.8%). Difficulty cleaning around brackets, appliance-related trauma, and discomfort were identified as the most common barriers to maintaining oral hygiene. Oral hygiene among orthodontic patients was influenced by multiple behavioural, educational, and treatment-related factors. Despite high reported motivation, the majority demonstrated inadequate plaque control. These findings highlight the importance of reinforced multimodal oral hygiene education and targeted preventive strategies to address mechanical and behavioural barriers during fixed orthodontic treatment.

Keywords: oral hygiene, fixed orthodontic appliances, plaque accumulation, orthodontic patients, oral hygiene practices

Assessment of the Selected Small RNA Expressions as a Biomarkers in Patients with Type 2 Diabetes Mellitus Present to General Medicine Ward, National Hospital of Sri Lanka, Colombo

D.A. Satharasinghe[1]*, S. Satheesh[2], P.A.D.S. Palihaderu[1], M.M. Govinna[1]

[1]*Department of Basic Veterinary Sciences, Faculty of Veterinary medicine and Animal Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**dilansatharasinghe@vet.pdn.ac.lk*

Type 2 Diabetes Mellitus (T2DM) is a major global non-communicable disease characterized by impaired insulin action and chronic hyperglycemia. Circulating microRNAs (miRNAs) have emerged as potential non-invasive biomarkers for disease monitoring and prognosis. This study aimed to evaluate the expression of hsa-miR-29a-3p and its association with glycemic control among patients with T2DM. A hospital-based cross-sectional study was conducted using blood samples collected from patients with T2DM attending the General Medicine Ward of the National Hospital of Sri Lanka. Participants were recruited using a convenience sampling method and categorized into glycemic control groups based on an HbA1c threshold of 7.5%, enabling a within-T2DM comparison. Plasma was separated for RNA extraction, and hsa-miR-29a-3p expression was quantified using real-time quantitative polymerase chain reaction (RT-qPCR). The expression levels were normalized against hsa-miR-425-5p as the reference gene and calculated using the $2^{-\Delta Ct}$ method. Receiver Operating Characteristic (ROC) curve analysis was performed to evaluate the ability of hsa-miR-29a-3p expression to discriminate between glycemic control categories. Among the analysed samples (n = 13), the mean normalized expression value of hsa-miR-29a-3p was 0.682 ± 0.57. The relatively high standard deviation indicated considerable inter-individual variability in miRNA expression among participants. ROC analysis demonstrated an Area Under the Curve (AUC) of 0.429, indicating that hsa-miR-29a-3p showed performance below random classification in distinguishing patients according to glycemic control status. Sensitivity and specificity varied across different cut-off values, and only a weak association was observed between hsa-miR-29a-3p expression and HbA1c levels. The findings suggest that hsa-miR-29a-3p alone has limited potential as a biomarker for differentiating glycemic control status among patients with T2DM in this cohort. The low discriminatory performance may be influenced by the small sample size and substantial biological variability in miRNA expression. Further investigations involving larger sample sizes, healthy control groups, and multi-miRNA biomarker panels are required to establish the clinical relevance of circulating miRNAs in T2DM monitoring and risk stratification.

Keywords: type 2 diabetes mellitus, MicroRNA, HbA1c, biomarker, qPCR

Association between Muscle Mass and Serum Creatinine to Body Weight Ratio in Patients with Diabetes Mellitus: Cross - Sectional Study from the National Hospital Kandy, Sri Lanka

P.A.U. Chathurani[1*], W.A.P.P. de Silva[1], R.D.P. Jayawardana[2], C. Antonypillai[3], S. Gunatilake[3]

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Diabetes and Endocrinology Unit, National Hospital Kandy, Kandy, 20000, Sri Lanka*
[3]*Department of Biochemistry, National Hospital Kandy, Kandy, 20000, Sri Lanka*
**Chathuranipau99@gmail.com*

Loss of skeletal muscle (sarcopenia) and altered body composition are increasingly recognized complications of diabetes that worsen insulin resistance and clinical outcomes. Serum creatinine (S.Cr), a muscle-derived metabolite, and the serum creatinine-to-body-weight ratio (S.Cr/BW) have been proposed as low-cost surrogates of muscle mass (MM), but their utility in Sri Lankan diabetic patients remains unclear. This clinic-based cross-sectional study evaluated the association of MM with S.Cr and the S.Cr/ BW and assessed their potential as simple, cost-effective surrogate markers for MM assessment. Study was conducted among patients attending annual screening at the National Hospital Kandy (NHK), Sri Lanka, from March to September 2025. A total of 384 patients with diabetes (predominantly type 2) were recruited after informed consent. Patients with macroalbuminuria (urinary albumin-to-creatinine ratio (UACR) >300 mg/g) were excluded to avoid the influence of advanced kidney damage on S.Cr. Anthropometric and body composition measurements were obtained using an Omron bioelectrical impedance monitor. The S.Cr, fasting plasma glucose (FPG), glycated hemoglobin (HbA1c), and UACR were obtained from clinic records, while demographic, lifestyle, and family history data were collected using a questionnaire. Statistical analyses included Spearman correlation, Mann–Whitney and Kruskal–Wallis tests, and a Generalized Additive Model (GAM). The cohort had a mean HbA1c of 8.58 ± 1.91% and BMI of 25.90 ± 4.01 kg/m². Males had higher S.Cr (1.11 ± 0.38 vs. 0.74 ± 0.23 mg/dL), S.Cr/BW (17.07 ± 6.32 $\times 10^{-3}$ vs. 12.37 ± 4.33 $\times 10^{-3}$ mg/dL/kg), and MM (18.09 ± 3.67 vs 13.59 ± 2.77 kg) compared to females. A weak to moderate positive association was reported between S.Cr and MM ($\rho = 0.308$, $p < 0.00001$), whereas no significant association was detected in males ($\rho = -0.154$, $p = 0.125$) or females ($\rho = 0.024$, $p = 0.748$). Similarly, S.Cr/BW alone was not reliably associated with MM. The GAM with S.Cr/BW, age, sex, and BMI improved MM prediction ($\rho = 0.814$, $R^2 = 0.643$). Results suggest that S.Cr moderately reflects MM in patients with diabetes, whereas the S.Cr/BW ratio alone is insufficient for accurate estimation. Multivariable models using demographic and anthropometric factors may provide a more reliable approach for predicting and assessing muscle health in diabetes care.

Keywords: diabetes, Muscle Mass (MM), sarcopenia, Serum Creatinine (S.Cr), Serum Creatinine-To-Body Weight Ratio (S.Cr/Bw)

Association between Shoulder Range of Motion and Fat Mass with Vertical Jump Performance in Volleyball Players

P.M.S.P. Polhengoda*, A. Ariyasinghe, H.C.W. Jayasekara, S.W.B. Konara, A. Kariyawasam

Department of Physiology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**panchalipolhengoda@gmail.com*

Vertical jump performance is a crucial indicator of both lower body power and overall athletic ability, both of which are essential in Volleyball. Although factors such as joint mobility and body composition influence jumping ability, their combined effects are not yet fully understood. Shoulder range of motion (ROM) contributes to effective arm swing mechanics and is important for force generation and movement coordination, while fat mass percentage (FM%) affects the net power-to-weight ratio. Thus, understanding how these variables relate to vertical jump performance can provide valuable insights for both training and performance optimization. Given the limited existing evidence, it remains unclear whether shoulder ROM and fat mass influence the performance of Volleyball players, especially among Sri Lankan Army athletes. A retrospective cross-sectional analytical study was conducted using existing routine fitness assessment records of Sri Lankan Army Volleyball players. All eligible archived physical fitness assessment records were included using a census sampling approach resulting in a total sample of 30. Data on shoulder flexion ROM, fat mass percentage, and vertical jump performance were extracted from the records. Shoulder flexion ROM and FM% had been measured previously using goniometry and Bioelectrical Impedance Analyzer respectively. Vertical jump height had been recorded using a standard vertical jump assessment protocol. Pearson correlation and multiple linear regression analyses were performed to examine associations among variables and identify predictors of vertical jump performance. Statistical significance was set at $p < 0.05$. Pearson correlation analysis revealed a significant moderate positive relationship between shoulder ROM and vertical jump performance ($r=0.372$, $p=0.043$). FM% showed a significant moderate negative correlation with vertical jump ($r=-0.408$, $p=0.025$). Meanwhile, multiple regression analysis indicated that overall model was statistically significant ($p=0.041$), with fat mass emerging as the strongest predictor of vertical jump performance. The findings indicate that both FM% and shoulder ROM significantly influence vertical jump performance. Higher fat mass percentages are negatively associated with vertical jump ability while greater shoulder mobility positively impacts the jump performance. Thus, training programs should put more emphasis on optimizing body composition while simultaneously improving mobility to enhance the athletic performances in Volleyball players.

Keywords: shoulder ROM, vertical jump, body composition, fat mass, volleyball

Association between Sociodemographic Factors, Menopausal Stage, and Knowledge of Menopause among Women in the Nallur MOH Area

S. Piraveena*, D. Sharmila, L. Kamalarupan, K. Nivetha

Department of Nursing, Faculty of Allied Health Sciences, University of Jaffna, Jaffna, 40000, Sri Lanka
**spiraveena@univ.jfn.ac.lk*

Menopause, the permanent cessation of menstruation, is a natural and inevitable stage in a woman's life, often accompanied by physical, psychological, and urogenital changes that can significantly affect quality of life. Understanding menopause, its symptoms, consequences, and management is essential, particularly in relation to sociodemographic factors and awareness levels among women. The objective of this study was to assess the association between sociodemographic factors, menopausal stage, and knowledge of menopause among women in the Nallur MOH area. A community-based cross-sectional study was conducted among 426 women aged 40–60 years. Data were collected using a semi-structured interviewer-administered questionnaire and analyzed using SPSS version 25.0. Associations between sociodemographic factors and knowledge of menopause were assessed using the chi-square test, with statistical significance considered at $p < 0.05$. The findings showed that age was not significantly associated with knowledge of menopause ($p = 0.075$). Among women aged 40–50 years, 14.5% had adequate knowledge, 29.8% moderately adequate knowledge, and 5.5% inadequate knowledge, while among those aged 51–60 years, 9.8% had adequate knowledge, 34.0% moderately adequate knowledge, and 6.5% inadequate knowledge. Educational status ($p < 0.001$), occupation ($p < 0.001$), and marital status ($p = 0.001$) showed statistically significant associations with knowledge levels. Higher levels of knowledge were observed among women educated above ordinary level and those who were employed. Family type was not significantly associated with knowledge ($p = 0.155$). In addition, menopausal stage showed a statistically significant association with knowledge levels ($p = 0.036$), indicating that awareness varies across different stages of menopause. Overall, the study revealed that knowledge of menopause among women was significantly influenced by educational status, occupation, marital status, and menopausal stage, while age and family type showed no significant association. These findings highlight the importance of targeted health education and awareness programs, particularly focusing on women with lower educational attainment and unemployment, to improve knowledge and promote better understanding and coping strategies related to menopause in the community.

Keywords: menopause, knowledge

Association between the Berg Balance Scale and the Biodex Stability System's Balance Evaluation in Stroke Patients at Teaching Hospital, Jaffna

U. Theleepan[1]*, K. Ajantha[2], S. Thiruvarangan[3]

[1]Physiotherapist, Teaching hospital, Jaffna, 40000, Sri Lanka.
[2]Consultant Neurologist, Teaching Hospital, Jaffna, 40000, Sri Lanka
[3]Primary care, Whakatane 3120 Bay of Plenty, New Zealand
**theleepanphysio@gmail.com*

Stroke frequently results in impaired balance, leading to an increased risk of falls and long-term disability. Accurate and reliable assessment tools are essential for evaluating balance and implementing effective fall prevention strategies. The Berg Balance Scale (BBS) is widely used to assess functional balance, while the Biodex Stability System (BSS) provides objective measures of postural stability, including the Overall Stability Index (OSI), Anterior-Posterior Stability Index (APSI), and Medial-Lateral Stability Index (MLSI). This study aimed to determine the association between BBS scores and BSS indices and to compare their diagnostic accuracy for fall risk among stroke patients. A cross-sectional study was conducted involving 150 first-time stroke patients aged 50–80 years who are able to stand independently without support. The BBS was administered by a trained therapist, and BSS indices were obtained using standardized protocols. A BBS score of <45 and an OSI cut-off value of 2.95, both validated in previous studies, were used to classify participants at risk of falls Correlation analysis, sensitivity, specificity, and diagnostic odds ratios were calculated. Receiver operating characteristic (ROC) analysis was performed to evaluate diagnostic performance. The mean BBS score was 37.5, indicating moderate balance impairment, while the mean OSI was 4.4. Significant negative correlations were observed between BBS and BSS indices (OSI: $r = -0.708$, APSI: $r = -0.662$, MLSI: $r = -0.636$; $P < 0.001$). The BSS demonstrated higher sensitivity (67%) and specificity (69.4%) compared to the BBS (sensitivity 52%, specificity 56%) in identifying fall risk. The diagnostic odds ratio was 4.60 for the BSS and 1.23 for the BBS. ROC analysis indicated moderate diagnostic performance for both tools (BBS: 0.65; BSS: 0.67). In conclusion, the BSS demonstrated more accuracy in predicting fall risk compared to the BBS in this Sri Lankan population. The combined use of both tools may enhance comprehensive balance assessment and improve fall risk management in stroke rehabilitation.

Keywords: Berg Balance Scale, Biodex Stability System, stroke, fall risk, postural control

Association of Pregnancy, Hormonal Contraceptive Use, and Substance Use with Disease Severity in Chronic Venous Insufficiency Using VCSS in a Tertiary Care Setting in Sri Lanka

R.M.J.B.S. Rathnayaka*, K.G.D. Perera, C.A.H.M.D.A. Chandrasekara, M.M.M.A. Mansoor, V.D.P. Liyanage, S. Narampanawa

Department of Surgery, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**jeewanrath@gmail.com*

Chronic venous insufficiency (CVI) is a common vascular disorder with multifactorial etiology, where hormonal and lifestyle factors are believed to influence disease progression. Pregnancy, hormonal contraceptive use, and substance use (smoking and alcohol) have been implicated in venous pathology; however, their relationship with disease severity remains inadequately characterized in the Sri Lankan context. The association between pregnancy-related factors, hormonal contraceptive use and substance use with disease severity is measured by the Venous Clinical Severity Score (VCSS). A descriptive cross-sectional study was conducted among 109 patients diagnosed with CVI attending General and vascular Surgical clinic, Teaching Hospital Peradeniya. Sri Lanka. Data were collected using an interviewer-administered questionnaire and clinical assessment, including VCSS scoring. Statistical analysis was performed using SPSS. Spearman's correlation was used to assess relationships between continuous/ordinal variables, while Chi-square and non-parametric tests (Mann–Whitney U) were used for categorical comparisons. A p-value <0.05 was considered statistically significant. The correlation between the number of pregnancies and VCSS score demonstrated a weak negative association (Spearman's rho = -0.205, p = 0.078), which was not statistically significant. Similarly, no significant association was observed between pregnancy status (nulliparous vs multiparous) and VCSS categories ($\chi^2 = 1.2$, p = 0.752). Duration of hormonal contraceptive use also showed a weak, non-significant negative correlation with VCSS score (Spearman's rho = -0.19, p = 0.102). Among male participants, smoking status showed a trend toward higher VCSS scores; however, this was not statistically significant (Mann–Whitney U = 87.5, p = 0.092). Alcohol consumption likewise demonstrated no significant association with disease severity (Mann–Whitney U = 94, p = 0.305). This study did not demonstrate statistically significant associations between pregnancy-related factors, hormonal contraceptive use, or substance use and CVI severity as measured by VCSS. Although weak trends were observed, particularly with smoking, these findings suggest that other factors may play a more dominant role in determining disease severity. Further large-scale, multicenter studies are recommended to better elucidate these relationships.

Keywords: chronic venous insufficiency, VCSS, pregnancy, hormonal contraceptives

Association of Preoperative Modified Glasgow Prognostic Score with Length of Hospital Stay and Postoperative Outcomes in Hepatobiliary and Pancreatic Surgery: A Pilot Study from Sri Lanka

S.U.D. Samarasinghe[1,2]*, R.I.S. Rajapaksha[1], L. Weerakoon[1], G. Vaikunthan[2]

[1]*Faculty of Medicine, University of Peradeniya, 20400, Sri Lanka*
[2]*Teaching Hospital of Peradeniya, Peradeniya, 20400, Sri Lanka*
**senani.samarasinghe@med.pdn.ac.lk*

The Modified Glasgow Prognostic Score (mGPS) is a widely used index reflecting systemic inflammation and nutritional status based on serum C-reactive protein (CRP) and albumin levels. It has been extensively studied in colorectal, renal, and lung cancers but remains underexplored in hepatobiliary and pancreatic procedures, particularly in low- and middle-income settings such as Sri Lanka. This study aims to evaluate the association between preoperative mGPS and postoperative outcomes in hepatobiliary and pancreatic surgery, focusing on length of hospital stay (LOS) and postoperative complications. A prospective cohort study is being conducted over 18 months in teaching hospitals in Sri Lanka, with a planned sample size of 80 elective patients. Due to ongoing data collection, a pilot analysis was performed using patients with complete data. mGPS was calculated using preoperative CRP and albumin levels. Postoperative outcomes included LOS and complications, with surgical complexity considered as a covariate. Statistical analyses included Spearman's rank correlation, Fisher's Exact Test, Kruskal–Wallis test, and logistic regression. A total of 17 patients were analyzed (mean age 51.9 ± 15.0 years; mean LOS 6.94 ± 3.21 days). mGPS distribution was 0 (n=10) and 1 (n=7), with complications occurring in 29.4% of patients. Median LOS was higher in mGPS 0 than in mGPS 1 (7.5 vs 5.0 days; p=0.0049). A strong negative correlation was observed between mGPS and LOS ($\rho = -0.70$, $p = 0.0017$). No significant association was found between mGPS and postoperative complications (p=0.34). Logistic regression showed lower odds of complications with higher mGPS (OR=0.25), which became non-significant after adjustment (adjusted OR=0.65). In conclusion, preoperative mGPS demonstrated a significant inverse association with LOS but not with postoperative complications. These findings should be interpreted with caution, as this is a pilot study with a limited sample size and the absence of mGPS 2 patients, which may restrict the reliability of the conclusions. The study is ongoing, and further analysis with a larger cohort is planned to improve robustness and generalizability. If mGPS demonstrates limited predictive value, future work will focus on developing a more appropriate prognostic model for the Sri Lankan population by incorporating additional clinical variables.

Keywords: modified Glasgow prognostic score, hepatobiliary surgery, pancreatic surgery, length of hospital stay, postoperative complications

Association of Sociodemographic and Clinical Factors with Nutritional Status in Chronic Kidney Disease Patients

D.T.M. Ariyaratne, M.S. Sagunthala, J.W.K.M.A. Jayasundara, M.I. Zainab, G.K. Nagasinghe, K.N. Nilmini*

Faculty of Medicine, Sabaragamuwa University of Sri Lanka, Ratnapura, 70000, Sri Lanka
**nadeesha@med.sab.ac.lk*

Chronic Kidney Disease (CKD) has been increasing worldwide in recent years, and malnutrition is a common and serious complication among affected patients. Sociodemographic and clinical factors influencing nutritional status are important for early intervention and supportive care. In Sri Lanka, there is limited research on the association between these factors, nutritional status among CKD patients.This study aimed to assess the association between sociodemographic characteristics and clinical factors such as CKD stage, disease duration, and comorbidities such as diabetes mellitus,hypertension and dyslipidemia with the nutritional status of CKD patients.A descriptive cross-sectional study was conducted among 210 randomly selected CKD patients attending the Nephrology Clinic and wards. Data were collected using the validated 7-point Subjective Global Assessment (SGA) and a pre-tested general questionnaire. Data were analyzed using descriptive statistics and Chi-square , with $p < 0.05$ considered statistically significant. A total of 210 participants were included in the study, consisting of 61% males and 39% females, with the majority (45%) aged 55–66 years. CKD stage 3 (31.9%) and stage 4 (27.6%) were the most prevalent, and most patients had a disease duration of 2–6 years (52.9%). Overall, 63.8% were mildly to moderately malnourished, 30% were well-nourished, and 6.2% were severely malnourished. Hypertension (81.9%) was the most common comorbidity, followed by diabetes mellitus (67.6%) and dyslipidaemia (40.5%). Mild to moderate malnutrition was observed in 64.8% of males and 62.2% of females, while least is severe malnourishment, with 2.3% male patients and 12.2% female patients. A significant association found between the nutritional status and gender ($p<0.013$) and CKD stage ($p<0.007$). Hypertension ($p = 0.846$), diabetes mellitus ($p = 0.889$), and dyslipidaemia ($p = 0.875$) were not statistically significant with the nutritional status of CKD patients.Malnutrition is common in CKD patients and significantly associated with CKD stage and gender but not with comorbidities. Routine nutritional screening, early detection, and individualized dietary interventions are essential to improve outcomes and quality of life through multidisciplinary care.

Keywords: chronic kidney disease, nutritional status**,** 7 point SGA

Audit of Histopathology Reporting of Oral Potentially Malignant Disorders: Compliance with Reporting Standards

S.M. Range[1,2]*, P.R. Jayasooriya[1]

[1]*Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Postgraduate Institute of Medicine, No 160, Nandadasa Kodagoda Mawatha, Colombo 7, 00700, Sri Lanka*
**d03497@pgim.cmb.ac.lk*

Standardized reporting of intraoral mucosal biopsies for leukoplakia and erythroleukoplakia, is essential for accurate diagnosis and patient management. These lesions may show epithelial dysplasia, which is a useful predictive marker for development of malignancy. Variability in documentation of necessary details and higher turnaround-time affect the quality of histopathology reports. Auditing the compliance of reporting these lesions with established standards helps identify gaps and improve the quality of histopathology reports. This retrospective audit evaluated compliance of histopathology reports of intraoral mucosal biopsies submitted for diagnosis of Oral Potentially Malignant Disorders at the Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, with established reporting standards. 40 consecutive reports between August 2025, and April 2026 were reviewed using a proforma recommended by The Royal College of Pathologists. Cases diagnosed as keratosis with or without dysplasia were included, while those diagnosed as Squamous Cell Carcinoma were excluded. Compliance was calculated as a percentage for each parameter. 100% compliance was observed in documenting indication for biopsy, lesion site and appearance, number of tissue fragments, biopsy site differentiation, dysplasia reporting, summary of microscopic findings, and preference for a diagnosis. Clinical diagnosis (92.5%), documentation of risk factors (90%) and availability of at least 3 levels for each biopsy (92.5%) also showed satisfactory compliance. Adequacy of sampling (55%), availability of histochemical stains to confirm absence of *Candida* (24.14%), definitive statements on invasive malignancy (13.5%), and reporting of *Candida* presence (52.5%) demonstrated suboptimal compliance. Recording of the size of the largest fragment showed no compliance (0%). Authorization of reports within 7 days, or documentation of reasons for delay, was achieved in 58.97% of cases. In the Sri Lankan context, features supportive of *Candida* in routine H&E sections including elongated rete ridges, neutrophil microabscesses and germinal centres within the corium are used to guide the selective use of special stains (PAS/DPAS), and absence of *Candida* is not routinely supported with additional special stains as recommended in the guidelines, due to limited resources for special stains. The findings highlight the need for improved documentation practices, adherence to reporting protocols, staff education and discussion with clinicians regarding inadequacy of sampling. Re-audit following corrective measures is recommended.

Keywords: oral potentially malignant disorders, audit, leukoplakia, erythroleukoplakia, epithelial dysplasia, histopathology reporting, royal college of pathologists, *Candida*

Awareness, Knowledge, Perception, and Practices Related to Digital Dentistry (DD) of The Pre-Clinical and Clinical Dental Undergraduates at the FDS, UOP

V.S. Walawage[1]*, A.E. Wickramasinghe[1], H.N.W. Wijayawardana[1], R.M. Jayasinghe[2], R.M.S.G.K. Rasnayaka[2], S.P. Abeysundara[3]

[1]*Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Prosthetic Dentistry, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**ddresearchpera@gmail.com*

No Show Abstract

Digital Dentistry (DD) involves integrating computer-controlled components like CAD/CAM, intraoral scanning, and 3D printing into clinical practice to enhance precision. Despite global adoption, understanding how dental undergraduates in Sri Lanka are equipped for these advancements is limited. Awareness of emerging trends is crucial for high-quality, time-efficient patient care. The study aimed to assess the levels of awareness, knowledge, perception, and practices related to digital dentistry among pre-clinical and clinical dental undergraduates at the Faculty of Dental Sciences, University of Peradeniya (FDS, UOP) to identify curricular gaps and barriers to implementation. A descriptive, cross-sectional study was conducted among 235 undergraduates selected via stratified random sampling from six batches at FDS, UOP. Data were collected using a pre-tested, self-administered questionnaire evaluating socio-demographics, awareness, knowledge, perceptions, and practical exposure. Statistical analysis, including Chi-squared tests for associations with clinical status, was performed using MINITAB software (version 18). Awareness of CAD/CAM terminology significantly increased with academic year, from 23.68% (1st year) to 100% (5th year) ($p<0.001$). Clinical students showed higher awareness of digital impressions and milling. While knowledge of terminology and materials was moderate, over 80% of students reported no exposure to CAD/CAM software. Practical interaction with intraoral scanners (10.51%) and 3D printers (19.07%) remained low. While theoretical awareness and positive perceptions of DD's efficiency grow during clinical years, practical exposure remains critically insufficient. The current BDS curriculum is perceived as inadequate for DD training, with students relying on social media. Significant improvements in infrastructure and curricular integration are mandatory to prepare students for modern dental practice with inculcation of DD.

Keywords: digital dentistry, CAD/CAM, intraoral scanning, 3D printing, dental education

Bacterial Contaminants and Antimicrobial Susceptibility Patterns on Canteen Dining Table Surfaces in a Medical Faculty, Sri Lanka

M.F.M. Zinhath[1]*, K.G.R.A. Kumara[2], G.M.T.M. Herath[2], U.P.R.U. Dissanayake[2], M.G.C.M. Muthuwaththa[2], M.A.A.S. Sharafa[1], H.D.W.S. Kudagammana[2]

[1]Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Microbiology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**mohamad.zinhath.19@med.pdn.ac.lk*

The canteen of the Faculty of Medicine, University of Peradeniya, functions as a central hub where students gather, rest, and consume meals after returning from clinical training in various hospitals. Movement between hospitals and the canteen raises the possibility of transferring healthcare-associated pathogens to shared high-touch surfaces. Dining tables, in particular, may act as reservoirs for both food-borne organisms and clinically relevant pathogens, creating a potential risk of indirect transmission. This study aimed to identify potentially pathogenic bacterial contaminants and determine their antimicrobial susceptibility patterns on dining table surfaces in a medical faculty canteen. A cross-sectional study was conducted using standardized aseptic swabbing of defined surface areas from 30 dining tables (four samples per table) immediately after lunch and prior to routine cleaning. Samples were cultured using standard microbiological techniques, and isolates were identified by Gram staining and relevant biochemical tests. Antimicrobial susceptibility testing was performed by the Kirby-Bauer disc diffusion method and interpreted according to Clinical and Laboratory Standards Institute (CLSI) guidelines. A total of 120 swabs yielded 584 bacterial isolates, of which 353 (60.4%) were Gram-positive, 133 (22.8%) were Gram-negative, 95(16.3%) demonstrated mix growth and 3(0.5%) showed no growth. No confirmed *Staphylococcus aureus* isolates were identified. Among Gram-negative bacteria, isolates included one presumptive multidrug-resistant *Salmonella* species, one beta-lactam-resistant *Escherichia* species, and one fully susceptible *Proteus* species, with other isolates comprising environmental organisms. Increased resistance was observed to third-generation cephalosporins and other beta-lactams, while the highest susceptibility was noted to piperacillin-tazobactam, imipenem, amikacin, and gentamicin. Canteen table surfaces in this setting showed relatively low levels of classical pathogenic contamination, and the absence of *Staphylococcus aureus* and other important pathogens suggests satisfactory hygiene practices. However, the detection of Gram-negative organisms, particularly multidrug-resistant *Salmonella*, is clinically significant and highlights the need for continued microbial surveillance and strict hygiene measures in environments that bridge hospital and community exposure.

Keywords: healthcare-associated, bacterial pathogens, cross-transmission, antimicrobial resistance

Childhood and Adolescent Cancers in Sri Lanka: A Population-Based Study from 2005 to 2022

A.G.A.N. Wijerathne[1]*, W.M.O.V.K. Weerasekara[1], S.L. Jayakody[2], N.S. Soysa [1,2]

[1]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**anupama.wijerathne.18@med.pdn.ac.lk*

Childhood and adolescent cancers represent a growing public health challenge worldwide, particularly in low and middle-income countries, including Sri Lanka. Even though they account for a relatively small proportion of total cancers, they contribute substantially to morbidity and mortality. Given the limited recent evidence from Sri Lanka, this study aimed to describe the incidence, mortality, and temporal trends of childhood and adolescent cancers from 2005 to 2022. Data on newly diagnosed cancer cases among individuals aged 0 - 19 years were extracted from National Cancer Registry and Childhood Cancer Registry of Sri Lanka, and the mortality data were extracted from Vital statistics compiled by the Department of Census and Statistics, Sri Lanka. Cases were classified according to the International Classification of Childhood Cancers (ICCC-3), stratified by sex and five-year age groups. Age-standardized incidence and mortality rates (per 100,000 population) were calculated using direct standardization method, applying WHO 2000 – 2025 world standard population. Temporal trends were analyzed using joinpoint regression. A total of 13,173 childhood cancer cases were reported over the 18-year study period, representing approximately 3% of all cancer cases. Incidence was slightly higher among males (male-to-female ratio 1.1:1.0). During the study period, age-standardized incidence rate has increased from 7.48 to 13.42 in males and from 7.10 to 12.02 in females. Total cancer incidence demonstrated an increasing trend with an APC of 3.71 (95% CI: 2.83 – 4.59), whereas, the mortality exhibited a declining trend with an APC of -2.24 (95% CI: -2.96 - -1.56). Leukemia was the most common cancer in both sexes; among males, it was followed by lymphoma and malignant bone tumors while among females, epithelial neoplasms and germ cell tumors were more prevalent. Between 2015 and 2019, soft tissue tumors showed the highest increment, while malignant bone tumors exhibited the greatest decrement. Overall, childhood cancer incidence in Sri Lanka has increased over time, whereas mortality has decreased. However, this rise in incidence may, in part, be attributable to improvements in cancer registration, diagnostic facilities, case ascertainment, and referral systems. Our findings highlight the need for enhanced surveillance and strengthened pediatric oncology services to address the evolving disease burden.

Keywords: childhood and adolescent cancer, incidence, temporal trends, Sri Lanka

Clinical and Behavioral Predictors of Epithelial Dysplasia Severity in Oral Leukoplakia: A Cross-Sectional Study from a Tertiary Care Centre in Sri Lanka

M.N.F. Rukshana[1]*, H.N.S. Soysa[2], P.R. Jayasooriya[3], R.D. Jayasinghe[1,2]

[1]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Oral Medicine & Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**rukshananzm@dental.pdn.ac.lk*

Oral leukoplakia (OL) is the most common potentially malignant disorder of the oral cavity, with a variable risk of malignant transformation. Epithelial dysplasia remains the most important histopathological predictor of malignant potential. Although clinical and behavioral factors have been implicated in disease progression, their combined effects in Sri Lankan populations, where betel quid chewing is highly prevalent remain underexplored. This study aimed to identify clinical and habit-related predictors of epithelial dysplasia severity in patients with OL. A cross-sectional study was conducted on 112 histopathologically confirmed cases of OL diagnosed and managed at the Division of Oral Medicine, Teaching Hospital, University of Peradeniya, between 2016 and 2023. Demographic, clinical, and risk habit data were retrieved from patient records. Lesion characteristics were recorded, and epithelial dysplasia was graded according to the WHO three-tier system. Associations were analyzed using chi-square tests, Kruskal–Wallis test, and binary and ordinal logistic regression models. The study showed a marked male predominance (88.4%) with a mean age of 56 years (SD = 13.87). Most patients were betel quid chewers (86.6%), with buccal mucosa being the most commonly affected site (54.5%). Epithelial dysplasia was present in 68.7% of cases. Increasing age was significantly associated with higher dysplasia severity (OR = 1.06 per year, $p < 0.001$). Non-homogeneous lesions showed increased odds of severe dysplasia (OR = 2.25, $p = 0.023$), and lesion size was significantly associated with dysplasia severity ($p = 0.042$), with larger lesions showing higher grades. Betel quid chewing demonstrated a strong association with dysplasia severity in both univariate and multivariable analyses (adjusted OR = 9.21, $p < 0.001$), with a dose–response relationship observed, where each additional year of chewing increased the odds of higher dysplasia grade by approximately 7% (OR = 1.07, $p < 0.001$). Site-specific analysis showed that betel quid chewing was strongly associated with buccal mucosa lesions (OR = 5.95, $p = 0.009$), while smoking was associated with labial commissure lesions (OR = 4.69, $p = 0.027$). Alcohol consumption was not significantly associated with outcomes. Age and betel quid chewing were the only consistent independent predictors of epithelial dysplasia severity in multivariable analysis. A clear dose–response relationship with chewing duration further supports the carcinogenic role of chronic exposure. These findings highlight the importance of identifying high-risk clinical and behavioral profiles for dysplasia severity in OL.

Keywords: oral leukoplakia, epithelial dysplasia, betel quid chewing, oral potentially malignant disorders, malignant transformation

Acknowledgement: *This study was supported by the University Research Grant, University of Peradeniya, Sri Lanka (Grant No. URG/DEN/2026/3).*

Clinical and Laboratory Profile of Chikungunya during the 2025 Outbreak in Central Sri Lanka: A Cross-Sectional Study

K.S. Thabrew[1], D.W.A. Shantha[2], S.R. Waidyatilleke[1]*, S.S. Senarathne[1], T. Manoshan[3], N.M.T. Anupama[3], L.P.M.M.K. Pathirage[1]

[1]*Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya 20400, Sri Lanka*
[2]*Professorial Teaching Unit, Teaching Hospital, Peradeniya 20400, Sri Lanka*
[3]*Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya 20400, Sri Lanka*
**sasmitha.tck@hotmail.com*

Chikungunya virus infection is an arboviral disease characterised by fever, arthralgia, and rash. After the 2006–2007 epidemic, Sri Lanka reported no further large outbreaks until a febrile illness outbreak emerged in the Central Province in March 2025. Contemporary clinical and laboratory descriptions of chikungunya in endemic South Asian settings remain limited. A cross-sectional study at Teaching Hospital Peradeniya enrolling 93 patients meeting the national suspected or probable case definition, after exclusion of serologically confirmed alternative febrile illnesses, was conducted to describe the clinical and laboratory profile of patients meeting the Sri Lanka Ministry of Health case definition for suspected or probable chikungunya during this outbreak, and to examine how presentation varies by IgM seropositivity, sex, and age. Clinical and laboratory data were recorded using a pretested interviewer-administered questionnaire; fever was ascertained by history as a symptom of the illness episode. Anti-CHIKV IgM was assessed by ELISA. Group differences by IgM status and sex were tested using Chi-squared and Fisher's exact tests; age associations were assessed by binary logistic regression, with polynomial regression where non-linearity was suspected. Symptom duration at presentation was not recorded. Mean age of the population was 46.1 years (SD 16.1); 65.1% were female; IgM seropositivity was 68.8%. Symptomatically, fever (90.0%), joint pain (93.8%), and fatigue (93.2%) predominated, with the knee most affected (87.1%). Skin rash occurred in 46.3%, elevated CRP in 72.5%, and thrombocytopenia in 41.5%. No significant differences were detected between IgM-positive and IgM-negative patients (all $p > .05$). Females had higher rates of knee involvement (95.3% vs. 70.8%, $p = .005$) and skin rash (54.0% vs. 29.6%, $p = .040$); males had more neutropenia (60.0% vs. 18.8%, $p = .031$). Joint pain increased with age (OR 1.14/year, $p = .013$), while mouth ulcers showed a U-shaped age distribution (polynomial $p = .005$). Chikungunya in this outbreak presented with prominent musculoskeletal and systemic involvement, with sex and age meaningfully shaping the clinical phenotype. Absence of symptom-duration data and inclusion of IgM-seronegative probable cases limit interpretation, but the findings provide a contemporary reference for recognition and management of chikungunya in endemic settings.

Keywords: chikungunya, arboviral infection, Sri Lanka, clinical profile, outbreak

Colorectal Cancer Incidence Trends in Sri Lanka from 2006 to 2022: A Join Point Regression Analysis of National Cancer Registry Data

K.H. Lakshitha[1]*, S.L. Jayakody[2], S. Jinujaan[1], C.N.R.A. Alles[1], N.S. Soysa[3]

[1]*Department of Biochemistry, Faculty of Medicine, University of Peradeniya,20400, Sri Lanka*
[2]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**hashanlakshithaofficial@gmail.com*

Colorectal cancer (CRC) is an emerging public health concern in South Asia, yet longitudinal trend data from Sri Lanka remain scarce; understanding these trends is critical for evidence-based cancer control planning and resource allocation at the national level, and this study provides the first join point regression-based characterization of colorectal neoplasm incidence trends in Sri Lanka. This study aimed to analyze temporal trends in CRC incidence in Sri Lanka from 2006 to 2022, across a collective colorectal category (combining C18, C19, and C20) and three ICD-10 anatomical subcategories - colon (C18), rectosigmoid junction (C19), and rectum (C20) — using national cancer registry data. Age-adjusted incidence rates (AAR) were calculated using the World Standard Population for the collective colorectal category and each subcategory independently, and temporal trends were assessed using the National Cancer Institute (NCI) Join point Regression Program, with Annual Percent Change (APC) and Average Annual Percent Change (AAPC) with 95% confidence intervals estimated using the permutation test method to characterize the direction and magnitude of incidence trends. The collective colorectal category demonstrated a statistically significant increasing trend across all cohorts, with AAPCs of 7.78% (95% CI: 6.43–9.15), 7.93% (95% CI: 6.41–9.46), and 7.86% (95% CI: 6.51–9.23) for males, females, and total, respectively (all $p < 0.000001$). Colon cancer similarly showed significant increases, with AAPCs of 8.41% (95% CI: 6.80–10.43), 7.81% (95% CI: 6.18–9.46), and 8.08% (95% CI: 6.58–9.59) for males, females, and total (all $p < 0.000001$). For the rectosigmoid junction, join point analysis identified a single join point in males and the total cohort, with a rapid increase in APC during 2006–2015 (male: 17.08%, 95% CI: 11.23–23.18; total: 17.83%, 95% CI: 11.14–24.92), followed by a slower and non-significant increase during 2016–2022 (male: 3.58%, 95% CI: −0.82–8.17; total: 4.72%, 95% CI: −0.17–9.56), while females showed a single significant AAPC of 11.03% (95% CI: 7.97–14.17; $p = 0.000001$). Rectal cancer showed consistent significant increases, with AAPCs of 6.94% (95% CI: 5.57–8.34), 6.60% (95% CI: 5.17–8.05), and 6.80% (95% CI: 5.52–8.09) for males, females, and total (all $p < 0.000001$). These findings reveal a uniformly significant and sustained rise in CRC incidence across all anatomical subsites and both sexes, with the rectosigmoid junction showing the steepest early acceleration, underscoring the urgent need for targeted screening programs and subsite-specific surveillance strategies within Sri Lanka's national cancer control framework.

Keywords: colorectal neoplasms, incidence trends, join point regression, age-standardized rates, Sri Lanka

Comparative Dosimetric Analysis of Lung Exposure in Breast Cancer Radiotherapy with and without Supraclavicular Fossa Irradiation Using Three-Dimensional Conformal Radiotherapy

S. Thanusiya[1]*, L. Thasanthan[1], S. Gunasekara [2]

[1]*Department of Radiography/ Radiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*National Cancer Institute Maharagama, Maharagama,10280, Sri Lanka*
**thanusiyasomasuntharam@gmail.com*

Radiotherapy is a key component of breast cancer management and plays an important role in reducing locoregional recurrence. However, the inclusion of supraclavicular fossa (SCF) irradiation may increase radiation exposure to adjacent organs at risk, particularly the lungs, thereby raising concern regarding radiation-induced pulmonary toxicity. This study aimed to evaluate and compare lung dose parameters in breast cancer patients treated with Three-Dimensional Conformal Radiotherapy (3D-CRT) with and without SCF irradiation, and to assess the relationship between SCF planning target volume (PTV) coverage and pulmonary dose metrics. A retrospective quantitative analysis was conducted using approved 3D-CRT treatment planning system records of 128 female breast cancer patients treated between 2023 and 2024 at the National Cancer Institute Maharagama. The study included 64 patients treated with SCF irradiation and 64 patients treated without SCF irradiation. Dosimetric parameters, including mean lung dose (MLD), lung V5, and lung V20, were extracted from dose-volume histograms, where V5 and V20 were defined as the percentage of lung volume receiving at least 5 Gy and 20 Gy, respectively. Data were analyzed using Mann–Whitney U tests and Spearman's rank correlation coefficients. Patients treated with SCF irradiation demonstrated significantly higher lung exposure than those treated without SCF irradiation ($p < 0.001$), with median V5 increasing from 23.3% to 30.7%, V20 from 11.1% to 16.2%, and MLD from 6.16 Gy to 8.48 Gy. Correlation analysis showed no statistically significant relationship between SCF-PTV coverage and MLD ($\rho = 0.110$, $p = 0.387$), V20 ($\rho = 0.135$, $p = 0.288$), or V5 ($\rho = 0.071$, $p = 0.578$), indicating that SCF-PTV coverage variation was not significantly associated with lung dose variation within the SCF group. In conclusion, SCF irradiation in breast cancer radiotherapy using 3D-CRT was associated with significantly higher lung dose exposure, highlighting the need for careful SCF field planning and lung dose optimization when nodal irradiation is clinically indicated.

Keywords: 3D-CRT, supraclavicular fossa irradiation, lung dosimetry, breast cancer, radiation toxicity

Comparative Fitness Profiles of Sri Lankan Male Field Hockey and Football Players: A Retrospective Study

W.M.S.L. Wijesooriya[1]*, S.C. Manawaduge[1], A.S. Ariyasinghe[1], A. Mallawaarachchi[2], A. Kariyawasam[1]

[1]*Department of Physiology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Physical Education, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**sandaruwijesooriya@gmail.com*

Field hockey and football are two globally popular team sports with distinct physiological and skill-related demands. The presence of sport-specific fitness profiles can guide coaches in talent identification and inform training schedules. However, comparative fitness data for Sri Lankan field hockey and football players are lacking. This study aims to bridge this gap and provide a foundation for future research by comparing anthropometric and physical fitness characteristics between Sri Lankan male hockey and football players. Retrospective data from male hockey (n= 27) and football (n=33) players aged range 18–37 years who underwent fitness testing at the Sports and Exercise Laboratory, Faculty of Medicine, University of Peradeniya were analyzed. Tests included anthropometry (height, weight, BMI), body fat percentage (bioelectric impedance), VO_2 max (Åstrand ergometer), back muscle strength (dynamometry), and flexibility (sit-and-reach). Independent t-tests and Mann-Whitney U tests were used for comparisons. The mean age of hockey players was (27.81± 4.35) years and of football players was (26.67± 4.26) years. Football players had significantly higher VO_2 max (52.44±6.0 vs. 42.87±8.87 ml/kg/min, $p<0.001$) and significantly lower fat percentage in the lower body (12.3±3.5 vs. 21.7±5.1, $p<0.001$) compared to hockey players. Hockey players had significantly higher BMI (22.7±3.4 vs. 21.1±2.1 kg/m², $p=0.034$) compared to football players. No significant differences were observed for height, weight, back muscle strength ($p=0.285$), or flexibility ($p=0.091$). The higher aerobic capacity and lower body fat in football players compared to hockey players reflect sport-specific endurance demands. Higher aerobic capacity in football is expected given the continuous running nature of football, whereas hockey involves more intermittent sprinting. The similarities in back muscle strength and flexibility may suggest comparable upper body and mobility requirements. These findings provide baseline data for coaches in guiding training programs in both sports and serve as a foundation for future research.

Keywords: field hockey, physical fitness, football, Sri Lanka

Comparison of Cooking and Non-Cooking Indoor $PM_{2.5}$ Levels and Their Association with Respiratory Symptoms among Pregnant Women in Sri Lankan Households

O.K.D.V.T Kumarasiri[1]*, M.R.F. Rishadha[1], P.N.D. Kumaranathunga[1], W.A.D.H.M. Wijayasinghe[1], C.M.J.C. Chandrasekara[1], K.A.N Manomi[2], J.M.D.C. Jayasinghe[2,3], C.B. Karunarathne[2,3], K.H.A.Y. Kariyawasam[2,6], H.M.C.R.K. Thilakaratna[1], C. Lin[4], J. Schwarze[4,5], P. Dissanayake[1], T. Amarasekara[2], G. Bowatte[1], R.M.D. Madegedara[3], C.S.E. Goonewardena[2], S.W. Wimalasekara[2], B.M.G.D. Yasaratne[1]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*University of Sri Jayewardenepura, Nugegoda, 10250, Sri Lanka*
[3]*Wayamba University of Sri Lanka, Kuliyapitiya, 60200, Sri Lanka*
[4]*Usher Institute, University of Edinburgh, UK*
[5]*Child Life and Health, Centre for Inflammation Research, Institute for Regeneration and Repair, University of Edinburgh, UK*
[6]*KIU University, Battaramulla,10120, Sri Lanka*
**okdvishwa123@gmail.com*

Household air pollution from cooking significantly contributes to indoor $PM_{2.5}$ levels, which is associated with adverse respiratory health effects. However, evidence comparing $PM_{2.5}$ levels during cooking and non-cooking periods and their relationship with respiratory symptoms remains limited in Sri Lanka. This study aimed to compare indoor $PM_{2.5}$ concentrations between these periods and to assess their association with respiratory symptoms among pregnant women. A cross-sectional analysis was conducted using data from 80 households with pregnant women in Kandy; Sri Lanka. $PM_{2.5}$ data were collected continuously measured over 72 hours, using portable air quality monitors and hourly values were analyzed. Among them sixty households used LPG and twenty used firewood as their main cooking method. The Wilcoxon signed-rank test was used for paired comparisons while Mann–Whitney U test assessed associations between cooking-time $PM_{2.5}$ exposure and respiratory symptoms. Mean $PM_{2.5}$ concentration during cooking (43.8 $\mu g/m^3$,SD 26.0) was significantly higher than during non-cooking periods (21.5 $\mu g/m^3$, SD 12.5). Cooking-time $PM_{2.5}$ was also significantly higher than daily average levels (28.5 $\mu g/m^3$, SD 15.4; $p < 0.001$). For respiratory symptoms, higher mean cooking-time $PM_{2.5}$ exposure was observed among symptomatic individuals compared to asymptomatic individuals. Mean cooking time $PM_{2.5}$ for women with symptoms were: cough (n=26) is 47.5 vs. 42.0 $\mu g/m^3$, sore throat (n=7) is 59.5 vs. 42.3 $\mu g/m^3$, sneezing (n=25) is 47.7 vs. 42.0 $\mu g/m^3$, and any symptom (n=40) 44.8 vs. 42.8 $\mu g/m^3$. However, these differences were not statistically significant ($p>0.05$ for all comparisons). Cooking activities significantly increase indoor $PM_{2.5}$ levels compared to non-cooking periods. Although no statistically significant associations were observed between cooking time $PM_{2.5}$ levels and respiratory symptoms, the trend of elevated exposure among symptomatic individuals suggests a possible relationship driven by the combined effect of these variables. Further studies with larger sample sizes are needed to clarify health impacts of cooking-related air pollution.

Keywords: $PM_{2.5}$, household air pollution, cooking exposure, pregnant women, respiratory symptoms

Competence in Basic Surgical Skills Among Medical Graduates Immediately After Graduation: A Self-Assessment Study

R.M.J.B.S. Rathnayake*, S. Narampanawa, V.D.P. Liyanage, M.M.M.A. Mansoor, H. Narampanawa

Department of Surgery, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**jeewanrath@gmail.com*

The transition to the intern house officer (IHO) role positions newly graduated doctors as the primary contact for emergencies. Therefore, undergraduate medical curricula must instill high competence in basic surgical skills, equipping graduates to handle this demanding role with professional confidence. This study aimed to determine the competence in basic surgical skills among medical graduates immediately after graduation and their confidence in applying these skills as incoming IHOs. A cross-sectional survey was conducted among a sample size of 430 medical graduates who completed the Final MBBS Examination in September 2025 across all twelve medical faculties in Sri Lanka. Data evaluating 21 basic surgical procedures, frequency of performance, and confidence levels were collected using a self-administered Google Form questionnaire. Statistical analysis, including Chi-square tests to determine associations between procedural exposure and confidence, was performed using SPSS software. Graduates demonstrated high performance and independent competence scores for routine ward procedures, including venepuncture (mean score 3.58), intravenous cannulation (3.44), and male catheterization (3.43). Conversely, significant deficiencies and non-performance rates were identified in emergency trauma and specialized care skills, such as splinting (25.8% not performed), Plaster of Paris (POP) application (mean score 1.58), and tracheostomy care (mean score 1.33). A highly statistically significant association was established between hands-on procedural exposure and self-reported independent competence for the majority of the evaluated procedures ($p < 0.001$). While Sri Lankan medical graduates exhibit adequate competence in routine vascular access, they lack vital hands-on experience and confidence in emergency and specialized surgical skills. These findings strongly advocate for curriculum enhancements, specifically enforcing standardized, competency-based assessments and mandatory minimum hands-on exposure criteria before graduation.

Keywords: basic surgical skills, clinical competence, intern house officer, procedural training, confidence

Congenital Facial Nerve Palsy with Co-existing Multiple Dental Problems: A Case Report

N.S. Narasinghe[1]*, E.M.U.C.K. Herath[2]

[1]*Department of Restorative Dentistry, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Division of Paedodontics, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**nisansalans@dental.pdn.ac.lk*

Congenital lower motor neuron facial nerve palsy is a condition present at birth that may arise due to developmental abnormalities or birth trauma affecting the facial nerve. Both the upper and lower facial muscles on the affected side are involved. Hypodontia is a dental condition characterized by the absence of one or more teeth. Both of these can occur in isolation or as part of a syndromic condition. A 9-year-old boy diagnosed with right-sided congenital facial nerve palsy presented to the clinic with his parents, complaining of social bullying and difficulty in chewing due to multiple missing teeth. Clinical examination confirmed congenital facial nerve palsy with right-sided ptosis, inability to wrinkle the forehead, flattening of the nasolabial fold, and deviation of the angle of the mouth to the left during smiling. However, the patient was able to blow his cheeks adequately due to mechanical compensation by the perioral musculature. Intraoral examination revealed mild hypodontia involving the lower anterior region, a high-arched palate, maligned teeth, early extraction of teeth due to dental caries, and only grade III mobile primary canines remaining in the mandibular arch. The patient was reportedly bullied by both his younger sibling and schoolmates because of the missing and malformed teeth, which had negatively affected his psychosocial well-being.Facial nerve palsy may contribute to food retention within the buccal vestibule on the affected side, thereby increasing the risk of dental caries. This risk can be further aggravated by poor dietary habits, particularly high consumption of refined carbohydrates, which can lead to severe carious destruction and the need for early tooth extractions due to poor restorability. In addition, the presence of an incidental finding of hypodontia and malformed teeth resulted in both compromised functional and aesthetic state.Management of this patient included preventive dental care, close monitoring of erupting permanent teeth, early orthodontic assessment, rehabilitation with an acrylic removable partial denture in the mandibular arch, and genetic assessment to exclude syndromic association. A multidisciplinary treatment approach with long-term follow-up on aesthetic and functional rehabilitation is needed when managing a congenital facial nerve palsy patient with co-existing multiple dental problems.

Keywords: facial nerve palsy, hypodontia, multidisciplinary treatment

Descriptive Epidemiology of Lightning Events in Sri Lanka, 2010–2025: A Secondary Analysis of National Disaster Data

S.R. Waidyatilleke[1], T.H. Hettiarachchi[2]*, S.D. Dharmaratne[2]

[1]Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**thh4061@gmail.com*

No Short Abstract

Lightning is a deadly but under-reported hazard in Sri Lanka. It causes more deaths per event than most other natural hazards in the country. The high case fatality, combined with rising annual counts, makes it a growing public health concern that deserves a clear national description. This study aimed to describe the time trend, spatial pattern, seasonal distribution, and human and housing impact of lightning events recorded in Sri Lanka from 2010 to 2025, in order to identify high-risk provinces, districts, and months for targeted public health action. A secondary data analysis was carried out using the national disaster database of Sri Lanka. All records labelled as lightning events between 2010 and 2025 were extracted. The number of events, deaths, injuries, missing persons, affected people, and damaged houses were summarised by year, month, province, and district. Frequencies, totals, and percentages were calculated using descriptive statistics. The case fatality rate was estimated as the proportion of events that caused at least one death. Only aggregate, anonymised values were analysed. A total of 1,158 lightning events were recorded, causing 318 deaths, 230 injuries, and 3 missing persons. In total, 8,511 people were affected. A total of 1,745 houses were impacted, of which 26 were destroyed and 1,719 (98.5%) damaged. Deaths were reported in 23.4% of all events, the highest case fatality among the major natural hazards in the dataset. Sabaragamuwa Province had the largest share of events (511; 44.1%), followed by North-Western (122; 10.5%) and Southern (110; 9.5%). Kegalle (337; 29.1%) and Ratnapura (174; 15.0%) were the most affected districts. April (22.6%) and May (17.8%) were peak months, matching the first inter-monsoon period. The annual number of recorded lightning events rose from 28 in 2010 to a peak of 230 in 2023; lower counts for 2024 (45) and 2025 (1) most likely reflect incomplete recording of recent events. Lightning is a high fatality but geographically concentrated hazard in Sri Lanka. Public education, lightning protection, and early warning should focus on Sabaragamuwa Province during the inter-monsoon months to reduce the rising burden.

Keywords: lightning, Sri Lanka, case fatality, Sabaragamuwa, descriptive epidemiology

Detection of Antibiotic-Resistant Bacteria in Street-Vended Kola Kenda in Selected Locations in the Colombo District, Sri Lanka: A Preliminary Study

F.N. Nawas[1*], K.D.B.M. Wijeratne[2]

[1]*Cardiff Metropolitan University, Cardiff, CF5 2YB, United Kingdom*
[2]*Genetech molecular diagnostics and School of Gene technology, Colombo, 00800, Sri Lanka*
**nawaznafilah@gmail.com*

Kola kenda, a traditional Sri Lankan herbal porridge consumed by vulnerable populations including postpartum women, the elderly, and immunocompromised individuals, poses food safety risks when vendor hygiene is inconsistent. No prior research has examined antimicrobial resistance (AMR) among bacteria isolated from this food. This preliminary cross-sectional study aimed to determine prevalence, antibiotic resistance profiles, and molecular identity of pathogens in street-vended kola kenda in the Colombo district; objectives were to isolate pathogens, assess resistance via Kirby-Bauer disc diffusion, and confirm species using species-specific PCR. One sample each of four varieties (karapincha, welpenella, kowakka, hathawariya) was purchased from five closely situated locations: Moratuwa Old Galle Road, Moratuwa New Galle Road, Mount Lavinia, Bellanwila, and Kohuwala. Each sample was inoculated onto LB agar in duplicates and incubated. Colonies were sub-cultured onto fresh LB agar for pure isolation and Gram stained for morphological characterization. For AST, pure colonies were suspended in LB broth, incubated to visible turbidity, and spread onto LB agar for Kirby-Bauer disc diffusion against amoxicillin (10 μg), ciprofloxacin (5 μg), and gentamicin (10 μg), interpreted using CLSI breakpoints. DNA was extracted via boiling lysis; species-specific PCR with agarose gel electrophoresis detected *E. coli* and *S. aureus*. Descriptive analysis was applied as sample size was insufficient for inferential statistics. All five samples (100%) showed bacterial contamination, predominantly Gram-negative. Of 17 isolates, resistance was highest to amoxicillin (76%), followed by ciprofloxacin (53%) and gentamicin (41%). Six isolates (35%) were multidrug-resistant (MDR), all from karapincha samples at Moratuwa locations (very high risk; 40%). PCR confirmed *E. coli* in kowakka (Bellanwila) and hathawariya (Kohuwala) samples indicating fecal contamination (high risk; 40%). The welpenella sample from Mount Lavinia had no MDR isolates or *E. coli* (lowest risk; 20%). No *S. aureus* was detected in any samples. These findings provide preliminary evidence that street-vended kola kenda in Colombo can harbour antibiotic-resistant and fecal-pathogenic bacteria. The small sample size is a limitation; findings cannot be generalized beyond these locations. Future studies should use larger, geographically diverse samples. Routine microbiological surveillance, improved hygienic practices during preparation, processing, and handling, and consumer AMR awareness campaigns are urgently recommended.

Keywords: antibiotic resistance*, E. coli,* kola kenda, PCR, street food safety

Development and Translational Evaluation of a *Garcinia cambogia*–based Nutraceutical for Urolithiasis Prevention

D.D.H.C. Thilakasiri[1], G.M. Somaratne[1]*, A.G.K. Chamodini[1], A. Chandrasekara[2], A. Bandara[3], A.G.K.C. Didulanga[4], M.A.J.N. Wijayarathna[5]

[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Nutrition and Dietetics, Wayamba University of Sri Lanka, Gonawila, NWP 60170, Sri Lanka*
[3]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Dermatology, National Hospital, Galle, 80000, Sri Lanka*
[5]*Wedagedara Producers (Pvt) Ltd, Bujjomuwa, Alawwa, 60280, Sri Lanka*
**gsomaratne@agri.pdn.ac.lk*

Urolithiasis is a common and recurrent medical condition worldwide, with calcium oxalate stones accounting for nearly 80% of cases. Current preventive strategies remain limited, emphasizing the need for safe, effective, and accessible nutraceutical interventions. *Garcinia cambogia*, a tropical fruit rich in hydroxycitric acid (HCA), has shown promising anti-urolithiatic properties through crystal inhibition and chelation mechanisms in experimental studies. This study aimed to develop and evaluate a standardized *Garcinia cambogia*–based nutraceutical using a translational research approach integrating *in-vitro* and *in-vivo* investigations to assess its efficacy and safety in reducing urinary lithogenic risk. A multi-phase study design was employed, comprising urinary stone characterization (n=17) using Fourier-transform infrared spectroscopy (FTIR) and microscopic analysis, formulation and standardization of a Garcinia-based supplement within safe HCA limits, *in-vitro* anti-urolithiatic assays, and a randomized placebo-controlled pilot clinical trial among healthy adults (n = 20) over 16 days. *In-vitro* assays demonstrated marked inhibition of calcium oxalate crystal nucleation (99.7±0.28%) and aggregation (65.2±4.4%), together with notable litholytic activity comparable to standard therapeutic agents. Clinical evaluation revealed no statistically significant changes in serum biochemical parameters, including calcium, uric acid, creatinine, and estimated glomerular filtration rate, indicating good short-term tolerability. Notably, a significant reduction in urinary oxalate concentration was observed within the intervention group (1.34±0.16 to 0.92± 0.28 mg/dL; $p < 0.05$), whereas no significant change was detected in the placebo group. This unexpected trend may reflect previously unrecognized interactions between HCA and urinary lithogenic pathways; however, the underlying mechanisms remain unclear and require further investigation. Additionally, a reduction in urinary white blood cell counts suggested a possible down-regulation of subclinical urinary inflammation. Given the limited sample size and short intervention duration, these preliminary clinical findings must be interpreted with caution. Overall, while the strong *in-vitro* data demonstrate robust anti-urolithiatic activity, these pilot clinical observations provide early translational evidence supporting the potential of *Garcinia cambogia*–based supplementation for urolithiasis prevention, warranting further rigorous evaluation in larger populations to confirm efficacy and clarify the underlying metabolic mechanisms.

Keywords: *garcinia cambogia*, urolithiasis, hydroxycitric acid, nutraceutical, anti-urolithiatic activity

Digital Health Systems for Improving Infectious Disease Surveillance in Developing Countries (Sri Lankan Perspective)

M.M.D.R. Bandara[1]*, A.N. Buddhapriya[2]

[1]*Faculty of Science, Horizon Campus, Malabe, 10115, Sri Lanka*
[2]*Oak Flats, New South Wales, 2529, Australia*
**divrashmika@gmail.com*

Infectious disease surveillance in developing countries is often limited by fragmented data systems, delayed reporting, and weak integration between laboratory and clinical services, which reduces the effectiveness of early detection and response. This study aims to evaluate existing gaps in surveillance systems and propose a practical digital health framework to improve infectious disease monitoring, with a focus on the Sri Lankan healthcare context. A conceptual research design was adopted, combining a focused literature review with practical observations from laboratory practices and healthcare data handling. The study identifies key challenges in current systems and develops a model that integrates centralized patient databases, real time reporting tools, and laboratory information management systems. The proposed framework enables the inclusion of diagnostic data, such as PCR and ELISA results, into a unified digital platform, improving data flow and coordination among healthcare providers. The findings suggest that this approach can significantly enhance data accuracy, reduce delays reporting, and improve accessibility of critical health information. It also supports early detection of disease patterns and enables faster and more coordinated outbreak responses. Furthermore, improved data integration can assist policymakers in evidence-based decision making and efficient resource allocation within healthcare systems. In conclusion, the implementation of integrated and scalable digital health solutions can strengthen infectious disease surveillance in resource limited settings. This study highlights the importance of adopting cost-effective digital strategies to build more resilient, proactive, and efficient health systems in developing countries such as Sri Lanka.

Keywords: digital health systems, infectious disease surveillance, public health informatics, healthcare data integration, developing countries

Digitalizing CPR Skills Training: A Low-Cost Smart Manikin System with Real-Time Feedback

S. Ganathipan[1], S. Kavishanthan[1], V.G. Amirsha[1], K. Kartheepan[1]*, M.S. Peeris[1], H.D.W.T.D. Dassanayake[2], Y. Vimukthi[1], I.B. Nawinne[1]

[1]*Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**e21214@eng.pdn.ac.lk*

High-quality cardiopulmonary resuscitation (CPR) is a critical lifesaving intervention that requires accurate compression depth, compression rate, complete chest recoil, minimal interruptions, and correct hand placement to maximize patient survival. However, CPR training in many medical and allied health educational institutions continues to rely on conventional spring-based manikins and instructor observation, resulting in subjective assessment and limited real-time feedback for trainees. Although commercially available smart CPR simulators provide objective performance evaluation, their high-cost limits widespread adoption, particularly in resource-constrained training environments. This study presents ResQ, a low-cost retrofit smart CPR training system with an estimated prototype cost of approximately LKR 35,000, designed to convert existing CPR manikins into intelligent training platforms while preserving the realism of conventional CPR practice. A prototype was developed by integrating Digital Barometric Pressure Sensors (HX710B) and Linear Magnetic Hall Effect Sensor (KY-024) with an embedded processing unit (ESP32-C3 32-bit RISC-V single-core processor) and wireless communication to continuously acquire CPR compression data. The system processes sensor inputs to generate quantitative outputs including compression depth, compression rate, chest recoil, hand placement, compression consistency, and interruptions, which are presented through dedicated real-time dashboards for both trainees and instructors. Initial functional validation demonstrated successful acquisition, processing, and visualization of these parameters during simulated CPR sessions, enabling immediate feedback to support trainee self-correction and instructor monitoring. Prototype evaluation conducted at the Nursing Skills Laboratory of the Faculty of Allied Health Sciences indicated that the physical appearance and chest compression response of the prototype closely resembled the CPR training manikins currently used in practical sessions, suggesting that the integration of sensing mechanisms preserved the tactile realism required for effective skills training. Quantitative validation against instructor assessment and established CPR training guidelines is currently underway to evaluate measurement accuracy and clinical applicability. The proposed system offers an affordable and scalable engineering solution for objective CPR skills assessment while enhancing simulation-based medical education and expanding access to data-driven CPR training in resource-limited healthcare institutions.

Keywords: Cardiopulmonary Resuscitation (CPR) training, real-time feedback, medical simulation, embedded sensing, performance analytics

Duodenal Lipoma at D3 Presenting with Suspected Intussusception and Gastric Outlet Obstruction

U.V. Jayalath*, B. Dassanayake, C. Dalugama

Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**uvinjayalath314@gmail.com*

Duodenal lipomas are rare benign submucosal tumors, accounting for less than 5% of gastrointestinal lipomas. Most are asymptomatic and incidentally detected. Symptomatic duodenal lipomas in the third portion (D3) are exceptionally rare and may produce nonspecific symptoms mimicking functional disorders when routine endoscopy is limited to the second duodenal portion. We describe a rare case of a symptomatic D3 duodenal lipoma causing recurrent vomiting initially misdiagnosed as a psychiatric eating disorder and highlight the importance of extending endoscopic examination beyond routine anatomical limits. A patient with recurrent unexplained non-bilious vomiting underwent extensive evaluation including multiple upper endoscopies limited to the second portion of the duodenum and colonoscopy, all reported as normal. Following psychiatric referral without improvement, repeat endoscopy deliberately extended into D3 was performed. Contrast-enhanced CT characterized the lesion, and endoscopic snare polypectomy was undertaken after targeted biopsies confirmed benign histology. Extended endoscopy revealed a smooth submucosal bulging lesion at the D2–D3 junction with overlying erythema and focal ulceration. CT demonstrated a well-defined submucosal lipoma measuring 7.7 × 16 mm arising from the lateral wall of D3, with associated ileal edema raising the possibility of intermittent intussusception. Histology confirmed a benign lipoma. Endoscopic snare excision achieved complete resection, with mature adipose tissue demonstrated on histopathology. The patient's vomiting resolved completely following resection, with no recurrence at three months. This case highlights that duodenal lipomas at D3 can cause gastric outlet-type symptoms and may be overlooked when endoscopic examination is confined to the standard extent. Careful extension into the third portion of the duodenum should be considered in patients with unexplained upper gastrointestinal symptoms, as endoscopic resection is both diagnostic and curative.

Keywords: duodenal lipoma, gastric outlet obstruction, endoscopic polypectomy, third duodenal portion, submucosal tumor

No Short Abstract

Early Budding Rete Morphology as a Histopathological Indicator of Fibrosis Progression in Oral Submucous Fibrosis: A Pilot Study

R.M.R.U. Chandrasekara[1], A.M. Fernando[2], P.R. Jayasooriya[2]*

[1]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
**primalijaya@dental.pdn.ac.lk*

Oral submucous fibrosis (OSF) is a chronic, progressive, oral potentially malignant disorder characterized by fibrosis of the oral mucosa. It commonly shows epithelial atrophy in initial stages of the disease followed by budding of rete ridges, reflecting increased epithelial proliferation. Although this feature is often interpreted as mild epithelial dysplasia, it does not fulfil all WHO dysplasia diagnostic criteria for such a diagnosis and its significance in the progression of disease remains unexplored. This study aimed to evaluate whether early budding rete morphology and severity of oral epithelial dysplasia (OED) associate with the progression of fibrosis in OSF. Hematoxylin and eosin stained histopathologically confirmed OSF sections were included in this pilot study. Fibrosis was classified as early, moderate, or advanced based on its extent of fibrosis and collagen bundle thickness and was also quantitatively measured using a calibrated graticule. Early budding rete ridges were defined as small buds comprising of 5-6 epithelial cells. Associations between early budding rete and grades of dysplasia with fibrosis were analyzed using the Mann-Whitney U test, Pearson correlation test and two-sample t-test, with $p < 0.05$ considered significant. A total of 30 oral submucous fibrosis cases were analyzed (mean age 42.37 ± 18.56 years; 26 males, 4 females). OED was absent in 6 cases, mild in 19, and moderate to severe in 5. Fibrosis was moderate in 14 cases and advanced in 16. Early epithelial budding was absent in 8 samples, with a mean fibrosis thickness of 1.785 ± 0.483mm, while 22 samples showed early budding rete ridges with a mean thickness of 1.746 ± 0.448mm ($p = 0.845$). Advanced fibrosis had a significantly higher early budding rete count than moderate fibrosis, with an average difference of 1.09 ($p = 0.044$). A weak positive correlation ($r = 0.069$) was observed between fibrosis thickness and early budding retes, ($p = 0.718$). Similarly, the moderate-to-severe dysplasia group showed a slightly higher mean fibrosis thickness (1.932 vs. 1.721 mm), ($p = 0.410$). In conclusion early budding rete morphology increases significantly with higher fibrosis grades, indicating it is a feature of disease progression. Fibrosis classified based on morphology appeared to be more reliable than thickness of fibrosis when assessing disease progression.

Keywords: oral submucous fibrosis, rete ridges, epithelial dysplasia, early budding, histopathology

Evaluating Daytime Sleepiness Among Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Study

D.W.A. Shantha[1]*, W.J.B.S.M.S. Jayawardana[2], S.R. Waidyatilleke[1], R.D. Gallage[3], I.K.M.S.S. Jayathilaka[3], D. Yasaratne[1], M. Pathirage[1,3]

[1]*Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Anatomy, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Family Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**arunasha@live.com*

Type 2 diabetes mellitus (T2DM) is a major public health issue in Sri Lanka, with nearly one in four adults affected. Sleep disturbances, particularly excessive daytime sleepiness (EDS), are now recognized as significant risk factors for impaired glucose metabolism, increased cardiovascular risk and reduced productivity. However, local data on excessive daytime sleepiness among T2DM patients are scarce. This study aims to evaluate the pattern of EDS and factors associated with EDS, measured using the Epworth Sleepiness Scale (ESS) in adults with T2DM. This is a cross-sectional study of 138 T2DM patients attending medical clinics in the teaching hospital, Peradeniya. Participants were recruited using consecutive sampling, and patients diagnosed with obstructive sleep apnoea, depression, or on sedative medications were excluded. Demographic and clinical data were collected through an interviewer-administered questionnaire and EDS was assessed using validated versions of Sinhala and Tamil ESS. EDS was defined as ESS more than 10 and associations were explored using the Mann–Whitney U test, Kruskal-Wallis test, Spearman's correlation and Chi-square test. The median age of the population was 65(IQR 56-70) years, with the majority (64%) being females and 35% being employed. EDS was detected in 17%. Moderate to high chance of dozing was noted in >30% of the participants, while sitting and reading, watching TV, and as a passenger in a car. However, only 22% had a moderate to high chance of dozing while sitting inactive in a public place. EDS was significantly higher in patients with an age of less than 55 years (31% vs 13%, p=0.042) and duration of T2DM for more than 10 years (25% vs 10%, p=0.026). There were no statistically significant associations found among sex, other comorbidities (hypertension, dyslipidemia, ischemic heart disease or chronic kidney disease), insulin therapy, BMI, waist and neck circumferences and EDS in this cohort. This demonstrates that EDS affected nearly one-fifth of this cohort, particularly in younger patients and those with longer duration of disease. Over one-third reported a moderate to high chance of dozing during sedentary activities, highlighting the potential under-recognition of sleep-related dysfunction in routine diabetes care. However, data on sleep duration, quality, and occupational factors limit further interpretation.

Keywords: excessive daytime sleepiness, T2DM, Epworth Sleepiness Scale, sleep disturbances

Evaluation of Facial Asymmetry Based on CT-Axial Skull Images and Development of a CT-Based Asymmetry Index for Mandibular, Zygomatic and Maxillary Sinus Deviations across Age Groups

W.S.H. Nandasiri*, K.L.S.S. Madhubhashini, J.A.I.N. Perera, A.L. Jayasinghe, M.G.R.S. Perera

Department of Radiography/Radiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**ahs19rad021@ahs.pdn.ac.lk*

Facial symmetry is an important determinant of facial aesthetics and functional balance. Although minor asymmetry is common, significant skeletal asymmetry may influence mastication, speech, breathing, and overall facial harmony. Computed Tomography (CT) provides high-resolution cross-sectional imaging without superimposition, making it a reliable modality for evaluating craniofacial structures. This study aimed to evaluate facial asymmetry using CT axial skull images and to develop a CT-based asymmetry index (AI) for the mandibular condyle, zygomatic arch, and maxillary sinus across different age groups in the Sri Lankan population. A retrospective cross-sectional study was conducted using 191 archived CT skull images of individuals aged 21–70 years (21–30, 31–40, 41–50, 51–60, and 61–70 years). Linear measurements from the mid-sagittal plane, established using stable cranial midline landmarks, to bilateral anatomical landmarks were obtained using RadiAnt DICOM Viewer. Measurements were independently performed by three researchers following a standardized protocol. The AI was calculated as $((R-L)/((R+L)/2)) \times 100$, where positive and negative values indicated right- and left-sided predominance, respectively. Descriptive statistical analyses and comparisons across age groups and gender were performed using Jamovi software. Measurable asymmetry was observed in all three anatomical regions. The mandibular condyle demonstrated the greatest asymmetry, followed by the zygomatic arch and maxillary sinus. The 21–30-year age group showed the lowest asymmetry values, whereas greater asymmetry was observed in older age groups, suggesting age-related skeletal remodeling. Females showed higher asymmetry values than males across all structures. The proposed CT-based asymmetry index provided an objective quantitative method for assessing craniofacial asymmetry. These findings support the use of CT imaging for objective facial asymmetry assessment and may contribute to establishing population-specific reference data for the Sri Lankan population, with potential applications in clinical diagnosis, surgical planning, forensic radiology, and future craniofacial research.

Keywords: facial asymmetry, computed tomography, Asymmetry Index (AI), mandibular condyle, zygomatic arch, maxillary sinus

Evaluation of the Success of Endotracheal Extubation Following Weaning from Mechanical Ventilation in a Level 3 ICU

V.G. Pinto, A.B. Abeysundara, P.G.D.A.P. Weerasinghe, P. Pieris, W.T.D. Kularatne*, D.G.H. Warnasuriya, D.G.V.S.K. Dharmasena, W.M.G.L.S. Weerakoon

Department of Anaesthesiology and Critical Care, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**tharanidakshika457@gmail.com*

Mechanical ventilation (MV) supports ventilation in patients with respiratory failure. Prolonged ventilation is associated with many complications and increased Intensive Care Unit morbidity and mortality. Hence, successful weaning with gradual reduction of ventilatory support, enabling patients to breathe independently, followed by extubation at the most appropriate time, is crucial. Different ventilatory modes, such as pressure support ventilation (PSV) and Continuous positive airway pressure (CPAP), are used to facilitate this transition by providing pressure assistance at the alveolar level. A failed extubation leads to the re-establishment of intubation. Extubation is advisable once the CPAP and PSV are at approximately 5 cm H_2O. The traditional method is to extubate the patient after a T-piece trial without supported pressure. The unit policy for extubation is to extubate directly without the T-piece trial. This study aims to assess the extubation processes and the factors influencing them through a retrospective observational study. We included 21 mechanically ventilated patients aged 18–80 years. Pediatric and obstetric neurological disorders, thoracic trauma, thoracic surgery, tracheostomy and patients in a vegetative state were excluded. Data were extracted on demographic details, success of extubation, need for reintubation, ventilation modes used, suctioning through the endotracheal tube, and bronchodilator use. Associations were analyzed using Fishers exact test. The mean age of the sample was 55.8 ± 15.9, with 57.1% being males. The extubation success rate was 76.19%, while the reintubation rate was 14.28%. Most patients were directly extubated (57%), while 9% underwent a T-piece trial. CPAP of 5 cmH_2O and PSV 8-10 cmH_2O were used before extubation. Suctioning was performed in 81% of cases, but 30 minutes before extubation. Bronchodilators were administered to 95.2% of patients 30 minutes after. The use of low sedation was statistically significant for extubation success ($p=0.048$), whereas ventilation modes used initially and during the weaning phase, and bronchodilator usage, were not significant ($p>0.05$). The high rate of extubation success justifies maintaining positive pressure in the lungs without interruption by the T-piece or suctioning before extubation.

Keywords: mechanical ventilation, weaning, extubation

Exploration of *ARID2* Gene Mutations in Oral Squamous Cell Carcinoma (OSCC): A Study of the Sri Lankan Cohort

K.S.N. Wijewardhana[1]*, R.D. Jayasinghe[2], N.M.T. Anupama[3], D.G.P.K. Senevirathna[4], R.G.S.C. Rajapakse[1]

[1]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 2400, Sri Lanka*
[3]*Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 2400, Sri Lanka*
[4]*Department of Biochemistry, Faculty of Medicine, Uva Wellassa University, Badulla, 90000, Sri Lanka*
**sachiniw@sci.pdn.ac.lk*

Oral squamous cell carcinoma (OSCC) is the most common type of oral malignancy in the world and represents a significant public health burden in South Asian countries, including Sri Lanka, where oral cancers show a significant percentage of all reported cancer cases. Despite advances in diagnosis and treatment, the molecular mechanisms underlying OSCC progression remain incompletely understood. Mutations in different cancer-associated genes are the main risk factors for tumorigenesis. *ARID2* (AT-rich interaction domain 2) is a gene that encodes a chromatin remodeling complex subunit and is considered a tumor suppressor gene. A novel finding in OSCC is the mutation of the *ARID2* gene, particularly in gingiva-buccal OSCC (GB-OSCC). However, the studies related to *ARID2* mutations in OSCC are limited and have not been conducted in Sri Lanka. Therefore, this study identified and characterized the specific *ARID2* gene mutations in OSCC samples collected within the Sri Lankan cohort. A total of 50 histopathologically confirmed oral biopsy samples were collected at the Dental Teaching Hospital, Peradeniya, comprising 15 OSCC, 30 potentially malignant disorders, and 5 healthy control samples. Genomic DNA was extracted, and the *ARID2* gene was PCR-amplified using intronic primers spanning exons 19 and 20. Amplified products were sequenced using Sanger sequencing, and the resulting sequences were aligned and analyzed in MEGA version 11 to detect mutations. Multiple sequence alignment identified a single point mutation in 1 of 15 OSCC samples (6.67%), located at chromosomal position chr12:169153, while no mutations were detected in the OPMD or healthy control groups. Fisher's exact test showed no statistically significant difference in mutation frequency between the three groups ($p = 0.398$), which likely reflects the low overall mutation frequency and limited sample size in this cohort. Nonetheless, this finding provides the first molecular evidence of an *ARID2* mutation within a Sri Lankan cohort. This mutation may potentially disrupt normal SWI/SNF chromatin remodeling complex function, which could contribute to dysregulated gene expression relevant to oral tumorigenesis. Overall, these findings establish a foundation for further investigation of *ARID2* as a molecular marker in OSCC and for exploring new avenues in OSCC research.

Keywords: *ARID2* Gene, chromatin remodeling complex, mutations, oral squamous cell carcinoma, tumor suppressor gene

Acknowledgement: *Financial assistance from the Uva Wellassa research grant (UWU/RG/2024/06) is acknowledged.*

Factors Affecting the Applicator Geometry and the Dosimetric Variation in High Dose-Rate-Intra-Cavitary Brachytherapy for Cervical Cancer

S.D. Panditha[1]*, P. Abeysinghe[2], L. Thasanthan[1]

[1]*Department of Radiography/ Radiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*National Cancer Institute Maharagama,10280, Sri Lanka*
**shehanideshika132@gmail.com*

No Show Abstract

Cervical cancer is one of the most common malignancies among women worldwide. High-dose-rate intra-cavitary brachytherapy (HDR-ICBT) is a critical component of definitive radiotherapy for cervical cancer, where optimal applicator geometry is essential for maximum target conformity and sparing of OARs. This prospective study was conducted to assess the factors influencing tandem and ovoid geometry and the effect of variations in applicator geometry on the dose distribution in HDR-ICBT among cervical cancer patients. A total of 70 cervical cancer patients who underwent HDR-ICBT and treated using standard tandem and ovoid applicators from September to November 2025 were included in this study. The parameters of applicator geometry, including tandem insertion length and separation of the ovoid tips, and dose measurements such as doses to Point A which is defined according to the Manchester system, the bladder and the rectum were extracted from the treatment planning system. Patient-related variables (patient age, body mass index (BMI), parity, FIGO stage and treatment intervals) were obtained from the patients' clinical records. For statistical analysis; Spearman correlation analysis, Pearson correlation analysis, and Kruskal-Wallis test were used. A statistically significant strong negative correlation was observed between EBRT-to-BT interval and tandem insertion length ($r = -0.673$, $p < 0.001$). Parity demonstrated a moderate positive correlation with tandem insertion length ($r = 0.534$, $p < 0.001$). No significant correlations were observed between applicator geometry and patient-related parameters including age, BMI, and FIGO stage (all $p > 0.05$). A statistically significant negative correlation was observed between ovoid tip separation and dose to Point A ($r = -0.313$, $p = 0.008$). No significant associations were observed between applicator geometry and doses to rectum or bladder (all $p > 0.05$). Findings of this study suggest that shorter EBRT-to-BT intervals and higher parity are associated with greater tandem-insertion length, while ovoid tip separation is negatively associated with dose to Point A. These findings highlight the importance of individualized treatment planning and the timely initiation of brachytherapy following EBRT. As this was a single-center study involving 70 patients, further studies with multicenter data analysis and larger sample sizes are recommended to validate these findings.

Keywords: cervical cancer, HDR ICBT, applicator geometry, dosimetry, time interval from EBRT to BT

Family Planning Education in Postpartum Care in Sri Lankan Hospitals

H.N.P. Hettiarachchi[1], T.H. Hettiarachchi[1]*, N.P. Jayasena[1], D.M.S.N. Dewagiri[1], D. Ranathunga[2], W. Abeykoon[3]

[1]*Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Senior Registrar in Obstetrics and Gynecology, National Hospital, Kandy, 20000, Sri Lanka*
[3]*Consultant in Obstetrics and Gynecology, National Hospital, Kandy, 20000, Sri Lanka*
**thh4061@gmail.com*

No Show Abstract

Postpartum family planning (PPFP) is a critical component of maternal and child health, supporting optimal birth spacing, reducing maternal and infant morbidity, and improving socioeconomic outcomes. Despite its significance, gaps in knowledge dissemination during the immediate postpartum period persist across many healthcare settings, and the adequacy of family planning education within Sri Lankan hospital wards remains insufficiently characterized. To evaluate the provision of family planning education to postpartum mothers within a Sri Lankan tertiary-care hospital setting and to identify areas requiring improvement. A cross-sectional clinical audit was conducted in Ward 7 of the National Hospital Kandy from 28 February to 6 March 2024. Sixty-one postpartum mothers were recruited and assessed through a standardized, validated questionnaire covering demographics, parity, prior contraceptive use, future family planning preferences, and a subjective knowledge score. Complementary qualitative interviews were carried out with doctors, nurses, and midwives. Descriptive and comparative analyses were applied, with informed consent, confidentiality, and anonymity maintained throughout. The mean maternal age was 28.14 years; 49.2% delivered by caesarean section and 49.2% by normal vaginal delivery. The cohort reflected national diversity (72.1% Sinhala, 18.0% Muslim, 9.8% Tamil), and 59.0% were primiparous. Approximately 41% reported no prior contraceptive use, and 31.1% remained undecided regarding postnatal contraception. Among non-users, fear of hormonal methods (66.7%) was the leading deterrent. A marked discrepancy emerged between healthcare professionals, who rated knowledge delivery close to 5/5, and mothers, 54.1% of whom rated it as low (1/5), particularly regarding interpregnancy intervals. Substantial gaps exist between the family planning education healthcare professionals believe they deliver and what postpartum mothers actually perceive receiving. Bridging this divide requires culturally sensitive, individualized counselling, earlier integration of family planning into antenatal care, structured postnatal clinic follow-up, targeted training for ward staff, and periodic re-auditing to ensure that PPFP services genuinely empower mothers to make informed reproductive choices.

Keywords: family planning, postpartum care, knowledge dissemination, Sri Lanka, clinical audit

Fatty Liver Index as a Predictor of Acute Coronary Syndrome: Evidence from a Tertiary Care Cohort at Teaching Hospital Peradeniya, Sri Lanka

M.R.C.L. Kularathna[1]*, D.M.P.U.K. Ralapanawa[1], J. Udupihille[2], S.U.B. Tennakoon[3]

[1]*Department of Medicine, Faculty of Medicine, University of Peradeniya,20400, Sri Lanka*
[2]*Department of Radiology, Faculty of Medicine, University of Peradeniya,20400, Sri Lanka*
[3]*Department of Community Medicine, Faculty of Medicine, University of Peradeniya,20400, Sri Lanka*
**hd_2024_07@med.pdn.ac.lk*

Acute coronary syndrome (ACS) is a leading cause of mortality worldwide and contributes substantially to premature cardiovascular deaths in South Asia, where the burden is increasingly linked to rising cardiometabolic risk factors, including metabolic dysfunction-associated steatotic liver disease (MASLD). The Fatty Liver Index (FLI) is a validated, non-invasive surrogate marker of hepatic steatosis, but its role as a predictor of ACS in South Asian populations remains insufficiently explored. This study aimed to evaluate the association between FLI and ACS and to assess its predictive utility in a Sri Lankan tertiary care cohort. A hospital-based case-control study was conducted at Teaching Hospital Peradeniya, Sri Lanka, from 2024 to 2025, including 200 ACS patients aged 25-85 years and 200 age- and sex-matched controls without cardiovascular disease. Exclusion criteria included chronic liver disease, viral hepatitis, cirrhosis, pregnancy, and incomplete data. Demographic characteristics, clinical risk factors (hypertension, diabetes, dyslipidemia, smoking, and alcohol consumption), and fasting blood samples were collected. The Fatty Liver Index (FLI) was calculated for all participants from anthropometric measures (body mass index and waist circumference) and biochemical markers (triglycerides and gamma-glutamyl transferase). Data were analyzed using the chi-square test, Mann-Whitney U test, binary logistic regression, and receiver operating characteristic (ROC) curve analysis. ACS patients were predominantly male (59.5% vs 46.0% in non-ACS) and older (61.72 vs 54.06 years). NSTEMI was the most common presentation (59.5%), followed by STEMI (25.0%) and unstable angina (15.5%). Univariate analysis identified significant associations between ACS and older age, higher BMI, increased waist circumference, elevated GGT and triglyceride levels, and greater FLI values ($p<0.05$), alongside established cardiovascular risk factors including hypertension, diabetes mellitus, dyslipidemia, smoking, and alcohol use ($p<0.001$). In multivariable analysis, increasing age (aOR 1.07), higher FLI (aOR 1.04 per unit increase), smoking (aOR 11.47), and hypertension (aOR 5.24), together with alcohol consumption, dyslipidemia, and diabetes mellitus, emerged as independent predictors of ACS, while sex was not independently associated. The FLI showed moderate discriminatory performance for ACS (AUC = 0.752). In Conclusion, the Fatty Liver Index is independently associated with acute coronary syndrome and demonstrates moderate predictive performance, supporting its potential role as a simple, non-invasive marker for cardiovascular risk stratification in clinical practice.

Keywords: fatty liver index, acute coronary syndrome, MASLD, cardiovascular risk, metabolic syndrome

Fluoride Content and Antibacterial Activity of Fluoride-Containing Commercial Mouthwashes in Sri Lanka against *Streptococcus mutans*

A.S. Thevathasan[1], T.A.N.R. Thibbutumunuwa[1], K.H. Thilakarathne[1], K.S.N.D. Gunawardhana[2]*

[1]*Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**ndg@dental.pdn.ac.lk*

Dental caries remains a significant oral health burden in Sri Lanka, particularly among populations with limited access to preventive care. Fluoride plays a key role in caries prevention through its dual action of promoting enamel remineralisation and suppressing cariogenic bacteria such as *Streptococcus mutans*. Although fluoride-containing mouthwashes are widely recommended, there is limited evidence regarding the actual fluoride content and antimicrobial efficacy of products available in the Sri Lankan market, a gap that hinders informed public health recommendations and undermines consumer confidence. Hence, this study aimed to evaluate the fluoride concentrations of commonly used commercial mouthwashes in Sri Lanka and to assess their antimicrobial activity against *S. mutans*, including effects on bacterial acid production and biofilm formation. Fifteen commercially available mouthwashes were selected through convenience sampling. Fluoride levels were determined using a fluoride ion-selective electrode, and products with detectable fluoride were further evaluated using disc diffusion assays and tested for their effects on acid production and biofilm formation under *in vitro* conditions. The results showed that only three mouthwashes (20%) contained measurable fluoride levels (381.33 ± 10.42 ppm, 223.66 ± 6.34 ppm, and 191.66 ± 4.06 ppm), two of which were locally manufactured. Among these, only one product, which contained clove oil, produced a clear inhibition zone (14.66 ± 0.57 mm) against *S. mutans*, while the other two showed no antimicrobial activity. In this study, 0.2% chlorhexidine served as the positive control and produced a mean zone of inhibition of 17 ± 0.5 mm. In acid production assays, fluoride-containing mouthwashes modestly increased pH (5.05–5.34) compared to the untreated control (pH 3.97), but remained below the level of the positive control (pH 6.46). No significant reduction in biofilm formation was observed for any of the products. These findings highlight that only a few mouthwash brands in Sri Lanka contain detectable fluoride. Therefore, incorporating fluoride into products may be beneficial for caries prevention. Future research should evaluate activity against other cariogenic bacteria, such as *Lactobacillus* species, test clinical isolates of *S. mutans*, and investigate additional caries-preventive properties of fluoride-containing mouthwashes beyond antimicrobial effects.

Keywords: fluoride, mouthwashes, dental caries, *streptococcus mutans*

Functional Characterization of Autologous Platelet-Rich Plasma (PRP): A Novel Therapeutic Approach for Oral Submucous Fibrosis

T.M.B.C. Tennakoon[1]*, N.S. Piyarathne[2], S.I. Karunarathne[1]

[1]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**chaminit@sci.pdn.ac.lk*

Oral submucous Fibrosis (OSMF) is a highly prevalent oral potentially malignant disorder in Asian regions, including Sri Lanka, primarily associated with the areca nut consumption. It is characterized by excessive abnormal deposition of Type I collagen within the oral submucosa due to its imbalanced fibrinogenesis and fibrinolysis, leading to reduced tissue elasticity, trismus, and an increased risk of malignant transformation in oral cancers. Autologous Platelet–Rich Plasma (PRP) therapy has recently emerged as a novel therapeutic approach to combat OSMF, with proven clinical efficacy. However, its underlying molecular mechanisms and optimal functional parameters for enzymatic actions remain undefined, limiting its standardization and utilization in clinical practice. Thus, this study aimed to functionally characterize PRP-mediated collagen degradation and identify optimal experimental conditions to establish an evidence-based therapeutic optimization. In this study, PRP was prepared using the standardized double centrifugation of whole blood obtained from clinically diagnosed OSMF patients (n=7) and age and sex matched disease-free controls (n=2). An in vitro collagen degradation assay was employed in two phases using Type I collagen as the substrate across varying collagen concentrations (30-250 µg/mL), PRP dilutions, and temperature conditions (25°C vs 37°C). Degradation was monitored at 1-hour and 4-hour time intervals via UV spectrophotometry (220 nm) followed by SDS-PAGE electrophoresis. The results revealed that PRP-mediated collagen degradation happens through an immediate PRP-collagen aggregation formation at the initial time point, resulting in an enzymatic scaffold followed by progressive proteolytic degradation. Maximum collagen degradation occurred at 0.5X PRP concentrations within the effective substrate range of 30-125µg/mL at 37º. Together, results suggest that PRP-mediated collagen degradation operates in a temperature-dependent manner, and optimal parameters to govern the collagen degradation are 0.5X PRP, 30-125 µg/mL collagen at 37 °C, providing a mechanistic rationale for standardizing PRP therapy for OSMF. Collectively, this pilot data strengthens the transformation of PRP therapy from an experimental setup to a mechanism-based clinical intervention in OSMF management.

Keywords: collagen degradation, collagen deposition, matrix metalloproteinase, oral submucous fibrosis, platelet-rich plasma

Acknowledgement: *Financial assistance from University Research Grant, University of Peradeniya, (URG/2025/36/S) is acknowledged.*

Histopathological Patterns of Non-Malignant Liver Diseases: A Five-Year Retrospective Study from a Tertiary Care Centre in Sri Lanka

K.M.K.N. Kangara[1]*, P.K.S. Tissera[1], T.M.A.H. Tennakoon[2]

[1]Department of Medical Laboratory Science, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Pathology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**ahs20mls017@ahs.pdn.ac.lk*

Non-malignant liver diseases are an important cause of morbidity worldwide, with metabolic liver disease contributing increasingly. Local histopathological data from Sri Lanka remain limited. This study aimed to describe the histopathological patterns of non-malignant liver diseases diagnosed at a tertiary care centre, and secondarily to explore associations between demographic factors, lesion characteristics, and the use of ancillary diagnostic techniques. A retrospective descriptive study was conducted on 105 liver biopsy and resection specimens diagnosed as non-malignant at the Department of Pathology, Faculty of Medicine, University of Peradeniya. Cases were classified as diffuse (affecting liver parenchyma globally/in a widespread pattern) or focal (localized/discrete) and grouped into inflammatory/immune-related conditions, fibrosis/cirrhosis, metabolic liver diseases, vascular lesions, biliary diseases, and developmental/benign tumour-like lesions based on the predominant final histopathological diagnosis. Demographic characteristics, specimen type, radiological findings, and use of special stains and immunohistochemistry (IHC) were analysed. Mean patient age was 40.2 ± 20.5 years, with a paediatric peak (12.5% aged 0–10 years) and a modal group aged 51–60 years (21.2%); 61.0% of patients were male. Diffuse lesions predominated (82.9%, n=87), and were more frequent in males (65.5%), while focal lesions were proportionally more common in females (61.1%; χ^2=4.44, p=0.035), reflecting higher proportion of benign focal lesions such as haemangioma and simple liver cysts among female patients. Inflammatory/immune-related conditions were the most frequent histopathological category (35.2%), predominantly hepatitis (31.4%). Fibrosis/cirrhosis accounted for 29.5%, mainly cirrhosis (28.6%). Metabolic liver diseases comprised 19.0%, predominantly steatohepatitis (14.3%). Vascular lesions (6.7%), biliary diseases (1.9%), and developmental/benign tumour-like lesions (7.6%) were less common. Special stains were performed in 65.7% of cases, mainly Perl's stain, while IHC (mainly CK7, CK19) was used in 18.1%. Radiological findings were available in 25.7% of cases, most frequently identifying focal lesions; diffuse inflammatory conditions were less consistently detected. In conclusion, diffuse lesions, particularly hepatitis and cirrhosis, dominated this cohort, consistent with referral patterns to a tertiary biopsy service. The relatively low frequency of metabolic liver disease likely reflects selection bias, as early-stage cases seldom undergo biopsy. Ancillary techniques, especially special stains, remain valuable in the diagnostic evaluation of non-malignant liver lesions.

Keywords: non-malignant liver diseases, histopathology, diffuse and focal liver lesions, special stains

Holding Mothers, Not Just Babies: Social Support Mediates Breastfeeding Stress and Postpartum Well-Being in First-Time Mothers

M.F.F. Afrah[1, 2]*, N.D. Selvaratnam[1]

[1]*Sri Lanka Institute of Information Technology (SLIIT), Malabe, 10115, Sri Lanka*
[2]*Liverpool John Moores University (LJMU), Liverpool, L3 5AH, United Kingdom*
**afrahfazil26@gmail.com*

The postpartum period is a critical phase marked by heightened psychological vulnerability, with breastfeeding-related challenges contributing to maternal distress. While breastfeeding-related stress has been linked to poorer mental health outcomes, limited research has examined its impact on maternal well-being as a multidimensional construct, particularly within the Sri Lankan context. In the present study, breastfeeding-related stress was operationalised using breastfeeding self-efficacy, whereby lower breastfeeding self-efficacy was conceptualised as an indirect indicator of breastfeeding-related stress, consistent with the breastfeeding self-efficacy framework and evidence that lower breastfeeding confidence is associated with greater psychological distress and breastfeeding difficulties. This study aimed to examine the relationship between breastfeeding-related stress and maternal well-being among first-time postpartum mothers and to investigate the mediating role of perceived social support. A quantitative cross-sectional design was employed with a sample of 128 first-time mothers aged 19–38 years who were breastfeeding or mixed-feeding infants under 12 months. Data were collected using the Breastfeeding Self-Efficacy Scale–Short Form (BSES-SF), the Multidimensional Scale of Perceived Social Support (MSPSS), and the WHO-5 Well-Being Index. Data was analysed using descriptive statistics, simple linear regression, and mediation analysis. Results indicated that lower breastfeeding self-efficacy significantly predicted poorer maternal well-being ($R^2 = .193$, $p < .001$). Breastfeeding self-efficacy also significantly predicted perceived social support ($R^2 = .158$, $p < .001$), while perceived social support significantly predicted maternal well-being ($R^2 = .354$, $p < .001$). Mediation analysis revealed a significant indirect effect ($\beta = -0.199$, $p < .001$), indicating that perceived social support partially mediated the relationship between breastfeeding self-efficacy and maternal well-being, while the direct effect remained significant. Overall, the findings support the proposed conceptualisation that lower breastfeeding self-efficacy, as an indirect indicator of breastfeeding-related stress, is associated with poorer maternal well-being, and that perceived social support partially mediates this relationship among first-time postpartum mothers in Sri Lanka.

Keywords: postpartum well-being, breastfeeding self-efficacy, social support, maternal mental health, Sri Lanka

Household Fuel Use and Airway Inflammation in Pregnant Mothers: A Comparative Analysis of FeNO Levels in Kandy District

O.K.D.V.T Kumarasiri[1]*, M.R.F. Rishadha[1], P.N.D. Kumaranathunga[1], W.A.D.H.M. Wijayasinghe[1], C.M.J.C. Chandrasekara[1], P. Priyanga[2], J.M.D.C. Jayasinghe[2,3], C.B. Karunarathne[2,3], K.H.A.Y. Kariyawasam[2,6], H.M.C.R.K. Thilakaratna[1], C. Lin[4], J. Schwarze[4,5], P. Dissanayake[1], T. Amarasekara[2], G. Bowatte[1], R.M.D. Madegedara[3], C.S.E. Goonewardena[2], S.W. Wimalasekara[2], B.M.G.D. Yasaratne[1]

[1]University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]University of Sri Jayewardenepura, Nugegoda, 10250, Sri Lanka
[3]Wayamba University of Sri Lanka, Kuliyapitiya, 60200, Sri Lanka
[4]Usher Institute, University of Edinburgh, UK
[5]Child Life and Health, Centre for Inflammation Research, Institute for Regeneration and Repair, University of Edinburgh, UK
[6]KIU University, Battaramulla,10120, Sri Lanka
**okdvishwa123@gmail.com*

Household air pollution from biomass fuel combustion remains a critical environmental health concern in Sri Lanka, particularly for vulnerable populations like pregnant women. Exposure to biomass fuel, mainly firewood smoke, is linked to adverse respiratory outcomes, yet the specific physiological impact on airway inflammation among expectant mothers in the Kandy District requires further investigation using objective biomarkers. This study aimed to determine whether fractional exhaled nitric oxide (FeNO) levels, a sensitive indicator of subclinical bronchial inflammation, differ significantly between pregnant mothers who use exclusively gas stoves and those who use a combination of gas and firewood stoves. In this cross-sectional study, 85 pregnant mothers were recruited and categorized into two groups: "Gas Only" (n = 36) and "Both Gas and Firewood" (n = 49). Mothers with active/passive smoking exposure, allergies, or severe asthma were excluded; maternal and gestational ages were not considered as parameters. FeNO levels were measured using standardized breath analysis devices to quantify eosinophilic airway inflammation. Data was analyzed using Welch's t-test to compare mean FeNO levels while accounting for unequal variances between the cohorts. The results revealed that FeNO levels were significantly higher among individuals using both gas and firewood stoves (M = 18.4ppb, SD = 6.96) compared to gas-only users (M = 11.1 ppb, SD = 3.34). This difference was statistically significant, Welch's $t(72.9) = 6.34$, $p < 0.001$, indicating that mixed fuel use is associated with substantially increased airway inflammation. These findings provide evidence that the integration of biomass fuel into household cooking, even alongside cleaner energy sources, poses a significant subclinical respiratory risk. The study concludes that partial fuel switching is insufficient to protect pregnant women from the harmful effects of household air pollution. These results underscore the need for public health interventions and targeted policies that promote the adoption of clean cooking technologies to safeguard both maternal and fetal respiratory health across the Kandy District region.

Keywords: Fractional Exhaled Nitric Oxide (FeNO), Household Air Pollution (HAP), airway inflammation, respiratory health

How Accurate is the Manual Palpation in Comparison to the Ultrasonography Confirmation of the Identification of the Cricoid Cartilage and Cricothyroid Membrane?

M.N.F. Najla[1]*, V. Pinto[2], I.A.N.P. Abeyrathne[1], C.N.U. Perera[1], R.D.W.M.N.J. Wadimuna[1], D.G.H. Warnasuriya[2]

[1]Teaching Hospital Peradeniya, Peradeniya,20400, Sri Lanka
[2]Department of Anaesthesiology and Critical Care, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**fathimanajla34@gmail.com*

Airway management is vital to maintain oxygenation. Endotracheal intubation provides a definitive airway. The difficult intubation situations necessitated emergency front-of-neck access (eFONA) to save the life of the patient. The anatomical site for eFONA is the cricothyroid membrane (CTM). Clinicians rely on manual palpation to identify the cricoid cartilage (CC) and CTM. The anaesthetist's experience and patient factors can lead to misidentification, lead to a failed airway. Ultrasound is a promising method for identifying anatomical structures. This study aims to assess the accuracy of the identification of CC and CTM by the conventional manual approach, confirmed by ultrasound. A prospective cross-sectional study was conducted, involving 56 adult patients who underwent surgery at the Teaching Hospital, Peradeniya. Patients with known neck masses, previous laryngeal surgery, or unstable cervical spine were excluded. Data on the anaesthetist's experience, along with identification of the CC and CTM of supine patients, were noted and marked on the neck. A second clinician, trained in airway ultrasound, identified the CC and CTM using the Transverse-Longitudinal Ultrasound. The distance between the manual identification and the correct identification by ultrasound was noted. The anaesthetist's experiences were comparable. Out of 56 patients, 37% were males. Personal feeling on palpating the cricoid was 62% 'easy', 24% was 'moderate', and 14% was 'difficult' to palpate. Only 21.43% occurrences showed that the manual palpation was comparable to ultrasound identification. A higher rate of misidentification (78.57%) by manual palpation was noted. The mean deviation for cricoid cartilage identification was 1.05cm, while CTM was 0.93cm. Both deviations were statistically significant ($p < 0.05$). There was a higher accuracy rate among males (45%) than females (5.88%), and a 48% accuracy rate in patients with a prominent thyroid notch. CTM deviation and the neck circumference correlation were negligible. Identifying the CC and the CTM by manual palpation exhibited misidentification. Factors such as gender, perceived difficulty of palpation, and thyroid notch prominence may influence the accuracy of manual identification. Thus, implementing ultrasound imaging to identify the above anatomical locations would be a safe approach. Improving the ultrasound skills of personnel dealing with the airway is deemed mandatory.

Keywords: eFONA, identification of cricothyroid membrane, definitive airway management

Impact of Care Dependency on the Quality of Life of Caregivers of Children with Special Needs, Jaffna, Sri Lanka

S. Sasrubi[1]*, L.B.T.C. Lokubalasuriya[2], S. Kumaran[1]

[1]*Department of Community & Family Medicine, Faculty of Medicine, University of Jaffna, Jaffna, 40000, Sri Lanka*
[2]*Department of Disability Studies, Faculty of Medicine, University of Kelaniya, Ragama, 11010, Sri Lanka*
**sasrubi@univ.jfn.ac.lk*

Caring for children with special needs place physical, psychological, social, and financial demands on caregivers, which may negatively affect their quality of life. This study aimed to assess the impact of care dependency of children with special needs on the quality of life of their caregivers. A cross sectional study was carried out among caregivers of students studying in special education units in thirty three Government schools of Jaffna, Sri Lanka. Information regarding children's dependency on mobility support, medication use, and assistive devices was collected. Quality of life of physical health, psychological health, social relationships, and environment of caregivers was assessed using the WHOQOL-BREF questionnaire, which is cross culturally validated in Tamil Language also. Data were analyzed using SPSS (V27.0). One-way ANOVA and independent sample *t* test were used to identify the mean differences in quality of life. A p-value of <0.050 was considered statistically significant. Three hundred and fifty-four caregivers participated in the study. Mean age of caregivers was 42.6 years (±6.95). Most caregivers were aged between 41-60 years (57.9%), mothers (72.0%), and received support from spouses in caregiving (94.4%). Mean age of students was 11.55 years (±3.09), and the majority were males (65.3%). Major clinical diagnoses were Down syndrome (18.4%), autism spectrum disorder (18.1%), specific learning disability (13.8%), and global developmental delay (10.5%). Overall mean quality of life score among caregivers was 12.01 ± 1.2 out of 20. Among the four domains, the highest mean score was observed in the physical domain (12.2 ± 1.2), followed by the psychological domain (12.2 ± 1.5), the environmental domain (12.1 ± 1.2), and the social domain (11.5 ± 1.9). Poorer quality of life across all domains was observed among caregivers of children who were dependent on medication and assistive devices, with statistically significant associations identified ($p < 0.050$). In addition, caregivers of children requiring mobility support demonstrated significantly lower scores in the physical health domain. However, age, gender, and type of disability of the students were not significantly associated with the caregivers' quality of life. These findings highlight the need for family centered interventions focusing on reducing caregiving burden of caregivers of children with special needs.

Keywords: quality of life, caregivers, special education, WHOQOL-BREF, Sri Lanka

Incidence and Mortality Trends of Male Reproductive System Cancers in Sri Lanka: A Population-Based Study

W.M.O.V.K. Weerasekara[1]*, A.G.A.N. Wijerathne[1], S.L. Jayakody[2], N.S. Soysa [1,2]

[1]Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**vimanshaweerasekara@gmail.com*

Male reproductive system cancers including prostate, testicular and penile cancers, contribute significantly to the global cancer burden. Among these, Prostate cancer (PC) is the most commonly diagnosed malignancy and the fifth leading cause of cancer-related mortality among men worldwide. In Sri Lanka, data on long-term trends of male reproductive system cancers remain limited. Therefore, this study aimed to describe the incidence and patterns of these cancers. The data were extracted from the Cancer Incidence and Mortality Database of Sri Lanka (Sri Lanka Cancer Registry) maintained by the National Cancer Control Programme (NCCP), Ministry of Health, Sri Lanka, from 2005 to 2022. Male reproductive system cancers were defined using ICD-10 classification and categorized into penile (C60), prostate (C61), testicular (C62) and other male genital organ cancers (C63). These data were used to estimate the incidence rates, including crude incidence rate (CR) and age-standardized incidence rate (ASIR). Trends in the ASIR, Annual Percentage Change (APC), and Average Annual Percentage Change (AAPC) were assessed using join-point regression. According to the data, male reproductive system cancers demonstrated a changing pattern over time. Between 2005 and 2022, a total of 16,930 cases were recorded with an AAPC of 8.19%. PC accounted for the majority of cases (n=13,849) followed by penile (n=1807), testicular (n=1133) and other genital cancers (n=141). Prevalence of cancers in the prostate, testis, penis, and other genital organs increased from 7.16% in 2005 to 8.62% in 2022. ASIR for prostate cancer increased markedly from 3.5 in 2005 to 11.1 per 100,000 in 2022, with an AAPC of 8.08%. Moreover, the AAPC for testicular cancers, penile cancers, and other genital cancers were 3.82%, 1.09%, and 5.71% respectively. Age-Standardized Mortality Rate (ASMR) for PC in Sri Lanka increased from 1.0 in 2005 to 3.26 per 100,000 in 2021 (AAPC = 6.21%). These findings highlight a growing burden of prostate cancer and other genital cancers in Sri Lanka, emphasizing the need for enhanced early detection, targeted screening, and effective management strategies to reduce morbidity and mortality.

Keywords: prostate cancer, male reproductive system cancers, cancer incidence, Sri Lanka, age-standardized rate

Incidental Dural-Based Masses Detected During a Routine Cadaveric Dissection

G.M.T. Dasun[1]*, W.A.M.S. Wickremasinghe[1], S. Sumanasekara[2], H.M.R.W. Angammana[1]

[1]Department of Basic Sciences, Faculty of Dental Sciences, Peradeniya, 20400, Sri Lanka
[2]Department of Pathology, Faculty of Medicine, Peradeniya, 20400, Sri Lanka
**thathsaraceo26@gmail.com*

Dural-based masses present a broad spectrum of neoplastic and non-neoplastic conditions. Meningiomas are common mass lesions that affect the dura and accounts for 39% of all central nervous system tumors, with up to 50% discovered incidentally post-mortem. Dural metastases frequently mimic meningiomas macroscopically and radiologically, posing significant diagnostic challenges. This report presents two incidentally detected intracranial dural-based masses identified during routine undergraduate cadaveric dissection at the Faculty of Dental Sciences, University of Peradeniya to emphasize the value of cadaveric dissection not only as a teaching tool but also as a source of anatomical and pathological observations to understand and study such pathologies. The first case involved a 72-year-old male cadaver with multiple firm masses adherent to the inner dural surface, predominantly left-sided, with the largest measuring 1 cm × 0.5 cm × 0.2 cm. Brain parenchymal compression proportionate to a disproportionately enlarged epidural space was noted, with no hemorrhage or bony changes. Histology showed atypical cells in syncytial nests with central necrosis and vague acinar formation. Immunohistochemistry demonstrated pan-cytokeratin positivity with EMA and PR negativity, supporting metastatic adenocarcinoma. The documented cause of death was Pneumocystis pneumonia in a post-renal transplant patient, with no prior malignancy diagnosis, suggesting clinically silent metastatic disease. The second case involved a 75-year-old female cadaver with a solitary loosely attached right-sided dural mass measuring 1 cm × 1 cm × 1 cm, associated with a proportionate arachnoid and brain defect but no bony involvement. Despite a documented history of disseminated renal cell carcinoma with pulmonary metastases, histopathological assessment of this mass confirmed a benign fibrous meningioma, characterized by a well-circumscribed lesion with extensive fibrosis and psammomatous calcifications. These cases highlight that clinically silent intracranial pathologies may go undetected during life. Histopathological evaluation remains essential for accurately distinguishing primary meningiomas from metastatic dural deposits. Furthermore, cadaveric dissection serves not only as a valuable pedagogical tool but also as a meaningful source of anatomical and pathological discovery.

Keywords: dural-based masses, meningioma, dural metastasis, cadaveric dissection, histopathology

Influence of Manual Dexterity and Self-Perceived Skills on Dental Skill Performance.

L.G.N.H. Wadasinghe[1]*, I.A. Thoradeniya[2], R.M.S.G.K. Rasnyaka[1], I.P. Thilakumara[1]

[1]*Department of Prosthetic Dentistry, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**d18070@dental.pdn.ac.lk*

As clinical dental procedures demand a high level of precision and motor control, manual dexterity is considered a fundamental component in dentistry. In addition to manual dexterity, a dental student's perception of their level of skill may also influence their performance at skills-based assessments. This study aims to assess the influence of manual dexterity and self-perceived skill levels on the performance at skills-based assessments of dental undergraduates. This cross-sectional study involved 114 dental undergraduates in their third year of study in 2023/2024 at the University of Peradeniya, selected using convenience sampling. Students with prior dental training were excluded. Each participant completed a self-administered, Likert-type questionnaire which assessed their self-perceived skill level in seven dental procedures. They also completed two manual dexterity tests; the Purdue Pegboard Test and the O'Connor Tweezer Test under direct vision and indirect vision (using a mirror). Finally, skills-based assessment marks were collected. Statistical analysis was carried out to assess the correlations between parameters. Among the study participants, 71.93% (82 students) were females and 85.96% (98 students) were right-handed. The results of the manual dexterity tests placed the participants within the normal range of healthy adults. A weak correlation was found between some manual dexterity test scores and self-perceived skill levels (Purdue pegboard test non-dominant hand under direct vision p 0.034, O'Connor Tweezer Test under direct vision p 0.032). Some manual dexterity tests showed weak correlation with skills-based assessment scores, while self-perceived skills level showed no significant correlation with these scores. Performance at skill-based assessments of dental undergraduates was found to have a weak correlation with their manual dexterity while no association was observed with self-perceived skill levels. The weak correlations may reflect influence of other factors, including clinical knowledge, stress, motivation, fatigue and time management which may also affect the performance in skill-based assessments. The cross-sectional nature of the study and the use of a sample from a single dental school in Sri Lanka were the main limitations. Further longitudinal studies are recommended to assess changes in manual dexterity and self-perceived skills throughout the academic years while accounting for confounding factors.

Keywords: manual dexterity, self-perceived skills, dental education, skill-based assessment

Acknowledgement: *The authors express their sincere appreciation to Mr. A.L.J.Bandara for the statistical support provided and to the Physiotherapy Unit of Teaching Hospital Peradeniya for facilitating the use of the Purdue Pegboard Test.*

INKIND: Analysing Psychological and Developmental Markers in Children's Drawings Through Multimodal Artificial Intelligence

S.N. Vidanagama*, M.A.L.E.D.Z.G. Rajapaksha, E.D.S.Y. Dhanuge, K. Ratneswaran, R.M.P.S. Rathnayaka

Informatics Institute of Technology, Colombo 04, 00400, Sri Lanka
**sanidavidanagama@gmail.com*

Children's drawings encode psychological and developmental information often missed in verbal assessments, yet automated interpretation remains limited. Existing approaches either rely on AI-generated annotations as ground truth without domain grounding, employ AI solely for visual element recognition without psychological interpretation, or perform binary classification without structured indicator extraction. No existing system integrates multimodal mood classification with literature-grounded drawing indicator analysis within a unified, interpretable framework. This study addresses this gap by presenting INKIND, a web-based multimodal AI system for the interpretable, non-diagnostic analysis of psychological indicators in children's drawings. The objective is to investigate the extent to which multimodal AI can extract and interpret established visual indicators in a manner that is transparent, domain-aligned, and accessible to non-expert stakeholders. The system accepts a drawing image alongside an optional text description and age as inputs via a Fast Application Programming Interface (FastAPI) backend integrating five components. Upon upload, the Visual Description Generation module, powered by a Vision Language Model (VLM), produces structured textual descriptions, while the Image Preprocessing unit employs the Meta Segment Anything Model for drawing isolation, perspective correction, Contrast Limited Adaptive Histogram Equalisation (CLAHE), and colour normalisation. The processed outputs feed two parallel streams: a Multimodal Early Fusion Architecture (MEFA) combining Residual Network with 50 layers (ResNet-50) image features and Distilled Bidirectional Encoder Representations from Transformer (DistilBERT) text embeddings for mood classification, and a Drawing Indicator Analysis (DIA) module operating within a Retrieval-Augmented Generation (RAG) framework that retrieves psychological and art-therapeutic literature from a ChromaDB vector database to identify indicators such as line pressure, shading intensity, figure completeness, and spatial confinement. The mood prediction and indicators are passed to a Large Language Model (LLM) based Recommendation Engine to generate non-clinical activity suggestions. Trained and evaluated on the KIDO Children Drawing Dataset (5,430 drawings, two emotional categories), the text and image models achieved accuracies of 97% and 74%, respectively, with the MEFA model reaching 73%. The system outputs a structured Integrated Analysis Report comprising mood classification, literature-grounded indicator analysis, and actionable recommendations, offering an ethically grounded workflow for interpretable drawing analysis.

Keywords: deep learning, psychological indicator analysis, children's drawings, vision language models, retrieval augmented generation

Interplay of Food Cravings, Dietary Patterns and Psychological Well-Being among Postmenopausal Women in Kandy District, Sri Lanka: A Cross-Sectional Study

W.P.G.A.D. Wickramasinghe[1], N.K. Weerasekara[2], A. Chandrasekara[3], K.I.C. Kandauda[4], R.P.N.P. Rajapakse[1], B.E.P. Mendis[1]*

[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
[2]*Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
[3]*Department of Nutrition and Dietetics, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka.*
[4]*Department of Gynecology and Obstetrics, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
**ereshamendis@agri.pdn.ac.lk*

Menopause is a significant biological transition in a woman's life characterized by the permanent cessation of menstruation. This transition can significantly influence dietary behaviors, often triggering cravings for energy-dense foods due to hormonal changes. These cravings are associated with dietary habits and psychological well-being. Thus, the present study aimed to examine the interplay among food cravings, dietary habits and psychological well-being among postmenopausal women in the Sri Lankan context. This cross-sectional, survey-based study included postmenopausal women (N = 80) from Kandy District, recruited through convenience sampling. Anthropometric measurements were taken using standard procedures. Food cravings were assessed using the standard Food Craving Questionnaire-Trait-Reduced (FCQ-T-r) version and a validated Food Craving Inventory (FCI). Dietary intake was evaluated through a food frequency questionnaire. Psychological well-being was assessed using the Depression, Anxiety, and Stress Scales–21 (DASS-21). The mean BMI was 27.9 ± 4.53 kg/m², classifying majority under obesity class I. Mean waist-hip ratio of 0.893 ± 0.060 indicated central obesity. Dietary assessment revealed that cereals and equivalents accounted for 46% of consumption frequency, while fruits represented only 5%. Cravings for sweets and high-carbohydrate foods were significantly higher compared to cravings for high-fat foods or fast-food fats ($p < 0.05$ for all). Depression score showed a moderate positive correlation with FCQ-T-r score ($r_s = 0.347$, $p < 0.01$), indicating that higher depression levels were associated with increased trait food craving tendencies. Stress score showed a weak-to-moderate positive correlation with FCQ-T-r score ($r_s = 0.288$, $p < 0.05$), indicating that higher stress levels were associated with increased trait food cravings, although the strength of this association is weaker than that observed for depression. There was no statistically significant correlation between anxiety score and FCQ-T-r score. Moreover, depression score demonstrated a weak-to-moderate positive correlation with sweet craving score ($r_s = 0.261$, $p < 0.05$), indicating that individuals with higher depression levels tended to experience cravings for sweets. Stress score showed a weak-to-moderate positive correlation with fast-food fat craving score ($r_s = 0.269$, $p < 0.05$), suggesting that individuals with higher stress levels were more likely to crave fast-food-type fatty foods. These findings highlight the importance of a larger-scale study incorporating biomarkers to further explore these interrelationships and their impact on postmenopausal health.

Keywords: food craving, obesity, postmenopause, psychological well-being

Introduction to Lead Optimization of Gut Microbiota-Derived Tryptamine for Reduced Hallucinogenic and Enhanced Antidiabetic Potential

S.K. Malaviarachchi*, U. Bandaranayake

Edith Cowan University, Rajagiriya, 10100, Sri Lanka
**sanudakusalvinijhs@gmail.com*

Despite the diverse therapeutic potential of gut microbiota-derived metabolites, tryptamines have been largely misused as recreational drugs. This is due to their ability to readily cross the blood-brain barrier (BBB) and produce hallucinogenic effects in the central nervous system (CNS). Previous research has identified the 6th and 7th positions of the tryptamine indole ring as sites at which structural modifications can be introduced to reduce the hallucinogenic activity. Hence, this study aimed to design and evaluate structural modifications that may reduce BBB permeability while enhancing one of tryptamine's known therapeutic potentials that require minimal CNS involvement, specifically its antidiabetic activity. A common scaffold used in the synthesis of dipeptidyl peptidase IV (DPP-4) inhibitors called '2(S)-cyanopyrrolidine' was linked through the 6th and 7th positions of the indole ring, forming two new tryptamine analogs, compound 1 and compound 2, respectively. Deviations of pharmacokinetic and toxicity profiles during this modification were monitored using ADMET predictors such as OSIRIS® property explorer, SwissADME, pkCSM, and Deep-PK. AutoDock4 molecular docking software was used to predict the binding affinity of these compounds to 3W2T (PDB structure of DPP-4). Improved pharmacokinetic and toxicity profiles were predicted for both new compounds compared to native tryptamine. While SwissADME and Deep-PK predicted BBB permeability and pkCSM predicted positive LogBB value for native tryptamine, BBB impermeability was predicted for the new compounds with negative LogBB values (suggesting low BBB permeability). The docking scores of compounds 1 and 2 were -8.48 and -8.52 kcal/mol, respectively, suggesting moderate binding affinity approaching that of the reference inhibitor vildagliptin (-8.91 kcal/mol). Molecular interactions visualized using Discovery Studio 2024 software revealed that in hydrogen bond formation, tryptamine and the new compounds shared amino acid residues that occupy the binding pocket of vildagliptin such as Glu205 and Glu206. Overall, these *in silico* findings suggest that the two newly proposed tryptamine analogs may serve as initial templates for lead optimization of tryptamines with reduced BBB permeability compared to native tryptamine. However, future research should involve retrosynthesis to identify synthetic routes for these compounds, and QSAR modelling and laboratory experiments to validate the BBB permeability and DPP-4 binding affinity predictions.

Keywords: gut microbiota, tryptamine, blood-brain barrier, antidiabetic, molecular docking

Investigating the Prevalence of *p53* Gene Exon 4 Mutations in Oral Submucous Fibrosis and Oral Squamous Cell Carcinoma Patients

R.U. Jayakody[1]*, R.M.R.U. Chandrasekara[2], N.S. Piyarathne[2], S.I. Karunarathne[1]

[1]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**ramalij@sci.pdn.ac.lk*

Oral squamous cell carcinoma (OSCC) is the most common malignancy in males in Sri Lanka. Oral submucous fibrosis (OSMF) is a progressive, oral potentially malignant disorder with a significant risk of transformation into OSCC. Despite this well-established progression, effective molecular markers for monitoring OSMF progression remain limited. The *p53* tumor suppressor gene, a key regulator of cell cycle progression and apoptosis, is one of the most frequently mutated genes in human cancers. A C-deletion mutation at exon 4 codon 63 of the *p53* gene has been proposed as a potential biomarker for OSCC; however, its prevalence in OSMF and OSCC patients in Sri Lanka has not been thoroughly explored. This study aimed to investigate the prevalence of *p53* exon 4 codon 63 C-deletion mutation in OSMF and OSCC patients compared with disease-free controls. Ethical clearance was obtained (ERC/FDS/UOP/2023/37), and unstimulated whole saliva samples were collected from biopsy-confirmed, 20 OSMF, 20 OSCC patients, and 10 age and sex-matched disease-free individuals from the Dental Teaching Hospital, Peradeniya. Individuals with prior cancer therapy or other oral potentially malignant disorders were excluded. Genomic DNA was extracted using a modified saline-based method and subjected to polymerase chain reaction (PCR) using wild-type and mutant-specific *p53* primers. The amplified products were analyzed by agarose gel electrophoresis, and representative samples underwent DNA sequencing followed by multiple sequence alignment to confirm the mutation. Mutant-specific PCR amplification was detected in all analyzable OSMF (100%) and OSCC (100%) samples, whereas wild-type amplification was absent in 57.8% of disease samples. Sequencing confirmed the *p53* exon 4 codon 63 C-deletion mutation in all sequenced OSMF (100%) and OSCC (100%) samples, but in only one disease-free control sample (16%). Mutation prevalence differed significantly between disease groups and controls ($p < 0.01$). These findings indicate a possible association between this *p53* C-deletion mutation and both OSMF and OSCC. Saliva-based mutation detection offers a non-invasive approach for molecular screening. However, larger longitudinal studies incorporating clinicopathological characteristics, including OSMF stage, OSCC grade, and habit history, are required to further evaluate the clinical significance and utility of this mutation as a biomarker for disease progression and early detection.

Keywords: mutation detection, mutant-specific PCR, oral oncology, precancerous condition, tumor suppressor gene

Acknowledgement: *Financial assistance from the Australian Alumni Association grant of University of Peradeniya (ERPPUAAVic-2024) is acknowledged.*

In Vitro Anti-*Candida* Activity of *Vateria Copallifera* Stem Bark Extract

S. Jayaweera[1], M.R.D.M. Senanayake[2], C. Gunasena[2]*, S. Seneweera[3], J.A.M.S. Jayatilake[2]

[1]*National institute of Fundamental Sciences, Kandy, 20000, Sri Lanka*
[2]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*School of Agriculture, Food and Ecosystem Sciences, University of Melbourne, 3010, Australia*
**chandirag@dental.pdn.ac.lk*

Vateria copallifera is an endemic plant in Sri Lanka with known antimicrobial activity. Furthermore, stem bark of *V copallifera* is used to prevent fermentation of palm sap traditionally suggesting an inhibitory effect of yeast. However, anti-*Candida* effect of *Vataria copallifera* has not been assessed previously. This study aimed to assess the anti-*Candida* effect of the methanolic extract of *V. copallifera* stem bark. Methanolic extract of the stem bark of *V. copallifera* was prepared from an authenticated plant by sonication in methanol and mechanical filtration. Anti-*Candida* effect of the extract of *V. copallifera* stem bark was assessed against standard isolates of five clinically important *Candida* species (*C. albicans, C. tropicalis, C. parapsilosis, C. krusei, C. glabrata*) using the well diffusion method and the minimum inhibitory concentration (MIC) was assessed using the pour plate method using the concentrations of 25mg/ml, 12.5mg/ml, 6.25 mg/ml, 3.125mg/ml of *V copallifera methanolic extract*. Nystatin (0.125mg/mL) and 2% DMSO were used as positive and negative controls. All experiments were quadruplicated. The zone of inhibition (ZOI) was taken as the anti-*Candida* effect. *V. copallifera* stem bark extract at 25mg/ml in 2% DMSO produced variable anti-*Candida* effect against all tested *Candida* species as follows; *C. glabrata* (ZOI -19 ±0.5 mm), *C. parapsilosis* (ZOI- 18.37 ±0.5 mm), *C. tropicalis* (ZOI-16.06 ±0.5 mm), *C. krusei* (ZOI- 15.56 ±0.5 mm) and *C. albicans* (ZOI- 13.44 ±0.5 mm). Nystatin produced the highest activity against *C. albicans,* ZOI-27 ±0.5 mm and other species ZOI-25 ±0.5 mm and 2% DMSO did not produce any ZOI. Anti-*Candida* activity of *V. copallifera* was significant against all *Candida* species (ANOVA, $p < 0.05$. MIC values of the stem bark extract of *V. copaliferra* differed among the species of *Candida* tested. Accordingly, the highest MIC was observed against *C. krusei* (5.5 mg/ml) and the lowest MIC was against *C. glabrata* (3 mg/ml). Methanolic extract of *V. copallifera* stem bark exhibits variable anti-*Candida* effect and MIC values against on *C. albicans, C. tropicalis, C. parapsilosis, C. krusei,* and *C. glabrata* showing its candidacy as a potential anti-*Candida* agent. Further studies will be useful to identify the active compounds within the *V. copallifera* stem bark that are responsible for anti-*Candida* effect.

Keywords: *Candida, Vateria copallifera,* antifungal, anti-*Candida, natural* product

In Vitro Anticandidal Activity of Commonly Used Commercial Mouthwashes in Sri Lanka against *Candida albicans*

M.A.I. Banu[1], T.V.M.T. Somarathna[2], M.P. Paranagama[2], K.S.N.D. Gunawardhana[2]*

[1]*Department of Medical Laboratory Science, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**ndg@dental.pdn.ac.lk*

Candida albicans is a commensal fungus of the oral cavity that can become an opportunistic pathogen under immunocompromised conditions, prolonged antibiotic use, or local factors such as hyposalivation and denture wearing, leading to oral candidiasis. With rising antifungal resistance and limited treatment options, there is growing interest in the potential of commercially available mouthwashes as adjunctive agents against *C. albicans*. However, the anticandidal activity of mouthwashes marketed in Sri Lanka remains largely unevaluated. Therefore, this study assessed the in vitro anticandidal activity of twelve commonly used commercial mouthwashes in Sri Lanka against a standard reference strain of *C. albicans* (ATCC 90028). Mouthwashes were initially screened using the disc diffusion method and a broth turbidity screening test. Mouthwashes showing complete inhibition of visible growth in the broth screening test were further evaluated by determining the minimum inhibitory concentration (MIC) using a two-fold serial macrodilution method with concentrations ranging from 50% to 0.195% (v/v). Of the twelve mouthwashes tested, five produced measurable inhibition zones in the disc diffusion assay, whereas seven completely inhibited visible fungal growth in the broth screening test. These comprised four 0.2% chlorhexidine-containing mouthwashes, one povidone-iodine-containing mouthwash, and two herbal mouthwashes. The discrepancy between the two assays may reflect the limited diffusion of some active ingredients through agar. Among the active products, the chlorhexidine-containing mouthwashes demonstrated the strongest antifungal activity, producing inhibition zones of 12–14 mm together with complete inhibition of visible growth in broth. In contrast, a plant extract-containing herbal mouthwash produced a mean inhibition zone of 9.17 ± 0.88 mm. MIC testing further confirmed that the chlorhexidine-containing mouthwashes exhibited the greatest activity, with MIC values of ≤6.25% (v/v), whereas the remaining active mouthwashes showed MIC values ranging from 25% to 50% (v/v). In conclusion, chlorhexidine-containing mouthwashes demonstrated superior in vitro anticandidal activity against *C. albicans* compared with non-chlorhexidine formulations. These findings suggest that chlorhexidine-containing mouthwashes may provide additional antifungal benefits beyond their conventional role in plaque control, particularly for individuals at risk of oral candidiasis. Further studies should evaluate their activity against clinical *Candida* isolates and *Candida* biofilms.

Keywords: *Candida Albicans*, mouthwashes, anticandidal activity, minimum inhibitory concentration, Sri Lanka

Knowledge and Perceptions on Palliative Care in Adult Non-Malignant Advanced Respiratory Diseases among Medical Officers in a Sri Lankan Teaching Hospital: A Cross-Sectional Study

D.L. Chandima[1,2]*, W.A.P.H. Jayarathna[3], B.M.G.D. Yasaratne[2,3]

[1]*Postgraduate Institute of Medicine, University of Colombo, 00700, Sri Lanka*
[2]*Teaching Hospital Peradeniya, 20400, Sri Lanka*
[3]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**delo.pv@gmail.com*

Advanced respiratory diseases are a major cause of morbidity and mortality, with significant symptom burden requiring comprehensive care. Although palliative care improves quality of life in these patients, its integration remains suboptimal. This study aimed to assess the knowledge and perceptions of palliative care in adult non-malignant advanced respiratory diseases among medical officers in Teaching Hospital Peradeniya. A descriptive cross-sectional study was conducted among 163 medical officers at Teaching Hospital Peradeniya using a stratified random sampling method from September 2025 to February 2026. Data were collected using a pretested, self-administered questionnaire assessing sociodemographic characteristics, knowledge, and perceptions. Knowledge was evaluated using 13 items and categorised as poor, good, or excellent. Perceptions, barriers, and facilitators were assessed using Likert-scale responses. Statistical analysis was performed using SPSS with non-parametric tests, chi-square tests, and Spearman's correlation. The majority of participants were female (71.2%), aged 28–52 years, and predominantly comprised Senior House Officers/Medical Officers (60.1%), with smaller proportions of postgraduate-qualified medical officers (16%), registrars (15.3%) and intern medical officers (8.6%). The mean knowledge score was 41.1% (SD 19.2), with the majority demonstrating poor knowledge (69.3%), while 23.9% had good and 6.7% had excellent knowledge. Knowledge gaps were particularly evident in early initiation of palliative care (20.9%), end-of-life care concepts (22.1%), and symptom management strategies. Higher knowledge was significantly associated with prior experience in a medical unit ($p < 0.001$) and higher career level ($p = 0.003$), but not with age, gender, duration of career, current work setting, or prior palliative care training. Perceptions towards early integration of palliative care were limited (22.7%). Major barriers included lack of training (71.2%), timing of referral (69.3%), uncertainty about patient selection (68.1%), and unawareness of available services (68.1%). Key facilitators identified were training and upskilling (80.4%), strengthening institutional palliative care services (58.8%), and improved collaboration with palliative care teams (57.1%). In conclusion, medical officers demonstrated poor knowledge and limited acceptance of early palliative care integration in advanced respiratory diseases. These findings highlight the need for targeted educational interventions and system-level improvements to enhance palliative care delivery in respiratory practice.

Keywords: COPD, palliative care, knowledge, perceptions, medical officers

Knowledge and Practices on Rational Antibiotic Use among a Selected Sample of Undergraduates at the University of Peradeniya

M.M.M.A. Mansoor[1]*, S.C. Manawaduge[1], W.W. Madubashana[1], N.P.P. Madusara[1], H.D. Manamendra[1], W.M.S.N.K. Navaratna[2]

[1]*Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**azharmansoor119@gmail.com*

Irrational antibiotics usage is the cause for antibiotic resistance - an increasing global health issue. This study aims to evaluate the knowledge and practices regarding antibiotic usage among a sample of undergraduates at the University of Peradeniya, assuming that this demographic is well-positioned to acquire, implement, and disseminate knowledge about rational antibiotic usage. A cross-sectional study was conducted using printed self-administered questionnaires among 393 undergraduates, of whom 197 were from health-related faculties (Medical and Allied Health Sciences) and 196 from non-health faculties (Science and Engineering). Faculties were first categorized as health and non-health, followed by random selection of faculties within those groups. Data were analyzed using Jamovi, and associations between independent variables and each aspect of knowledge, attitudes, and practices were assessed using Chi-square tests and Fisher's exact tests where appropriate. The population consisted of 189 males and 204 females. Majority knew that antibiotics are not used for viral infections (62.3%), in which the females (57.1% vs 42.9% males, $p = 0.007$) and health-related undergraduates (64.7% vs 35.3% non-health related, $p < 0.001$) were significantly high. The majority identified amoxicillin as an antibiotic (91.1%) and paracetamol (83.7%), piriton (76.3%) as not antibiotics. Majority had incorrect practices in taking over-the-counter (OTC) antibiotics for the common cold (66.5%) and fever (57.5%), completing the full antibiotic course (72.1%) and sharing antibiotics (62.4%). Around 52% self-medicated using antibiotics when feeling unwell before exams. Health-related undergraduates were significantly better in not taking OTC antibiotics for common cold (62.1% vs 37.9% non-health related, $\chi2=11.43$, $p < 0.001$), fever (61.1% vs 38.9% non health related, $\chi2=13.92$, $p < 0.001$) and diarrhea. (54.6% vs 45.4% non-health related, $\chi2=3.89$, $p = 0.048$) In conclusion, undergraduates possess correct knowledge regarding the purpose of antibiotics, but lack knowledge of cause of common symptoms, whether bacterial or not. Majority have poor practices. Health education regarding the correct use of antibiotics can improve knowledge and practices. Establishing stricter guidelines and policies will especially help promote correct practices in antibiotic use.

Keywords: antibiotic misuse, antibiotic resistance, University of Peradeniya

Knowledge and Practices towards Alendronate Therapy among Postmenopausal Women Treated with Alendronate at National Hospital, Galle

E.H.M.D. Gunawardhana[1]*, H.W.A.S. Subasinghe[1], K.I.M. De Silva[1], L.C.P.T. Liyanaarachchie[2]

[1]Faculty of Allied Health Sciences, University of Ruhuna, Matara, 80046, Sri Lanka
[2]Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**damithgunawardhana135@gmail.com*

Postmenopausal women are at an increased risk of reduced bone mineral density and deterioration of bone structure leading to osteoporosis, osteopenia, bone fractures and skeletal deformities. Bisphosphonates, particularly alendronate sodium, are used to manage these conditions by increasing bone mineral density and reducing the fracture risk. Long term use of bisphosphonates is associated with gastrointestinal complications including esophagitis and gastric irritations. Therefore, the effectiveness and safety of alendronate therapy depend on patient knowledge, adherence, and correct administration practices. This study aimed to evaluate the knowledge and practices of the postmenopausal women regarding alendronate therapy. A descriptive cross-sectional study was conducted among 300 postmenopausal women aged 50 – 80 years attending the National Hospital, Galle. Participants had received oral alendronate therapy for over three months. Data were collected using a validated, interviewer administered questionnaire on socio-demographic characteristics, knowledge and administration practices related to alendronate therapy. Data were analysed using SPSS version 25.0 and Microsoft Excel 2013.Chi-squared test was used to identify the association between categorical variables. Among the participants, 234 (78%) had high knowledge on alendronate therapy while only 11 (3.7%) demonstrated poor knowledge. Majority of the participants (96.3%) correctly identified the dose and dosing frequency. However, knowledge on missed dose management (13.7%) and 24.7% potential side effects was limited. Overall, 288 (95.7%) participants had good alendronate administration practices. Among them, more than 95% correctly followed the recommended dosing frequency and posture of administration. A significant negative correlation was observed between age and both knowledge and practice levels ($p < 0.001$) indicating that elderly participants poor understanding on correct medication use. Educational level, marital status and employment status were not associated with either knowledge or practice scores. These results showed that the knowledge and practices towards alendronate therapy was satisfactory in this target population. However, the findings emphasized the requirement of focused educational interventions. In this regard simple education approaches such as visual aids, reinforcing education when the women return for follow-up visits, and educating the caregiver may improve the safe and effective use of alendronate.

Keywords: alendronate, bisphosphonates, knowledge, practices, postmenopausal women

Knowledge, Attitudes, and Practice of Lifestyle Modifications Recommended for Hypertension Management among Adult Hypertensive Patients in a Tertiary Care Hospital in Sri Lanka

U.V. Jayalath*, P. Iroshima, P. Jagathsiri, S. Jayalath, P. Januban

Faculty of Medicine, University of Peradeniya, Peradeniya,20400, Sri Lanka
**uvinjayalath314@gmail.com*

Hypertension is a major modifiable risk factor for cardiovascular, cerebrovascular, and renal diseases, affecting nearly one billion individuals worldwide. Effective blood pressure control depends not only on pharmacological therapy but also on sustained adherence to recommended lifestyle modification measures. This study evaluated the knowledge, attitudes, and practices (KAP) related to lifestyle modification among adult patients with hypertension attending a tertiary care hospital in Sri Lanka. A hospital-based cross-sectional study was conducted over one year among adult patients attending the Hypertension Clinic at Teaching Hospital Peradeniya. Data were collected using a structured self-administered questionnaire assessing sociodemographic characteristics and KAP regarding lifestyle modification in hypertension management. Statistical analysis was performed using ANOVA to assess associations between variables, with statistical significance defined at $p < 0.05$. A total of 399 participants were included, of whom 243 (60.9%) were female. The mean body mass index was 24.7 ± 4.19 kg/m². The mean knowledge, attitude, and practice scores were 80.3 ± 13.3, 76.2 ± 4.5, and 55.4 ± 18.5, respectively. Adequate knowledge regarding lifestyle modification was observed in 57.5% of participants. However, unfavorable attitudes and inadequate practices were identified in 94.9% and 87.7% of participants, respectively. No statistically significant associations were observed between KAP scores and age, sex, ethnicity, educational status, or duration of hypertension. Knowledge and attitude scores demonstrated significant associations with the most recent systolic blood pressure reading ($p < 0.05$). Although participants demonstrated relatively adequate knowledge regarding lifestyle modification measures for hypertension management, corresponding attitudes and practices remained suboptimal. These findings highlight the need for targeted educational and behavioral interventions aimed at improving the implementation and long-term adherence to lifestyle modification strategies among patients with hypertension.

Keywords: hypertension, lifestyle modification, knowledge, attitudes and practices, blood pressure control, Sri Lanka

No Show Abstract

Knowledge, Attitudes, and Practices Regarding Dental Caries and Its Prevention Among First-Year Undergraduates at the University of Peradeniya

P.A. Hewage[1]*, R.M.S.G.K. Rasnayaka[2], H.N.F. Rimasha[3], M.N.F. Riska[3], E.D. Rupasingha[3]

[1]Department of Restorative Dentistry, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Prosthetic Dentistry, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[3]Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**kavya@dental.pdn.ac.lk*

Dental caries is one of the most prevalent chronic conditions affecting populations worldwide, particularly among young adults. Although largely preventable, poor oral hygiene habits and limited awareness of preventive strategies contribute to its persistence. University students, especially first-year undergraduates, are vulnerable as they often adopt new lifestyles that may compromise their oral health. This study aimed to assess the knowledge, attitudes, and oral health practices regarding the aetiology and prevention of dental caries among first-year undergraduates at the University of Peradeniya. A descriptive cross-sectional study was conducted among 415 first-year undergraduates selected using simple random sampling. Data were collected through a multilingual (Sinhala, Tamil, and English) self-administered online questionnaire and analysed using SPSS version 23. More than 87% of participants demonstrated satisfactory knowledge regarding dental caries, its causes, and preventive measures. However, preventive practices remained suboptimal: only 19.3% replaced toothbrushes when bristles were flared, 29% brushed for the recommended 2–3 minutes, and 9.77% reported using non-fluoridated toothpaste. Female students demonstrated significantly higher knowledge scores ($p < 0.001$), while no significant association was observed between gender and preventive awareness ($p = 0.157$). No significant differences were identified between health-related and non-health-related faculties. Pearson correlation analysis showed no significant relationship between knowledge and preventive behaviour ($p = 0.319$). In conclusion, although first-year undergraduates demonstrated good knowledge of dental caries, this knowledge was not consistently translated into appropriate oral health practices. These findings highlight the need for behaviour-focused oral health promotion programmes that strengthen motivation and practical preventive skills across all faculties.

Keywords: dental caries, undergraduates, oral health, knowledge, preventive practices

Knowledge, Attitudes, and Self-Medication Practices Regarding Over-the-Counter Drugs and Antibiotics among University Undergraduates: A Cross-Sectional Study

N.K. Hewanayaka[1]*, T.M.I.U.K. Tennakoon[1], S.P. Abeysundara[2]

[1]*Department of Pharmacy, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Statistics and Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**ahs20pcy009@ahs.pdn.ac.lk*

Antibiotic resistance is a growing global health concern. Misuse of antibiotics as Over-the-Counter (OTC) drugs is widely practiced, especially among university students. Therefore, it is essential to measure undergraduates' knowledge, attitudes, and self-medication practices regarding antibiotics and OTC drugs. The main objective of the study is to assess knowledge, attitudes, and self-medication practices regarding antibiotics and OTC drugs among undergraduates at the University of Peradeniya and to examine whether these differed significantly across faculties, particularly, comparing students from health-related and non-health-related faculties. A cross-sectional study was conducted among undergraduate students from all nine faculties at the University of Peradeniya. After obtaining ethical approval, data were collected from 494 participants using a convenience sampling method using a pre-tested structured questionnaire. Collected data were analyzed using Microsoft Excel and Minitab statistical software. Among the participants (n=494), 77.9% were females. Fever, stomachache/gastritis, and cough were the most common conditions self-treated using OTC medications. Amoxicillin was incorrectly identified as an OTC drug by 39.43% of participants. Self-medication with OTC drugs and antibiotics was reported by 80.24% and 40.37% of participants, respectively. Most participants obtained medication-related information from doctors, online resources, and pharmacists. Additionally, 59.42% kept leftover medications for future use, while 65.76% shared antibiotics or OTC drugs with family or friends. Interestingly, 33.76% agreed that antibiotics help to cure colds and flu, while 16.95% agreed that OTC medications are a better option than prescription drugs. Only 21.97% participated in university awareness programs on responsible drug use. One-way ANOVA analysis revealed significant differences in OTC and antibiotic knowledge scores were observed among faculties (OTC: $F(8, 485)=27.91$, $p<0.001$; Antibiotics: $F(8, 485)=65.27$, $p<0.001$). Students from Medicine, Dental, and Allied Health Sciences demonstrated higher knowledge scores than those from Arts and Management faculties, highlighting the influence of academic background on medication awareness. Self-medication with OTC drugs and antibiotics is widely practiced among undergraduate students. Their knowledge regarding antibiotics and OTC drugs is insufficient while the academic background plays an important role in awareness and understanding of OTC drugs and antibiotic use. These findings highlight the importance of organizing educational campaigns to promote safe drug use and awareness of antibiotic resistance among undergraduates.

Keywords: antibiotics, antibiotic resistance, over-the-counter drugs, self-medication

Lipid Profile Patterns in Newly Diagnosed Type 2 Diabetes Mellitus Patients: A Cross-Sectional Study from the National Hospital Kandy, Sri Lanka

S.H.R.A. Sarathchandra[1]*, W.A.P.P. De Silva[1], R.D.P. Jayawardana[2], C. Antonypillai[3], S. Gunatilake[3]

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Diabetes and Endocrinology Unit, National Hospital Kandy, Kandy, 20000, Sri Lanka*
[3]*Department of Biochemistry, National Hospital Kandy, Kandy, 20000, Sri Lanka*
**rashmiaaloka@gmail.com*

Dyslipidemia is a major modifiable cardiovascular risk factor in type 2 diabetes mellitus (T2DM), yet its burden and early determinants at diagnosis remain inadequately characterized in Sri Lanka. This study aimed to assess the prevalence, patterns, and independent predictors of dyslipidemia, focusing on glycemic control, lifestyle factors, and adiposity among newly diagnosed T2DM patients. A hospital-based cross-sectional study was conducted at the National Hospital, Kandy. Sociodemographic, anthropometric, lifestyle, and clinical data were collected using a structured questionnaire from 360 newly diagnosed, treatment-naïve T2DM patients. Patients receiving treatment for dyslipidemia or with chronic liver disease, chronic kidney disease, or other metabolic disorders affecting lipid metabolism were excluded. Fasting lipid parameters and glycemic indices, measured within one week of diagnosis, were obtained from laboratory records. Multivariate logistic regression models identified independent predictors of dyslipidemia phenotypes. Dyslipidemia was highly prevalent (>80%), with mixed lipid abnormalities observed in over 30% of participants. Reduced HDL-C and elevated TG were the most frequent abnormalities. Poor glycemic control (HbA1c ≥6.5%) was present in 88.6% and showed weak positive correlations with TC ($\rho = 0.142$, $p = 0.007$), LDL-C ($\rho = 0.126$, $p = 0.017$), and TG ($\rho = 0.146$, $p = 0.006$). Physical activity showed weak negative correlations with TC ($\rho = -0.217$, $p < 0.001$), LDL-C ($\rho = -0.194$, $p < 0.001$), and TG ($\rho = -0.186$, $p < 0.001$), and a positive correlation with HDL-C ($\rho = 0.114$, $p = 0.030$). Multivariate analysis identified male sex as an independent predictor of low HDL-C (aOR 7.86, 95% CI: 3.92–15.26), poor glycemic control as a predictor of elevated LDL-C and hypercholesterolemia (aOR ≈2.0), and higher physical activity as protective against hypertriglyceridemia (aOR 0.43, $p < 0.05$). Waist circumference showed a significant positive association with the TG/HDL ratio ($p = 0.008$), highlighting the role of visceral adiposity in early lipid derangement. Atherogenic dyslipidemia is highly prevalent at T2DM diagnosis and is influenced by modifiable metabolic and lifestyle factors, particularly poor glycemic control and central obesity. These findings add to the limited regional evidence by demonstrating the contribution of visceral adiposity to early lipid abnormalities and support routine lipid screening, central obesity assessment, and early cardiovascular risk management at the time of T2DM diagnosis.

Keywords: cardiovascular risk, dyslipidemia, glycemic control, lipid profile, type 2 diabetes mellitus

Long-Term Physical and Psychological Outcomes in ICU Survivors: A Prospective Cohort Study

A.B. Abeysundara[1], M.D.K.I. Wickramaratne[1], W.T.D. Kularatne[1]*, S.U.B. Tennakoon[2], S. De Silva[1], A. Ratnayake, S.U.D. Samarasinghe[1], J. Udupihille[3], S.D.V. Abeygunawardena[1], P.G.D.A.P. Weerasinghe[1], D.G.H. Warnasooriya[1], P.S.K. Nanayakkara[1], V.G. Pinto[1], S.N. Abeysundara[1], W.M.G.L.S. Weerakoon[1], D.G.V.S.K. Dharmasena[1]

[1]*Department of Anaesthesiology and Critical Care, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Radiology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**tharanidakshika457@gmail.com*

Most survivors of critical illness endure significant long-term complications due to the severity of illness as well as any life-saving procedures that they have undergone. This can result in a functional decline and loss of independence. Intensive care survivors are also at a higher risk of long-term psycho-pathological disorders. The objective of the study was to assess the long-term physical and psychological outcomes following intensive care unit (ICU) management and the associated factors like the glycemic status. This prospective cohort study was conducted at the main ICU of Teaching Hospital Peradeniya with a sample size of 197. All patients getting admitted to the main ICU were recruited to the study. Patients who passed away during the ICU stay or during the follow-up period were excluded. The study was conducted throughout a year, and each patient was followed-up for 6 months after discharge, with monthly assessments of levels of depression, anxiety, mobility impairment, stressful memory recall, and insomnia. Descriptive statistics and Fisher-freeman-Halton exact test were used for data analysis. The majority of participants (>92.4%) experienced two or more issues, with depression and anxiety being the most common conditions. Their severity gradually decreased over time. The prevalence of depression and anxiety, at 61% and 84% in the first month, reduced to 11% and 21% by month four. The percentage of completely independent patients increased from 34% to 70% over the six-month period. In the first month, 51% of patients experienced severe or very severe stressful memory recall; however, only 2% remained in those categories by month six. The proportion of patients without insomnia rose from 4% in the first month to 50% by month six. Depression, anxiety, mobility impairment, and stressful memory recall showed significant associations with the duration of ICU stay ($p<0.001$) and invasive ventilation ($p=0.001$, $p=0.003$, $p=0.031$, $p=0.020$). Most ICU survivors face long-term physical and psychological complications, with the severity gradually decreasing over time following ICU discharge. Depression, anxiety, stress, and mobility impairment were significantly associated with the duration of ICU stay and invasive ventilation. Vigilant monitoring and management of these consequences are crucial for optimal patient care.

Keywords: long term outcomes, intensive care

Mapping "Pockets of Susceptibility": A Community Case Report on Geographic Clustering of Vaccine Hesitancy in Kandy District, Sri Lanka

D.M. Perera[1], W.M.S.N.K. Navaratna[2*]

[1] *Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**samidi.navaratna@med.pdn.ac.lk*

While Sri Lanka maintains a robust National Immunisation Programme (NIP), localised vaccine hesitancy threatens sustained coverage and the long-term success of public health initiatives. Shifting socio-demographic factors and the spread of misinformation have created pockets of sub-optimal immunity within urban and semi-urban populations, making the identification of geographic "hotspots" critical for preventing the resurgence of vaccine-preventable diseases (VPDs). This community case report analysed the spatial distribution of vaccine-hesitant families within the Kandy District to identify high-risk clusters and assess regional epidemiological vulnerabilities. A descriptive analysis was employed to systematically organise and summarise secondary data obtained from the Office of the Regional Director of Health Services (RDHS) across 20 Medical Officer of Health (MOH) areas. For the purpose of this study, "vaccine hesitancy" represents a state of total vaccine refusal, where families were identified by local healthcare staff due to repeated non-compliance with the national schedule. A total of 583 vaccine-refusing families were identified district-wide. Geographic mapping at the MOH area level revealed intense clustering; the Akurana MOH area alone accounted for 318 families, representing 54.5% of the district's total burden. While individual home addresses were unavailable for mapping due to data limitations, secondary clusters identified in Wattegama (n=54), Kundasale (n=45), and Yatinuwara (n=32) MOH areas occurred mainly among closely associated families and acquaintances within those specific communities. Overall, refusal was documented in 17 out of 20 MOH areas, while three areas reported zero hesitant families. The high density of vaccine hesitant families in Akurana creates a significant "pocket of susceptibility" where localised herd immunity is compromised. Given high regional mobility for trade and labour, these clusters pose a continuous risk for the re-emergence or localized transmission of VPDs should the pathogens be introduced into circulation. To address this novel public health threat, a Vaccine Acceptability Support Team (VAST) was introduced as a targeted collaborative intervention. Although comprehensive programmatic results are not yet complete or fully available, early field observations indicate highly positive outcomes, successfully engaging families who previously refused to even open their doors to Public Health Midwives (PHMs) and motivating them to bring their children to clinics for vaccination. Such localized, culturally sensitive interventions are vital to rebuilding community trust and ensuring the long-term sustainability of national immunization schedules.

Keywords: vaccine hesitancy, vaccine refusal, Kandy district, VAST, herd immunity, immunisation

Maternal Delivery Characteristics and Neonatal Outcomes of Teenage Deliveries Occurred in Teaching Hospital Jaffna, Sri Lanka

T.P.G.A.N. Nanayakkara[1]*, J. Saumya[1], K.A.H.S. Kumarasinghe[1], R. Vaanmathy[1], S. Raguraman[2], S. Sasrubi[1]

[1]*Department of Community & Family Medicine, Faculty of Medicine, University of Jaffna, Jaffna, 40000, Sri Lanka*
[2]*Department of Gynecology and Obstetrics, Faculty of Medicine, University of Jaffna, Jaffna, 40000, Sri Lanka*
**achinthyan4@gmail.com*

Teenage pregnancy (13–19 years) is a global public health issue, with 12 million births annually in developing regions and associated with maternal and neonatal morbidity. In Sri Lanka, rates have risen, peaking in certain districts, linked to low socioeconomic status, disrupted family and schooling. The objective of the study was to assess maternal and neonatal outcomes of teenage deliveries. A retrospective study was conducted at Teaching Hospital Jaffna. A total of 200 teenage deliveries were recorded during 2024. Details of maternal obstetric and neonatal outcomes were collected from the Bed Head Tickets of teenage mothers using the KoboCollect software. Descriptive statistics were used to analyse the data in SPSS version 26.0. Ethical clearance was obtained from Medical Faculty of University of Jaffna. Of the teenage deliveries, 178 teenage deliveries with complete data were included in the study sample. Among the study participants, 33.1% (n=59) had planned admissions. The mean maternal age was 18.3 ± 0.9 years, ranging from 14 to 19 years. Majority of mothers underwent normal vaginal delivery (76.9%, n=137), followed by emergency caesarean section (19.1%, n=34) and elective caesarean section (3.4%, n=6). Most commonly reported immediate maternal delivery complications were postpartum hemorrhage (11.8%, n=21), prolonged labor (5.6%, n=10), and sepsis (3.4%, n=6). Male : female newborn ratio was 1.02:1, with male babies accounting for 50.6% (n=90). Mean birth weight was 2.80 ± 0.47 kg (range: 1.0–3.94 kg). The mean body length was 49.5 ± 3.9 cm, the mean head circumference was 33.0 ± 1.7 cm. The prevalence of preterm birth was 12.4% (n=22). Congenital anomalies were identified in 2.8% (n=5) of newborns, including anorectal malformation, atrioventricular canal defect, Ebstein anomaly, natal teeth, and polydactyly. Overall, 20.8% (n=37) of newborns required admission to the neonatal intensive care unit, mainly due to low birth weight (9.6%, n=17), fetal distress (4.5%, n=8), and preterm birth (2.8%, n=5). Teenage pregnancy leads to adverse maternal morbidity and neonatal outcomes. Teenage deliveries at Teaching Hospital Jaffna showed notable maternal complications and neonatal intensive care admissions, highlighting the importance of targeted antenatal, intrapartum, and postnatal care

Keywords: teenage pregnancy, maternal outcomes, neonatal outcomes, Jaffna teaching hospital

Maternal Working Status and Psychological Quality of Life as Determinants of Antenatal Depression in Kandy District

W.A.D.H.M. Wijayasinghe[1*], O.K.D.V.T Kumarasiri[1], M.R.F. Rishadha[1], P.N.D. Kumaranathunga[1], C.M.J.C. Chandrasekara[1], J.M.D.C. Jayasinghe[2,3], C.B. Karunarathna[2,3], K.H.A.Y. Kariyawasam[2,6], H.M.C.R.K. Thilakarathna[1], C. Lin[4], J. Schwarze[4,5], P. Dissanayake[1], T. Amarasekara[2], G. Bowatte[1], D. Madegedara[3], C.S.E. Goonawardena[2], S.W. Wimalasekara[2], D. Yasaratne[1]

[1]University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]University of Sri Jayewardenepura, Nugegoda, 10250, Sri Lanka
[3]Wayamba University of Sri Lanka, Kuliyapitiya, 60200, Sri Lanka
[4]Usher Institute, University of Edinburgh, UK
[5]Child Life and Health, Centre for Inflammation Research, Institute for Regeneration and Repair, University of Edinburgh, UK
[6]KIU University, Battaramulla, Sri Lanka
[*]hashinimadurangi624@gmail.com

Depression during pregnancy can adversely affect maternal well-being and pregnancy outcomes. This study aimed to assess depressive symptoms among pregnant mothers and identify associated factors, including working status, quality of life (QoL), and household environmental conditions in the Kandy District. A cross-sectional study was conducted among 202 pregnant mothers in Kandy District, Sri Lanka. Depression was assessed using the DASS-21 and categorized into five levels. QoL was measured using the WHOQOL-BREF. Ethical approval for the study was obtained from the Research and Ethical Review Committee, National Hospital, Kandy (ERC Ref. No. NHK/ERC/159/2024). The majority of participants were classified as not having depression (85.4%, n = 170), while 2.5% (n = 5) had mild, 8.0% (n = 16) moderate, 2.5% (n = 5) severe, and 1.5% (n = 3) extremely severe depression. Non-working mothers had a higher proportion of moderate-to-extremely severe depression (23/152; 15.1%) compared to working mothers (1/47; 2.1%). The mean depression score was higher among non-working mothers (4.46 ± 7.10) compared to working mothers (2.68 ± 4.26). This difference was statistically significant ($t = 2.10$, $p = 0.038$). Mothers with moderate to extremely severe depression showed lower psychological (63.96 ± 16.62 vs 78.96 ± 10.64, $p<0.001$) and environmental QoL scores (68.24 ± 13.37 vs 78.86 ± 11.89, $p<0.001$) out of 100 compared to those with normal to mild depression. In ordinal logistic regression analysis, non-working mothers had significantly higher odds of being in more severe depression categories compared to working mothers ($B = 1.78$, $p = 0.026$; OR ≈ 5.95). Psychological QoL ($B = -0.058$, $p = 0.041$) and environmental QoL ($B = -0.063$, $p = 0.015$) were significantly associated with depression severity, while income, education, parity, maternal age, passive smoking, and stove type were not statistically significant factors. In this study, most pregnant mothers had normal depression levels. Non-working status and lower psychological and environmental QoL were associated with higher depression severity. These findings suggest the importance of considering psychosocial and environmental factors in antenatal mental health care.

Keywords: antenatal depression, maternal working status, psychosocial quality of life, environmental quality of life, DASS-21

Molecular Detection and Genotyping of *Candida albicans* in Dental Caries Lesions of a Cohort of Sri Lankan Adults

V.D. Keerthithilaka[1]*, J.A.C.K. Dahampath[1], L.K.D.N. Wijewardhana[2], U.S.S. Udagedara[2], G.K. Edirisinghe[3], P.A. Hewage[3], M.P.C.S. Dhanapala[1], M.P. Paranagama[2]

[1]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Restorative Dentistry, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**vishwak@sci.pdn.ac.lk*

Dental caries is a global public health problem affecting more than two billion people worldwide. *Candida albicans* is known to have cariogenic properties and synergistic interactions with cariogenic bacteria. The association between *C. albicans* and caries severity, as well as its genotypic distribution in adults, remains poorly understood. This study aimed to investigate the occurrence of *C. albicans* in dental caries lesions and their genotypic diversity in a cohort of Sri Lankan adults. Plaque samples were collected from active carious lesions of 75 patients aged ≥18 years attending the Dental Teaching Hospital, Peradeniya. CHROMagar Candida medium was used for the presumptive isolation of *C. albicans*, followed by subculture on Sabouraud dextrose agar. DNA was extracted from isolated colonies, and PCR was performed for species-specific identification targeting the *KER1* gene, and for ABC genotypic identification targeting the transposable intron region within its 25S rDNA gene. The data were analyzed using R (version 4.4.2). The mean age of participants was 34.0 years (range: 18–73), with 72% females and 28% males. The mean DMFT (Decayed, Missing, and Filled Teeth) score was 9.6. *C. albicans* was detected in 46.7% (35/75) of samples. Fisher's exact test revealed a significant association between caries group and *C. albicans* positivity ($p = 0.02$). Pairwise Fisher's exact test demonstrated a significantly higher *C. albicans* positivity in the group with a DMFT score of >20 compared to the group with a DMFT score of 1–5 ($p = 0.02$). Binary logistic regression analysis further demonstrated a significant positive association between DMFT and *C. albicans* positivity (OR = 1.10, 95% CI: 1.01–1.21, $p = 0.02$). Among the genotypes, genotype A was predominant, accounting for 51.4% of positive isolates, while genotypes B and C were detected in 25.7% and 22.9% of isolates, respectively. These findings indicate an association between increasing caries severity and *C. albicans* positivity, highlighting the fungal involvement in the progression of dental caries. Being the first study in Sri Lanka to link *C. albicans* to increased caries severity among adults, our findings underscore the need for further longitudinal studies to establish causality and evaluate antifungal preventive strategies.

Keywords: ABC genotypes, *Candida albicans*, dental caries, molecular identification, Sri Lankan adults

Molecular Detection of *Streptococcus sobrinus* in the Supragingival Microbiome in a Cohort of Sri Lankan Pre-School Children

J.A.C.K. Dahampath[1]*, V.D. Keerthithilaka[1], L.K.D.N. Wijewardhana[2], U.S.S. Udagedara[2], L.K.N. Premathilaka[3], E.M.U.C.K. Herath[3], B.G.T.L. Nandasena[2], C.S. Dhanapala[1], M.P. Paranagama[2]

[1]*Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Community Dental Health, Faculty of Dental Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**s19031@sci.pdn.ac.lk*

Early childhood caries (ECC) is a global oral health concern, with a notably high prevalence in Sri Lanka. *Streptococcus sobrinus* is a key cariogenic bacterium in the dysbiotic carious microbiome and has potential for use in caries risk assessment and targeted preventive strategies. However, its prevalence or association with ECC has not yet been studied in Sri Lanka. This study, therefore, represents the first cross-sectional investigation in Sri Lanka to detect *S. sobrinus* in supragingival biofilm samples from caries-free (CF), mild ECC (M-ECC), and severe ECC (S-ECC) children using molecular methods and to assess its association with caries severity. A total of 169 children under 6 years were enrolled in the study (mean age:48.33 months;83 females,86 males). Children with recent antibiotic or mouthwash use, systemic illnesses, or orthodontic appliances were excluded. They were classified based on dmft scores into CF (n = 44), M-ECC (n = 35), and S-ECC (n = 90) groups; the mean dmft score of ECC children was 6.77. Their supragingival plaque samples were collected and cultured on Mitis salivarius agar, and bacterial DNA was extracted using a boiling method. PCR was performed using species-specific primers targeting the *gtfU* gene to detect *S. sobrinus.* The resulting 155 bp amplicon was detected using agarose gel electrophoresis and further validated by bidirectional Sanger sequencing, which showed 100 % identity with the *S.sobrinus* reference sequence in the NCBI database. The highest prevalence of *S.sobrinus* was in the M-ECC group (28.6%), followed by the S-ECC (17.7%) and CF groups (9.1%). Multinomial logistic regression using CF as reference demonstrated a clinically relevant trend toward higher odds of ECC with *S. sobrinus* positivity; however, associations did not reach statistical significance (M-ECC; OR=2.97, 95% CI:0.76-11.6, p=0.12, S-ECC; OR=1.70, 95% CI=0.75-4.55, p=0.43), likely attributable to the limited sample size and low overall prevalence of *S.sobrinus*. The higher prevalence in M-ECC than S-ECC may partly reflect the small M-ECC sample size or the higher contribution of *S.sobrinus* for caries initiation. These preliminary findings warrant a larger cohort study to clarify the true association between *S. sobrinus* and ECC severity in Sri Lankan preschool children.

Keywords: early childhood caries, dental molecular epidemiology, *gtfU* gene, *Streptococcus sobrinus*, Sri Lanka

Acknowledgement: *Financial assistance from the University Research Grant URG/2023/10/D is gratefully acknowledged.*

Multifactorial Determinants of Long-Term Glycemic Control in Type 2 Diabetes: An Institutional Study from a Tertiary Care Endocrine Clinic in Sri Lanka

H.H. Mathangaweera[1]*, A. Withanaarachchi[1], E.M.S. Ekanayake[2]

[1]*University of Kelaniya, Kelaniya, 11600, Sri Lanka*
[2]*National Hospital, Kandy, 20000, Sri Lanka*
**hirunihasanjali99@gmail.com*

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder marked by persistent hyperglycemia. Glycated hemoglobin (HbA1c) is the standard indicator of long-term glycemic control. In Sri Lanka, T2DM affects about 9.8% of adults, yet institutional-level evidence on influencing factors and patient perspectives, remain limited. The study aimed to identify factors affecting long-term glycemic control among T2DM patients attending a tertiary care Endocrine Clinic in Sri Lanka and explore patients' perceptions regarding their disease management. A mixed-method cross-sectional study with retrospective clinical record review was conducted among 200 T2DM patients attending the Endocrine Clinic, National Hospital, Kandy. Data were collected through in-person questionnaires and clinical records. Glycemic control was evaluated using baseline and follow-up HbA1c values (%) over three months, including ΔHbA1c (follow-up minus baseline) and poor control (HbA1c ≥7%). Eight latent factors with socio-demographic moderators were assessed. Quantitative analysis included descriptive statistics, Elastic Net (prediction), Random Forest (model performance), Double Machine Learning (causal inference), SHAP (predictor interpretability), and Partial Least Squares Structural Equation Modeling (PLS-SEM) (theory validation) using SmartPLS v4.1.1.5. Qualitative data underwent content analysis. The mean baseline and follow-up HbA1c were 9.02% and 8.96%, respectively, with 86.5% (n=173) classified as poorly controlled. Random Forest outperformed Elastic Net (R^2=−0.160, RMSE=2.887), indicating non-linear relationships. Double Machine Learning showed no causal effect of adherence (ATE=0.011, p=0.918). SHAP highlighted income, cost, and disease burden as influential factors. PLS-SEM explained 7.2% variance, identifying medication adherence as the only significant predictor (β=0.838, p=0.029), that strongly affecting HbA1c and highlighting the multifactorial nature of glycemic control. Poor long-term glycemic control remains prevalent among T2DM patients in tertiary care. Findings indicate that medication adherence alone is insufficient, as glycemic outcomes are influenced by interacting behavioral, clinical, psychosocial, and socioeconomic factors. Integrated, multifaceted interventions are needed to improve sustainable diabetes management in tertiary care settings.

Keywords: glycated hemoglobin, medication adherence, PLS-SEM, tertiary care, type 2 diabetes mellitus

Nutritional Status and Dietary Patterns among Hospitality Industry Employees in Sri Lanka: A Case Study of an Internationally Affiliated Hotel and a Resort

R.H. Gamaethige[1], D.M.S.S. Daundasekara[1]*, C.Y. Bandara[2], L.M. Rankoth[3]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Cinnamon Hotels & Resorts, Colombo 02, 00200, Sri Lanka*
[3]*Cinnamon Bey, Beruwala, 12070, Sri Lanka*
**saumalid@agri.pdn.ac.lk*

The hospitality industry significantly contributes to a nation's economy and the employee well-being is vital to sustaining the industry's reputation and growth. However, there are limited evidence related to the nutritional status and diet of Sri Lankan hospitality industry employees. Therefore, this study aimed to assess the nutritional status and dietary patterns among employees in the Sri Lankan hospitality industry, examining the factors associated with the risk of overweight/obesity. A cross-sectional descriptive study was conducted among 240 hospitality industry employees working full-time at a Resort in Beruwala, and a hotel in Colombo, using convenience sampling. A self-administered questionnaire was used to collect socio-demographic data, dietary habits, lifestyle factors and health status. Nutritional status was assessed using body mass index (BMI), waist-to-hip ratio, waist circumference, hip circumference, and body fat percentage. Dietary intake was assessed using a validated Food Frequency Questionnaire (FFQ) and cafeteria menu reviews. Majority of the participants in the sample were males working in the food and beverage preparation department with a monthly income of Rs 50,000 – 75,000. The mean age was 38±11 years, and the mean BMI was 24.07±4.51 kg/m^2, with 58% in the overweight/obesity category. The mean body fat percentage, waist circumference, and waist to hip ratio were 25.76±9.43%, 85.68±11.33 cm, and 0.89±0.09, respectively, indicating a considerable risk of central adiposity. Further, participants were classified into the moderate healthy food consumption category. A significant proportion of participants reported smoking and alcohol consumption, with 30% engaging in physical activity. Menu assessment revealed lower fruit and vegetable servings, frequent sugary foods, and high-oil content in meals as potential issues. Correlation analysis revealed that lower physical activity and fruit consumption to be significantly associated with a higher BMI ($p < 0.05$) while meal skipping, and having hypertension was significantly associated with the risk overweight/obesity ($p < 0.05$). Further, employees with higher income and those with hypertension had greater odds of having central obesity ($p < 0.05$). In conclusion, the study provided evidence of higher prevalence of overweight/obesity among participants, indicating the need for changes in the cafeteria menus and long-term interventions to help employees maintain a healthier body weight.

Keywords: hospitality industry, nutritional status, dietary patterns, overweight

Opioid Sparing Laparoscopic Guided TAP Block in Laparoscopic Hernia Repair: A Case Series

S. Samarasinghe[1]*, A.S. Samarasinghe[2], K. Jayalath[2]

[1]*Department of Anesthesiology & Critical Care, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of General Surgery, National Hospital, Kandy, 20000, Sri Lanka*
**senani.samarasinghe@med.pdn.ac.lk*

Transversus abdominis plane (TAP) block is widely used to improve postoperative analgesia following laparoscopic hernia repair. Randomized trials demonstrate that ultrasound-guided TAP blocks reduce early postoperative pain scores and opioid consumption compared to port-site infiltration. However, meta-analyses suggest that although TAP blocks are superior to no regional technique, their advantage over local infiltration remains inconsistent. Already acceptable approaches like laparoscopic-guided TAP, the "Doyle's bulge," offer a practical alternative, integrating regional analgesia into the surgical workflow while maintaining efficacy within multimodal analgesia strategies. This retrospective case series, conducted at a tertiary care hospital, evaluated the analgesic efficacy of laparoscopic-guided transversus abdominis plane (TAP) block as an adjunct to multimodal analgesia in four patients who underwent laparoscopic hernia repair. The cohort included two inguinal and two paraumbilical hernias (three elective and one emergency), with patients aged 28–63 years and body mass index (BMI) ranging from 23–41 kg/m². All procedures utilized mesh fixation with helical titanium tacks, a known contributor to early postoperative somatic pain. All patients received standardized multimodal analgesia (intravenous fentanyl, morphine, paracetamol, and diclofenac suppository) in addition to a laparoscopic-guided TAP block (Doyle's Bulge) using 0.25% plain bupivacaine (2 mg/kg; 30–60 mL). Pain was assessed using the 11-point Numerical Rating Scale (NRS) at 6, 12, and 24 hours postoperatively. A progressive reduction in mean NRS scores was observed: 3.5 (range 2–6) at 6 hours, 2.5 (1–3) at 12 hours, and 1.75 (1–3) at 24 hours. Rescue subcutaneous morphine was required in only two patients within the first 12 hours. Three patients were discharged within 28 hours, while the morbidly obese emergency case (BMI 41 kg/m²) required 60 hours. No TAP-block-related complications or local-anaesthetic toxicity were observed. These findings align with studies demonstrating reduced early postoperative pain and opioid consumption with TAP block. Pain scores were comparable or slightly favorable relative to reported ranges (NRS 3–5). However, meta-analyses suggest its advantage over infiltration remains variable. The laparoscopic-guided TAP block appears safe, feasible, and effective, warranting validation in larger trials.

Keywords: Transversus Abdominis Plane (TAP) block, laparoscopic hernia repair, multimodal analgesia, opioid-sparing anaesthesia, regional anaesthesia

Out-of-pocket Expenses on Outpatient Care among Patients with Diabetes during an Economic Crisis: A Single-Centre Study in Northern Sri Lanka

V. Sureskumar*, R. Kumar

Department of Community and Family Medicine, Faculty of Medicine, University of Jaffna, 40000, Sri Lanka
**vithusha@univ.jfn.ac.lk*

In Sri Lanka, healthcare is delivered free-of-charge at public hospitals but the 2022 economic crisis led to shortages in medicines, diagnostics, and other services. Diabetes is a chronic illness requiring close follow up and life-long treatment. This hospital-based descriptive cross-sectional study aimed to estimate out-of-pocket expenses (OOPE) on outpatient diabetes care and associated socioeconomic and clinical factors among adult (≥18 years) patients attending medical clinics at Teaching Hospital Jaffna. Systematic sampling was applied to recruit 250 participants from all five medical clinics between February and March 2024. An interviewer-administered questionnaire and data extraction form were used to collect data, which were analysed with SPSS (v21). Kruskal-Wallis H and Mann-Whitney U tests were used to assess associations between OOPE and selected socioeconomic and clinical factors (significance level 0.05). In total, 250 patients participated (response rate 96.8%). Majority were >60 years (n=172,68.8%), women (n=154,61.6%), without G.C.E O/L qualifications (n=140,56%), homemakers (n=136,54.6%), with a monthly household income <LKR 45,000 (n=215,86.0%). Private outpatient services were accessed in the prior month by 80% (n=200) of the sample, mostly from pharmacies (n=170,68.0%), laboratories (n=105,42.8%), channeling centers (n=79,31.6%) and family doctors (n=20,8.0%). Median total OOPE on outpatient diabetes care in the prior month was LKR 4,070 (IQR 1,650-8,250), primarily on direct payments for consultations, medicines, medical supplies, laboratory investigations and transport, amounting to a median of LKR 3,240 (IQR 1,100-7,585). The majority (62.0%) coped by cutting back on other household expenses; 46% borrowed from family members, relatives, friends, and microfinance companies. Males, those with higher education, higher household income, having diabetes for longer duration, and on combined therapy with insulin and oral medications were more likely to spend more ($p<0.05$). In sum, patients who access Teaching Hospital Jaffna for outpatient diabetes care incur substantial direct OOPE, compelling many to cut back on household expenses and borrow. The findings highlight the importance of ensuring medicine are available at public hospitals and implementing social safety nets for vulnerable households, particularly during times of crisis. Further multi-center studies on the financial burden of chronic illnesses are needed to guide policymaking.

Keywords: diabetes care, access to healthcare, out-of-pocket expenses, economic crisis, Jaffna

Physical Function, Pain, Depressive Symptoms, and Health-Related Quality of Life among Institutionalized Older Adults in Central Province, Sri Lanka: Preliminary Findings of a Cross-sectional Survey

E.M.J.S.K. Ekanayaka[1]*, I. Liyanage[1], E. Liyanage[1], D.A.R.K, Dassanayake[1], S.R.M.W.M. Samaranayaka[1], S. Rathnayake[2]

[1]*University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Centre for Digital Innovations in Health and Social Care, Institute of Health and Social Care, University of Bradford, United Kingdom*
**sanya@ahs.pdn.ac.lk*

Rapid socio-economic transitions have increased the number of older adults residing in aged care homes in Sri Lanka. This population is vulnerable to age-related declines in physical function, chronic pain, depressive symptoms, and reduced quality of life (QOL). Evidence on these multidimensional health outcomes among institutionalized older adults in the Central Province, Sri Lanka remains limited. This study aimed to assess physical function, pain, depressive symptoms, and health related QOL (HRQOL) among older adults in aged care homes in the Central Province, Sri Lanka. A cross-sectional survey was conducted among residents aged ≥60 years. The calculated sample size was 484; preliminary findings are presented from 10 homes (n=80). Participants residing >3 months were included, while those with neurological disorders affecting motor function or severe cognitive impairment were excluded. Data were collected via structured interviewer-administered questionnaires and objective assessments. Physical function was measured across strength, flexibility, balance, and mobility using grip strength, Chair Sit-and-Reach, Back Scratch, One-Leg Stance, and Timed Up and Go (TUG) tests. Pain intensity was assessed with the Numeric Rating Scale, depressive symptoms with the Geriatric Depression Scale (GDS-15), and HRQOL with the EQ-5D instrument. Descriptive statistics were analyzed using SPSS version 25. Participants were predominantly female (78.8%), mean age 75.9 ± 5.5 years. Hypertension (46.3%) and diabetes (38.8%) were the most common comorbidities. Physical function was markedly reduced with low grip strength in dominant (66.3%) and non-dominant (70.0%) hands, poor upper limb flexibility (71%) and lower limb flexibility (27.5%), impaired balance in 75.0%, and impaired mobility in 41.3%. High pain was reported by 25%. Depressive symptoms were prevalent (57.5%), including mild (41.3%), moderate (10.0%), and severe (6.3%). HRQOL deficits were most evident in walking ability (48.8%), pain/discomfort (47.5%), and emotional well-being (46.3%), while self-care remained relatively preserved. The mean perceived overall health score was 66.43 ± 25.41, with 8.8% reporting poor and 26.3% fair health status. Overall, both physical and psychological health were substantially compromised, highlighting significant multidimensional health deficits and emphasizing the need for comprehensive multidisciplinary interventions to improve health and well-being among older adults in aged care homes in Sri Lanka.

Keywords: depressive symptoms**,** institutionalized older adults, physical function, quality of life

Acknowledgement: *University of Peradeniya Research Grant for funding the research project, and National Secretariat for Elders for giving permission to conduct this study, and all participants.*

Preliminary Identification of Phytochemicals in a Polyherbal Formulation for Oral Health Care Using LC–MS

L.K.D.N. Wijewardhana[1]*, K.S.N.D. Gunawardhana[1], P.A. Paranagama[2], G. Dias[3], L. Jayasinghe[4], B.M.H.S.K. Banneheka[1], M.P. Paranagama[1]

[1]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Kelaniya, Kelaniya, 11600, Sri Lanka*
[3]*Department of Anatomy, University of Otago, Dunedin, New Zealand*
[4]*National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka*
**devindiphd@dental.pdn.ac.lk*

Polyherbal formulations are widely utilized in traditional medicine for their enhanced therapeutic efficacy and reduced toxicity compared to single-compound therapies. However, their complex chemical composition poses challenges for quality control and standardization. This study aimed to conduct preliminary phytochemical profiling of a polyherbal formulation rich in natural antimicrobial and antioxidant compounds developed at the Faculty of Dental Sciences, University of Peradeniya, as an adjunct in the management of dental caries and periodontitis. The formulation consisted of *Piper betle* leaves, *Syzygium aromaticum* flower buds, *Myristica fragrans* seeds and mace, *Elettaria cardamomum* fruits, *Kaempferia galanga* rhizomes, and *Coriandrum sativum* seeds. Plant materials were processed, combined in previously optimized proportions, and extracted using ethanol via ultrasonication. The extract was analyzed using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry (HPLC–ESI–MS) in negative ion mode. Chromatographic peaks were identified based on their retention times and corresponding mass spectra. Tentative identification of the corresponding phytochemicals was performed by comparing their mass-to-charge (m/z) ratios with those reported in the literature. Key compounds tentatively identified included hydroxychavicol, eugenol, myristicin, malabaricone B, α-terpinyl acetate, ethyl *p*-methoxycinnamate, and chlorogenic acid. Further studies employing authentic reference standards are required to confirm compound identities, their quantification, and the evaluation of their effect on common oral pathogens. In conclusion, our results lay the foundation for phytochemical profiling of this polyherbal oral health care formulation, which will facilitate the maintenance of its batch-to-batch consistency and promote compliance of consumers and regulatory bodies.

Keywords: polyherbal formulation, oral healthcare, HPLC, LC-MS, phytochemical profiling

Acknowledgement: *Peradeniya University Research Grant URG/2024/10/D is gratefully acknowledged.*

Polymorphonuclear Neutrophil Counts Among Adolescents at Different Stages of Fixed Orthodontic Treatment: A Cross-Sectional Study

S. Ravikkumar[1*], W.B.M.C.R.D. Weerasekera[2], B.S.M.S. Siriwardana[2]

[1]*Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Faculty of Dental Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
**sarmika2001@gmail.com*

Fixed orthodontic appliances introduce a persistent foreign body into the oral environment, creating plaque-retentive niches and initiating localized inflammatory responses. Polymorphonuclear neutrophils (PMNs), as key mediators of innate immunity, are rapidly recruited during inflammation and may reflect systemic changes associated with orthodontic treatment. This study aimed to compare PMN counts among adolescents at different stages of fixed orthodontic therapy. A cross-sectional analytical study was conducted at the Dental Teaching Hospital, University of Peradeniya, involving 60 adolescents (20 per group) aged 12–18 years. Participants were categorized into three groups: pre-treatment controls, patients undergoing treatment for 1–3 months, and patients treated for more than one year. Individuals with recent infections, systemic diseases, periodontal disease, smoking habits, or medications known to influence neutrophil counts were excluded. Capillary blood samples were obtained via finger-prick, and PMN counts were determined by manual microscopic analysis performed by a single examiner. Statistical analysis was performed using Jamovi (version 2.3.28). Group comparisons were conducted using one-way Welch's ANOVA followed by Games-Howell post-hoc tests, with significance set at $p < 0.05$. Statistically significant difference in PMN counts was observed among the three groups ($F = 35.5$, $p < 0.001$). The 1–3-month treatment group showed the highest mean PMN count (70.3 ± 2.03), compared with the control group (64.8 ± 3.13) and the >1-year treatment group (64.3 ± 3.36). PMN counts were significantly higher in the 1–3-month group than in both the control and >1-year groups ($p < 0.001$), whereas no significant difference was observed between the control and >1-year groups ($p = 0.876$). These findings suggest that fixed orthodontic treatment is associated with a transient inflammatory response during the early phase of treatment, with PMN counts returning to near-baseline levels after prolonged treatment. Understanding these immunological changes may help clinicians optimize patient monitoring and reinforce oral hygiene practices during orthodontic therapy.

Keywords: fixed orthodontic treatment, polymorphonuclear neutrophils, inflammation, adolescents, immune response

Poor Sleep Quality among Hemodialysis Patients in Sri Lanka: A Pittsburgh Sleep Quality Index Analysis

D.C.R. Weerakoon[1,2]*, I.W.S.N. Wijayawardhana[2], U.S.S. Ekanayake[2], W.M.S.P. Weerakoon[3], H.D.W.T. Damayanthi[1], J.M.K.B. Jayasekara[2]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*General Sir John Kotelawala Defence University, Werahera, 10290, Sri Lanka*
[3]*University of Jaffna, Jaffna, 40000, Sri Lanka*
**dcrweerakoon1997@gmail.com*

Sleep quality is a common and a highly disregarded medical concern among hemodialysis patients that can pose negative impacts on physical and psychological quality of life. This study intended to evaluate the prevalence of poor sleep quality and its component domains among patients receiving hemodialysis. A cross-sectional study was conducted at three hemodialysis centers in Anuradhapura and Polonnaruwa districts of Sri Lanka, including a random sample of 310 maintenance hemodialysis patients. The Pittsburgh Sleep Quality Index (PSQI) was used to assess the sleep quality of patients, which includes seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The study population presented a mean age ± SD of 56.04 ± 11.12 years and a predominance of male individuals: 77.1% (n=239). A significant majority of 83.3% exhibited poor sleep quality. More than half of the population (61.5%, n=184) reported long sleep latency, taking > 30 minutes to fall asleep, indicating signs of insomnia. A majority of 38.8% (n=116) of the patients only have a sleep duration of < 5 hours and do not receive the adequate rest required for them. A significant proportion of 39.8% (n=119) of the participants reported low sleep efficiency of <65% due to several sleep disturbances, including waking up in the middle of the night or early in the morning, taking too long to fall asleep, breathing difficulties, feeling too hot, and physical pains. More than half of the population (60.5%) suffer from moderate to severe levels of such sleep disturbances. Due to inadequate rest and sleep, a significant proportion of the participants (37.1%) reported daytime sleepiness and dysfunction. However, a clear majority of the study sample (89.6%) were not taking any sleeping medication. The study disclosed a striking prevalence of poor sleep quality in the population. Long sleep latency, less sleep duration, and subpar sleep efficiency due to multiple sleep disturbances were identified as significant issues in the population. These findings highlight the need for routine sleep assessment and targeted interventions in hemodialysis care.

Keywords: sleep quality, hemodialysis, Pittsburgh Sleep Quality Index, sleep latency, sleep efficiency

Acknowledgement: *The authors would like to acknowledge the financial support received from the National Science Foundation of Sri Lanka (NSF/SCH/2025/08) and the Ministry of Health, Sri Lanka.*

Position- Specific Anthropometric and Physical Fitness Characteristics of Forwards and Backs in Sri Lankan Army Rugby Players

S.C. Manawaduge*, W.M.S.L. Wijesooriya, A.S. Ariyasinghe, S.W.B. Konara, A. Kariyawasam

Department of Physiology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**scm2737@gmail.com*

Rugby is a sport that is gaining prominence in Sri Lanka. Optimising physical fitness for specific playing positions is crucial for training elite players. Yet the lack of Sri Lankan research data hinders the development of evidence-based, position-specific training. This study assessed and compared anthropometric and physical fitness parameters between forwards and backs in a Sri Lankan league rugby team. Retrospective data was collected and analysed from 33 male professional army rugby players (age 27.58±4.80 years), categorised as forwards (n=22) and backs (n=11), who underwent fitness testing at the Sports and Exercise Laboratory, Faculty of Medicine, University of Peradeniya. Tests included anthropometry, body fat percentage via bioelectrical impedance analysis (BIA) and skinfold thickness, VO_2 max (Åstrand ergometer), left and right grip strength (handgrip dynamometry), shoulder push and pull strength, back and hamstring muscle strength (dynamometry), vertical jump, and flexibility (sit-and-reach). Independent t-tests, Mann-Whitney U, and Spearman correlations were used (Significance $p<0.05$). Compared to backs, forwards had significantly higher weight (82.96±11.89 vs. 70.48±6.73 kg, $p=0.003$), BMI (28.17±3.27 vs. 24.13±1.61 kgm^{-2}, $p=0.001$), skinfold fat percentage (16.37±3.17 vs. 13.03±3.07% kgm^{-2}, $p=0.015$), upper body fat (24.71±4.89 vs. 20.45±4.02%, $p=0.018$) and lower body fat (22.91±5.27 vs. 17.95±3.67%, $p=0.009$). In strength, forwards had significantly greater back strength (127.41±16.5 vs. 113.18±15.85 kg, $p=0.025$) compared to backs, but no significant differences were observed in grip strength, shoulder push and pull, or hamstring strength. Backs had significantly higher VO_2 max (46.94±7.90 vs. 39.09±9.25 ml/kg/min, $p=0.004$). No significant differences were found in players' height, flexibility or vertical jump ($p>0.05$). In both backs and forwards, VO_2 max negatively correlated with upper body fat ($r=-0.54$, $p=0.001$), lower body fat ($r=-0.61$, $p<0.001$), skinfold fat percentage ($r=-0.60$, $p<0.001$) and resting pulse rate ($r=-0.47$, $p=0.005$). Back strength positively correlated with hamstring strength ($r=0.75$, $p<0.001$). These results indicate forwards possess greater body mass, fat, and upper-body-pulling strength, reflecting greater physical demands (e.g., scrum and ruck) placed on them. Backs are leaner and have higher VO_2 max, which reflects the endurance demands of backline play. This study provides a baseline for position-specific training, player recruitment, in Sri Lankan male rugby players and a platform for future research activities.

Keywords: rugby training, positional differences, performance analysis, Sri Lanka

Prevalence and Awareness of Thalassemia Among a Selected Cohort of Students of the Faculty of Allied Health Sciences, University of Peradeniya

S.A.S. Dewindi, S. Thilakarathne*

Department of Medical Laboratory Science, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka
**shyamali.thilakarathne@ahs.pdn.ac.lk*

Thalassemia is one of the most common inherited hemoglobinopathies globally and remains a significant public health concern in Sri Lanka due to lifelong treatment burdens, psychosocial impact, and economic costs. Early carrier identification and increased public awareness are key prevention strategies. This study aimed to determine the prevalence of beta thalassemia carriers and assess knowledge, attitude, and practice (KAP)-based awareness of thalassemia among second-year undergraduates of the Faculty of Allied Health Sciences, University of Peradeniya. A descriptive cross-sectional analytical study was conducted from September to October 2025 among second-year undergraduates. Carrier status was assessed in 151 students using full blood count indices (MCV<80 fL; MCH<27 pg), followed by HPLC confirmation (HbA2>3.5%), with results obtained from the Thalassemia Unit, National Hospital, Kandy. Awareness was assessed separately in 161 students from the same population using a structured, self-administered KAP questionnaire. Knowledge, attitude, and practice scores were combined into an overall awareness score and categorized using modified Bloom's cut-off criteria. Of the 151 students screened, 12 (7.9%) showed hypochromic microcytic indices, of whom 3 (2.0%) were confirmed as beta thalassemia carriers, with a mean HbA2 of 4.8%. Among the 161 students assessed for awareness, 96.9% had heard of thalassemia, but only 21.7% demonstrated good knowledge, 39.1% positive attitudes, and 10.6% good preventive practices revealing a gap between superficial awareness and actionable understanding. Knowledge level differed significantly by academic department ($p<0.001$), with Medical Laboratory Science students showing higher knowledge, likely due to greater academic exposure. Gender was significantly associated with attitude ($p=0.005$) and practice ($p=0.002$). Weak positive correlations were found among the knowledge, attitude, and practice domains ($r=0.177–0.266$). In conclusion, this study found a 2.0% prevalence of beta thalassemia carriers among second-year undergraduates. While students showed positive attitudes, they lacked detailed knowledge and preventive practices. Limitations include a relatively small sample size and inability to detect silent carriers via FBC. University awareness programmes, genetic education, and regular screening are recommended to reduce the future burden of thalassemia.

Keywords: thalassemia, awareness, carrier prevalence, undergraduate students, Sri Lanka

Prevalence of Musculoskeletal Disorders and Their Impact on Quality of Life, and Functional Performance among Provincial School Teachers in Gangawata Korala Division in Kandy District, Sri Lanka

S.S. Roobini*, S. Rajeswaran, M.K.N. Samadi, E. Liyanage, M.M.J.P. Manchanayake

Department of Physiotherapy, University of Peradeniya, Kandy, 20000, Sri Lanka
**roobisri14@gmail.com*

Background: School teachers are prone to Musculoskeletal disorders (MSDs) due to the unique and wide variety of daily work tasks and duties perform repeatedly for prolonged period without adequate intervals. MSDs have a huge impact on quality of life and functional performance. Objectives: This study aimed to determine the prevalence of MSDs among school teachers in Gangawata korala division in Kandy district and to investigate their impact on quality of life and functional performance. Methodology: A descriptive cross-sectional study was conducted among 576 school teachers in Gangawata korala division in Kandy district. The Nordic Musculoskeletal Questionnaire (NMQ) was used to assess the prevalence of MSDs, while quality of life was assessed using SF-36 Questionnaire. Functional performance was assessed by the Timed Up and Go test (TUG). Results: The mean age of the participants was 45.13 ± 8.90, with males 45.30 ± 8.89 years and females 45.10 ± 8.91 years. Physical and mental quality of life were compared between teachers with MSDs in at least one body part in three regions: upper extremity, lower extremity and spinal region to teachers without MSDs in these three regions using the Mann-Whitney U test. Similarly, functional performance was compared between teachers with MSDs and teachers without MSDs in these three regions using the independent sample t-test. The prevalence of MSDs was 84.2 %, most commonly affecting the knee (49.8%), lower back (45.7%), and neck (42.7%). Functional performance scores were significantly lower in teachers with MSDs across upper extremity, lower extremity, and spinal regions ($p < 0.05$) compared to those without MSDs. Quality of life showed significantly lower Physical component summary scores in the three MSD regions, whereas Mental component summary scores were significantly higher ($p < 0.001$) in teachers with MSDs. Conclusion: This study revealed a significant prevalence of MSDs in school teachers, particularly affecting the upper body, lower body, and spine, and their negative impact on functional performance and physical quality of life. The findings emphasize the need for targeted preventive and physiotherapy-based interventions to enhance teachers' physical health and mobility.

Keywords: musculoskeletal disorders, functional performance, quality of life, school teachers, prevalence

Probable Wilson's Disease with Normal Ceruloplasmin Diagnosed Using Leipzig Criteria in a Resource-limited Setting

U.V. Jayalath*, S.S. Wattuehwa, C. Dalugama

Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**uvinjayalath314@gmail.com*

Wilson's disease (WD) is an autosomal recessive disorder of copper metabolism causing progressive hepatic copper accumulation. Diagnosis relies on composite criteria including reduced ceruloplasmin, elevated urinary copper, Kayser-Fleischer rings, or genetic confirmation. Normal ceruloplasmin occurs in a minority of hepatic WD cases, creating diagnostic challenges, particularly in resource-limited settings where advanced investigations are unavailable. We describe a case of probable Wilson's disease diagnosed using structured Leipzig criteria when classical markers were absent and advanced testing was unavailable, demonstrating the value of composite diagnostic reasoning in unexplained cirrhosis. A man with portal hypertensive cirrhosis of unknown etiology underwent systematic evaluation. Twenty-four-hour urinary copper excretion, serum ceruloplasmin, and slit-lamp examination were performed. Viral, autoimmune, and common metabolic causes were excluded. D-penicillamine challenge was instituted with repeat urinary copper measurement. The Leipzig scoring system was applied to stratify diagnostic probability when liver biopsy and genetic testing were unavailable. Twenty-four-hour urinary copper was markedly elevated at 612 µg/day (reference <50 µg/day). Serum ceruloplasmin was normal at 28 mg/dL, and Kayser-Fleischer rings were absent. D-penicillamine therapy increased urinary copper excretion to 1,248 µg/day with subsequent biochemical improvement, including declining transaminases and bilirubin levels. Leipzig scoring yielded 4 points (urinary copper >5× the upper limit of normal plus marked chelation response), consistent with probable Wilson's disease. This case demonstrates that normal ceruloplasmin and absent Kayser-Fleischer rings do not exclude hepatic Wilson's disease. Quantitative urinary copper assessment and structured Leipzig criteria provide objective diagnostic support when histology and genetic testing are unavailable. Secondary copper accumulation should, however, be distinguished from primary Wilson's disease in patients with cirrhosis.

Keywords: Wilson's disease, ceruloplasmin, cirrhosis, Leipzig criteria, copper metabolism

No Show Abstract

Radiation Exposure from Repeated Paediatric Upper Extremity Plain Radiography: A Retrospective Analysis of Dose-Area Product Values

S.A.G.L. Gunawardana[1]*, V. Sivakumar[2], H.A.S. Seram[2]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400 Sri Lanka*
[2]*Department of Physics, University of Peradeniya, Peradeniya, 20400 Sri Lanka*
**mphil251018@pgis.lk*

Paediatric patients are more sensitive to ionizing radiation due to their longer life expectancy and the increased cumulative risk of stochastic effects. Even though upper extremity imaging involves relatively low radiation doses, multiple repeated exposures that occur due to rotation, misalignment, motion artefacts, external artefacts or technical errors, can significantly increase the cumulative radiation dose. Research objective is to assess dose-area product (DAP) in repeated upper extremity plain radiographic examinations in paediatrics using digital radiographic (DR) system at a major children's hospital in Sri Lanka. With the ethical approval, data (DAP (mGy cm^2) and exposure parameters (kVp and mAs)) were collected from August 2025 to March 2026. Children under 15years, who underwent upper-extremity radiographic examinations (arm, elbow, forearm, hand and finger) were included. The DAP readings of the same examination of same patient with multiple exposures were analysed. 21/303 examinations (44 exposures from 14 patients) were involved repeated exposures representing approximately 7% of all examinations and they were included in the final analysis. 19 examinations were repeated once and 2 were repeated twice. Repeated exposures were not categorized according to the cause of repetition. Descriptive statistics were applied to analyse distribution of radiation doses, cumulative DAP ratios were expressed as medians and ranges across repetition categories, establishing a theoretical single-exposure baseline ratio of 1.0. The observed cumulative DAP ratios ($DAP_{cumulative}$/ $DAP_{minimum}$) quantify the cumulative exposure relative to the lowest exposure of the corresponding examination. When an examination was repeated once, the $DAP_{cumulative}$ became approximately 2.44 times (Range: 2.00 - 4.13) the $DAP_{minimum.}$ When an examination was repeated twice, $DAP_{cumulative}$ became approximately 8.11 times (Range: 6.71 - 9.50) the $DAP_{minimum}$. This variation originates from the difference in exposure parameters between initial and repeated images. Findings of this study are less applicable to general population due to its small sample size and single centre design. However, this study suggests that repeated imaging can contribute to a cumulative exposure that exceeds what would be expected from multiplication of exposure of each initial examination dose. Therefore, it is recommended to avoid repeating examinations, as they cause higher radiation exposure to children.

Keywords: dose-area product, dose optimization, multiple exposures, paediatric upper extremity plain radiography, radiation protection

Readiness For Self-Directed Learning Among Dental Undergraduates of University of Peradeniya, Sri Lanka

L.C. Dalugoda[1], A.W.A.Y.P. Abeysekara[1], N.U.I. Wijesingha[1], H.M.R.W. Angammana[2*]

[1]*Faculty of Dental sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**angammanar@dental.pdn.ac.lk*

Self-Directed Learning (SDL) is essential for dental professionals to maintain evidence-based dentistry and lifelong learning. However, the Sri Lankan teacher directed school education often hinders the development of these skills, making the transition to university education challenging. This study investigated the Self-Directed Learning Readiness (SDLR) among dental undergraduates and its associated factors.A cross-sectional survey was conducted at the Faculty of Dental Sciences University of Peradeniya targeting the entire undergraduate student population currently registered at the faculty. An online questionnaire based on Williamson 60-item rating scale of Self-Rating Scale of Self-Directed Learning (SRSSDL) was used. However, response rates varied across batches, and potential response bias inherent to the online survey methodology should be acknowledged as a limitation.The response rate was 73.87% with 523 responses. The overall mean SDL score was 215.3 which is a moderate level according to the SRSSDL(141-220). Male students had a higher mean score (216.08) compared to female students (214.71) which was not statistically significant (p=0.593). There was a notable fluctuation in SDLR scores across batches with Batch 23 having the highest of 223.86 with a statistically significant difference compared to other batches (p=0.046). Domain-wise analysis revealed significant differences in learning strategies (p=0.034) and learning activities (p< 0.001), while awareness, evaluation, and interpersonal skills showed no significant variation across batches.Furthermore, Pearson correlation analysis showed no significant association between SDLR scores and academic performance (GPA) (r = 0.059, p = 0.219), suggesting that traditional assessment methods may not adequately capture self-directed learning competencies.Notably, junior clinical batches recorded lower SDLR scores. While this may possibly be related to increased clinical workload and structured schedules limiting opportunities for self-directed engagement, this association was not directly investigated and warrants further exploration. In conclusion, this study reveals that dental undergraduates at the University of Peradeniya possess a moderate level of readiness for SDL, while non-clinical batches demonstrate higher readiness likely due to the adoption of interactive learning strategies. A significant readiness reduction occurred during the transition to clinical training.

Keywords: self-directed learning, dental undergraduate

Rising Burden of Strong Wind Events in Sri Lanka, 2010–2025: A Descriptive Secondary Analysis of National Disaster Data

S.R. Waidyatilleke[1], T.H. Hettiarachchi[2]*, S.D. Dharmaratne[2]

[1]*Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**thh4061@gmail.com*

No Show Abstract

Strong winds are the most frequently reported natural hazard in Sri Lanka. They damage houses, injure people, and disrupt livelihoods, especially in the central highlands and Sabaragamuwa region. Despite their high frequency, national patterns remain poorly summarised in publicly accessible literature. This study aimed to describe the time trend, spatial distribution, seasonal pattern, and human and housing impact of strong wind events recorded in Sri Lanka from 2010 to 2025, in order to identify districts and seasons that need targeted disaster risk reduction. A secondary data analysis was carried out using the national disaster database of Sri Lanka. All records classified as strong wind events from 2010 to 2025 were extracted. Counts of events, deaths, injuries, missing persons, affected people, families affected, and damaged or destroyed houses were summarised by year, month, province, and district. Frequencies, totals, and percentages were calculated using standard descriptive statistics. The proportion of destroyed houses among all impacted houses and the proportion of events resulting in death were also computed. Only aggregate, anonymised values were analysed. A total of 7,146 strong wind events were recorded. They caused 200 deaths, 590 injuries, and 79 missing persons. About 688,030 people and 180,982 families were affected. A total of 115,047 houses were impacted, of which 6,381 (5.5%) were destroyed and 108,666 (94.5%) damaged. Sabaragamuwa Province reported the highest share of events (1,898; 26.6%), followed by Central (1,156; 16.2%) and Southern (824; 11.5%). Kegalle (972; 13.6%), Ratnapura (926; 13.0%), and Kandy (790; 11.1%) were the most affected districts. May (15.0%) and July (11.9%) were the peak months. The annual count rose from 173 in 2010 to 1,486 in 2020. Only 1.4% of events caused deaths. Strong wind events are rising in frequency in Sri Lanka and mainly cause housing damage rather than deaths. Risk reduction, particularly roof strengthening, safer construction, and household preparedness, should focus on Kegalle, Ratnapura, and Kandy districts before the May peak.

Keywords: strong wind, Sri Lanka, housing damage, Sabaragamuwa, disaster risk reduction

Root Crown Ratios of Permanent Teeth in Patients Attending University Dental Hospital, Peradeniya

B.M.C.A. Bandaranayake[1*], T. Suwathijah[1], M.S. Loyidcy[2], R.D. Jayasinghe[1]

[1]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Department of Nursing, Faculty of Allied Health Science, University of Peradeniya, Peradeniya,20400, Sri Lanka*
**chamilkab@dental.pdn.ac.lk*

The root–crown ratio (RCR) is an important parameter in evaluating tooth prognosis and treatment planning in orthodontics and prosthodontics. Unfavorable R/C ratios associated with short dental roots may compromise orthodontic anchorage, increase stress on abutment teeth, and worsen the prognosis of affected teeth. Panoramic radiographs are widely used for assessing R/C ratios due to their reproducibility and minimal influence of tooth angulation on measurements. This was a cross sectional, retrospective record review done at the Dental Teaching Hospital, Peradeniya, Sri Lanka and the reference and source of populations was DPTS patients attended to the Dental Teaching Hospital, Peradeniya. Statistical analysis was performed using IBM SPSS Statistics (version 26.0). Descriptive statistics were computed for each tooth and for arch-level mean root–crown ratios, including mean and standard deviation. Normality of the arch-level variables was assessed using the Shapiro–Wilk test. Since the data showed an approximately normal distribution, parametric tests were applied. Gender differences in tooth-level and arch-level root–crown ratios were assessed using the independent samples t-test. Differences between maxillary and mandibular arch mean root–crown ratios were assessed using the paired samples t-test. The association between upper and lower arch mean root–crown ratios were evaluated using Pearson correlation. A p-value < 0.05 was considered statistically significant. Out of the total 200 DPTs, 98 were males and 102 were females. The mean RCR was highest for tooth 25 in the maxilla and tooth 35 in the mandible. The mandibular arch mean RCR was significantly higher than the maxillary arch mean (mean difference -0.420, 95% CI -0.448 to -0.392, p<0.001). Gender differences were statistically significant only for teeth 16, 17, and 44 (mean differences +0.08, 95% CI 0.01 to 0.15; +0.10, 95% CI 0.01 to 0.19; and -0.12, 95% CI -0.22 to -0.01). No significant gender difference was found at the arch level (upper arch 95% CI -0.007 to 0.093; lower arch 95% CI -0.065 to 0.057). Within the limitations of this study, mandibular teeth demonstrated generally higher root–crown ratios than maxillary teeth among patients attending University Dental hospital, Sri Lanka. Gender-related differences were confined to a few teeth (16,17 and 44) and were not clinically meaningful.

Keywords: crown root ratio, panoramic radiograph, statistically significant variations

Salivary Hyalinizing Clear Cell Carcinoma of Minor Salivary Glands of the Palate and Clear Cell Odontogenic Carcinoma of the Maxilla - A Case Series and a Literature Review Comparing Clinicopathological Presentation

A.M. Fernando[1]*, S.M. Range[1,2], P.R. Jayasooriya[1]

[1]*Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya 20400, Sri Lanka*
[2]*Postgraduate Institute of Medicine, No 160, Nandadasa Kodagoda Mawatha, 00700, Colombo 7, Sri Lanka*
**ayodyamethmini99@gmail.com*

Hyalinizing clear cell carcinoma (HCCC) and Clear cell odontogenic carcinoma (CCOC) represent two distinct but histologically similar malignancies that pose a significant diagnostic challenge in anatomically ambiguous palate and maxilla. This study aims to compare clinicopathological characteristics and review relevant literature to better define their relationship. The study was designed as a retrospective clinicopathological analysis consisting of an institutional case series (3 HCCC : 1 CCOC) integrated with a comprehensive review of 22 HCCC and 13 CCOC cases identified in the literature. The analysis assessed clinical parameters including age, sex, tumour location, size and symptom duration alongside long term outcomes and metastatic potential. Histologically, the study prioritized the identification of subtle differentiating features between HCCC and CCOC. Both HCCC and CCOC mainly occur in adults (41–60 years) with a female predilection, and no significant differences were found between palatal HCCC and maxillary CCOC for most parameters ($p>0.05$). Only weak associations were observed for symptom duration (Cramér's $V = 0.28$), lesion size (Cramér's $V = 0.37$) and outcome (Cramér's $V = 0.32$).Metastasis showed a weak association, occurring only in one CCOC case and not in HCCC. HCCC tended to present as smaller lesions, while CCOC more often exceeded 2 cm. Both tumour types showed delayed presentation and generally favourable survival, with no disease-related deaths in HCCC but more patients living with disease, whereas CCOC had more patients disease-free with a small number of deaths. In anatomically ambiguous sites like the palate and maxilla, differentiation between HCCC and CCOC relies on subtle histopathological features. Diffuse hyalinization, glandular differentiation, mucin-containing cells, and salivary gland association favor HCCC, while patchy hyalinization, larger lobules, and peripheral palisading favor CCOC. However, overlap of mucin may occasionally be seen in CCOC, CK19 is not entirely specific, and reports of intraosseous HCCC further blur the distinction. HCCC and CCOC cannot be distinguished by a single feature and require combined evaluation; their overlapping features and shared EWSR1 rearrangement indicate a close relationship, with subtle differences making diagnosis difficult especially in maxillary and palatal lesions and CCOC may represent the intraosseous counterpart of HCCC.

Keywords: hyalinizing clear cell carcinoma, clear cell odontogenic carcinoma, palate, maxilla, EWSR1 rearrangement

Sero-Prevalence of Hepatitis A and Hepatitis E Virus Infections in Selected Urban and Estate Populations in the Kandy District of Sri Lanka

G.G.K.T. Thilakarathne[1]*, R.A.S.B. Randeni[1], M.G.C.M. Muthuwaththa[1], U.V. Kalansooriya[1], G. Bowatte[2], F. Noordeen[1]

[1]*Department of Microbiology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**kasunithush0521@gmail.com*

Hepatitis A virus (HAV) and hepatitis E virus (HEV) pose a significant public health problem worldwide. They are primarily transmitted through contaminated food and water, and communities living under poor socio-economic conditions are at increased risk of infection. In Sri Lanka, community-based sero-prevalence data on these infections are limited. This study aimed to assess the sero-prevalence of HAV and HEV infections in selected urban and estate settings of the Kandy District of Sri Lanka and to investigate their association with socio-demographic factors. A descriptive, cross-sectional study was conducted from May to October 2025 in a sample of 180 adults from selected estate (44.4%, n=80) and urban (55.6%, n=100) populations. A convenient sampling was used to collect data and blood samples, which were tested for anti-HAV IgG and anti-HEV IgG antibodies using individual ELISAs (Wantai diagnostics, PRC). Statistical analysis was performed using SPSS version 23.0. Chi square or Fisher's exact test was used to assess the associations of sero-prevalence of HAV and HEV infections with socio-demographic factors. The mean age of the study participants was 41.74 (SD ± 15.29) years, and 61.7% were females. The overall anti-HAV IgG sero-prevalence was 97.8% (95% CI: 94.4–99.1), with exposure rates of 97.0% (95% CI: 91.5–99.0) in the urban sector and 98.7% (95% CI: 93.3–99.8) in the estate sector. In contrast, the overall anti-HEV IgG sero-prevalence was 2.8% (95% CI: 1.2–6.3), with comparable rates in urban (3.0%, 95% CI: 1.0–8.5) and estate (2.5%, 95% CI: 0.7–8.7) sectors. No significant associations were observed between HAV or HEV sero-positivity with age, gender, ethnicity, residence, occupation, educational level, or marital status ($p > 0.05$). In conclusion, high anti-HAV IgG sero-prevalence in urban and estate populations indicates a widespread past exposure or immunity. On the other hand, low anti-HEV IgG sero-prevalence suggests a relatively limited circulation of HEV in the study population. The use of convenient sampling and only five anti-HEV positive cases may limit the generalizability of the results.

Keywords: sero-prevalence, Anti-HAV IgG, anti-HEV IgG, Kandy district, Sri Lanka

Acknowledgement: *University of Peradeniya (URG/2025/CG-28/30/M).*

Smoking Cessation Behavior and Factors Associated with Motivation to Quit among COPD Patients at Teaching Hospital Peradeniya: A Cross-Sectional Study

S.M.Y. Serasinghe[1,2]*, W.A.P.H. Jayarathna[3], B.M.G.D. Yasaratne[2,3]

[1]Postgraduate Institute of Medicine, University of Colombo, 00700, Sri Lanka
[2]Teaching Hospital Peradeniya, 20400, Sri Lanka
[3]University of Peradeniya, Peradeniya 20400, Sri Lanka
**yasodhisera993@gmail.com*

Smoking is the leading modifiable risk factor for chronic obstructive pulmonary disease (COPD). However, many patients continue to smoke despite significant disease burden. This cross-sectional study evaluated smoking cessation behavior and factors associated with motivation to quit among 97 COPD patients attending the respiratory clinic and medical wards at Teaching Hospital Peradeniya, recruited using consecutive non-probability sampling. Data were collected via interviewer-administered questionnaires. Nicotine dependence was assessed using the Fagerström Test for Nicotine Dependence (FTND), disease severity using the COPD Assessment Test (CAT), modified Medical Research Council (mMRC) scale, and GOLD classification, and motivation using the Transtheoretical Model, with psychological factors related to motivation using the Trying To Quit (TTQ) questionnaire. All patients were males, with the majority aged 61–70 years (47.4%), and 48.5% were classified as GOLD category E. Overall, 40.2% of patients were in the precontemplation stage, indicating low readiness to quit despite high symptom burden. Significant associations were observed between motivational stage and age ($p < 0.001$), socioeconomic status ($p = 0.009$), COPD GOLD category ($p = 0.001$), smoking exposure in pack-years ($p = 0.002$), nicotine dependence ($p = 0.002$), prior quit attempts ($p = 0.004$), and duration of quit attempts ($p < 0.001$). Patients aged >60 years, those with higher smoking exposure (>10 pack-years), greater nicotine dependence, and GOLD category E were more likely to be in the precontemplation stage. Individuals without prior quit attempts were predominantly in the precontemplation stage, whereas longer quit attempts (>3 months) were associated with higher motivational stages (contemplation and preparation). Higher nicotine dependence and greater smoking exposure were associated with lower motivation to quit, whereas prior quit attempts and longer abstinence were associated with higher readiness. The mean TTQ score was 33.0 ± 6.38 and was significantly higher in lower motivational stages ($p = 0.045$). TTQ scores showed a moderate positive correlation with nicotine dependence ($r = 0.586$, $p < 0.001$) and increased significantly across COPD categories ($p < 0.001$), indicating greater psychological difficulty with increasing disease severity and dependence. Smoking cessation behavior in COPD is multifactorial, highlighting the need for structured, stage-based interventions combining behavioral and pharmacological strategies.

Keywords: COPD, smoking cessation, nicotine dependence, motivation to quit, TTQ questionnaire

Sociodemographic Characteristics of Patients Admitted with Heart Failure to a Tertiary Care Hospital in Sri Lanka

B.G.S.S.R. Jayathissa*, D.M.P.U.K. Ralapanawa, K.R.N.U. Kekulawala

Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**samudaya.jayathissa.18@med.pdn.ac.lk*

Heart failure (HF) is a major contributor to global morbidity and hospitalization, with sociodemographic determinants shaping disease burden and healthcare utilization. Comprehensive data characterizing the sociodemographic profile of hospitalized HF patients in Sri Lanka, particularly within tertiary referral settings, remain limited. This study aimed to describe the sociodemographic characteristics of patients admitted with HF to Teaching Hospital Peradeniya, a tertiary referral center in central Sri Lanka, generating baseline data to inform future healthcare planning and equity-focused research in this population. A prospective observational study was conducted among patients admitted with confirmed HF to Teaching Hospital Peradeniya over a 15-month period, from April 2024 to June 2025. Sociodemographic variables collected included age, sex, ethnicity, religion, geographic distribution, occupation, monthly income, educational level, and marital status. Data were analyzed descriptively using frequencies, percentages, and mean ± standard deviation, with stratification by sex and age group where applicable. A total of 208 patients were included. Mean age was 67 ± 11.5 years (range 28-95), with 67.31% (n=140) aged 60-79 years; 64.42% were male. Ethnically, 78.74% were Sinhalese, 13.04% Muslim, and 8.21% Tamil. Geographically, 96.14% originated from the Kandy district. Occupationally, 34.47% were unemployed and 31.55% were manual labourers. Income data were available for 63.29% of patients, of whom 28.50% fell within the lower-middle income category (≤LKR 30,000/month); income was undocumented for the remainder. Among 183 patients with educational data, 43.72% had not completed Ordinary Level education and 3.28% had attained higher education. HF admissions to this single tertiary center were predominantly older adult Sinhalese males from the Kandy district, with high unemployment and low educational attainment among those with available data. Given the single-center design and incomplete income documentation, findings should not be generalized nationally; rather, they provide baseline sociodemographic data to guide future, specifically designed equity-focused HF research.

No Short Abstract

Keywords: heart failure, sociodemographic factors, Sri Lanka, hospital admissions, tertiary care

Socio-Demographic Factors Affecting Self-Care Practices among Hypertensive Patients Attending a Tertiary Care Hospital in Sri Lanka

P.M.S.P. Polhengoda[1*], N.S.W. Ranasinghe[2], T.K. Weerasinghe[3], U.K. Ralapanawa[4], A. Kariyawasam[1]

[1]*Department of Physiology, Faculty of Medicine, University of Peradeniya, Peradeniya,20400, Sri Lanka*
[2]*Mahara Health Care, Abu Dhabi, United Arab Emirates*
[3]*School of Nursing and Midwifery, Gold Coast Campus, Griffith University, Queensland 4222, Australia*
[4]*Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya,20400, Sri Lanka*
** panchalipolhengoda@gmail.com*

Hypertension prevails as a major public health concern particularly in both low- and middle-income countries as a major contributor to global mortality and morbidity. Thus, effective self-care practices are essential for disease control. However, these practices are influenced by socio-demographic factors contributing to health outcomes. To assess self-care practices and demographic determinants influencing these practices among hypertensive patients in a tertiary care setting in Sri Lanka, a descriptive cross-sectional study was conducted among 338 hypertensive patients attending the follow-up clinic at Teaching Hospital Peradeniya. Data were collected using an interviewer-administered questionnaire and the validated H-SCALE tool. Self-care practices were assessed across main domains such as medication adherence, diet, physical activity, smoking, alcohol consumption and weight management. Associations between socio- demographic factors (age, gender, education level, income level, family support) and self-care practices were analyzed using chi-square tests, with statistical significance set at $p<0.05$. Of the 338 participants included in the study, 91.4% demonstrated good self-care practices. Drug compliance (95%), weight management (98.2%) and alcohol abstinence (100%) showed high adherence, whereas adherence to physical activity (13.3%) and recommended dietary practices (29.6%) remained low. Socio-demographic factors showed variations in adherence levels. Better self-care practices were observed among older adults (>65 years-93.7%), female gender (93.5%) in comparison to males (88.5%). Higher income levels (monthly income >50,000/= (96.0%)), educational levels (100%) and availability of family support (90.7%) were also related to better self-care practices. Higher adherence was also observed among patients who regularly attended follow-up clinics and lived closer to healthcare facilities. Bivariate analysis (chi-square tests) showed significant associations between smoking and gender ($p<0.0001$) and between ethnicity and adherence to the recommended dietary (DASH) practices ($p=0.005$). Poor self-care practices were related to limited healthcare access and lower socio-economic status. Differences in socio-demographic factors such as age, gender, monthly income, education, and family support may influence hypertension related self-care practices among hypertensive patients in Sri Lanka. Targeted initiatives addressing social determinants are useful to improve health education and access to healthcare services in order to reduce disparities and improve health outcomes.

Keywords: self-care, social determinants, hypertension, health equity, Sri Lanka

Acknowledgement: *We sincerely thank all participants for their invaluable contributions to the study.*

Spatial Characterization of Luminal Tapering in the Abdominal Aorta Using *In Vivo* CT Imaging

K. Thilakshana, E.M.M.S. Thilakarathna, M. Vaksala, L.R.S. Liyanage, M.A.J.C. Marasinghe*

Department of Radiography/ Radiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**janaka@ahs.pdn.ac.lk*

The abdominal aorta demonstrates progressive reduction of luminal area from the aortic hiatus to the infrarenal level. Spatial characterization of this tapering using CT is essential for hemodynamic modelling, vascular surgical planning, and biomechanical modeling. Normative tapering data across discrete anatomical levels using ROI remains limited in current literature. This study aimed to quantify and spatially characterize luminal tapering of the abdominal aorta, to evaluate segmental and total tapering patterns, and to assess sex-based differences including the upper-to-lower tapering ratio as a novel index of segmental tapering distribution. A retrospective descriptive study was conducted using CECT abdomen images of 216 healthy adults (108 males, 108 females; mean age=53.8±15.4 years). Luminal cross-sectional area (CSA)was measured using ROI analysis at three anatomical levels (aortic hiatus, suprarenal, and infrarenal) using the RadiAnt DICOM viewer. Absolute and relative tapering were calculated for upper segment (aortic hiatus to supra renal), lower segment (suprarenal to infrarenal) and total aorta (aortic hiatus to infra renal). Upper to lower tapering ratio was derived for both absolute and relative tapering, where a ratio less than 1.0 indicates lower segment dominance. Statistical analysis was performed using Jamovi. Statistical significance was set at $p<0.05$. Lower segment relative tapering was significantly greater than upper segment in both males (30.16% vs 19.93%, $p<0.05$) and females (34.94% vs 22.42%, $p<0.05$). Males demonstrated significantly greater total absolute tapering ($p<0.05$) while females showed significantly greater total relative tapering (50.99% vs 44.94%, $p<0.05$). The mean±SD upper-to-lower relative tapering ratio was 0.626±3.761, with 79.6% demonstrating lower segment dominance. The ratio did not differ significantly between sexes ($p>0.05$). Significant progressive luminal tapering was confirmed across all three levels with greatest tapering in the infrarenal segment in both sexes. Males exhibited greater absolute tapering while females demonstrated greater relative tapering. The upper-to-lower tapering ratio provides a novel index of segmental tapering distribution. These normative values provide clinically relevant reference data for vascular intervention planning and biomechanical modelling of the abdominal aorta.

Keywords: abdominal aorta, luminal tapering, cross-sectional area, CECT, ROI, tapering ratio

Spatial Epidemiology of Dengue and Leptospirosis in Sri Lanka: A Geospatial Analysis of Disease Clustering and Hotspots

W.A.T.W. Wijesooriya*, R. Punchimanage, R. Siyambalapitiya

Department of Statistics and Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**wishva.wijesooriyaco@gmail.com*

Dengue and leptospirosis are significant vector-borne and zoonotic diseases that impose a considerable public health burden in Sri Lanka. Although their prevalence is well documented, understanding their distinct spatial patterns at a sub-national level is essential for effective resource allocation and targeted interventions. This study aims to identify, analyze, and compare the spatial distributions and hotspots of dengue and leptospirosis across Sri Lanka's 25 districts. District-level monthly aggregated case data were analyzed using multiple spatial statistical techniques. Global spatial autocorrelation was assessed using Getis-Ord Global G and Global Moran's I statistics. Local clustering patterns were identified using Local Indicators of Spatial Association (LISA) and Getis-Ord Gi* hotspot analysis. Additionally, spatial regression models, namely the Spatial Lag Model (SLM) and Spatial Durbin Model (SDM), were applied to evaluate the influence of climatic variables, including average rainfall and temperature. Results reveal significantly different spatial distributions between the two diseases. Dengue exhibited strong local clustering, with Kernel Density Estimation (KDE) identifying a dominant hotspot in the highly urbanized Western Province. Global Moran's I for dengue showed significant positive spatial autocorrelation (3.250, $p = 0.000675$), indicating clustering of similar values. However, the Getis-Ord Global G statistic was not significant (-0.8412, $p = 0.7999$), suggesting a complex pattern driven by localized clusters of both high and low values. Outside the Western Province, most districts did not exhibit statistically significant hotspot or cold spot patterns. In contrast, leptospirosis showed strong global clustering, supported by both Global Moran's I (5.0178, $p = 0$) and Getis-Ord Global G (2.0997, $p = 0.0178$). Spatial Lag Model results indicated rainfall as a significant positive predictor for both diseases, with stronger influence on leptospirosis ($\beta = 0.764$, $p < 0.001$) compared to dengue ($\beta = 0.570$, $p = 0.011$). Hotspot analysis identified significant leptospirosis clusters in southern districts such as Kalutara, Galle, Matara, and Hambantota, characterized by high rainfall and agricultural activity, while northern regions showed cold spots. Overall, dengue and leptospirosis exhibit distinct, non-random spatial patterns influenced by different risk factors. Dengue is strongly associated with urbanization, whereas leptospirosis is linked to agro-climatic conditions. These findings highlight the importance of spatial statistical tools in developing targeted, disease-specific public health strategies.

Keywords: dengue, leptospirosis, spatial, clustering, hotspots, coldspots

Statistical Assessment of Cardiovascular Health Trends among Indian Patients: Insights from Medical Records

N.W.I.M.S. Sewwandi*, L.S. Nawarathna

Department of Statistics & Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**sahasris@sci.pdn.ac.lk*

Cardiovascular diseases (CVDs) are a leading global health concern, with India experiencing an age-standardized mortality rate that significantly exceeds the global average. Early identification is vital to lower mortality. This study highlights the need for data-driven insights to optimize healthcare delivery. The primary objective is to examine differences in clinical and demographic variables between CVD and non-CVD patients. Additional objectives include identifying key risk group characteristics and developing predictive models for CVD diagnosis. This study investigates clinical and demographic parameters to optimize early detection and risk stratification within this population. Using a secondary dataset from the Mendeley Data repository, this study analyzed the medical records of 1,000 adult patients (765 males, 235 females) with a mean age of 49.24 years. The cohort comprised 580 patients diagnosed with CVD and 420 without. Invalid zero values in serum cholesterol and slope variables were handled using K-Nearest Neighbors (KNN) imputation based on Gower distance. Nonparametric tests evaluated associations, k-prototypes clustering stratified patient risk profiles, and classification models (KNN, Binary Logistic Regression [BLR], and Decision Trees [DT]) predicted diagnosis. Preliminary analysis revealed widespread deviations from standard clinical metrics, including a mean serum cholesterol of 329.80 mg/dL. Advanced analysis established that age ($p = 0.7587$) and gender ($p = 0.672$) were not significantly associated with disease status. Conversely, chest pain type, fasting blood sugar, resting blood pressure, cholesterol level, maximum heart rate, old peak, and number of major vessels showed strong significant associations ($p < 0.05$). The k-prototypes algorithm identified two optimal clusters: a low-risk group (550 patients; 13.7% CVD prevalence) and a high-risk group (450 patients; 44.3% CVD prevalence characterized by an elevated average blood pressure of 169 mmHg and cholesterol of 370 mg/dL ($X^2 = 546.39$, $p < 0.001$). Predictive modeling achieved high classification metrics; KNN yielded the highest accuracy (95.60 %), followed closely by BLR (94.50%) and DT (92.00%). The high predictive accuracy suggests that these models can support early diagnosis and improve cardiovascular care in resource-limited settings in India. This study also serves as a valuable resource for researchers in statistical approaches to disease detection.

Keywords: binary response models, cardiovascular diseases, k-nearest neighbors, nonparametric tests, risk group identification

Stress Factors and Coping Mechanisms among Final Year Undergraduate Students of University of Peradeniya

J.A.D.I. Jayakody[1]*, D. Iddawela[2]

[1]*Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Parasitology, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**dilukshijayakody@gmail.com*

University life is often accompanied by various challenges that can lead to elevated stress among students which may vary across demographics. Furthermore, students are adopting different coping mechanisms depending on those stressors. Existing studies have largely focused on undergraduate students in general, with less attention given to final-year undergraduates across all faculties of University of Peradeniya, who face increasing academic demands and responsibilities. This study aims to identify the key stress-inducing factors and prevalent coping mechanisms among final year undergraduates of university of Peradeniya. A descriptive cross-sectional study was conducted among 361 final-year undergraduates at the University of Peradeniya in 2025 using stratified sampling method to include all faculties. Data were collected using a pre-tested, self-administered questionnaire consisting standard survey tools; Student Stress Inventory (SSI), Coping Strategy Indicator (CSI) and analyzed using SPSS. Descriptive statistics were used to discover prevalent stress factors and coping mechanisms among subscales of SSI and CSI and independent sample t test and one way ANOVA were used to identify those factors across demographics. The study found that academic stress (M=25.29, SD=3.04) was the most prevalent among final-year undergraduates, followed by environmental (M=23.55, SD=2.51), interpersonal (M=21.74, SD=2.98), and physical stress (M=18.96, SD=2.37). Major stressors included examination pressure (M=3.26, SD=0.79), high parental expectations (M=3.14, SD=1.04), and discomforts like crowding and long queues (M=3.21, SD=0.83), with sleep problems (M=2.34, SD=0.70), and fatigue (M=2.34, SD=0.76), being the most common physical symptoms. Females reported significantly higher physical stressors than males (p=0.001). Coping strategies were mainly problem-solving oriented (M=25.05, SD=2.85), with younger students (20–22 years) (p=0.006) scoring lower in this domain. Social support seeking, such as peer support (M=2.26, SD=0.63), and reassurance (M=2.20, SD=0.70), and avoidance behaviors, such as sleeping more than usual (M=2.23, SD=0.62), and distraction (M=2.20, SD=0.66), were also commonly adopted. This study identified academic stress factors as predominant stressors while problem solving strategies as the mostly adopted coping mechanism among final-year undergraduates of the University of Peradeniya. These findings emphasize that structured stress management programs, counseling services and reforms in academic scheduling should be strengthen in order to uplift students' mental wellbeing.

Keywords: stress factors, coping mechanisms, final year undergraduates, University of Peradeniya

Temporal Trends and Epidemiological Patterns of Non-HIV Sexually Transmitted Infections in Kandy, Sri Lanka from 2015 to 2025

W.M.S.N.K. Navaratna[1*], P.H.I.M. De Silva[2], T.H. Hettiarachchi[1], W.K.N.R Chandrasiri[1], R.M.B.I. Rathnayake[1]

[1]*Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*MOIC, STD/ AIDS Control Program Kandy, 20000, Sri Lanka*
**samidi.navaratna@med.pdn.ac.lk*

Sexually transmitted infections (STIs) other than HIV remain a significant public health concern in Sri Lanka, requiring continuous surveillance to guide effective control strategies. A retrospective descriptive analytical study using clinic-based surveillance data from 2015 to 2025 assessed temporal trends and epidemiological patterns of non-HIV STIs in Kandy. A total of 4,609 non-HIV STI cases were reported over the 11-year period. By type, genital herpes was the most frequent (1,861 cases; 40.4%), followed by non-gonococcal urethritis (1,065; 23.1%), genital warts (978; 21.2%), syphilis (431; 9.4%), and gonorrhoea (129; 2.8%), with other STIs accounting for 145 (3.1%). Annual totals declined overall from 601 cases in 2015 to 379 in 2025, a reduction of 36.9%, though with notable fluctuations: a marked decline between 2019 and 2022 (407 to 290 cases) was followed by a resurgence in 2023 (484 cases). Genital herpes was the most consistently reported STI, dominating almost every year and indicating sustained endemic transmission. Genital warts showed variability, peaking at 127 cases in 2023 before stabilizing. Syphilis increased gradually from 20 cases in 2021 to 47 in 2025, suggesting re-emergence, while gonorrhoea rose sharply from 2 cases in 2021 to 32 in 2024, with a slight decline in 2025. In contrast, non-gonococcal urethritis declined from 209 cases in 2015 to 30 in 2025. Age-stratified analysis showed the highest burden among the 25–49 year group, while those aged ≥50 years also contributed notably, particularly for chronic viral infections such as herpes. By gender, bacterial STIs such as gonorrhoea and infectious syphilis were more common among males, whereas viral STIs, especially genital herpes, were more frequently reported among females. The overall decline with fluctuations, persistence of viral STIs, re-emergence of bacterial infections, demographic variations, and likely service disruptions suggest that STI trends in Kandy are dynamic and multifactorial, requiring strengthened surveillance, consistent preventive services, and targeted interventions to control transmission.

Keywords: sexually transmitted infections, epidemiology, temporal trends, Kandy district, non-HIV STIs

Temporal Trends of Major Gynecological Cancers in Sri Lanka: An Ecological Study

R.M.B.S. Weerasooriya[1]*, S.L. Jayakody[2], C.N.R.A Alles[1], N.S. Soysa[3]

[1]*Department of Biochemistry, Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**bimsara.weerasooriya.18@med.pdn.ac.lk*

Gynecological cancers impose a substantial burden in low- and middle-income countries such as Sri Lanka. Cervical, ovarian, and endometrial cancers are major gynecological malignancies with distinct etiologies, risk factors, and prevention opportunities, and their changing incidence reflects demographic and epidemiological transitions. This retrospective population-based study analyzed annual incidence data for these cancers in Sri Lanka from 2006 to 2022 using reports from the National Cancer Control Programme. Histological data were classified according to WHO tumor classification guidelines using ICD-O codes. Age-standardized incidence rates (ASIRs) were calculated using the world standard population, and Joinpoint regression analysis was performed to identify significant temporal changes and estimate average annual percent changes (AAPCs) with 95% confidence intervals using Joinpoint Trend Analysis Software. From 2006 to 2022, 17,132 cervical, 12,493 uterine, and 15,169 ovarian cancer cases were reported in Sri Lanka. Uterine cancer showed the steepest rise, with ASIR increasing from 2.95 in 2006 to 9.77 in 2022, corresponding to a significant AAPC of 7.89% (95% CI: 6.64–9.70; $p < 0.001$). Ovarian cancer also showed a significant increase, with ASIR rising from 7.22 to 9.72, corresponding to an AAPC of 2.72% (95% CI: 1.63–3.82; $p < 0.001$). In contrast, cervical cancer remained stable, with ASIR fluctuating marginally and an AAPC of 0.45% (95% CI: −0.51 to 1.41; $p = 0.33$). Peak crude incidence rates were 11.43 per 100,000 for ovarian cancer (2021), 11.36 for uterine cancer (2020), and 11.30 for cervical cancer (2016). Histologically, squamous cell carcinoma predominated in cervical cancer (77.9%), surface epithelial tumors in ovarian cancer (69.1%), and epithelial carcinomas in uterine cancer (79.3%). This first national trend analysis of major gynecological cancers in Sri Lanka highlights a marked rise in uterine and ovarian cancers alongside stable cervical cancer incidence, emphasizing the need for site-specific prevention strategies and further investigation into modifiable risk factors, particularly for uterine cancer.

Keywords: gynecological cancers, cervical cancer, ovarian cancer, endometrial cancer, incidence trends, Sri Lanka

Trends and Age-Specific Patterns of Childhood and Adolescent Cancer Incidence in Sri Lanka: A National Registry Analysis (2005–2022)

J.H.A.B.N. Jayathilake[1]*, V.D.P. Liyanage[2]

[1]*International Patient Care Unit, Asiri Hospital, Kandy, 20000, Sri Lanka*
[2]*Department of Surgery, Faculty of Medicine, University of Peradeniya, Kandy, 20400, Sri Lanka*
**jhavishkabn@gmail.com*

No Short Abstract

Childhood and adolescent cancer incidence has increased globally, yet long-term epidemiological data from low- and middle-income countries remain limited. A previous national study reported an increasing trend up to 2019; the present analysis extends registry data to 2022 and additionally characterises adolescent-specific trends, age- and sex-specific incidence peaks, child–adolescent differences, and the most recent cancer-type and mortality distribution. This study aimed to describe national temporal trends, age- and sex-specific patterns, and common cancer types among children and adolescents in Sri Lanka. A retrospective, registry-based descriptive analysis used National Cancer Registry of Sri Lanka data for individuals aged 0–19 years (2005–2022). Age-specific incidence rates (per 1,000,000) were evaluated for four age groups (0–4, 5–9, 10–14, and 15–19 years). Trends were analysed by age group and sex, and cancer-type and mortality distributions were assessed using recent national reports. Data were analysed descriptively using IBM SPSS version 26. Annual cases rose from 523 in 2005 to 780 in 2019, peaked at 1,032 in 2021, and declined slightly to 940 in 2022 (an approximately 97% increase, 2005–2021). Sex distribution remained near-equal with a consistent, modest male excess (2005: 274 males versus 249 females, M: F 1.10; 2022: 499 versus 441, M: F 1.13), representing a mild rather than marked difference. Children (0–14 years) contributed approximately 70% of cases and adolescents (15–19 years) about one-third. Age-specific incidence was highest among males aged 0–4 years and females aged 15–19 years, the latter showing the steepest rise (74.9 to 153.9 per 1,000,000, 2005–2019). In 2022, the commonest cancers were leukaemia (30.9%), central nervous system tumours (11.1%), bone tumours (10.0%), lymphomas (9.7%), and germ cell tumours (6.9%, the least common of the leading types); leukaemia was also the leading cause of cancer-related mortality. Childhood and adolescent cancer incidence in Sri Lanka increased substantially over two decades, with a near-equal overall sex distribution but distinct age-specific peaks that differed between sexes. The sustained burden of leukaemia and rising adolescent incidence, particularly among females, underscore the need for strengthened surveillance, earlier diagnosis, and age-appropriate oncology services.

Keywords: childhood cancer, adolescent cancer, cancer incidence, cancer registry, Sri Lanka

Trends in Incidence and Mortality of Oesophageal Cancer in Sri Lanka: A Population-Based Analysis by Age, Sex, and Histology. 2006–2022

S. Jinujaan[1]*, K. H. Lakshitha[1], S.L. Jayakody[2], C.N.R.A. Alles[1], N.S. Soysa[2,3]

[1]Department of Biochemistry, Faculty of Medicine, University of Peradeniya, Peradeniya,20400, Sri Lanka
[2]Center for Research in Oral Cancer, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[3]Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Peradeniya,20400, Sri Lanka
**selvarajah.jinujaan.18@med.pdn.ac.lk*

Oesophageal cancer remains a major global and national health burden characterized by high mortality and late clinical presentation. In Sri Lanka, it consistently ranks among the leading cancers, exhibiting shifting demographic and histological patterns. Continuous evaluation of these epidemiological changes is vital for informing targeted national cancer control policies. This study aims to evaluate the trends in incidence and mortality of oesophageal cancer in Sri Lanka from 2006 to 2022. Specific objectives include analyzing age-standardized rates (ASR), age- and sex-specific patterns, histological subtypes, tumor location, and mortality trends to guide future prevention and early detection strategies. A retrospective, population-based observational study was conducted using secondary data from the Cancer Incidence and Mortality Database of Sri Lanka (Sri Lanka Cancer Registry). All cases diagnosed between 2006 and 2022, coded under ICD-10 C15, were included. Mid-year population estimates were used to calculate crude incidence rates and age-standardized incidence rates (ASRs) per 100,000 population, using the WHO standard population for standardization. Joinpoint regression analysis was performed to identify statistically significant changes in linear trends. The estimated annual percentage change (AAPC) was calculated to assess temporal shifts in incidence and mortality across age groups, sex, histology, and anatomical locations. Among 28,142 recorded cases (55.6% males), the overall ASR significantly increased from 6.62 per 100,000 in 2006 to 8.76 in 2022 (AAPC 2.82%). Male incidence rose significantly (AAPC 4.50%), whereas female rates remained statistically stable. Although squamous cell carcinoma remained predominant (74.2%), adenocarcinoma exhibited a more pronounced and significant increasing trend (AAPC 9.04% vs. 3.43% for SCC). Anatomically, middle-third tumors significantly decreased (AAPC -4.87%). While overall and male crude mortality rates showed non-significant declines, female mortality significantly decreased over the study period (AAPC -3.00%). Oesophageal cancer incidence is rising significantly in Sri Lanka, predominantly driven by older males and a striking increase in adenocarcinoma. These evolving patterns underscore the urgent need for targeted public health interventions, risk factor mitigation, and early screening strategies tailored to vulnerable demographic groups.

Keywords: oesophageal cancer, incidence trends, joinpoint regression, adenocarcinoma, Sri Lanka

Theme 2



Engineering Resilliant, Productive and Sustainable Bio-Economics

Agriculture and Veterinary Sciences

Application of Essential Oil-Infused Biopolymer Films for Post-Harvest Quality Improvement of Sour Banana (*Musa* spp.)

S.U.M. Kumarasiri[1], K.D.C. Pamalka[2], G.S.G. Liyanage[2]*

[1]*Department of Biotechnology, Faculty of Life and Medical Sciences, BMS Campus, Colombo, 00600, Sri Lanka*
[2]*Department of Food Science and Nutrition, Faculty of Life and Medical Sciences, BMS Campus, Colombo, 00600, Sri Lanka*
**geethika.l@bms.ac.lk*

Sour banana (*Musa* spp.) is a nutritious and economically valuable fruit in Sri Lanka; however, their short post-harvest shelf life leads to significant economic losses. Conventional preservation methods are often neither cost-effective nor environmentally friendly. Therefore, new sustainable methods are needed to address this issue. In this study, biopolymer films were developed using locally available agro-waste material, jackfruit seed flour (JSF), combined with a blend of cinnamon and lemongrass essential oils (EO) to extend the shelf life of sour banana as an eco-friendly preservation method. Polyvinyl alcohol (PVA, 3%) served as the film-forming polymer. Eight treatments were investigated: an untreated control, a commercial carbendazim treatment (0.16%), PVA alone, PVA+JSF (2.5%), PVA+JSF+XG (0.2%), and PVA+JSF+XG formulations containing an essential oil (EO) blend at 0.5%, 1.0%, or 1.5%. Thickness and water vapour permeability (WVP) were measured in the developed films. Twelve bananas at the early ripening stage were assigned randomly to each treatment. The bananas were sterilized with 70% ethanol, wrapped with the films, and stored at 30±4°C. Fruit quality was assessed on days 0, 7, and 14 by measuring peel colour change, weight loss percentage, decay index, titratable acidity (TA), total soluble solids (TSS), and ascorbic acid content (AAC). Data were analysed by two-way analysis of variance that revealed a significant interaction between treatment and storage time, followed by Tukey's HSD multiple comparison test. A p value of <0.05 was considered as significant. Film thickness was similar across all treatments (0.18 ± 0.05 mm). Films containing 0.5% and 1% EO exhibited consistent WVP values [1.43 ± 0.00 (g·mm)/(m²·day·mmHg)] after 24 hours. By the end of the 14-day storage period, bananas treated with 1.0% EO exhibited the lowest weight loss (7.41±1.99 %) and maintained the highest AAC (25.41 ± 0.00 mg/100g) among all treatments. In contrast, untreated control bananas showed 23.16 ± 2.21% weight loss and retained only 18.49 ± 2.77 mg/100g of ascorbic acid by day 14, indicating rapid senescence. The TA of control and commercial treatments showed sharp declines to 0.28 ± 0.03% and 0.24 ± 0.04% respectively by day 14, whereas EO treated bananas maintained moderately higher TA levels (0.55 ± 0.00%). The decay index at day 14 was significantly lower in EO treatments (86.77 ± 2.01%) compared to control and all non-EO formulations (99.00 ± 0.00%). Overall, films incorporated 1% EO blend proved most effective at extending banana shelf life, offering an eco-friendly alternative to conventional preservatives. Future studies should include microbial growth quantification to better assess the antimicrobial efficacy of the coatings.

Keywords: essential oil, films, jackfruit seed flour, post-harvest preservation, sour banana

Association Between Farm Management Practices and *Enterocytozoon hepatopenaei* (EHP) Occurrence in *Litopenaeus vannamei* Grow-out Farms in Chilaw, Sri Lanka

H.A.R.W. Kotuwegedara[1], K.K.P.R.B. Adhikaram[1], T.A. Gunawardana[2], S.H.N.P. de Silva[3], N.M.T. Anupama[2]*, S.S. de S. Jagoda[1]

[1] Centre for Aquatic Animal Disease Diagnosis and Research, Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2] Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[3]Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**thilinianupama@vet.pdn.ac.lk*

Enterocytozoon hepatopenaei (EHP) is an economically significant intracellular microsporidian parasite causing hepatopancreatic microsporidiosis in *Litopenaeus vannamei*, resulting in growth retardation, size variation, and considerable production losses in intensive aquaculture systems. Despite increasing global prevalence, the role of farm management and biosecurity practices in influencing EHP occurrence and intensity remains poorly understood. This study investigated the association between farm management practices and EHP occurrence in commercial *L. vannamei* farms in the Chilaw aquaculture zone, Sri Lanka. Following preliminary EHP screening, twenty commercial shrimp farms were selected and categorized into four groups based on EHP detection within the culture cycle: EHP-undetected throughout, pre-stocking detection (persistent infection), early-stage detection (positivity at 14–28 days of culture, [DOC]), and late-stage detection (positivity after 28 DOC). Farm visits and hepatopancreas sampling were conducted biweekly from stocking to harvest. EHP was detected and quantified by PCR and qPCR assays targeting the PTP2 gene. A structured questionnaire survey assessed farm management and biosecurity practices, encompassing health screening of post-larvae management, pond preparation and grow-out management (water quality, feed, stocking density and health). A total management score (TMS) was calculated for each farm based on implemented practices. A one-way ANOVA showed that TMS was significantly different between the different EHP detection groups ($p<0.001$). Post hoc Tukey analysis indicated EHP undetected farms had significantly higher TMS (mean = 90.3 ± 1.44) compared to pre-stocking detection (mean = 42.0 ± 15.76), early-stage detection (mean = 61.9 ± 9.12), and late-stage detection farms (mean = 67.8 ± 14.65). A Kruskal-Wallis test confirmed significant differences in EHP copy number between detection stage groups ($p < 0.001$), validating the biological distinction between groups. Spearman's correlation further confirmed a strong negative association between TMS and EHP copy numbers at final harvest (DOC 70; $\rho = -0.815$, $p < 0.001$), indicating that farms with higher management scores consistently exhibited lower infection intensity at the end of the culture cycle. The findings suggest that improved farm management and biosecurity practices may play an important role in reducing EHP occurrence and infection intensity in commercial shrimp farming systems under local culture conditions.

Keywords: EHP, *Litopenaeus vannamei*, biosecurity, total management score, copy number

Acknowledgement: *Blue Planet Fund - Ocean Country Partnership Programme (OCPP) MPhil Scholarships Project.*

Bioactive Properties and Heavy Metal Composition of Wild and Cultivated Morphotypes of *Kappaphycus alvarezii*: A Comparison of Raw and Cooked Forms

P.A.R. Yasawardhana[1], B.C. Jayawardana[1], R. Liyanage[2], H.W.S.S. Subasinghe[1], M. Dhamsara[1], P. Weththasinghe[1]*

[1]*Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Nutritional Biochemistry Research Program, National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka*
**pabodhaw@agri.pdn.ac.lk*

Kappaphycus alvarezii is an edible seaweed with bioactive compounds and health benefits. This study examined the effects of source (wild vs. cultivated) and thermal processing (raw vs. cooked) on the bioactive properties and heavy metal composition of green and brown morphotypes of *K. alvarezii*. Wild and cultivated seaweed morphotypes were collected from Jaffna, Sri Lanka. Cooked samples were prepared by soaking in distilled water (1:10 w/v) followed by boiling at 100ºC for ten minutes. The dried samples of raw and cooked seaweeds were extracted using 65% ethanol and used for further analyses. Total phenolic content (TPC) and antioxidant capacities were determined using 2,2′-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS), 2,2-diphenyl-1-picrylhydrazyl (DPPH), and oxygen radical absorbance capacity (ORAC) assays. Anti-diabetic potential was determined using alpha-amylase inhibitory assay (IC_{50}), and heavy metal concentrations were measured by inductively coupled plasma optical emission spectrometry (ICP-OES). A two-factor factorial design was employed using the source and the thermal processing method as factors for the data analysis. The findings showed that cooking reduced TPC ($p < 0.05$) in both wild and cultivated forms of green and brown morphotypes. In contrast, cooking increased ABTS and DPPH activities in wild samples but decreased them in cultivated samples of both green and brown morphotypes ($p < 0.05$). In brown morphotypes, cooking elevated the ORAC activity in wild samples and decreased ($p < 0.05$) in cultivated samples. In green morphotypes, cooking reduced the ORAC activity in wild samples and increased it in cultivated samples. The wild, green, cooked sample demonstrated the strongest alpha-amylase inhibitory activity with an IC_{50} value of 13.89 ± 1.66^{C} mg/mL ($p < 0.05$). Cooked brown samples showed the highest accumulation levels of Cr and Cd, at 38.78 ± 1.78^{C} ppb and 25.47 ± 1.47^{b} ppb, respectively ($p < 0.05$) compared to the green morphotype in cultivated form. However, heavy metal concentrations remained well below the World Health Organization safety limits (50 ppb for Cr and 500 ppb for Cd). Overall, the findings demonstrate that both source and thermal processing significantly influence the bioactive properties of *K. alvarezii*. Despite a reduction in phenolic content with cooking, certain antioxidant activities enhanced depending on the morphotype; and both green and brown morphotypes remain safe and promising candidates for functional food applications.

Keywords: *Kappaphycus alvarezii*, bioactive potential, heavy metals, wild, cultivated, thermal processing

Acknowledgement: *This research was funded by the Sri Lanka Council for Agricultural Research Policy (SLCARP) under the National Agricultural Research Plan (NARP) of Sri Lanka 2025 (Grant No: NARP/2025/UP/AG/01).*

Bowen Ratio Dynamics Over the Western Indian Ocean as an Early Warning Signal for Extreme Rainfall Events in the Central Province of Sri Lanka

E.T.S. Madhubhashini

Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
thushani@pdn.ac.lk

The Central Province of Sri Lanka sustains recurrent rainfall-triggered landslide disasters, particularly during the northeast monsoon transition months of October through January; yet operational early warning systems rely on rainfall intensity alone and lack ocean-state precursors. This study examined whether surface energy flux variables over the western equatorial Indian Ocean (70–80°E, 0–8°N) are associated with extreme monthly rainfall in the Central Province, explicitly distinguishing concurrent indicators from antecedent (lagged) predictors. Nine satellite-derived and reanalysis predictors — sea surface temperature (MODIS-Aqua), surface wind speed and 500 hPa wind components (MERRA-2), latent heat flux (LHF), sensible heat flux (SHF), near-surface air temperature (GLDAS NOAH), and surface relative humidity (AIRS) — were extracted as area-averaged monthly time series from NASA Giovanni for 2002–2026, and the Bowen ratio (SHF/LHF) was derived as an index of ocean surface energy partitioning. Central Province rainfall was obtained from the UN-SPIDER satellite hazard archive. A random forest ensemble, chosen for its capacity to capture non-linear relationships and interactions among collinear predictors across multiple lags, was trained on 2002–2013 data (n = 132 months) and validated on an independent 2014–2026 period (n = 143 months), incorporating both concurrent and one to three-month lagged predictor terms. The Bowen ratio was the dominant discriminator, with extreme months ($\geq 90^{th}$ percentile) showing concurrent Bowen ratios of 0.33 versus 0.79 in normal months (Spearman $r = -0.658$, $p < 0.001$), alongside a strong concurrent LHF correlation ($r = +0.576$, $p < 0.001$); surface wind speed at a three-month lag provided a weaker antecedent signal ($r = +0.398$, $p < 0.001$). On the independent validation set, the model achieved $R^2 = 0.525$ (RMSE = 99.3 mm) and correctly identified 67% of extreme months at a precision of 0.62. Because the strongest signals are concurrent, this skill reflects predominantly near-real-time ocean-state diagnosis rather than a validated multi-month forecast. The Bowen ratio and latent heat flux nonetheless represent physically interpretable, satellite-observable indicators that provide a promising foundation for ocean-state-informed hazard monitoring, with the lagged wind-speed signal warranting further investigation as a candidate early-warning precursor.

Keywords: Bowen ratio, latent heat flux, extreme rainfall, central province Sri Lanka, random forest

Acknowledgement: *This work was supported by a University of Peradeniya Research Grant (URG/ARG/2026/2).*

Can $MgCl_2$-Modified Biochar-Based Urea Fertilizers Mitigate Nitrogen Losses?

E.M.A.Y. Hathnagoda, R.S. Dharmakeerthi*

Department of Soil Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**dharmakeerthirs@agri.pdn.ac.lk*

Nitrogen losses from conventional urea (U) fertilizers through leaching and ammonia volatilization significantly reduce nitrogen use efficiency (NUE) and contribute to environmental pollution in agricultural systems. Developing slow-release fertilizer formulations has emerged as a promising strategy to synchronize nitrogen release with plant demand and minimize nutrient losses. This study aimed to mitigate N losses from urea by developing a slow-release fertilizer using poultry litter biochar modified with $MgCl_2$ (BC-M), U, and Limus® urease inhibitor (I). BC-M was produced by pre-soaking poultry litter in $MgCl_2$ followed by pyrolysis at 500°C. Two new fertilizers were produced by soaking BC-M in either U (BC-M+U) or U+I (BC-M+U+I), followed by coating with a biodegradable coating material. A microcosm leaching column study was conducted using an Alfisol with five treatments: 0U, U, U+I, BC-M+U and BC-M+U+I arranged in a completely randomized design with three replicates. All treatments except 0U received the same N rate (239.61mg/kg). Leachates were collected daily over two weeks and analysed for NH_4^+-N and NO_3^- -N. A two-week closed chamber study using the same soil and treatment combinations evaluated NH_3 volatilization. All treatments, except 0U, received a uniform N rate of 1.5g/kg of soil. Throughout the experimental period, U+I had the highest cumulative NH_4^+-N content in the leachates, which was significantly higher than that of U. By the fourth day NH_4^+-N in BC-M+U and BC-M+U+I was comparable to that of U+I. NO_3^- -N content did not differ significantly among treatments ($P>0.05$). Highest cumulative NH_3 volatilization (14.9%) was recorded in U treatment, that was comparable to BC-M+U (13.1%). In comparison, U+I had significantly lower ($P<0.05$) and delayed NH_3 emission. Ammonia volatilization did not differ significantly between U+I (6.5%) and BC-M+U+I (7.1%), although BC-M+U+I-treated soil emitted NH_3 sooner. The NH_4^+-N leaching results suggest a combined effect of Limus®-mediated urease inhibition and limited delay in urea release by BC-M. It was concluded that urea intercalation into modified BC is not effective at reducing NH_3 volatilization losses or increasing plant available N in soils under the experimental conditions tested. Further research is needed to assess the NUE of the BC-M+U+I under field conditions.

Keywords: modified biochar, slow-release urea, urease inhibitor, ammonia volatilization, nitrogen use efficiency

Characterization of ZnO, MgO, and S Nanoparticles Synthesis via Green Synthesis from *Azadirachta indica*

W.K.D.T. Waththage[1]*, G.R.D.P. Menike[1], M.J.M.S. Kurera[1], K.M. Mewan[2], R.D.A.A. Rajapaksha[2], I.P.T.N. Gunasingha[2], W.M.K.T. Wickramasinghe[2]

[1]*Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Gonawila, 60170, Sri Lanka*
[2]*Department of Nano Science Technology, Faculty of Technology, Wayamba University of Sri Lanka, Kuliyapitiya, 60200, Sri Lanka*
tiranyawattage@gmail.com

Green-synthesis of nanoparticles has emerged as a sustainable and environmentally friendly alternative to conventional chemical synthesis by utilizing biological materials as reducing and stabilizing agents. Among various plant resources, *Azadirachta indica* (neem) is rich in bioactive phytochemicals that facilitate nanoparticle synthesis while minimizing environmental impacts. Zinc oxide (ZnO), magnesium oxide (MgO), and sulphur (S) nanoparticles have attracted considerable interest because of their potential applications as nanofertilizers and nanopesticides for improving nutrient use efficiency, crop productivity, and sustainable agricultural practices. The objective of this study was to synthesize ZnO, MgO, and S nanoparticles using *A. indica* leaf extract through a green synthesis approach and to evaluate their structural and physicochemical characteristics for potential agricultural applications. Fresh neem leaf extract was used as a natural reducing and capping agent for nanoparticle synthesis. The synthesized nanoparticles were characterized using X-ray diffraction (XRD) to determine crystal structure and crystallite size, UV–visible spectroscopy was used to evaluate optical properties, and pH analysis was used to assess physicochemical characteristics. XRD analysis confirmed that ZnO nanoparticles exhibited a hexagonal wurtzite structure with a primary diffraction peak at 36.15° (22,606 cps) indexed to the (101) plane, MgO nanoparticles showed a face-centred cubic structure with a dominant peak at 43.00° (11,041 cps) corresponding to the (200) plane, while sulphur nanoparticles crystallized in an orthorhombic phase with a primary peak at 23.15° (3,115 cps) assigned to the (222) plane. Average crystallite sizes calculated via the Scherrer equation were 26.4 nm for ZnO, 21.3 nm for MgO, and 23.5 nm for sulphur nanoparticles, confirming successful nanoscale synthesis. UV–visible spectroscopy revealed characteristic maximum absorption peaks at 355 nm for ZnO, 340 nm for MgO, and 327 nm for sulphur nanoparticles. The measured pH values were 5.709, 10.8, and 7.3 for ZnO, MgO, and sulphur nanoparticle suspensions, respectively. These findings demonstrate that *A. indica* mediated green synthesis provides an efficient, cost-effective, and eco-friendly route for producing structurally well-defined nanoparticles with desirable optical and physicochemical properties, highlighting their potential for nano-enabled fertilizers, controlled nutrient delivery systems, and sustainable agricultural applications.

Keywords: crystallite size, green synthesis, nano-fertilizers, reducing agents, X-Ray diffraction

Comparative Evaluation of Nutrient, Bioactive and Toxicological Profiles of Raw and Cooked Forms of *Sargassum polycystum* and *Padina antillarum*

S.A.I.S. Subasinghe[1]*, B.C. Jayawardana[1], R. Liyanage[2], H.W.S.S. Subhasinghe[1], P. Weththasinghe[1]

[1]*Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Nutritional Biochemistry Research Program, National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka*
**imans@agri.pdn.ac.lk*

This study investigated the nutrient composition, bioactive potential, and toxicological profiles of raw and cooked forms of two underutilized seaweeds (*Sargassum polycystum* and *Padina antillarum*) collected from Jaffna, Sri Lanka. Seaweeds were washed, oven-dried at 55°C, ground, and sieved. To prepare cooked seaweeds, dried seaweeds were rehydrated (1:10 with distilled water for 1 h), boiled for 15 min, drained, and re-dried at 55 °C. All samples were stored at −20 °C until analysis. Proximate composition of dried seaweeds was measured. Heavy metal (Cd and Pb) contents of raw and cooked samples were analysed using ICP-OES. Water extracts of raw and cooked seaweeds were assessed for anti-diabetic potential (α-amylase inhibition assay), cytotoxicity (brine shrimp bioassay) and antioxidant activities, including total phenolic content (TPC), 2,2′ azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) radical scavenging (ABTS) activity, 2,2-diphenyl-1-picryl-hyrazyl-hydrate radical scavenging (DPPH) activity, ferric reducing antioxidant power (FRAP) and oxygen radical absorbance capacity (ORAC). The crude protein content was comparable between the two species (9.4% in *S. polycystum* and 8.9% in *P. antillarum*). *P. antillarum* exhibited higher ash (36%) and crude fibre (26%) contents, while *S. polycystum* had higher fat content (1.5%) ($p<0.05$). Cooked *S. polycystum* showed higher ($p<0.05$) DPPH, TPC, and FRAP values compared to the raw form. Both forms of *S. polycystum* had similar ($p>0.05$) ORAC and ABTS values. Cooked *P. antillarum* exhibited the higher ($p<0.05$) TPC, ABTS, FRAP, ORAC and lower ($p<0.05$) DPPH value compared to the raw form. Cooked *S. polycystum* had the higher ($P<0.05$) anti-diabetic potential (IC_{50} = 3.81 mg/mL) compared to raw form, while no difference ($p>0.05$) was observed between the raw and cooked forms of *P. antillarum*. Both seaweeds reduced heavy metal contents after cooking. The concentrations of heavy metals were within the WHO permissible limits. The brine shrimp lethality assay demonstrated no detectable cytotoxicity in extracts of seaweeds, with all samples exhibiting lethal concentration (LC_{50}) values greater than 4000 ppm. Overall, both raw and cooked seaweed exhibit good nutritional and bioactive properties. Cooking improved antioxidant activities while reducing heavy metals in both species.

Keywords: *Sargassum polycystum*, *Padina antillarum*, bioactivity, toxicological profile, thermal processing

***Acknowledgement**: This research was funded by the Sri Lanka Council for Agricultural Research Policy (SLCARP) under the National Agricultural Research Plan (NARP) of Sri Lanka 2025 (Grant No: NARP/2025/UP/AG/01).*

Comparative Evaluation of Oral Infection Methods for *Enterocytozoon hepatopenaei* (EHP) in *Litopenaeus vannamei*

H.A.R.W. Kotuwegedara[1], K.K.P.R.B. Adhikaram[1], T.A. Gunawardana[2], N.M.T. Anupama[2]*, S.S. de S. Jagoda[1]

[1]*Centre for Aquatic Animal Disease Diagnosis and Research, Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**thilinianupama@vet.pdn.ac.lk*

Enterocytozoon hepatopenaei (EHP) is a microsporidian parasite causing severe growth retardation and significant economic losses in *Litopenaeus vannamei* aquaculture. Establishing reliable and reproducible laboratory infection models is essential for understanding pathogenesis and developing effective control strategies. This study evaluated three different oral infection protocols using EHP infected hepatopancreas to identify the most efficient approach for experimental infection. Juvenile *L. vannamei* (~1 g) were screened for EHP, WSSV, and IHHNV, and healthy shrimp were stocked into 50 L glass tanks at a density of 15 shrimp per tank under controlled conditions. Three oral infection protocols were tested: Protocol 1 administered fresh infected hepatopancreas at 10% of body weight as a single dose; Protocol 2 administered 5% fresh infected hepatopancreas three times within 24 hours; Protocol 3 mixed fresh infected hepatopancreas with feed in a 1:1 ratio and offered twice daily at 5% of body weight for three consecutive days. Control groups were fed disease free hepatopancreas. Each treatment was maintained in duplicate tanks. The infective material was confirmed positive for EHP using quantitative PCR (qPCR) targeting the PTP2 gene, with an initial copy number of 6.77×10^6 post infection hepatopancreatic samples were collected at 72 hours and seven days after initial exposure and analysed by qPCR. Protocol 1 (10% single-dose) successfully established rapid and consistent infection with mean copy numbers of 3.06×10^2 at 72 hours and 7.06×10^2 at seven days. Protocol 2 showed no detectable infection at 72 hours but demonstrated infection at seven days with a mean copy number of 6.62×10^2, indicating delayed establishment. Protocol 3 proved least effective, showing no detection at 72 hours and only weak infection at seven days with a mean copy number of 1.94×10^1. The 10% single-dose oral administration of infected hepatopancreas was the most effective method for rapid and consistent EHP infection in *L. vannamei*, establishing infection within 72 hours and ensuring reliable parasite replication by day seven. This standardized methodology provides reproducible protocols for future EHP research, facilitating investigations into infection mechanisms, host-parasite interactions, and the development of effective disease control measures critical for sustainable shrimp aquaculture production.

Keywords: EHP, oral infection, *Litopenaeus vannamei*, infection protocols, aquaculture

Acknowledgement: *Blue Planet Fund - Ocean Country Partnership Programme (OCPP) MPhil Scholarships Project.*

Detection of *Enterocytozoon hepatopenaei* (EHP) in Pond Water and Soil: Implications for Environmental Transmission in Shrimp Aquaculture Systems of Sri Lanka

K.K.P.R.B. Adhikaram[1], R. Kottuwegedara[1], A.W. Kalupahana[2], T.A. Gunawardana[2], N.M.T. Anupama[2]*, S.S.S. de S. Jagoda[1]

[1]Centre for Aquatic Animal Disease Diagnosis and Research, Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**thilinianupama@vet.pdn.ac.lk*

Enterocytozoon hepatopenaei (EHP) is a major microsporidian pathogen affecting *Litopenaeus vannamei*, responsible for significant economic losses in shrimp aquaculture. Since its first report in Sri Lanka in 2022, understanding environmental reservoirs has become critical for effective disease management. Lagoon water and pond-bottom soil are considered potential sources for the persistence and horizontal transmission of EHP within shrimp farming systems. This study aimed to evaluate the occurrence of EHP in incoming water and pond soil in *L. vannamei* grow-out farms in the North Western Province of Sri Lanka. A total of 55 shrimp farms were surveyed. From each farm, incoming water sample (1 L) from the lagoon and a pooled soil sample from a recently harvested pond were collected. Pond soil samples were obtained by pooling subsamples collected from the centre and four corners of the pond. Water samples were filtered through 0.45 µm membrane filters prior to DNA extraction, while DNA from pond soil samples was extracted directly. All samples were analysed using polymerase chain reaction (PCR) targeting the spore wall protein (SWP) gene for EHP detection. We detected EHP in 60.0% (33/55) of lagoon water samples and 74.5% (41/55) of pond soil samples, indicating a high level of environmental contamination. The higher prevalence observed in pond soil suggests that sediments may serve as a more stable reservoir for EHP spores compared to the water column. Detection in both environmental matrices confirm the potential for indirect transmission pathways within shrimp farming systems, independent of direct host-to-host contact. These findings highlight the critical role of environmental reservoirs in the persistence and spread of EHP in aquaculture systems. Effective disease management strategies should therefore incorporate sediment management, pond preparation, and water quality control as key components of farm-level biosecurity. This study provides important insights into the epidemiology of EHP and supports the development of targeted interventions to reduce disease risk in Sri Lanka's shrimp farming industry.

Keywords: EHP, shrimp aquaculture, environmental reservoirs, pond soil, lagoon water

Acknowledgement: *Blue Planet Fund - Ocean Country Partnership Programme (OCPP) MPhil Scholarships Project.*

Detection of Methicillin-Resistant *Staphylococcus aureus* and Extended-Spectrum Beta-Lactamase Producing Enterobacteriaceae Among Cattle and Farm Workers in Central Province, Sri Lanka

S. Branavan[1], M. Atapattu[1], R.N. Jinadasa[2], L.V.C. Liyanapathirana[3], W.R.P. Wijesinghe[1]*

[1]*Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**priyangaw@sci.pdn.ac.lk*

Antimicrobial resistance (AMR) is a critical challenge in livestock farming due to excessive antibiotic usage and the interaction between humans and animals. However, there is limited evidence on the prevalence and spread of antibiotic-resistant bacteria between livestock and farm workers in Sri Lanka, highlighting the importance of surveillance at the human-animal interface. Therefore, this study aimed to detect the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) and extended-spectrum β-lactamase-producing (ESBL) *Escherichia coli* and *Klebsiella* spp. in cattle and humans from livestock farms in the Central Province of Sri Lanka. Samples were collected over six months from 12 livestock farms (large: 2, medium: 2, small: 8), including 94 cattle and 37 farm workers, using convenience sampling, obtained following ethical approval. Nasal, throat, axillary, groin, and peri-rectal swabs from humans and udder and peri-anal swabs from cattle were collected. Isolation and identification were performed using standard microbiological methods and antibiotic susceptibility testing was done following CLSI M100 (2025) guidelines. MRSA was identified via cefoxitin disc diffusion. ESBL producers were screened by cefotaxime and ceftazidime disc diffusion and PCR targeting bla_{SHV}, $bla_{TEM,}$ and bla_{CTX-M}. Isolates positive for one of these genes and resistant to either cefotaxime, ceftazidime, or both were considered ESBL producers. Combined-disc confirmatory testing was unavailable. *S. aureus* was found in 23.4% (22/94) of cattle and 35.1% (13/37) of humans. The prevalence of MRSA was 1.1% (1/94) in cattle and 5.4% (2/37) in humans, all originating from small-scale farms. Erythromycin resistance was observed at 17.1% (6/35) of *S. aureus* isolates (cattle: 2.1% (2/94); human: 10.8% (4/37)). *E. coli* and *Klebsiella* spp. were identified in 36.2% (34/94) and 3.2% (3/94) of cattle, and 27.0% (10/37) and 5.4% (2/37) of humans, respectively. Only four ESBL-producing *E. coli* were detected (3.2% [3/94] in cattle and 2.7% [1/37] in humans). Of these four isolates, two carried both bla_{TEM} and bla_{CTX-M}, while two possessed only bla_{TEM}. In total, two *S. aureus* and three *E. coli* were multidrug-resistant (resistance to ≥3 antimicrobial classes). Multidrug-resistant MRSA and ESBL producer detection underlines the need for continued surveillance and further studies incorporating a One Health approach in Sri Lankan livestock farms.

Keywords: antimicrobial resistance, ESBL, resistance in livestock farms, MRSA

Acknowledgement: *URC Multidisciplinary Research Grant 2024 (Grant No. 449).*

Development and Evaluation of a Beetroot-Based Functional Sports Drink: Nitrate Standardization, Sensory Acceptability, and Ergogenic Effects on Cardiovascular Fitness in University Athletes

S.M.N.S. Bandara[1], A. Chandrasekara[2], N.K Weerasekara[3], R.P.N.P Rajapakse[1], B.E.P Mendis[1]*

[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, 20400, Sri Lanka*
[2]*Department of Nutrition and Dietetics, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka*
[3]*Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**ereshamendis@agri.pdn.ac.lk*

Commercially available sports drinks are predominantly formulated with synthetic additives, offering limited physiological benefits beyond basic hydration and energy replenishment. Beetroot (*Beta vulgaris L.*), a rich dietary source of inorganic nitrate, presents considerable potential for ergogenic beverages that enhance athletic performance through augmented nitric oxide (NO) bioavailability. This study developed and evaluated a standardized beetroot-based sports drink, assessing nitrate content, thermal stability, sensory acceptability, and efficacy in improving endurance and cardiovascular health among university athletes. A sequential product development and human intervention design was used. Beetroot was washed, peeled, blended with distilled water, filtered, and formulated with food-grade pectin, citric acid, and sodium benzoate; samples from three agro-climatic zones of Sri Lanka were analysed for nitrate (modified Kjeldahl–Devarda's alloy method), yielding 138.1 ± 2.4 mg/100 g fresh weight; 362 g beetroot per 500 mL was therefore used, giving a calculated dose of 499.9 ± 8.7 mg nitrate per serving. Thermal stability was evaluated across a pasteurization range of 75 – 95°C, confirming nitrate content remained within this calculated dose across all conditions. A four-week randomized controlled trial was conducted with 30 university athletes (16 male, 14 female) in intervention and control groups. Endurance was assessed via Cooper's 12-Minute Run Test (VO2 max), and cardiovascular status via resting blood pressure. Sensory evaluation used 9-point hedonic scales with an untrained panel (n = 51), benchmarking against two commercial sports drinks. After four weeks, the intervention group showed a significant 4.51 ± 3.26 $mL \cdot kg^{-1} \cdot min^{-1}$ (~9%) rise in VO2 max ($p < 0.001$), with significant reductions in systolic (−5.20 ± 5.27 mmHg, ~4.5%; $p = 0.002$) and diastolic (−3.53 ± 2.64 mmHg, ~4.7%; $p < 0.001$) blood pressure, confirming enhanced aerobic capacity and cardiovascular efficiency. Friedman tests showed the formulated beverage achieved sensory acceptability statistically comparable to one commercial product and significantly higher than the other for appearance and overall acceptability ($p < 0.001$), despite containing no added sugar or synthetic flavouring. These findings confirm the efficacy of the beetroot-based sports drink for improving endurance and cardiovascular health, underscoring the commercial and agricultural significance of value-added beetroot processing for Sri Lanka's functional foods sector.

Keywords: beetroot, dietary nitrate, vo2 max, blood pressure, ergogenic aid

Development of Fibre-Enriched Cookies Incorporating Psyllium Husk and Selected Underutilized Flours and Evaluation of Physicochemical and Sensory Properties

S.J.A. Punsarani[1], E.R.J. Samarakoon[1]*, K.A.D. Kalahinayake[2], T.P.K.M. Nanayakkara[2]

[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Innexco (pvt) ltd, Galle, 80000, Sri Lanka*
**rasanjalis@agri.pdn.ac.lk*

Fibre-enriched bakery products are gaining attention for their health benefits and growing demand for functional foods that enhance digestive health and overall well-being. As one of the most widely consumed bakery products, cookies offer a convenient medium for delivering health promoting compounds. This study developed and evaluated fibre-enriched cookies using psyllium husk (PH) combined with *Kohila* flour (*Lasia spinosa*) (KF) and horse gram flour (*Macrotyloma uniflorum*) (HF), replacing wheat flour at 30% and 40% levels in composite blends. *Kohila* rhizomes and horse gram seeds were oven dried to 14% moisture content, ground and sieved to a particle size of 250 µm. Composite flour formulas were developed by substituting wheat flour with PH (20-30%), KF (5-10%), and HF (5-10%). Functional properties of composite flours and wheat flour were assessed. Cookies containing 30% and 40% composite flour blends were baked at 170 ºC for 15-17 min, with 100% wheat flour cookies serving as the control. Physical properties of cookies and sensory evaluation were assessed. Proximate composition, total dietary fibre (TDF) content and water activity were analysed solely with the control and best sensorially acceptable cookie formulations. Functional properties of flours revealed significant differences ($p<0.05$) in water and oil absorption capacities, swelling power and colour values (L*, a*, b*) between composite flours and wheat flour. The physical parameters of cookies; thickness, diameter, spread ratio and color varied significantly across formulations ($p<0.05$), where weight did not differ significantly. However, sensory evaluation indicated that the 30% substitution (20% PH, 5% KF and 5% HF) had the highest scores and was comparable to the control. Proximate analysis indicated that the selected formulation had higher moisture (3.88 ± 0.04%), crude fat (20.37 ± 2.27%), crude fibre (0.94 ± 0.04%) and total ash (1.70 ± 0.04%) contents compared to the control, while crude protein (10.24 ± 0.26%) and carbohydrates (66.06 ± 1.60%) were lower. The selected formulation had markedly increased the TDF content (12.6%) compared to the control (2.0%). These results indicated that the 30% replacement enhanced dietary fibre while maintaining acceptable physicochemical and sensory profiles, highlighting the potential of underutilized flours for sustainable, health-focused baking.

Keywords: fibre-enriched cookies, psyllium husk, *Kohila flour*, horse gram flour, cookies

Acknowledgement: *The financial support provided by Innexco, Sri Lanka, for the successful completion of this research is gratefully acknowledged.*

Economic Impact of Climate Change on Paddy in Sri Lanka: A Ricardian Analysis with Future Projections

S.A.K.U. Sooriyaarachchi*, S.N. Dissanayake

Department of Agricultural Economics and Business Management, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**kasunis@agri.pdn.ac.lk*

Paddy cultivation in Sri Lanka faces growing threats from climate variability, yet integrated economic assessments combining historical analysis with future projections remain scarce, limiting evidence-based policy responses. This study evaluates the sensitivity of paddy net revenue to historical climate variability (2001-2024) across *Maha* and *Yala* cultivation seasons, and projects future economic impacts under alternative emission pathways through 2100 to inform climate adaptation policy. A district-level panel dataset covering 13 paddy-cultivating areas was analysed using fixed-effects and pooled OLS Ricardian regression models with quadratic climate terms, capturing non-linear temperature and precipitation effects across four monsoon periods: the first inter-monsoon (FIM), southwest monsoon (SWM), second inter-monsoon (SIM), and northeast monsoon (NEM). Net revenue per acre (Gross Revenue minus Total Cost of Cultivation), sourced from Cost of Cultivation Reports (Department of Agriculture), served as the dependent variable. Climate data were obtained from NASA POWER, and future projections were derived from bias-corrected Coupled Model Intercomparison Project Phase 6 (CMIP6) outputs from the Canadian Earth System Model Version 5 (CanESM5) under three Shared Socioeconomic Pathways: SSP1-2.6 (low-emission), SSP2-4.5 (intermediate), and SSP5-8.5 (high-emission), for 2026–2100. Results indicate that during *Maha*, higher SIM temperatures ($\beta = -3.407$, $p < 0.05$) negatively affect net revenue, reflecting early-growth agronomic sensitivity, while favourable NEM conditions enhance grain filling and yield, positively influencing net revenue ($\beta = 10.077$, $p < 0.01$). During *Yala*, moderate increases in SWM temperature and precipitation improve income, whereas elevated FIM minimum temperatures reduce profitability ($\beta = -3.278$, $p < 0.05$) due to seedling heat stress; increased FIM precipitation ($\beta = 0.146$, $p < 0.01$) supports early crop establishment. These climatic effects are interpreted via established agronomic mechanisms, although crop management variables were not modelled. Under SSP1-2.6, net revenues rise 17–28% across both seasons, but under SSP5-8.5 these gains reverse sharply after mid-century, with projected net revenue losses, relative to the 2001-2024 historical mean baseline, reaching 474% in *Maha* and 114% in *Yala* by 2076–2100, losses above 100% denoting negative net revenue, as temperature increases exceed 7°C and rainfall rises beyond agronomic thresholds. These findings highlight critical climatic thresholds, underscoring the need for targeted climate adaptation strategies.

Keywords: panel data, monsoon variability, SSP scenarios, food security, climate adaptation

Effect of Reduced Urea Application on Rhizosphere Chemical Properties and Abundance of Nitrogen-Fixing Bacteria in a Maize-Stylo Intercropping System

G.D.N.M. Gammanpila[1], W.S. Dandeniya[1], K.M. Devindi[1], K.A.K.S. Perera[2], S. Edirisinghe[2], M.B.P.K. Mahipala[3]*

[1]*Postgraduate Institute of Agriculture, Peradeniya,20400, Sri Lanka*
[2]*Plantseeds Private Limited, DIMO Agribusinesses, Dambadeniya, 60130, Sri Lanka*
[3]*Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**pmahi@agri.pdn.ac.lk*

Reducing inorganic nitrogen (N) input in maize-legume intercropping systems may influence rhizosphere processes by altering soil chemical properties and microbial activity. This study investigated the effects of reduced urea application on rhizosphere chemical properties and the abundance of nitrogen-fixing bacteria (NFB) in a maize (*Zea mays* L. cv. Veera) – stylo (*Stylosanthes guianensis*) intercropping system. A pot experiment was conducted using grower bags (diameter 45 cm and height 45 cm), each containing one maize and seven stylo plants. The experiment was arranged in a complete randomized design with four urea application rates: 425, 383, 340, and 0 kg ha^{-1}, representing 100%, 90%, 80%, and 0% of the recommended rate, respectively. Recommended basal dose of TSP (100 kg/ha) and MOP (50 kg/ha) were applied to all treatments. Rhizosphere soil samples were collected at tasselling (VT) and dough (R4) stages of maize and analysed for pH, electrical conductivity (EC), total dissolved solids (TDS) and organic carbon content (OCC). The available N, P, K, and NFB abundance were measured at R4 stage. At VT stage, reduced urea application significantly decreased ($P<0.05$) rhizosphere pH from 5.95 (100% urea) to 4.50 (0% urea), with corresponding declines in EC (141.35 to 88.66 µS/cm) and TDS (62.5 to 48.0 mg/L). At R4 stage, pH remained relatively stable ($P>0.05$) across treatments (5.47–5.73), but EC decreased significantly ($P<0.05$) with lower urea rates. Most notably, NFB abundance at R4 stage increased dramatically as urea decreased ($P<0.05$), rising from 199.7×10^3 CFU/g at 100% urea to $49{,}576.7\times10^3$ CFU/g at 0% urea. Available K also increased substantially ($P<0.05$) from 167.35 to 467.88 mg/kg in the absence of urea. A simultaneously conducted field experiment confirmed that neither maize plant dry weight (242.52 vs. 217.08 g $plant^{-1}$) nor dry matter yield (13.50 vs. 12.08 MT ha^{-1}) differed significantly ($P>0.05$) between the 100% and 90% recommended urea application rates at the R4 stage in a maize-stylo intercropping system. These findings indicate that reducing or eliminating urea application in maize-stylo mixed-stand forage systems significantly ($P<0.05$) enhances nitrogen-fixing bacterial populations and modifies rhizosphere chemical properties, particularly increasing available potassium. The substantial increase in NFB abundance under reduced urea suggests greater reliance on biological N fixation, supporting sustainable forage production with lower inorganic N inputs.

Keywords: biological nitrogen fixation, electrical conductivity, organic carbon content, soil fertility, sustainable forage production

Acknowledgement: *This study was funded by Sri Lanka Council for Agricultural Research Policy (NARP-2024-UP-AG 01).*

Effects of Dietary Inclusion of Tubifex (*Tubifex tubifex*) Worm Meal on Growth Performance, Stress Tolerance, and Economic Efficiency of Mrigal (*Cirrhinus mrigala*) Fry During the Fry-to-Fingerling Stage

B.A.D.L. Madushanka[1], M. Dhamsara[2], P. Weththasinghe[1,2]*

[1]*Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**pabodhaw@agri.pdn.ac.lk*

Tubifex (*Tubifex tubifex*) worm meal is a locally available, easy-to-culture, high-protein feed ingredient with considerable potential as an alternative to fishmeal in aquafeeds. The present study evaluated the effects of partially replacing fishmeal with tubifex worm meal in the diets of mrigal (*Cirrhinus mrigala*) during the fry-to-fingerling stage on growth performance, economic efficiency, and stress tolerance. Four isonitrogenous and isoenergetic diets were formulated: a fishmeal-based control diet (CD) and three diets replacing fishmeal with tubifex worm meal at 15% (15 TW), 25% (25 TW), and 35% (35 TW). A total of 1440, 38-day-old mrigal fry (mean initial weight: 0.28 g) were randomly assigned to 12 (1 m × 1 m × 1 m) outdoor steel cages. Fish were fed the experimental diets three times daily at feeding rates of 12%, 10%, 8%, and 6% of body weight per day, adjusted biweekly, over 56 days. The growth performance and economic efficiency were estimated. At the end of the feeding period, 10 fingerlings from each cage were challenged with a stress response test by exposing them to 30 ppt salinity in a 500 mL pre-aerated water bath. Mean final weight (FW), weight gain (WG), apparent feed intake (appFI), specific growth rate (SGR), and apparent feed conversion ratio (appFCR) were not significantly affected across diets ($p > 0.05$) compared to CD (CD; FW: 1.51 ± 0.06, WG: 1.23 ± 0.05, appFI: 3.49 ± 0.00, SGR: 3.01 ± 0.06, appFCR: 2.83 ± 0.13 and 35 TW; FW: 1.53 ± 0.04, WG: 1.25 ± 0.04, appFI: 3.49 ± 0.00, SGR: 3.03 ± 0.04, appFCR: 2.80 ± 0.08). The cost of production varied 305.88, 282.28, 268.60, and 255.73 LKR across CD, 15 TW, 25 TW, and 35 TW, respectively, while the 35 TW yielded the highest profit index (6.69 ± 0.06) and the lowest incidence cost (0.58 ± 0.01; $p < 0.05$). Survival during the stress test was also similar across all dietary groups ($p=0.092$). These findings suggest that fishmeal can be substituted with tubifex worm meal up to 35% without affecting growth performance and vigour, while maximizing economic gains.

Keywords: fishmeal, *Tubifex tubifex, Cirrhinus mrigala,* growth performance, stress tolerance

Empirical Foundations for a Spatially Cointegrated Retail Fish Price Index in Sri Lanka

W.A.A.H. Wijepala[1], E.M.E.K. Ekanayake[2]*, C. Withanage[1,2], A.M.A.S.M. Bandara[3], P. H. Abeysundara[3]

[1]*Multidisciplinary AI Research Centre-Industry and Digital Economy, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Manufacturing and Industrial Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Operations Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**emekanayake@eng.pdn.ac.lk*

Fisheries are vital for Sri Lankan food security, yet existing literature primarily focuses on isolated wholesale hubs, generalized supply chains, or localized consumption behaviours rather than comprehensive retail inflation dynamics. A critical research gap remains: national inflation metrics rely on unweighted averages that fail to capture the severe spatial market frictions dictating actual retail seafood prices. This study conducted an exploratory analysis of temporal and spatial retail price variations across Sri Lanka to identify the foundational baselines required to build a national Fish Price Index (SL-FPI). The primary objective was to map initial species baskets and spatial market pools, establishing a framework for subsequent econometric modelling to isolate specific price drivers. To achieve this, we evaluated weekly retail price data for marine fish across 25 administrative districts (2000–2025) from the Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI), resolving missing values via moving average imputation. To analyse spatial hierarchies, we calculated district-level average price ranks across key species. We stratified the districts into four pools based on two criteria: coastal proximity and the presence of major wholesale hubs (Peliyagoda and Negombo). These pools consist of Central Price Setters (Colombo, Gampaha), Coastal Markets, Intermediate Inland hubs, and Central Highlands. The Central Highlands exhibits the highest structural price premiums, while peripheral coastal markets reflect the lowest baseline prices. However, despite acting as the central wholesale driver, Colombo commands high retail price ranks, suggesting an urban premium influenced by distinct consumer preferences and greater regional purchasing power. Furthermore, inland price rigidities suggest are consistent with consumer substitution toward freshwater alternatives, suggesting that retail market integration is heavily fragmented by distance, urbanization and in some cases the quality of the catch. Relying on unweighted national averages obscures the true economic cost of seafood. To account for these variations, a functional Sri Lankan FPI must integrate the structural factors driving price fluctuations, utilizing them to define representative species baskets and calibrate hedonic price adjustments. The next phase of this project will utilize these empirically derived regional pools to develop spatially weighted index formulas and calibrate econometric price-transmission models, establishing a robust framework for the final SL-FPI.

Keywords: fish price index, spatial cointegration, market friction, exploratory data analysis, food security

Acknowledgement: *This research was conducted under the University Research Council (URC) Grant, University of Peradeniya (Grant No. URG/MNG/2026/1).*

Enzyme Supplementation in Rice Bran-Based Diets for Broiler Chickens: Effects on Growth Performance and Nutrient Utilization

W.V.G.D.L. Gamage[1], B.C. Jayawardana[1], R. Samarakoon[2], L.M. Rankoth[3], N.D. Karunaratne[4], P. Weththasinghe[1]*

[1]*Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Farm Animal Production and Health, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**pabodhaw@agri.pdn.ac.lk*

The use of rice bran in poultry feed is limited by the presence of anti-nutritional factors, which can be mitigated through enzyme supplementation to enhance its nutritional value. This study evaluated the effects of supplementing rice bran-based broiler chicken diets with xylanase in combination with protease and super-doses of phytase on growth performance, nutrient digestibility, and intestinal health. Five iso-energetic and iso-nitrogenous diets were formulated: Diet 1 served as the control (corn-soybean meal diet containing rice bran); Diet 2 included the control diet supplemented with xylanase (0.2 g/kg) and phytase (500 FTU/kg); Diet 3 included the control diet supplemented with xylanase (0.2 g/kg), protease (0.5 g/kg), and phytase (500 FTU/kg); Diet 4 included the control diet supplemented with xylanase (0.2 g/kg) and a super-dose of phytase (1000 FTU/kg); and Diet 5 included the control diet supplemented with xylanase (0.2 g/kg) and a super-dose of phytase (1500 FTU/kg). A total of 120 one-day-old Ross 308 chicks were randomly allocated to the five dietary treatments (n=4; 6 birds per replicate) and fed with experimental diets for 35 days. At the end of the feeding period, growth performance, relative organ weights, nutrient digestibility, and the incidence of intestinal lesions were evaluated. Results showed no significant differences ($P > 0.05$) among the dietary treatments in body weight gain, feed intake, feed conversion ratio, relative organ weights, and the occurrence of intestinal lesions. All enzyme-supplemented diets enhanced ileal protein and phosphorus digestibility. However, fibre digestibility was higher ($P < 0.05$) in the diets containing xylanase with phytase super-doses (Diets 4 and 5) compared to protease-supplemented diet (Diet 3). Apparent ileal dry matter digestibility was highest ($P < 0.05$) in diets supplemented with xylanase together with phytase super-doses (Diets 4 and 5). The combination of xylanase and phytase super-doses appeared to enhance the degradation of anti-nutritional factors, thereby improving nutrient availability. In conclusion, the inclusion of xylanase and phytase, particularly at super-doses in rice bran-based broiler diets improved nutrient digestibility without affecting growth performance or intestinal health.

Keywords: rice bran, broiler chicken, phytase super-dose, xylanase, nutrient digestibility

Evaluating the Impact of Ecological and Remote Sensing Variables on Mangrove Carbon Stock Prediction Using Machine Learning

Y. Mathivathanan[1]*, V. Abishethvarman[2], K.D.N. Kumari[3]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department Computing & Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
[3]*Department of Mathematics and Philosophy of Engineering, The Open University of Sri Lanka, Nawala, Nugegoda, 10250, Sri Lanka*
**ymathivathanan@gmail.com*

Mangrove ecosystems represent efficient natural carbon sinks, playing a crucial role in climate change mitigation due to their high capacity for biomass accumulation and long-term carbon sequestration. However, estimating mangrove biomass and carbon stocks remains challenging because of limited field accessibility, cost-intensive measurements, and the spatial heterogeneity of coastal environments. This study examines the relationship between satellite-derived remote sensing data and mangrove carbon stocks using machine learning approaches, aiming to enhance predictive accuracy through the integration of ecological and geospatial variables. A dataset comprising 300 observations was utilized, incorporating field-based measurements such as above-ground biomass, below-ground biomass, and total carbon stock, along with satellite-derived optical bands (B1–B12) and radar backscatter variables (VV and VH). The methodological framework involved data preprocessing, feature selection, and the development of two random forest regression models: one based solely on satellite-derived variables and another integrating both satellite and ecological features. Model performance was assessed using the coefficient of determination (R^2), Root Mean Square Error (RMSE), and Mean Absolute Error (MAE), and feature importance analysis was conducted to identify key predictors. The satellite-only model demonstrated moderate predictive performance with an R^2 of 0.3359, RMSE of 785.83, and MAE of 464.36, indicating limited explanatory power when relying on remote sensing data. In contrast, the integrated model showed improved performance compared with the satellite-only model, achieving an R^2 of 0.9942, RMSE of 73.66, and MAE of 38.89. The enhancement in predictive accuracy underscores the significant contribution of ecological variables, with soil carbon stock emerging as the most influential predictor of total carbon stock. Among the satellite-derived variables, spectral band B4 and radar backscatter (VH) exhibited moderate importance, suggesting that vegetation reflectance and structural characteristics play meaningful role in carbon estimation. Overall, the findings demonstrate that while satellite data provides valuable spatial information, its predictive effectiveness is enhanced when combined with ground-based ecological measurements. This study highlights importance of hybrid modelling approaches for ecosystem carbon estimation and offers a scalable framework for improving carbon stock assessment in mangrove forests. The results contribute to the advancement of remote sensing-based ecological modelling and monitoring of blue carbon ecosystems for climate change mitigation.

Keywords: carbon stock estimation, ecological modelling, machine learning, mangrove ecosystems, random forest regression

Evaluation of Antioxidant Activities and Phytochemicals of Edible *Kappaphycus alvarezii* Under Controlled Fermentation

M.A.N.F.Z. Shanfara[1]*, C.M. Peries[1], A.P. Henagamage[1], B.V.A.S.M. Bambaranda[2]

[1]*Department of Science and Technology, Uva Wellassa University, Badulla, 90000, Sri Lanka*
[2]*Department of Animal Science, Uva Wellassa University, Badulla, 90000, Sri Lanka*
**shanfarazaffnam01@gmail.com*

Edible seaweeds are sustainable sources of nutrients and bioactive compounds. Red algae, *Kappaphycus alvarezii,* commercially known for its high carrageenan content, possess significant antioxidant properties and a rich phytochemical profile, with potential applications in functional foods and nutraceuticals. Fermentation is a bioprocess that offers a promising approach to improve bioavailability and nutritional value. This study aims to evaluate the antioxidant capacity and phytochemical composition of *Kappaphycus alvarezii* under controlled fermentation to assess its potential for nutraceutical applications. Fresh seaweed samples were initially shade-dried under open-air conditions and subsequently fermented using a mixed probiotic culture of lactic acid bacteria for 24, 48, and 72 hours, while an unfermented sample served as the control. Ultrasonication-assisted extraction using ethanol, followed by freeze-drying, was employed to obtain the crude extract. Qualitative phytochemical screening was conducted for phenols, flavonoids, terpenoids, saponins, and quinones. The total phenolic content (TPC) and total flavonoid content (TFC) were quantitatively assessed. Qualitative phytochemical screening revealed that there was the presence of flavonoids and phenols in all samples. Antioxidant activity was evaluated using DPPH and ABTS assays. The pH of the medium decreased naturally during fermentation, and the pH difference during fermentation was significantly influenced by the fermentation time ($p<0.05$). Results of the ANOVA revealed that the fermentation time significantly affected the antioxidant activity, TPC, and TFC ($p<0.05$). Statistically, the 72-hour fermented sample exhibited the highest antioxidant activity for both DPPH (68.1%) and ABTS (73.5%) assays, which was greater than that of the unfermented sample (DPPH-63.9%, ABTS-73.2%). Meanwhile, TPC (103 mg GAE/100g) and TFC (25.08 mg QE/100g) peaked at 48 hours before declining, and were not greater than those of the unfermented sample. However, 24-hour fermentation time showed the lowest values for both DPPH and ABTS antioxidant activities, TPC, and TFC. Correlation analysis indicated a strong relationship between ABTS antioxidant activity and TFC, while DPPH antioxidant activity had no significant ($p<0.05$) relationship with either TPC or TFC. Consequently, the research findings revealed that the controlled lactic acid fermentation for more than 24 hours may enhance the antioxidant potential in *Kappaphycus alavrezii*.

Keywords: antioxidant activity, controlled fermentation, edible seaweed, *Kappaphycus alvarezii*, total phenolic content

Evaluation of Nutritional Profile and Antioxidant Activity of *Nymphaea nouchali* Seeds Grown in Sri Lanka

G.A.D.B.S. Dharmaprema[1], I.D. Weerarathna[1], R.W.M.M. Gunarathna[1], B.M.A.B. Basnayake[1], R. Liyanage[2], D.R. Uduwela[3,4], E.R.J. Samarakoon[1]*

[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Division of Nutritional Biochemistry, National Institute of Fundamental Studies, Hantana Road, Kandy, 20000, Sri Lanka*
[3]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Chemistry, Faculty of Science, University of Colombo, Colombo, 00300, Sri Lanka*
**rasanjalis@agri.pdn.ac.lk*

Nymphaea nouchali is an underutilised aquatic plant with promising nutritional and functional attributes; however, its physicochemical composition and bioactive potential remain poorly characterised, limiting its utilization as a functional food ingredient. This study evaluated the proximate composition, mineral profile, and bioactive properties of *N. nouchali* seeds. Seeds were collected at peak maturity from natural aquatic habitats in Kurunegala District, Sri Lanka. Seeds were washed, sun-dried to 10–12% moisture content (wet basis), milled, and sieved through a 150 µm mesh. Proximate composition was determined using AOAC methods, vitamin C by DCPIP titration, and minerals by ICP-MS. Bioactive compounds were extracted at 1:10 (w/v) with ethanol, methanol, water, hexane, and dichloromethane, followed by 30 min of sonication, 20 min of shaking, and centrifugation at 6000 rpm for 10 min. Total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activities (DPPH, ABTS, and FRAP) were evaluated. Data were analysed using one-way ANOVA and Tukey's test ($p<0.05$). The results indicated that *N. nouchali* seeds contained moisture (11.41 ± 0.07%), ash (2.35 ± 0.07%), fat (1.37 ± 0.11%), carbohydrates (48.80%), crude protein (20.24 ± 0.54%), and crude fibre (15.83 ± 0.95%), with comparatively higher protein and fibre contents than conventional cereals such as rice, wheat, and maize. The seeds also contained 5.30 ± 0.15 mg/100 g of vitamin C, which was superior. Potassium (2767.30 mg/kg), sodium (1254.01 mg/kg), magnesium (1194.41 mg/kg), and calcium (1056.99 mg/kg) were the predominant minerals, with calcium and sodium contents exceeding those reported for most conventional cereals. Among the extraction solvents, ethanol yielded the highest bioactive activity, producing the highest ($p<0.05$) TPC (22.26 ± 0.85 mg GAE/g DW) and TFC (36.90 ± 5.48 mg CAE/g DW), together with the strongest ($p<0.05$) antioxidant capacities (DPPH: 492.62 ± 1.54 mM TE/g DW; ABTS: 1022.64 ± 12.58 µM TE/g DW; FRAP: 44.48 ± 3.47 µM Fe^{2+}/g DW), whereas aqueous extracts exhibited moderate activity. Overall, these findings show that *N. nouchali* seeds have favourable nutritional and bioactive properties, suggesting potential as a functional food ingredient. However, further studies on product development, bioavailability, and *in vivo* efficacy are needed to confirm their practical application.

Keywords: underutilized aquatic plant, nutritional profiling, bioactive compounds, functional food applications

Acknowledgement: *The authors acknowledge the University Research Council (URC), University of Peradeniya, for financial support provided through the Multidisciplinary Research Grant 2025 (MRG No. 29).*

Evaluation of the FAMACHA© System for Use in Goat Production Systems in Sri Lanka

I.P. Nambuge[1], W.S.N. Gunawardana[2], H.M.H.J. De Silva[1], N.M.T. Anupama[1]. R.P.V.J. Rajapakse[1], D.S. Thilakarathne[1]*

[1]*Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Melbourne Veterinary School, Faculty of Science, University of Melbourne, Victoria, 3010, Australia*
**dsamanthikat@gmail.com*

Goat farming is increasingly popular in Sri Lanka. Farmers deworm goats to control gastrointestinal parasites; however, anthelmintic misuse may contribute to resistance development. Targeted selective treatment (TST) can reduce selection pressure for resistance, and the FAMACHA© system is used for TST globally. Its suitability, however, under local conditions remains unclear. This study aimed to assess the applicability of the FAMACHA© system for goats in Sri Lanka. A cross-sectional study was conducted using 100 goats from nine selected districts representing the dry, intermediate, and wet zones of Sri Lanka. FAMACHA© scores (1–5, ranging from red, healthy mucous membranes to pale, severe anaemia), body condition scores, faecal egg counts per gram of faeces (EPG) and blood parameters, including packed cell volume (PCV%), haemoglobin concentration (Hb g/dL), red blood cell count (RBC), white blood cell count (WBC) and total protein level (g/dL) were recorded. Spearman's rank correlation analysis was performed using Minitab software to assess the relationships between FAMACHA© scores and haematological, biochemical, and parasitological parameters. FAMACHA© scores showed significant negative correlations with PCV ($r = -0.526$, $p < 0.001$), Hb ($r = -0.521$, $p < 0.001$), and RBC ($r = -0.484$, $p < 0.001$). Positive correlations were observed between FAMACHA© scores and EPG ($r = 0.408$, $p < 0.001$) and total protein levels ($r = 0.146$, $p = 0.148$). However, correlations with BCS ($r = -0.158$, $p = 0.117$) and WBC ($r = 0.024$, $p = 0.815$) were not significant. Significant associations with PCV, Hb, RBC, and EPG indicate the potential applicability of FAMACHA© as a TST aid in Sri Lankan goat production systems, although potential confounders such as nutrition, breed, and concurrent infections should be considered. Further evaluation with larger, seasonal studies and diagnostic performance assessment is recommended.

Keywords: goats, FAMACHA©, haematology, faecal-egg-counts

Acknowledgement: *Research grant IAEA CRP 26954.*

Evaluation of the Knowledge and Adoption Level of Biosecurity Practices among Small and Medium Scale Poultry Farmers in Kandy District of Sri Lanka

N.M. Hettipathirana[1]*, H.M.R.P. Bandara[2], L. Udayanga[1]

[1]*Department of Biosystems Engineering, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, 60170, Sri Lanka.*
[2]*Kelun Lifesciences PVT Ltd., Industrial Park-BOI Zone, Pallekale, 20168, Sri Lanka.*
**udayanga@wyb.ac.lk*

No Show Abstract

Biosecurity practices play a pivotal role in controlling disease outbreaks and ensuring productivity in poultry farming systems. However, the adoption level of biosecurity practices remains highly limited among poultry farmers in Sri Lanka. Therefore, this study was conducted to evaluate the knowledge, attitudes and adoption level of biosecurity practices among small and medium scale poultry farmers in Kandy district of Sri Lanka, while characterizing key driving factors influencing the adoption of biosecurity measures. A total of 273 poultry farmers in Kandy district were recruited based on stratified random sampling approach. A structured interviewer-administered questionnaire was used to collect data on socio-demographic characteristics, poultry farming background, structural and operational biosecurity practices, along with knowledge and attitudes on biosecurity practices. Descriptive statistics and Chi-square test of association were used for data analysis. The majority of the respondents were males (95.0%), between 36-50 years of age (48.7%). Around 52.4% of poultry farmers were rearing 200 to 500 birds, followed by 33.4% rearing less than 100 birds. Meanwhile, 55.7% of farmers were receiving more than Rs. 50,000 as their monthly income. A higher fraction of respondents had completed Ordinary Level Examinations (48.7%) as their highest educational qualification. Backyard (50.9%) and semi-intensive systems (49.1%), emerged as the dominant farming systems. The most common poultry type raised were layers (39.9%), followed by broilers (34.4%). Around 64.1% of poultry farmers had a higher knowledge on biosecurity practices, while 90.8% were characterized with highly positive attitudes towards biosecurity practices. Despite the higher knowledge level, most of the poultry farmers denoted a poor adoption level of both operational (94.9%) and structural (63.0%) biosecurity practices. Income level, ownership status, previous trainings and the number of workers emerged as the significant driving factors ($p<0.05$) for adoption of operational biosecurity practices. Meanwhile, adoption level of structural biosecurity practices was significantly influenced by the education level, income, farming system, poultry type and ownership status ($p<0.05$). The findings of this study highlight the importance of strengthening the veterinary extension services, institutional support and capacity building, while enabling micro finance facilities to promote compliance of biosecurity practices among small and medium scale poultry farmers in Kandy district.

Keywords: biosecurity practices, poultry farming, knowledge, driving factors, Sri Lanka

Gene Cassettes of Class 1 Integrons and Antimicrobial Resistance Profiles of Multidrug-Resistant *Aeromonas veronii* and *Aeromonas hydrophila* Isolated from Municipal Tap Water in the Central Province of Sri Lanka

Y.P. Thuduwage, R.M.P.A. Bandara, S.S.S.de S. Jagoda*

Centre for Aquatic Animal Disease Diagnosis and Research, Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**samanthika@vet.pdn.ac.lk*

No Show Abstract

Class 1 integrons are genetic elements that capture, integrate, and express gene cassettes, many of which encode antimicrobial resistance (AMR). *Aeromonas* species are emerging waterborne pathogens that cause infections in humans, such as acute gastroenteritis and severe septicaemia. This study aimed to detect gene cassettes associated with class 1 integrons and to assess antimicrobial resistance in multidrug-resistant (MDR) *Aeromonas* spp. isolates from municipal tap water in Central Province, Sri Lanka. The study was conducted from December 2024 to February 2026. A total of 38 treated water samples from Nuwara Eliya and 36 from Kandy were aseptically collected, centrifuged, enriched, and cultured on glutamate starch phenol red (GSP) agar. Colonies were characterized using Gram staining and biochemical tests, with genus-level confirmation by PCR targeting the 16S rRNA gene. Antimicrobial resistance patterns were determined using the disc diffusion method against seven antibiotics: ampicillin (10 µg), tetracycline (30 µg), gentamicin (10 µg), imipenem (10 µg), ciprofloxacin (5 µg), ceftazidime (30 µg), and aztreonam (30 µg). Species-level identification of MDR isolates was confirmed by Sanger sequencing. Class 1 integrons and gene cassettes were detected in MDR *Aeromonas* isolates using separate PCR assays. Sanger sequencing of MDR isolates from Nuwara Eliya identified three *A. veronii*, one *A. hydrophila*, and one *A. jandaei* (5/38 samples). One *A. veronii* isolate and the *A. jandaei* isolate exhibited resistance to all tested antibiotics. Additionally, two *A. veronii* isolates were susceptible only to imipenem and aztreonam. The *A. hydrophila* isolate was susceptible to ceftazidime and imipenem. All three *A. veronii* isolates carried class 1 integrons, and two also harboured gene cassettes. From Kandy, one *A. hydrophila* and one *A. veronii* isolate were obtained (2/36 samples), and both were resistant to all tested antibiotics. The *A. hydrophila* isolate harboured class 1 integrons and associated gene cassettes. Our results show a high prevalence of class 1 integrons and gene cassettes in MDR *Aeromonas hydrophila* and *A. veronii* isolated from municipal tap water in the Central Province, highlighting persistence of MDR *Aeromonas* in treated water and potential public health risks. Further studies should sequence gene cassettes and expand antimicrobial resistance profiling more comprehensively.

Keywords: Class 1 integrons, gene cassettes, multidrug resistance, *Aeromonas*, public health

High Occurrence of Extended Spectrum β-lactamase Producing and Carbapenem Resistant *Escherichia coli* Among Free Roaming Dogs in Sri Lanka

R. Prasanya, D.R.A. Dissanayake*, K.A.V. Manaram, H.M.T.G. Alagalla, K.K.V. Fernando, W.A.P.M. Dewasmika

Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**anuruddhika@vet.pdn.ac.lk*

Antimicrobial resistance (AMR) has emerged as a major global public health concern due to the increasing resistance to critically important antimicrobials, including third generation cephalosporins and carbapenems. Dogs, often overlooked within the One Health framework, may act as reservoirs and disseminators of antimicrobial resistant bacteria because of their close association with humans. Free-roaming dogs may additionally serve as sentinel animals reflecting environmental dissemination of antimicrobial resistant bacteria. This study investigated the occurrence and antimicrobial resistance profiles of extended spectrum β-lactamase (ESBL) producing and carbapenem resistant *Escherichia coli* isolated from clinical and carriage samples of dogs in Sri Lanka. A total of 252 samples were collected between April 2025 and January 2026 from clinically affected dogs presented to the Veterinary Teaching Hospital, Peradeniya, and apparently healthy free-roaming dogs from six geographical locations. The locations were conveniently selected and included Bandarawela, Kataragama, Vavuniya, Puttalam, Kandy, and Sigiriya. Urine, pus, nasal swabs, and faecal samples were collected and isolation was performed on MacConkey agar supplemented with cefotaxime or meropenem. Presumptive isolates were sub-cultured on *E. coli* chromogenic medium and subjected to standard biochemical tests, and PCR to confirm as *E. coli*. Double Disk Synergy test and modified Hodge tests were used to confirm phenotypic ESBL and carbapenemase production, respectively**.** Antimicrobial susceptibility testing for ciprofloxacin, gentamicin, cefotaxime, ceftazidime, and meropenem was performed by Kerby–Bauer disk diffusion method according to EUCAST 2025 guidelines. Among 212 non-duplicate *E. coli* isolates recovered, 90 originated from clinically affected client-owned dogs and 122 from free-roaming dogs. Cefotaxime resistance was detected in 30.3% (37/122) of isolates from free-roaming dogs and 7.8% (7/90) of client-owned dogs. Similarly, meropenem resistance was observed in 22.1% (27/122) and 2.2% (2/90) of isolates, respectively, with both differences being statistically significant ($p < 0.001$). Phenotypic tests confirmed 24 isolates (free-roaming = 20, client-owned = 4) as ESBL producers and 18 isolates as carbapenemase producers (free-roaming = 18). Those isolates were mostly from relatively warmer regions such as Kataragama and Vavuniya. Multidrug resistance was identified in 15.2% of third-generation cephalosporin and/or carbapenem-resistant isolates, all originating from free-roaming dogs. Gentamicin retained comparatively greater activity against resistant isolates. These findings confirm the high occurrence of beta lactam resistance in *E. coli* isolated from free-roaming dogs in Sri Lanka. The high resistant rates observed in free-roaming dogs may reflect environmental contamination and dissemination of resistant bacteria, highlighting their potential role as sentinel indicators of environmental AMR within the One Health framework.

Keywords: *E. coli*, ESBL, carbapenems, dogs, free-roaming

Acknowledgement: *University Research Grant NRPL/2024/01/v is acknowledged.*

Human-Monkey Conflict in Contrasting Landscapes: A Questionnaire-Based Comparison Between a Managed Horticultural Estate and a Rural Village in Dambewatana, Sri Lanka

T.D.D. Heshan[1], A. Dangolla[1]*, K.B. Ranawana[2], H.E.M.K. Bandaranayake[1], B.G.S.S. Gamage[1]

[1]*Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**adangolla@gmail.com*

Human–wildlife conflict is increasing across several districts in Sri Lanka, creating an urgent need for effective and socially acceptable mitigation strategies. The endemic Toque Macaque (*Macaca sinica*), also known as Toque Monkey, is a major contributor to this conflict, particularly in human-dominated landscapes outside protected areas, where its population size remains uncertain. There have been many scientific approaches to mitigate the issue from diverse perspectives; however, they have often resulted in fragmented solutions that are difficult to implement without strong community participation and political support. Public perception, shaped by daily exposure and livelihood activities, plays a critical role in designing practical interventions. This study aimed to determine whether perceptions and damage patterns differ significantly between managed and traditional agricultural landscapes in Dambewatana, Sri Lanka. Data were collected using a structured questionnaire administered to 119 respondents selected through a convenience sampling method, including villagers (n = 62) and workers of the Ellawala Horticulture Farm (n = 57). The questionnaire comprised 45 items covering socio-demographic characteristics, frequency and types of monkey encounters, crop and property damage, seasonal variation, and mitigation strategies, and data were analysed using IBM SPSS software. A significantly higher proportion of villagers (91.9%) perceived increased human settlement expansion compared to workers (80.7%; $p = 0.024$), whereas workers more frequently reported forest encroachment by workers (56.1%) than villagers (9.7%; $p < 0.001$). Awareness of human–monkey conflict was significantly lower among villagers (3.2%) compared to workers (22.8%; $p = 0.002$). All villagers (100%) reported combined damage to multiple resources, while workers identified specific categories such as paddy, vegetables, and fruits. Villagers predominantly expressed helplessness (53.2%), whereas workers reported experiencing multiple concurrent impacts. Although no significant difference was observed in suggested mitigation measures, both groups strongly supported systematic population control (villagers 93.5%, workers 86%) and expressed willingness to participate in management efforts (villagers 98.6%, workers 86%). In conclusion, human–monkey conflict in Dambewatana is strongly influenced by socio-ecological context and awareness levels, and the high level of community support provides a strong foundation for implementing sustainable, education, and habitat management.

Keywords: community perception, human–monkey conflict, population control, Sri Lanka, toque macaque

Acknowledgement: *Financial assistance from the Sri Lanka Council for Agricultural Research Policy (Grant No. NARP/2025/UP/VS/01) is acknowledged.*

In-situ Morphological Characterization of a Collection of Coffee (*Coffea* spp.) Germplasm Grown in Home Gardens in Sri Lanka

J.A.J.P. Jayasooriya, R.M.S.D.L. Abeyrathne, K.I.S. Thamali, S.A.C.N. Perera*

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**chandrikaperera@agri.pdn.ac.lk*

Coffee is a popular beverage crop worldwide. Yet, Sri Lanka occupies a very low position in the global coffee trade despite its huge potential for coffee cultivation. One of the main reasons for this drawback is the lack of suitable cultivars to meet the current market demands. Assessing the genetic variation in existing breeding populations is highly important for selection and variety development. This research aimed to determine morphological variation in cultivated coffee plants collected in the Kandy, Kegalle, Kurunegala, Matale, Galle, Nuwara Eliya and Gampaha districts. The current study was exploratory research consisting of 117 randomly selected coffee plants. Morphological traits were scored following the International Plant Genetic Resources Institute (IPGRI) descriptor manual for 23 qualitative and 19 quantitative traits. Descriptive statistics were derived for the traits scored using Minitab (Version 19) statistical software. Quantitative trait-based principal component (PC) and cluster analyses were performed using Minitab statistical software and a dendrogram was derived based on the complete linkage method and Euclidean distances. Of the studied qualitative characters, leaf petiole colour, leaf blade colour, plant habit, and anther position were monomorphic across the study panel. The first, second, and third PCs accounted cumulatively for 39.5%, 50.4%, and 57.9% of the total variation. Variation in the first PC was dominated by fruit fresh weight. The dendrogram revealed a total of six clusters indicating considerable variations among the cultivated coffee germplasm in Sri Lanka. The revealed diversity among the coffee genotypes in both quantitative and qualitative traits can be utilized successfully in coffee crop improvement by providing scientific information for germplasm conservation, parental selection and cultivar development in coffee breeding.

Keywords: cluster analysis, dendrogram, morphological characterization, principal component analysis

Acknowledgement: *This work was supported by the Multidisciplinary Research Grant (MRG 383), for which we are sincerely grateful.*

In Vitro Evaluation of Antagonistic Potential of Native *Trichoderma asperellum* Against *Colletotrichum lindemuthianum* Causing Anthracnose in Common Bean

N.M.S.D. Nawarathna[1]*, M.L.M.C. Dissanayake[2]

[1]*Faculty of Graduate Studies, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
[2]*Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
**nawarathnasandunika19@gmail.com*

Common bean (*Phaseolus vulgaris* L.) is a vital legume produced in Sri Lanka, serving as a primary dietary protein. Bean anthracnose is a devastating, seed-borne disease which can lead to yield losses up to 100% under favorable humid conditions. Excessive use of synthetic fungicides has led to environmental and health hazards. Consequently, there is an urgent need for bio-control agents as eco-friendly and sustainable alternatives. This study aimed to evaluate the antagonistic potential of locally isolated *Trichoderma asperellum* SE12 against bean anthracnose under *in vitro* conditions. Infected bean pods were collected from farmlands in Haputale area through stratified random sampling. Nine fungal isolates and three bacterial isolates were obtained from infected bean pods. Two potentially pathogenic fungal isolates (BA3 and BA7) were identified by using morphological characteristics and pathogenicity was confirmed by Koch's postulates. The identity of locally isolated antagonistic fungus was molecularly confirmed as *T. asperellum* SE12 (Genbank Accession number – PX482175). The antagonistic fungal isolate was tested against BA3 and BA7 using dual culture assays on Potato Dextrose Agar (PDA) in a completely randomized design with nine replicates at 25°C for seven days along with control samples, and data were analysed using one-way analysis of variance (ANOVA) followed by Tukey's HSD test at $p<0.05$. Both BA3 and BA7 isolates were morphologically identified as *Colletotrichum lindemuthianum*, characterized by hyaline to pale brown mycelium, cylindrical conidia with obtuse ends and oil globules, saucer-like acervuli, septated setae, and appressoria structures. The conidia were measured 12.16 - 21.87 × 4.06 - 5.85 µm (av. 16.38 × 5.02 µm) on PDA. The initially whitish colony colour turned to dark grey with the maturity of the pathogen on PDA. Dual culture assays demonstrated that *T. asperellum* SE12 significantly ($p<0.0001$) inhibited the growth of *C. lindemuthianum* with a mean mycelial growth inhibition percentage of 81.83 ± 0.37% on PDA. Mycoparasitism was evident through microscopically observed hyphal coiling. The results conclude the *in vitro* antagonistic efficacy of native *T. asperellum* SE12 against *C. lindemuthianum*. Further validation in greenhouse and field trials is ongoing to assess its potential for the development and commercialization as a bio fungicide.

Keywords: antagonism, bean, bio fungicide, *Colletotrichum lindemuthianum*, *Trichoderma asperellum*

Isolation and Preliminary Characterization of Phosphate-Solubilizing Rhizobacteria Associated with *Annona muricata* and *Phyllanthus emblica* Rhizospheres in North Central Province of Sri Lanka

H.W.W.M.U.S. Thalgodapitiya*, L.H.M.T. Bandara, M.M.K. Bandara, R.G.P.T. Jayasooriya

Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale, 50300, Sri Lanka
**supipithalgodapitiya1997@gmail.com*

The excessive and prolonged application of chemical fertilizers has led to significant deterioration of soil health, compromised environmental sustainability, and reduced long-term agricultural productivity, thereby driving the increasing demand for environmentally friendly nutrient management strategies. Among essential macronutrients, phosphorus is frequently a limiting factor for plant growth due to its low bioavailability in soil caused by fixation and immobilization processes. Phosphate-solubilizing rhizobacteria (PSRB) play a crucial role in enhancing phosphorus availability by solubilizing inorganic phosphates and mineralizing organic phosphorus compounds, thereby promoting plant growth and soil fertility. This study aimed to isolate and preliminarily characterize native PSRB associated with underutilized fruit crops in the North Central Province of Sri Lanka. Rhizospheric soil samples were collected from the active root zone (0-15 cm) of healthy soursop (*Annona muricata)* and amla (*Phyllanthus emblica)* plants at eight locations, including five sites in Anuradhapura district and three sites in Polonnaruwa district, where crops exhibited vigorous growth under minimal external fertilizer inputs. Isolation was performed on Pikovskaya medium, and distinct colonies with clear halo zones indicative of phosphate solubilization were selected and purified by repeated subculturing. Morphological and biochemical characterization was conducted for preliminary characterization. Genomic DNA was extracted from all isolates, followed by amplification of the 16S rRNA gene to confirm bacterial DNA. Functional gene analysis was performed using PCR targeting the *phoD* gene, which encodes alkaline phosphatase responsible for the mineralization of organic phosphorus into plant-available forms. A total of eight distinct phosphate-solubilizing bacterial isolates were obtained. All isolates successfully amplified the 16S rRNA gene (~1500 bp), confirming their bacterial identity, while positive amplification of the phoD gene (~400 bp) indicated their genetic potential for organic phosphorus mineralization. These findings highlight the significant potential of native rhizobacterial strains associated with underexplored rhizosphere niches of underutilized fruit crops to enhance phosphorus bioavailability and soil fertility. The consistent detection of the *phoD* gene across all isolates highlights their functional capability in organic phosphorus mineralization. Therefore, these isolates represent promising candidates for the development of locally adapted microbial biofertilizer formulations, contributing to sustainable nutrient management and environmentally resilient agricultural systems in Sri Lanka.

Keywords: phosphate-solubilizing bacteria, phosphorus bioavailability, rhizosphere soil, sustainable agriculture

Acknowledgement: *This research was supported by the Science and Technology Human Resource Development Project, Ministry of Higher Education, Sri Lanka, funded by the Asian Development Bank (STHRD/CRG/R2RJ4).*

Leveraging Voluntary Food Standards to Enhance Export Competitiveness: Evidence from Sri Lanka's Coconut-Based Processed Food Industry

S.P.S. Senarathna[1], B.E.P. Mendis[1]*, M. De Alwis[2], M.A.S. Swarnamali[3]

[1]*Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*MA's Tropical Food Processing (Pvt) Ltd, Colombo, 00800, Sri Lanka*
[3]*Coconut Development Authority, Colombo, 00500, Sri Lanka*
**ereshamendis@agri.pdn.ac.lk*

The expansion of global food trade has heightened the importance of Voluntary Food Standards (VFS) in ensuring food quality, safety, and international market access. Although Sri Lanka possesses a strong coconut resource base and established processing capacity, its coconut-based processed food industry continues to demonstrate underutilized export potential, partly due to limited alignment with evolving buyer requirements and market-specific certification expectations. This study examines how VFS can be leveraged to enhance export competitiveness in Sri Lanka's coconut-based processed food industry. Export competitiveness is defined as the ability of firms to access, maintain, and expand their presence in international markets through compliance with buyer requirements, product differentiation, strengthened buyer confidence, and improved market positioning. The study provides sector-specific evidence on how exporters apply food standards across different destination markets. A qualitative research design was employed to generate in-depth insights into certification practices, buyer expectations, and market-specific requirements. Primary data were collected through purposive sampling from 34 direct exporters and 25 industry experts representing the coconut-based processed food sector. Structured questionnaires, semi-structured interviews, and focus group discussions were used to gather data. The study considered major export destinations, including the United States, European Union, Middle East, Canada, India, and Australia. Thematic analysis was applied to identify recurring patterns relating to certification adoption, export strategies, and competitiveness. The findings indicate that VFS play a central role in facilitating access to high-value markets, supporting product differentiation, and strengthening buyer confidence. All surveyed exporters held ISO 22000 certification, while 93% also possessed organic certification, reflecting a strong industry commitment to food safety and sustainability-related standards. However, the strategic use of VFS varied across firms. High certification costs, infrastructure limitations, and gaps in technical expertise constrained the ability of some exporters to fully capitalize on certification benefits. The study concludes that VFS extend beyond compliance requirements and function as strategic instruments for unlocking Sri Lanka's underutilized export potential in coconut-based processed foods. Strengthening institutional support, improving technical capacity, and reducing financial barriers to certification adoption will be essential to enable broader participation and enhance the global competitiveness of the sector.

Keywords: voluntary food standards, export competitiveness, market access, certification adoption, coconut-based processed foods

Mangrove Conservation in Coastal Jaffna: Evidence from a Household Willingness to Pay Study

S. Yasintha*, S.N. Dissanayake

Department of Agricultural Economics and Business Management, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka.
**yasinthas@agri.pdn.ac.lk*

Mangrove ecosystems provide important ecological and socio-economic services, including coastal protection, biodiversity conservation, climate regulation, fisheries support, recreation and carbon sequestration. The *Sarasalai* mangroves are among the important coastal mangrove ecosystems in Jaffna, supporting environmental stability and local livelihoods. However, increasing anthropogenic pressures and fragmented land ownership threaten their effective conservation and long-term sustainability. This study attempted to estimate households' Willingness to Pay (WTP) for mangrove conservation, identify the socio-economic and institutional factors influencing WTP, and assess community perceptions regarding mangrove ecosystem services and conservation responsibility to support sustainable and community-based mangrove management strategies in *Sarasalai*, Jaffna. The study employed the Contingent Valuation Method (CVM) using a payment card approach with six bid amounts (0, 500, 1000, 1500, 2000 and 2500) and a 'don't know' response option, determined on a pre-test findings and socio-economic conditions in the study area. Primary data were collected from 100 randomly selected households through a pre-tested structured questionnaire and key informant interviews. An interval regression model was applied to estimate the mean WTP and to analyse the determinants influencing households' willingness to contribute toward mangrove conservation. The findings revealed that the estimated mean annual WTP for mangrove conservation was LKR 1,185 per household (95% CI: LKR 1,021–1,350). Environmental awareness emerged as the most influential determinant, increasing WTP by approximately 228%, indicating the strong influence of knowledge and understanding of ecosystem services on conservation attitudes. Higher income households and respondents employed in private sector demonstrated significantly higher WTP, suggesting greater financial capacity and stronger support for conservation. Conversely, respondents who perceived mangrove conservation as solely the government's responsibility showed approximately 67% lower WTP, suggesting reduced community participation when conservation responsibility is externally assigned. Respondents with secondary education exhibited relatively lower WTP compared to those with primary education, warranting further investigation of education-related influences on conservation behaviour. The study highlights the importance of environmental awareness, community participation and shared responsibility in strengthening sustainable mangrove conservation. The findings provide valuable insights for policymakers and environmental institutions in developing participatory conservation strategies, awareness programs and locally managed conservation funding mechanisms for the long-term protection of mangrove ecosystems in coastal Jaffna.

Keywords: willingness to pay, contingent valuation method, payment card

Morphological Evaluation of Selected Vegetative Traits of Sorghum (*Sorghum bicolor* (L.) Moench) Landraces in Sri Lanka

B.N.D. Bogahapitiya[1]*, M.J.M.S. Kurera[1], D.R. Gimhani[1], A.L.J. Bandara[2], V.H.B.S. Somasiri[3], U.G.D.S. Gunawardhana[1], P.G.S.C. Ariyarathne[1]

[1]*Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Gonawila, 60170, Sri Lanka*
[2]*Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Gonawila, 60170, Sri Lanka*
[3]*Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Gonawila, 60170, Sri Lanka*

Sorghum (*Sorghum bicolor* (L.) Moench) is an important cereal crop known for its adaptability to diverse environmental conditions and its potential in food and agricultural systems. In Sri Lanka, sorghum landraces are cultivated across different agro-ecological regions; however, their morphological variation remains insufficiently characterized. This study aimed to evaluate vegetative growth traits of selected sorghum landraces and compare them with the standard variety ICSV 112 to identify promising genotypes. Sorghum landraces were collected from Mahailuppallama (ICSV 112, Sweet Sorghum, Sorghum 8949, EF FOEHN), Kuliyapitiya (WUIL1aS_2601), Peradeniya (WUWM2bS_2601), Polonnaruwa (WUDL1cS_2601), and Jaffna (WUDL4S_2601, WUDL4S_2501). The experiment was conducted using a generalized augmented randomized complete block design (*ex situ* analysis). Morphological characterization was performed following ICRISAT descriptors. Quantitative traits such as plant height at four and six weeks after planting and basal tiller number were recorded, while qualitative traits including plant pigmentation were also observed. Quantitative data were analysed using analysis of variance (ANOVA) under a general linear model, and mean separation was performed using Fisher's Least Significant Difference (LSD) test at the 5% significance level, while qualitative traits were analysed using frequency distribution and hierarchical cluster analysis based on Gower distance and Ward's method. The results revealed significant differences ($P < 0.001$) among the sorghum varieties for plant height at both growth stages. WUIL1aS_2601 exhibited the greatest plant height, while the WUDL4S_2501 recorded the lowest plant height. Basal tiller numbers did not differ significantly, although some genotypes (WUWM2bS_2601, WUDL1cS_2601, WUDL4S_2501) produced relatively higher tiller numbers than ICSV 112, suggesting genetic variation that may be useful for future breeding studies. Cluster analysis grouped the nine varieties into three distinct clusters, confirming phenotypic diversity. Overall, WUIL1aS_2601 exhibited superior vegetative growth performance and warrants further evaluation under field conditions. The study highlights the potential of sorghum as a climate-resilient crop. These landraces may represent valuable genetic resources for future breeding programs targeting adaptation to drought-prone environments.

Keywords: basal tillers, cluster analysis, germplasm evaluation, morphological characterization, *Sorghum bicolor*

Occurrence of *Salmonella* spp. and *Escherichia coli* in Retail Broiler Chicken Manually Processed in Live Bird Handling Shops and Their Hygienic Practices Within Colombo Municipality – Preliminary Findings

A.P.V. Kavidya[1]*, P.A.U. Sewwandi[1], I.A. Perera[2], K. Thananjayan[1], Y.D. Gunasekara[3], A.W. Kalupahana[1], R.S. Kalupahana[1]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Municipal Veterinary Department, Colombo 10,0100, Sri Lanka*
[3]*University of Melbourne, Melbourne, 3010, Australia*
**venushikavidya0920@gmail.com*

Broiler chicken is widely consumed in Sri Lankan food culture, favoured over beef, mutton and pork due to its affordability, availability and cultural acceptance. Recent statistics indicate high popularity for chilled broiler chicken in the local market. However, limited data are available on the microbiological quality of such broiler meat manually processed and sold in live bird handling meat shops. Therefore, this study focused on evaluating the prevalence of two common food-borne pathogens in retail broiler chicken meat and assessing hygienic practices in live bird handling meat shops in public markets of Colombo Municipality. A descriptive cross-sectional study was conducted. Data were collected through direct observation, interviewer-administered questionnaires and assessment checklists. Hygienic parameters were evaluated related to the handling of live birds, meat, equipment, water supply, waste disposal and personal hygiene. To explore the microbiological quality of the meat, a 250 g meat sample was purchased from each outlet. The vendor's standard wrapping method was used to simulate consumer exposure during handling. *Escherichia coli* and *Salmonella* spp. were isolated from meat, utilizing standard protocols and PCR was performed to confirm the isolates which were identified through biochemical methods. The results revealed that, among 44 chicken meat samples collected from 27 stalls, the prevalence of *Salmonella* spp. was 57% (25/44) while the prevalence of *Escherichia coli* was 50% (22/44). According to the observational study, 74% (20/27) of stalls were found to be in poor hygienic status, and 22% (6/27) were found in moderate level. Several deficiencies were identified, including poor waste management, inadequate cleaning practices, lack of hand washing, unsuitable methods of keeping live birds with meat items, poor pest control and limited use of protective equipment by workers. Inadequate awareness regarding practices and irregular monitoring by authorities were also observed. This study highlights a high prevalence of zoonotic pathogens in retail poultry, indicating potential public health risks associated with the improper hygienic practices. However, further studies are needed to investigate the association between pathogen prevalence and specific hygienic practices in live bird handling meat shops to better understand the factors contributing to microbial contamination. Therefore, immediate interventions are required to enforce regulations, improve hygiene management and enhance awareness among vendors, ultimately reducing the risk of zoonotic disease transmission.

Keywords: food-borne pathogens, *Salmonella*, *Escherichia coli*, broiler chicken, live bird handling

One Health Insights into *Staphylococcus aureus* in Live Bird Handling Meat Shops of Colombo Municipality – Preliminary Findings

P.A.U. Sewwandi[1]*, I.A. Perera[2], Y.D. Gunasekara[3], U.P.R.U. Dissanayake[1], E.G.W. Gunawardena[4], K.S.A. Kottawatta[1], H.M.T.K. Karunarathna[1], L.V.C. Liyanapathirana[1], R.S. Kalupahana[1]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Municipal Veterinary Department, Colombo 10, 01000, Sri Lanka*
[3]*University of Melbourne, Melbourne, 3010, Australia*
[4]*China Sri Lanka Joint Research & Demonstration Centre for Water Technology, Peradeniya, 20400, Sri Lanka*
**p.a.udeshika90@gmail.com*

Live bird handling meat shops (wet markets) are high-density human–animal–environment interfaces that facilitate zoonotic pathogen transmission, highlighting the importance of a One Health approach. However, there is limited data from Sri Lanka on pathogen prevalence in such settings. *Staphylococcus aureus* colonizes humans and animals and can spread through direct contact, contaminated surfaces, and respiratory secretions. Its ability to acquire antimicrobial resistance, including methicillin resistance in *Staphylococcus aureus* (MRSA), makes it a significant public health concern with potential entry into the food chain. Therefore, this study aimed to determine the occurrence of *S. aureus* in chickens, workers, and environmental samples from selected public and private wet markets in the Colombo Municipality using a One Health approach. A total of 220 samples were collected from 38 wet markets, including 132 nasal swabs from slaughtered broiler chickens, 56 nasal swabs from chicken handlers and 32 environmental dust swabs (collected from air exhaust areas measuring 10 cm × 10 cm). In addition, 32 air samples were obtained using the settle plate method, in which mannitol salt agar plates were exposed at each sampling location for 10 minutes at a height of 5 ft. Isolation and identification of *S. aureus* were performed using standard microbiological techniques, including growth on Mannitol salt agar, Gram staining, catalase testing, slide and tube coagulase tests, and DNase testing. Isolates positive for all identification tests were considered *S. aureus*. The highest isolation rate was observed in handlers, 30% (17/56; detected across 14/32 locations), followed by chicken samples, 9.8% (13/132; detected across 11/38 locations). No *S. aureus* isolates were recovered from environmental dust samples (0/32) or air samples (0/32). Antibiotic susceptibility and molecular characterization of the isolates are pending. The detection of *S. aureus* in both humans and chickens suggests possible bidirectional transmission within wet market environments. Although environmental samples were negative, close human–animal interaction may facilitate bacterial spread. These findings highlight the need for stricter animal handling and market hygiene practices, improved worker education, and routine One Health surveillance to monitor and reduce the spread of pathogenic *S. aureus* in wet markets.

Keywords: *Staphylococcus aureus*, MRSA, wet markets, antimicrobial resistance, one health

Acknowledgement: *University Research Council Multidisciplinary Research Grant (No 21)2025, University of Peradeniya*.

Prevalence and Minimum Inhibitory Concentration Profiling of Amoxicillin-Resistant Bacteria in Coastal Waters of the Northern and Southern Provinces of Sri Lanka

U.B.K. Silva[1], J.A.G.V. Sewmi[2,3,4], G.Y. Liyanage[2,4], A.K.M.M.K. Meddage[2,3], P.A.A.S. Adhikari[2,3], P.M. Sadupama[2,5], P.M. Manage[2]*

[1]*Department of Biotechnology, Faculty of Life and Medical Sciences, BMS Campus, Colombo 06, 00600, Sri Lanka*
[2]*Centre for Water Quality and Algae Research, Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, 10250, Sri Lanka*
[3]*Faculty of Graduate Studies, University of Sri Jayewardenepura, Nugegoda, 10250, Sri Lanka*
[4]*Department of Aquatic Bioresources, Faculty of Urban and Aquatic Bioresources, University of Sri Jayewardenepura, Gangodawila, Nugegoda, 10250, Sri Lanka*
[5]*Teaching Hospital, Polonnaruwa, 51000, Sri Lanka*
**pathmalal@sjp.ac.lk*

Antimicrobial resistance (AMR) represents a severe and escalating threat to global public health, complicating the effective treatment of infectious diseases. Wastewater discharge, agricultural runoff, and aquaculture effluents introduce antibiotic residues and antibiotic-resistant bacteria (ARB), making coastal waters particularly vulnerable to contamination. In Sri Lanka's coastal waters, where such data is scarce, this study evaluated the prevalence and resistance profiles of bacteria resistant to amoxicillin (AMX). Water samples were collected in triplicate from eleven coastal sites: six in the Northern Province (Karaitivu, Anaikodai, Ponnalai, Dambakola Patuna, Point Pedro, and Dutch Fort-Jaffna) and five in the Southern Province (Polhena, Weligama, Koggala, Unawatuna, and Hikkaduwa). AMX-resistant bacteria were isolated using the standard pour plate method on nutrient agar supplemented with 60 µg mL^{-1} AMX. Minimum inhibitory concentrations (MICs) were determined via agar dilution following Clinical and Laboratory Standards Institute (CLSI) guidelines. Total viable counts were higher in the southern sites (5.07×10^4 - 6.75×10^4 CFU mL^{-1}) than in the northern sites (1.21×10^4 - 1.53×10^4 CFU mL^{-1}; $p<0.001$), with the highest count observed at Hikkaduwa. Similarly, AMX-resistant bacteria were more prevalent in the south (2.03×10^4 - 4.94×10^4 CFU mL^{-1}) compared to the north (3.13×10^3–1.11×10^4 CFU mL^{-1}; $p<0.001$). Among 40 distinct isolates, high-level resistance (>360 µg mL^{-1}) was heavily prevalent, particularly in the Northern Province (95.83%) compared to the Southern Province (75.0%). While the remaining northern isolates (4.17%) displayed only low-level resistance at 60 – 120 µg mL^{-1}, southern isolates exhibited a broader spectrum of resistance profiles, showing MIC values of 6.25% at 60–120 µg mL^{-1}, 12.5% at 180 – 240 µg mL^{-1}, and 6.25% at 240–360 µg mL^{-1}. These findings reveal a complex geographic disparity in AMX resistance; while the southern coastal region demonstrates a higher overall prevalence of AMX-resistant bacteria at 60 µg mL^{-1}, the northern coastal region is identified as a significant hotspot for high-level resistance. To mitigate this spread, it is crucial to strengthen local antibiotic stewardship and upgrade wastewater treatment infrastructure across both provinces. Furthermore, it is highly recommended that subsequent research incorporate molecular techniques to map antibiotic resistance genes (ARGs) and expand the geographical scope to understand the ecological impact of AMR.

Keywords: amoxicillin resistance, Antimicrobial Resistance (AMR), environmental surveillance, coastal pollution, northern province

Role of AWD in Compensating the Climate-Induced Paddy Productivity Losses in Sri Lanka

E.M.N. Manjula[1]*, S. Dissanayake[1,2], J. Weerahewa[1,2]

[1]*Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Agricultural Economics & Business Management, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**nayoeka@agri.pdn.ac.lk*

Climate change has become a significant challenge to agriculture, particularly in paddy cultivation which depends on monsoon rainfall during *Yala* and *Maha* cropping seasons. Therefore, the "Alternate Wetting and Drying" (AWD) method was introduced as a climate smart agricultural practice (CSA) which conserves water, reduces greenhouse gas emissions and maintains yield. However, limited attention has been given to understanding the economy-wide implications of AWD adoption under climate change. Therefore, this study evaluates the economy-wide effects of climate change and AWD-induced paddy productivity changes and the extent to which AWD can compensate for the climate change-induced losses in Sri Lanka by 2050. The standard GTAP 11 model was employed using the 2017 database as the reference year. A 2050 baseline was constructed by incorporating SSP5 projections for population, GDP, labour force, and capital stock. Literature-based estimates indicate that under the RCP8.5 scenario there is a 3.16% decline in paddy productivity by 2050, while global meta-analysis found a yield improvement by 1.52% with AWD adoption. These climate change and AWD-induced shocks were introduced as an output-augmenting productivity shock to the paddy sector, while changes in labour, capital, land use, production and trade were determined endogenously within the GTAP framework. Current AWD adoption was assumed to be 12%, while the full adoption scenario assumed AWD implementation across irrigated paddy areas in the dry and intermediate zones of Sri Lanka. Based on the findings, climate change has adverse effects on GDP, paddy output, prices, factor payments, trade and welfare while AWD adoption has positive effects on them. Further, AWD was able to partially compensate climate change induced losses. When a full AWD adoption rate is assumed, it can offset an additional climate change induced GDP loss by 26.23%, output loss by 26.43%, factor payment increase by 25 - 26.5 %, price increase by 26.46%, exports decrease by 27.5%, import increase by 26.86%, and welfare loss by 26.52% compared to the current AWD rate. Therefore, AWD shows strong potential as a CSA strategy to reduce climate change induced effects in Sri Lanka and it is worthy to promote it to its full capacity.

Keywords: CSA, AWD, climate change, paddy productivity, economy-wide effects

Acknowledgement: *This research was supported by the Association of Asian Social Science Research Councils (AASSREC) Research Grant.*

No Show Abstract

Role of Macrofauna in Farm-Level Prevalence of *Enterocytozoon hepatopenaei* (EHP) in Shrimp Aquaculture Systems in North Western Province of Sri Lanka

K.K.P.R.B. Adhikaram[1], H.A.R.W. Kotuwegedara[1], A.W. Kalupahana[2], T.A. Gunawardana[2], N.M.T. Anupama[2]*, S.S.S. de S. Jagoda[1]

[1]Centre for Aquatic Animal Disease Diagnosis and Research, Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**thilinianupama@vet.pdn.ac.lk*

Enterocytozoon hepatopenaei (EHP) is the most significant microsporidian pathogen infecting *Litopenaeus vannamei*, causing hepatopancreatic microsporidiosis (HPM) disease. EHP causes significant economic losses in shrimp aquaculture worldwide. This pathogen was first reported in 2022 in the Puttalam District, North Western Province of Sri Lanka. Farm-level macrofaunal communities are considered to play a major role in disease transmission. Various macrofaunal groups, including crabs, molluscs, fish, and insects, are commonly associated with shrimp farming environments and natural aquatic ecosystems. This study aimed to investigate the association between macrofaunal communities and EHP prevalence across shrimp farms in the North Western Province of Sri Lanka. A total of 55 shrimp farms in the North Western Province were surveyed, and 158 macrofaunal samples were collected based on accessibility, comprising fish, molluscs, crabs, and aquatic insects. Species identification was conducted based on morphological characteristics. Organs from potential macrofaunal carriers were collected according to sample type, as follows: crabs (hepatopancreas, stomach, and gills); fish (gills); molluscs (gills and stomach); and insects (whole body). Organs were collected and pooled from five samples per farm. Detection of EHP was performed using nested polymerase chain reaction (PCR) targeting the spore wall protein (SWP) gene. The dominant macrofaunal species identified included *Glossogobius giuris* (n=32), *Perisesarma bidens* (n=54), *Oreochromis niloticus* (n=6), *Cerithidea cingulata* (n=18), *Gerris spp.* (n=12), *Euphausiacea spp.* (n=31), and *Turritella spp.* (n=5). Three species each of Arthropoda, Chordata, and Mollusca were identified based on morphological characters. All samples tested positive by nested PCR using the SWP primers. EHP was detected across multiple macrofaunal groups, with the highest prevalence observed in *Glossogobius giuris* (68.75%; 22/32), followed by *Perisesarma bidens* (59.26%; 32/54), *Gerris* spp. (58.33%; 7/12), and *Cerithidea cingulata* (50.00%; 9/18). EHP was not detected in *Euphausiacea* spp., *Oreochromis niloticus*, or *Turritella* spp. These findings provide strong evidence that macrofauna contribute to the environmental persistence and transmission of EHP in shrimp aquaculture systems and to the spread of disease into natural aquatic ecosystems. The results emphasize the need for enhanced biosecurity measures, including the management of macrofaunal populations within farms, to reduce the risk of disease spread at both the farm level and in natural aquatic ecosystems. This study advances the current understanding of EHP epidemiology and offers practical insights for improving disease control strategies in Sri Lanka's shrimp farming industry.

Keywords: EHP, shrimp aquaculture, macrofauna, *Glossogobius giuris, Perisesarma bidens*

Acknowledgement: *Blue Planet Fund - Ocean Country Partnership Programme (OCPP) MPhil Scholarships Project.*

Sensor-Integrated Tracking System for Food Waste Management: A Cost-Effective Mitigation Strategy for the Sri Lankan Hospitality Sector

D.M.N. Jesika[1]*, G.M. Somaratne[1], N.S. Dharmaratne[2], D.W.N. Sandanika[3], T.P.G.K. Upathissa[1], M.A. Samarasekera[3]

[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Cinnamon Hotels and Resorts, Colombo 02, 00200, Sri Lanka*
**fst19018@agri.pdn.ac.lk*

Food waste generation within the hospitality industry poses a critical threat to environmental sustainability, social equity, and economic stability. Precise waste measurement and monitoring are fundamental prerequisites for waste mitigation. Currently used manual waste measurement and reporting remains labor-intensive and low in accuracy. Although high-end AI waste-tracking solutions have been introduced, their adoption in developing countries like Sri Lanka is hindered by high implementation costs and a lack of customization for local food items. This study presents a low-cost, sensor-integrated tracking system engineered for large-scale hotel kitchens. The architecture of the system leverages Internet of Things (IoT) integration, utilizing load cells/weight sensors coupled with an HX711 amplifier and ESP32 microcontroller to facilitate accurate weight capture and seamless data acquisition. Weight data is synchronized via a Firebase cloud database to a dedicated Flutter-based mobile application, which serves as the primary user interface for hotel staff. The mobile application enables real-time selection of waste sources and categories while generating comprehensive waste reports, including edible vs. non-edible analysis across distinct operational areas and key waste indicators, such as edible food waste per cover and CO_2 emission from edible food waste to drive data-driven waste reduction strategies. System validation was conducted by testing in a real hotel kitchen environment. A paired t-test comparing the automated scale measurements against manual weight measurements yielded ($p > 0.05$), confirming the system's accuracy by indicating the mean difference between the two systems was statistically insignificant. Furthermore, a Wilcoxon Signed-Rank test was done for staff feedback evaluation ($p < 0.05$), demonstrating significant improvements of the system over the manual method in terms of usability, data clarity, organization, and operational relevance. While commercial tracking systems require an enterprise investment of 90 million LKR plus recurring annual fees, this localized hardware system costs around 25,000 LKR per unit, providing a highly financially viable alternative. This localized, low-cost digital solution offers a scalable framework for enhancing sustainability within the hospitality industry.

Keywords: food waste, weight sensors, hospitality industry, database, mobile application

Structural and Functional Insights into *Rc* Allelic Variation Governing Pericarp Pigmentation in Sri Lankan Traditional Rice Germplasm

W.K.K.I.K. Rathnayaka, D.R. Gimhani*, D.S. Liyanage, L.P.M. Kumarasiri

Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Gonawila, 60170, Sri Lanka
**dgimhani@wyb.ac.lk*

The *Rc* gene encodes a basic helix-loop-helix (bHLH) transcription factor that regulates proanthocyanidin biosynthesis and pericarp pigmentation in rice. Allelic variation at this locus determines red, brown, and white pericarp colours. Pericarp colour was visually evaluated using the Rice Germplasm Characterization Catalogue (PGRC) in previous studies (33 pigmented and 14 non-pigmented). This study evaluated *Rc* allelic diversity and its structural-functional implications in 47 Sri Lankan traditional rice varieties using *Nipponbare* as a reference. The *Rc* gene sequences of 47 Sri Lankan rice varieties present in the International Rice Research Institute's 3000 Rice Genome Project (IRRI 3K RGP) database were retrieved from Rice SNP-Seek database. Cluster analysis of the amino acid sequences (AA) identified nine distinct clusters, from which 24 representative varieties were selected based on amino acid length and colour (19-pigmented, 5-non-pigmented). Protein lengths ranged from 351 to 668 amino acids and correlated with pericarp colour. Full-length alleles (664–668 AA) were associated with 11 pigment varieties, while truncated alleles (351–473 AA) were linked to white and seven pigment pericarp varieties. ProtParam, SWISS-MODEL homology modelling, and PyMOL analyses revealed significant differences in physicochemical properties, molecular weight, aliphatic index, and secondary structures according to length. Domain (NCBI CDD) and motif (Motif Scan) analyses showed that all white pericarp varieties possessed only one domain and two motifs. Four white varieties carried the known 14-bp deletion at position 1408 in exon 6. Notably, *Kuruluwee* variety lacked this deletion but contained a C1353A substitution that introduced a premature stop codon. Sixteen pigmented varieties had two domains and four motifs, including the critical bHLH transcriptional activation-like domain, while light brown/striped varieties (6) typically showed three motifs. Two pigmented exceptions (*Galawaka handeran*, and *Kula karuppan*) with only one domain and two motifs were further analysed, revealing unique SNP(A897G) in *Galawaka handeran* that likely compensate for the missing domains to restore function. Statistical analyses confirmed a significant association between motif count and pericarp colour (Kruskal-Wallis test, $p = 0.007$).

Keywords: allelic variation, bHLH transcription factor, pericarp pigmentation, proanthocyanidin, *Rc* gene

Structural Characterization of Salinity-Responsive *OsSWEET15* Allelic Variants in Sri Lankan Traditional Rice Germplasm

U.J. Nishshanka[1], D.R. Gimhani[1]*, D.S. Liyanage[1], A.M. Kariyawasam[2], L.P.M. Kumarasiri[1], U.D.G.S. Gunawardana[1]

[1]*Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Gonawila, 60170, Sri Lanka*
[2]*Duke-Ruhuna Collaborative Research Centre, Faculty of Medicine, University of Ruhuna, Galle, 80000, Sri Lanka*
**dgimhani@wyb.ac.lk*

Salinity stress severely constrains rice productivity by disrupting ion homeostasis and metabolic balance. SWEET family sugar transporters regulate sucrose partitioning under abiotic stress, making them important targets for understanding natural adaptation mechanisms. This study investigated molecular variation in *OsSWEET15* across 48 rice accessions to identify sequence-level signatures associated with salinity tolerance in traditional Sri Lankan indica rice varieties. Coding sequences from 48 rice varieties, including the *Nipponbare* reference genome and traditional Sri Lankan indica varieties, were retrieved from International Rice Research Institute (IRRI), 3,000 Rice Genomes Project. They were analysed using MEGA12 software for multiple sequence alignment and phylogenetic reconstruction. Representative varieties — salinity-susceptible *Nipponbare,* moderately tolerant *Godawee*, and salt tolerant *Pachchaperumal* — were selected for comparative analysis. Conserved domain analysis was performed using NCBI CDD, structural analysis using PyMOL, TMHMM was used to predict transmembrane helices, and Protter was used for graphical visualization of membrane topology. Multi-variety alignment of 319 amino acid sequences revealed five distinct substitution patterns clustering phylogenetically: R290H in *Sigardis/Puttunellu/Chandina*, I236T in *Godawee/Pachchaperumal*, P275T in *Samba/Kuruthaseenati*, combined I263T/P275T in *Sudukarayal*, and an N-terminal deletion spanning residues 1–24 in *Murunga. Godawee, Pachchaperumal, Murunga*, and *Samba* clustered with the established salt-tolerant landrace *Pokkali*. Notably, the I236T substitution, replacing hydrophobic isoleucine with polar threonine, occurred exclusively in tolerant varieties. The introduction of threonine may confer greater hydrogen-bonding capacity and potential phosphorylation sites, which could modulate local transporter conformation and improve *OsSWEET15* function under salinity stress. This amino acid change may therefore, enhance structural flexibility at the TM7–cytoplasmic interface, supporting more efficient sugar transport and osmo-protective responses in tolerant genotypes. Conserved domain analysis confirmed preservation of dual MtN3_slv domains and PQ-loop motifs across all varieties with highly significant E-values (10^{-28} to 10^{-3}). TMHMM predicted seven transmembrane helices, positioning residue 236 at the cytoplasmic TM7 interface. PyMOL structural alignment showed a global RMSD of 0.000 Å and a localized RMSD of 0.009 Å at residues 230–240, indicating spatially confined conformational divergence at the mutation site. The I236T substitution in *OsSWEET15* represents a structurally plausible molecular marker of natural salinity adaptation with potential utility for developing salt-resilient rice varieties in affected agricultural regions.

Keywords: *OsSWEET15*, salinity tolerance, i236t substitution, indica rice, phylogenetic clustering

Supplementation of Yeast Fractions (Safmannan®) in Broiler Diets: Effects on Growth Performance and Nutrient Digestibility Under High Stocking Density

V.S.A. Vidanapathirana[1], B.C. Jayawardana[1], R. Samarakoon[2], N.D. Karunaratne[3], L.P.I.N.P. Jayawardene[4], S. Singh[5], K.H.M.N.B. Konthasinghe[1], J. Guluwattha[1], W.V.G.D.L. Gamage[1], P. Weththasinghe[1]*

[1]Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[3]Department of Farm Animal Production and Health, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[4]Aletek Internationals (Pvt) Ltd, Sri Lanka
[5]Phileo by Lesaffre, France
**pabodhaw@agri.pdn.ac.lk*

Many intensive broiler productions rely on high stocking densities to maximize output, yet overcrowding elevates stress, compromises gut health, and reduces productivity. Yeast-derived postbiotics have shown promising effects in improving broiler performance as sustainable alternatives to antibiotic growth promoters. This study aimed to evaluate the effects of Yeast Fractions containing mannan-oligosaccharides and β-glucans **(**Safmannan®) supplementation on growth performance and ileal nutrient digestibility in broiler chickens reared under standard and high stocking densities. A two-factor factorial design was employed using 112 one-day-old Cobb 500 broilers randomly assigned to four treatments (n = 4 replicates per treatment): T1, control diet at standard stocking density (SSD; 11.11 birds/m²); T2, control diet at high stocking density (HSD; 15.32 birds/m²); T3, 0.05% yeast fractions supplemented diet at SSD; and T4, 0.05% yeast fractions supplemented diet at HSD. Birds were fed with experimental diets for 35 days. Growth performance parameters, carcass traits, relative organ weights, ileal nutrient digestibility were assessed. Final body weight and body weight gain were significantly increased with the yeast fractions supplementation under standard stocking density ($P < 0.001$). Carcass yield and breast muscle yield were significantly reduced in birds fed yeast-derived postbiotics under both stocking densities ($P < 0.001$). Relative weights of the heart, liver, caecum, duodenum, and jejunum were also significantly reduced in birds fed yeast-derived postbiotics under both stocking densities ($P < 0.001$). Overall, dietary supplementation with yeast fractions containing mannan-oligosaccharides and β-glucans improved growth performance in broilers reared under standard stocking density. Therefore, yeast fractions containing mannan-oligosaccharides and β-glucans show potential as a promising functional feed additive for improving broiler production.

Keywords: broiler chicken, stocking density, yeast postbiotics, growth performance, nutrient digestibility

Synergistic Enhancement of Oxacillin Efficacy Against MRSA Using Green Synthesized Silver Nanoparticles from *Syzygium cumini* Leaf Extract

V.Janarthani[1], T.P. Gamagedara[2]*

[1]*Department of Medical Laboratory Science, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
**piumnilg@ahs.pdn.ac.lk*

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a major global health concern due to its resistance to beta-lactam antibiotics, including oxacillin. Nanoparticles have emerged as a promising alternative antimicrobial strategy, particularly when combined with existing antibiotics. This study aimed to synthesize and characterize silver nanoparticles (AgNPs) using *Syzygium cumini* leaf extract and evaluate their synergistic antibacterial activity with oxacillin against MRSA. Silver nanoparticles were synthesized via a green method by reacting 1 mM $AgNO_3$ with aqueous leaf extract (1:5 ratio, pH 8.15). Formation of AgNPs was confirmed by a colour change to brown and a characteristic surface plasmon resonance peak at 411 nm in UV-visible spectroscopy. Dynamic light scattering analysis revealed a mean hydrodynamic diameter of 155 nm and a high polydispersity index (0.92), indicating a heterogeneous nanoparticle distribution. An ATR-FTIR analysis confirmed the presence of functional groups from plant-derived biomolecules acting as reducing and stabilizing agents. Scanning electron microscopy was used to characterize the surface morphology and microstructure of AgNPs. Antimicrobial activity was evaluated using the disk diffusion method against four genetically confirmed MRSA strains and methicillin-susceptible *Staphylococcus aureus* (MSSA, ATCC 25923), with AgNPs alone, oxacillin alone and the AgNP-oxacillin combination alongside distilled water as a negative control. Silver nanoparticles exhibited concentration-dependent antibacterial activity against MRSA ($p < 0.001$, $\eta^2 = 0.554$). The combination of AgNPs with oxacillin produced significantly larger zones than AgNPs alone ($p = 0.010$), indicating a significant synergistic effect. Against MSSA, the combination demonstrated significantly greater activity than the individual treatments ($p < 0.001$, $\eta^2 = 0.942$). These findings highlight the potential of *S. cumini*-mediated AgNPs as antibiotic adjuvants and support further investigation into nanoparticle-based combination therapies to combat multidrug-resistant pathogens.

Keywords: Silver Nanoparticles (AgNPs), green synthesis, *Syzygium cumini*, Methicillin-resistant *Staphylococcus aureus* (MRSA), oxacillin

Temporal Infection Dynamics of *Enterocytozoon hepatopenaei* (EHP) and its Association with Shrimp Growth Performance in Commercial *Litopenaeus vannamei* Farms in Chilaw, Sri Lanka

H.A.R.W. Kotuwegedara[1], K.K.P.R.B. Adhikaram[1], T.A. Gunawardana[2], S.H.N.P. de Silva[3], N.M.T. Anupama[2]*, S.S. de S. Jagoda[1]

[1]*Centre for Aquatic Animal Disease Diagnosis and Research, Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**thilinianupama@vet.pdn.ac.lk*

Enterocytozoon hepatopenaei (EHP) is an economically significant microsporidian parasite causing hepatopancreatic microsporidiosis in *Litopenaeus vannamei*, resulting in retarded growth and severe production losses in the shrimp aquaculture industry. This study investigated temporal EHP infection dynamics and associations with shrimp growth performance and water quality in commercial *L. vannamei* farms in the Chilaw aquaculture zone, Sri Lanka. Following preliminary screening, twenty commercial shrimp farms were selected and categorized into four groups based on EHP detection patterns: EHP-undetected, pre-stocking detection, early-stage detection (14–28 days of culture [DOC]), and late-stage detection (>28 DOC). Twenty shrimp were collected biweekly from stocking to harvest and pooled for PCR-based detection. The EHP copy number was quantified using quantitative PCR (qPCR) targeting the PTP2 gene. Average body weight, body length, and selected water quality parameters were recorded concurrently. A linear mixed model analysis revealed EHP copy number was significantly influenced by detection stage, sampling timepoint, and their interaction ($p < 0.001$), EHP copy numbers progressively increased throughout the culture period in infected groups, with pre-stocking detection farms exhibiting the highest sustained infection load, while EHP-undetected farms maintained zero copy numbers throughout the study period. Average body weight and body length were significantly affected by detection stage, sampling timepoint, and their interactions ($p < 0.001$). Spearman's correlation at the final harvest point (DOC 70) confirmed significant negative associations between EHP copy number and body weight ($\rho = -0.720$, $p < 0.001$) and body length ($\rho = -0.550$, $p = 0.012$) confirming impaired growth in infected groups. Among water quality parameters, total ammonia showed significant temporal and detection stage variation, whereas pH, salinity, differed significantly among detection stages ($p < 0.001$). These findings demonstrate that EHP infection stage at stocking and progressive copy number escalation are critical causes of shrimp growth outcomes, underscoring the need for rigorous pre-stocking EHP screening and early molecular detection in local commercial shrimp farming.

Keywords: EHP, infection dynamics, copy number, growth performance, temporal analysis

Acknowledgement: *Blue Planet Fund - Ocean Country Partnership Programme (OCPP) MPhil Scholarships Project.*

The Effect of Two Fungal Species Isolated from Sporocarps of *Marsilea minuta* on Paddy Seed Germination and Early Seedling Growth

*K.P.A.S. Pathirana, N.S. Gama-Arachchige**

Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**nalin@sci.pdn.ac.lk*

Marsilea minuta is a heterosporous aquatic fern commonly found in paddy field ecosystems. During dry periods, it produces drought-resistant sporocarps that can harbour fungi affecting paddy seed germination and seedling growth. This study identified fungi associated with *M. minuta* sporocarps and evaluated their effects on paddy seed germination and early seedling growth. Fungi were isolated from surface-sterilized and non-sterilized sporocarps using agar plate techniques and identified based on Commonwealth Mycological Institute (CMI) descriptions, followed by DNA sequence confirmation using the internal transcribed spacer (ITS1 and ITS2) regions. The effects of fungal spore suspension (50µL of 10^5 CFU/mL per seed) on germination percentage, root length, and shoot length were assessed using five paddy varieties (BG 367, BG 479, *Hangimutthan*, *Kalumurunga*, and *Suwadal*) with four replicates of 100 seeds per each treatment, compared to an untreated control (seeds treated with sterile distilled water). Seeds were germinated for 14 days at 25°C under a 12 h light/12 h dark conditions. Germination data were analysed using the Kruskal–Wallis test followed by Dunn's *post hoc* test, while root and shoot lengths were analysed using the Wilcoxon rank-sum test at a significance level of $P<0.05$. Two fungal species (*Neopestalotiopsis clavispora* and *Mucor irregularis*) were isolated from sporocarps. *N. clavispora* was detected both externally and internally and did not significantly affect germination but significantly enhanced seedling growth, increasing root length by approximately 11–25% and shoot length by 13–24%, with the greatest response observed in *Kalumurunga* ($P < 0.05$). *Mucor irregularis* was restricted to the sporocarp surface and significantly reduced germination by approximately 6–13% across all paddy varieties, with the greatest reduction observed in BG 367 ($P < 0.05$). It also reduced root length by 2–8% and shoot length by 4–12% in BG 367, *Hangimutthan*, *Kalumurunga*, and *Suwadal*, although a slight growth increase (~4%) was observed in BG 479. These findings demonstrate that *N. clavispora* and *M. irregularis* associated with *M. minuta* sporocarps exert contrasting effects on paddy seed performance. Further, *N. clavispora* shows potential as a bio-stimulant to enhance seedling vigour, whereas *M. irregularis* poses a risk to seed germination in paddy ecosystems.

Keywords: developed varieties, fungal pathogens, its, sporocarp-associated fungi, traditional varieties

Traditional Sweetener to Functional Food: Improving the Bioactive Profile of Kithul Treacle through *Tabernaemontana divaricata* Nectar-Microbiome Fermentation

K. Ravi, U.B.K. Silva, A.H.A. Samarakkody, E.W.B.K. Perera, T.L. Jayasuriya, P.A. Sewwandi, R.B.N. Dharmasiri*

Faculty of Life and Medical Sciences, BMS Campus, Colombo 06, 06000, Sri Lanka
**nadeemadharmasiri@sjp.ac.lk*

Floral nectar harbours unique microbial communities and natural antimicrobial properties. Whereas kithul treacle, a traditional Sri Lankan sweetener with physicochemical properties similar to bee honey, has its natural food preservative potential largely understudied. This study investigated the biotechnological application of *Tabernaemontana divaricata* floral nectar microbiome to enhance the food preservative capabilities and bioactive profile of kithul treacle through microbial fermentation. To achieve this, bacteria from *T. divaricata* nectar were isolated and screened for sugar fermentation and antagonistic properties to prepare a compatible consortium that could ferment fructose, sucrose, and glucose. Selected strains were phenotypically characterized using Gram staining and molecularly characterized through 16S rRNA gene sequencing, BLAST analysis and phylogenetic mapping. The consortium was used to ferment kithul treacle for 21 days at room temperature. Fermented treacle was evaluated using a PEN3.5 E-Nose system for volatile organic compound (VOC) profiling and functional enhancements were evaluated using anti-microbial activity assays (disc diffusion) and anti-inflammatory assays (albumin denaturation). All steps except the initial culturing involved duplicates, while the anti-inflammatory assay involved quadruplicates. Initial culturing yielded 14 isolates, of which eight fermented all three sugars. The antagonistic assay identified a compatible three-strain consortium of Gram-negative bacilli, consisting of *Atlantibacter hermannii* (PZ138294), *Pantoea* sp. (PZ142719), and *Klebsiella pneumoniae* (PZ143343). Phylogenetic analysis placed them into distinct, genus-level clades supported by high bootstrap values ranging from 86% to 93%. The PCA biplot of E-Nose sensor readings showed a distinct shift in fermented treacle's VOC profile, closely aligning it with that of bee honey. One-way ANOVA and Tukey's HSD *post hoc* tests of inhibition zone diameters of the disc diffusion assay showed greater antimicrobial activity of fermented treacle (0.15 cm) than the control (0.05 cm) against *Candida parapsilosis*, with a statistically significant effect ($p < 0.05$). Its activity was comparable to bee honey (0.13 cm; $p > 0.05$). Furthermore, the anti-inflammatory assay revealed that the fermented treacle had an inhibition percentage of 87.57% at 100% concentration, exceeding the control (82.62%) and almost equalling bee honey (88.08%) in anti-inflammatory activity. In conclusion, enhanced anti-inflammatory and antimicrobial activities, together with altered VOC profiles, indicate that nectar-derived microbial fermentation improves the functional properties of kithul treacle.

Keywords: bee honey, floral nectar, food preservative, kithul treacle, *Tabernaemontana divaricata*

Acknowledgement: *This work was supported by the Faculty of Life and Medical Sciences, BMS Campus, Colombo, Sri Lanka under the research grant provided by the Finance Department.*

Theme 3



Engineering Intelligent, Sustainable and Human-Centric Systems

Engineering & Technology

A Clamp-On Magnetic Field Energy Harvester for Self-Powered Dynamic Line Rating Sensor Nodes

H.M.D.D. Nawarathne, A.S. Bandara*, S.J. Siriwardena, T.M.T.N. Thennakoon, J.B. Ekanayake

Department of Electrical and Electronic Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**anushkab@ee.pdn.ac.lk*

The increased integration of renewable energy resources into transmission networks has intensified power flow variability, exposing the limitations of static line rating methods that systematically underutilise conductor capacity by relying on conservative worst-case thermal assumptions. Dynamic Line Rating (DLR) offers a data-driven alternative through real-time environmental and electrical monitoring. However, its widespread deployment is constrained by the absence of viable, autonomous power solutions for sensor nodes situated in remote transmission infrastructure, where grid-connected supply is economically and logistically prohibitive and conventional battery systems impose recurring maintenance costs and environmental burdens. This study investigates a clamp-on Magnetic Field Energy Harvester (MFEH) as a fully self-sustaining power source for DLR sensor nodes, exploiting stray electromagnetic fields emanating from AC current-carrying transmission conductors, an energy source that is continuously available, unlike intermittent ambient sources such as solar or wind. The MFEH system comprises a toroidal inductive pickup coil, a rectifier, a four-switch buck-boost (FSBB) converter for power conditioning, and an ESP32 microcontroller is used to implement an impedance matching algorithm for Maximum Power Point Tracking (MPPT), enabling dynamic optimisation of energy extraction across varying conductor current magnitudes and load conditions. Harvested surplus energy is directed to a supercapacitor buffer to sustain operation during low-current contingencies. Experimental characterisation across distribution line currents ranging from 20 A to 80 A demonstrated harvested power levels between 80mW to 2280mW, with a peak conversion efficiency of 70.89% in the FSBB converter at fixed impedance operation. These results provided sufficient regulated output power to continuously operate the DLR sensor node while maintaining a stable 8 V supply. These findings establish that infrastructure-independent, self-powered DLR deployment is technically feasible, offering a scalable pathway to cost-effective grid instrumentation. By enabling continuous real-time line rating without external power dependency, this approach directly supports reductions in transmission congestion, curtailment of renewable generation, and advances the operational intelligence of smart grid infrastructure.

Keywords: dynamic line rating, energy harvesting, electromagnetic induction, maximum power point tracking, smart grid

A Cloud-Native Dynamic Pricing Engine for Shared Parking Using Demand Forecasting

T.P.H. Nethmin[1], S. Nishankar[2]

[1]*Department of Computing and Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
[2]*Department of Software Engineering, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*

Urban parking systems commonly rely on static pricing models despite demand influenced by time, weather, and nearby events, resulting in congestion during peak hours and underutilization during off-peak periods. This study presents a cloud-native dynamic pricing engine that integrates demand forecasting with real-world pricing rules for shared public-private parking ecosystems. The proposed framework combines predictive analytics with practical deployment considerations to address real-world parking inefficiencies in urban environments. The proposed framework is evaluated using historical Seattle parking transaction data enriched with Meteosource weather data and Eventbrite event signals to validate its demand forecasting and dynamic pricing components for deployment in shared public-private parking ecosystems. The research evaluates seven forecasting models, namely Histogram Gradient Boosting Regressor (HGBR), XGBoost Regressor (XGBR), Random Forest Regressor (RFR), LSTM, CNN-LSTM, LSTM-GRU, and Transformer. Data preprocessing was performed at hourly granularity, incorporating engineered temporal and contextual features to capture both recurring patterns and external demand drivers. Forecast outputs were transformed into dynamic prices using a rule-based pricing function with defined minimum and maximum bounds, along with stability constraints to ensure smooth and fair pricing adjustments. The system was deployed using a cloud-native architecture based on Azure Functions, enabling scalable, serverless execution and real-time API-based access to parking lot owners and other stakeholders. Experimental results demonstrate that CNN-LSTM achieved the best forecasting performance, while RFR delivered the highest revenue uplift of 3.08% for parking lots. LSTM-GRU produced the most stable pricing behavior without price stability violations, and all models satisfied the fairness constraints. Notably, models with superior predictive accuracy did not consistently yield optimal revenue outcomes, highlighting the complex relationship between forecasting and pricing effectiveness. Under a multi-criteria evaluation framework incorporating forecasting accuracy, business performance, price stability, and fairness, the Transformer model achieved the best overall performance by maintaining a balanced trade-off across all dimensions. These findings emphasize the importance of evaluating end-to-end system performance rather than relying solely on predictive metrics. The study demonstrates the feasibility and practical value of deploying scalable, demand-aware dynamic pricing systems, contributing to more efficient, adaptive, and sustainable smart parking management solutions for shared public-private parking ecosystems.

Keywords: dynamic pricing, smart parking, demand forecasting, cloud computing, machine learning

No Show Abstract

A Comparative Analysis of the Energy Demands and Runtime of Large Language Models when Deployed on User-Side Devices

H.U. Ahamed, A.L.A.D.T.T. Aturusinghe, D.M.K.N. Dewmini, M.G.S.K. Jayarathne*

Sri Lanka Institute of Information Technology (SLIIT) Kandy Uni, Kandy, 20000, Sri Lanka
**sonalijayarathne@outlook.com*

Large Language Models (LLMs) are statistical algorithms trained on massive amounts of data to predict the most appropriate response to a user prompt. LLMs requires a substantial supply of resources to function and despite the increase in the number of LLMs locally deployed, studies about LLM energy consumption are limited to those run at data centers, with research on locally deployed LLM energy consumption lacking. This study aims to bridge that gap by providing important information on the energy consumption and runtime of LLMs deployed on user-side devices via a comparison of the energy consumption and runtime efficiency of selected locally deployed LLMs across different prompt categories on consumer-grade hardware. For this task, a personal laptop having 16.0GB RAM and an Intel(R) UHD Graphics GPU was configured with Ollama for local LLM deployment and HWiNFO64 for hardware monitoring. To ensure the relevancy of the research, the study uses the 5 prompt categories most used in locally deployed LLMs (Factual, Reasoning, Long Generation, Code Generation and summarization), however future studies will use more novel prompts with increasing complexity. For proper evaluation we chose models developed by different companies (DeepSeek-R1(7B), Gemma 3(4B), and Phi-4 Mini (3.8B)). Using Ollama, each model was run 45 times, with 3 tests per prompt. During each test, HWiNFO64 recorded average power use and runtime, and these average values were compared across models and categories. The findings indicate that throughout the test cases, an overall average of 23.34 Watts (W) was consumed by all three LLMs at a mean runtime of 37.81 seconds. Furthermore, results reveal that DeepSeek-R1 (7B) had the greatest power demand with an average of 29.89 W, while Gemma 3(4B) recording the lowest demand for power with an average of 18.72 W needed. The results denote that there exists a relationship between model architecture, prompt category and PC system specifications that affects energy usage. By elaborating on this relationship and offering key insights, this study provides opportunities for future LLM development in consideration of user-device capabilities and to propose a reproducible LLM benchmark for consumer grade hardware to support future research.

Keywords: large language models, energy consumption, client-side LLM deployment, runtime efficiency, energy efficiency, model runtime

A Multi-Agent AI Framework for Real-Time Flood Disaster Response Using Satellite Imagery and Geospatial Analysis

M.B. Abeywardena[1]*, R.W.V. Imansha Dilshan[1], A.L. Supun Tharaka[2], I.H.R.P. Iddamalgoda[1]

[1]*Department of Software Engineering, University of Kelaniya, Kelaniya, 11600, Sri Lanka*
[2]*Department of Electronics and Computer Science, University of Kelaniya, Kelaniya, 11600, Sri Lanka*
**minindubim@gmail.com*

Flood disasters demand rapid situational awareness spanning hazard detection, infrastructure disruption, evacuation planning, and community coordination, yet conventional GIS workflows depend on manual tools and specialist intervention, delaying critical decisions for first responders in resource-constrained emergency environments. This study aimed to design, implement, and evaluate an autonomous multi-agent AI framework that converts satellite imagery and geospatial data into actionable, near-real-time flood-response intelligence usable by non-GIS-expert responders, integrating vision-language modelling, multi-agent orchestration, and geospatial analytics into a single decision-support pipeline. The system employed four specialized agents orchestrated through CrewAI with a Llama 3.2 reasoning backbone. A Qwen2-VL-7B vision-language model was fine-tuned using Low-Rank Adaptation on an AMD Instinct MI300X GPU with the Cyclone Ditwah 2025 Sentinel-1 SAR dataset (50,000 samples; 45,000/5,000 train/validation split) for damage-zone classification and GeoJSON generation, while live precipitation from the Open-Meteo API and OpenStreetMap road networks processed via GeoPandas and NetworkX supported blocked-road detection, shelter identification, and hazard-avoidant routing. Evaluation used 5,000 validation scenes and 50 routing scenarios. The fine-tuned model achieved 83.70% mAP@0.5 (82.51% precision, 86.77% recall) for damage-zone detection, generating valid GeoJSON outputs in under five seconds per image; the pipeline produced complete situational reports in under sixty seconds, and the routing module generated topologically valid evacuation paths in 41 of 50 cases. Supporting modules delivered early warning alerts, seven-day forecasting, geotagged incident reporting, missing-person tracking, SOS dispatch, and offline HTML map export. These results show that combining fine-tuned vision-language models, multi-agent orchestration, and geospatial analytics can consolidate fragmented flood-response workflows into a unified, near-real-time decision-support process suitable for resource-constrained emergency environments.

Keywords: multi-agent ai, flood disaster response, vision-language models, geospatial analytics, emergency decision-support

A Regenerative Braking System for an Open Wheeled Single Seater Rear Wheel Drive Formula-Type Race Car

P.K.W.R.M.T.R.B. Pilapitiya*, W.A.T.A. Wedisinghe, M.T.M.M. Thajudeeen, W.M.A.A.B. Weerakoon, A.T.G.S.K. Ampitithanne, H.M.D. Illankoon, H.M.A.D.K. Herath

Department of Automotive Engineering, Faculty of Engineering and Construction, ICBT Kandy Campus, Kandy, 20000, Sri Lanka
**nirupilapitiya@gmail.com*

Braking systems in high-performance race cars must deliver consistent stopping power, precise modulation, and high thermal resistance under extreme operating conditions. Modern motorsport increasingly emphasizes energy efficiency and sustainability, driving the adoption of regenerative braking technologies. Regenerative braking converts kinetic energy, generally lost as heat during deceleration, into electrical energy that can be stored and reused, improving vehicle efficiency. Consequently, regenerative braking has become vital in motorsport for improving efficiency and reducing energy losses. This project presents the design, development, integration, and validation of a combined conventional hydraulic and regenerative braking system for a single-seater rear-wheel-drive race car named Diablo XI, developed for Formula motor sports competitions in Sri Lanka. The project focused on advanced engineering integration, improved efficiency, and cost-effective safety enhancements. A novel belt-driven, generator-based regenerative braking mechanism is proposed, enabling energy recovery in a cost-effective manner suitable for internal combustion engine-powered race vehicles. SolidWorks, the computer-aided design and simulation tool, was used to model the system prior to physical implementation. The project used conventional braking system consists of ventilated disc brakes on all four wheels, a vacuum-assisted brake booster, a dual-line master cylinder, semi-metallic brake pads, production-based calipers, steel brake lines, and DOT 3 brake fluid. The regenerative braking system utilizes a modified alternator operating as a generator, driven via a belt connected to the engine crankshaft. Generator engagement is controlled through an overrunning clutch activated during braking events. The recovered electrical energy is stored in a 12V lithium-ion battery pack equipped with a battery management system (BMS). The hydraulic braking system was validated through static inspections and dynamic testing at speeds of up to 100 km/h. Braking performance under repeated racing conditions was evaluated, and the test results confirmed reliable braking performance, consistent generator engagement during braking events, and successful battery charging while maintaining vehicle safety, stability, and handling characteristics. Future work will focus on comprehensive track testing and further optimization of the regenerative braking strategy to maximize energy recovery and braking performance under competitive racing conditions. Overall, this study demonstrates the feasibility of implementing a low-cost regenerative braking system for student-level and grassroots motorsport applications.

Keywords: energy recovery, formula car, hydraulic braking system, motorsport, regenerative braking

A Unified Comparative Analysis of Attention Mechanisms for Pneumonia Detection in Chest X-Ray Images

T. Selvarasa*, A. Ramanan

Department of Computer Science, University of Jaffna, Jaffna, 40000, Sri Lanka
**thushani05s@gmail.com*

Lower respiratory tract infections continue to represent a significant global health burden, particularly among children in low-resource settings. Limited access to expert radiological interpretation further increases the need for reliable automated diagnostic systems using chest X-ray (CXR) imaging. This study presents a systematic and controlled comparative analysis of three widely used attention mechanisms: Squeeze-and-Excitation (SE), Spatial Attention (SA), and Convolutional Block Attention Module (CBAM) within a unified deep learning framework for pediatric pneumonia detection. Unlike existing studies, many approaches report results using inconsistent datasets, preprocessing methods, and training strategies, making fair comparison difficult. To address this limitation, the present study ensures fairness and reproducibility by integrating each attention mechanism into the same ResNet50 backbone architecture and training all models under identical experimental conditions. The study utilises a publicly available Chest X-ray dataset (https://tinyurl.com/kaggle-CXR) comprising 5,856 pediatric CXR images, categorised into pneumonia and normal classes, using the predefined patient-wise train, validation, and test splits to prevent data leakage and ensure fair evaluation. Consistent preprocessing and data augmentation techniques are applied to improve model generalisation. Each attention module is incorporated across all hierarchical stages of the network, enabling progressive refinement of feature representations from low-level visual patterns to high-level disease-specific characteristics. Model evaluation is conducted using accuracy, precision, recall, and F1-score, along with Grad-CAM visualisations to assess interpretability and highlight clinically relevant lung regions. An ablation study is conducted to analyse the contribution of attention placement across network stages and evaluate the impact of channel and spatial attention components. The experimental findings indicate that all attention-based models outperform the ResNet50 models, confirming the effectiveness of attention mechanisms in improving classification performance. ResNet50 achieved an accuracy of 91.03%, while ResNet50+SE, ResNet50+SA, and ResNet50+CBAM achieved 91.99%, 92.31%, and 92.95%, respectively. ResNet50+CBAM improved accuracy by 1.92 percentage points over ResNet50. Test results confirm this gain stems specifically from combined channel-spatial refinement across all stages, not either component alone. These findings offer the first controlled evidence that CBAM's advantage holds specifically for pediatric pneumonia detection.

Keywords: pneumonia, chest X-Ray Image, deep learning, attention mechanisms, CBAM

A Wireless Soft PLC Architecture for Scalable and Cost-Efficient Intelligent Automation Platform for Precision Agriculture

S.J. Siriwardena*, A.S. Bandara, J.B. Ekanayake, B.G.L.T. Samaranayake

Department of Electrical and Electronic Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e19377@eng.pdn.ac.lk*

Intelligent automation in precision agriculture demands scalable, adaptive, and cost-effective control architectures capable of reliable operation across distributed environments. Conventional Programmable Logic Controllers (PLCs), while deterministic and robust, are limited by high cost, hardware dependency, and poor scalability in geographically dispersed applications. This work proposes a software-defined Soft Programmable Logic Controller (Soft-PLC) architecture that virtualizes traditional PLC functionality while maintaining deterministic execution and hierarchical organization. A unified cyber-physical framework is introduced using a single long-range LoRa communication network to support sensing, closed-loop control, and actuation over distances up to 1 km. Wireless sensor nodes, each powered by a dedicated solar panel with a backup battery pack, measure nitrogen, phosphorus, potassium, pH, temperature, humidity, and electrical conductivity. Data are transmitted to a centralized control hub at intervals ranging from 30 seconds to 5 minutes, depending on agronomic requirements. The unified bidirectional LoRa infrastructure replaces the multiple communication gateways and multi-network infrastructure of conventional PLC-based precision agriculture systems, reducing system complexity and communication hardware by 30–50%. Control logic is executed on a Raspberry Pi-based hub using a deterministic scan-cycle paradigm (input acquisition, logic execution, output update) aligned with IEC 61131-3 standards, achieving local controller scan times of 40–80 ms. End-to-end communication performance is evaluated separately through LoRa network latency and packet loss. The system follows ISA-95 layered design principles to ensure structured interaction between field devices, control processes, and supervisory systems, supporting integration with existing industrial automation frameworks. The key contribution is the integration of Soft-PLC virtualization, unified LoRa communication, and ISA-95 architecture into a scalable, hardware-independent automation platform for precision agriculture. Field validation over 72 hours in an open agriculture field with node–hub distances from 200 m to 1 km demonstrates the feasibility and stable short-term operation of the proposed architecture, with an average communication latency of 180 ms (range: 150–250 ms) and a packet loss rate of 2.3% (below 5% across all nodes). The system achieves a 40–50% cost reduction compared to conventional PLC-based precision agriculture setups while maintaining comparable control performance, providing a scalable automation and communication platform capable of supporting future AI-driven precision agriculture applications.

Keywords: soft PLC, intelligent automation, LoRa network, wireless control, precision agriculture

Acknowledgement: *The authors acknowledge the financial support provided by the University of Peradeniya (Grant No. URG/2024/17/E) and the Department of Electrical and Electronic Engineering, University of Peradeniya, for providing the facilities and support necessary to conduct this research.*

Accuracy Comparison of Lightweight Vision-Language Models for Multimodal Fake News Detection

E.M.C.P. Ekanayake*, D. Herath

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**panchaliekanayake1999@gmail.com*

Fake news shared on digital platforms increasingly combines textual and visual content to spread misleading information. The Indian Fake News Dataset (IFND) is a multimodal benchmark for fake news detection in the Indian news domain. The use of lightweight vision-language models for multimodal fake news detection on the IFND dataset has not yet been explored. We focus on lightweight vision-language models because fake news detection on social media platforms requires models that can process large amounts of multimodal content efficiently and with reasonable computing cost. In this work, we conduct a comparative analysis of lightweight vision-language models for binary fake news detection on IFND. Each sample is represented as a caption-image pair, and the model predicts whether the multimodal content is true or fake. The study is conducted on a subset of IFND containing 25,224 samples. Our experiments compare the performance of six lightweight vision-language models on this benchmark. Among the evaluated models, InstructBLIP achieved the best test accuracy of 72%, while Qwen-VL showed the lowest test accuracy of 33%. These results show that lightweight vision-language models can be applied for multimodal fake news detection, although their performance differs considerably across model architectures. Overall, this work presents a benchmark of lightweight vision-language models on IFND and highlights their potential for practical multimodal misinformation detection.

Keywords: fake news detection, multimodal misinformation, lightweight vision-language models, IFND

Accuracy Comparison of Machine Learning and Statistical Methods for Daily Rainfall Estimation in the Kelani River Basin, Sri Lanka

S.W. Kamburugamuwa*, M.M.G.T. De Silva, H.M.D.K. Herath, N.G.P.B. Neluwala

Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**sachini.kamburugamuwa@gmail.com*

Accurate estimation of daily rainfall at local scales remains a major challenge in hydrology due to the highly nonlinear and spatially variable nature of precipitation. For flood forecasting and water resource management, accurate rainfall prediction is essential. This study evaluates the performance of machine learning and conventional techniques for estimating daily rainfall at the Hanwella station, located within the Kelani River Basin, based on rainfall data from four neighbouring stations. An Extreme Gradient Boosting (XGBoost) model and a Long Short-Term Memory (LSTM) model were developed using multi-station rainfall data from 2020 to 2025, while spatial interpolation techniques such as Inverse Distance Weighting (IDW) and the Normal Ratio method were used as reference techniques. The LSTM model was trained using 3-day temporal sequences with various loss functions (Mean Absolute Error (MAE), Mean Squared Error (MSE), Huber loss, Mean Squared Logarithmic Error (MSLE), and Log-Cosh loss). The performance of all four models was assessed using Root Mean Square Error (RMSE), MAE, and Nash–Sutcliffe Efficiency (NSE). These evaluation metrics were calculated separately for the validation and testing datasets to provide a comprehensive comparison of model performance. Among the evaluated methods, the IDW approach ($p = 2$) exhibits the highest performance, achieving an RMSE of 18.32 mm/day and an NSE of 0.63, indicating a moderate level of predictive accuracy, whereas the remaining methods demonstrate comparatively lower predictive accuracy. XGBoost demonstrated competitive performance on the structured tabular dataset, followed by the Normal Ratio method, while LSTM showed the lowest overall accuracy. This behaviour may be attributed to the dominance of spatial relationships over temporal dynamics, thereby limiting the effectiveness of sequence-based learning. These outcomes imply that model configuration, feature representation, and data properties significantly impact model performance. The LSTM model has difficulty predicting peak rainfall events, even if it was able to capture overall rainfall variability. XGBoost shows superior performance on the structured dataset compared to LSTM, but both methods can be further improved. This study helps to make more accurate flood predictions and water resource management by offering useful insights for enhancing rainfall estimation techniques.

Keywords: LSTM, XGBoost, inverse distance weighting, normal ratio method, RMSE, MAE, MSE, NSE, Kelani River Basin

Acknowledgement: *This research was supported by the National Research Council Grant (Grant No.: IDG 24-106).*

An Integrated Computer Vision Framework for Structural Defect Identification, Quantification, and Multi-Parameter Severity Assessment in Reinforced Concrete Beams

U.L.N.T. Bandara[1]*, H.M.P.B. Ariyaratne[1], J.A.S.C. Jayasinghe[1], U. Jayasinghe[2]

[1]*Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**e19044@eng.pdn.ac.lk*

Current computer vision applications in Structural Health Monitoring (SHM) predominantly focus on binary crack detection, offering limited support for engineering condition assessment, prioritization of repairs, and maintenance decision-making. Existing studies have demonstrated reliable crack quantification; however, multi-parameter severity assessment frameworks that convert measured crack characteristics into actionable condition ratings remain comparatively underexplored. To address this gap, this study developed a comprehensive image-based framework integrating automated structural defect identification and precise geometric quantification directly with a robust severity assessment model tailored for Reinforced Concrete (RC) beams. A benchmark dataset of surface cracks exclusively in RC beams was constructed using images captured under realistic field and laboratory conditions, intentionally including varying illumination, texture, shadows, staining, and surface deterioration commonly encountered during inspections. A total of 300 high-resolution images were collected, with 100 images manually annotated for semantic segmentation. The dataset was divided into training, validation, and testing subsets of 70%, 20%, and 10%, respectively. The finalized dataset includes precise crack masks and image-derived parameters such as crack width, length, orientation, location, density, and branching characteristics. Semantic segmentation and advanced image-processing techniques were utilized to automatically extract these physical parameters, prioritizing critical serviceability thresholds and the spatial distribution of cracks. Additionally, image preprocessing procedures, including contrast enhancement and noise reduction, were successfully evaluated to improve visibility under challenging conditions. The quantified crack characteristics were subsequently integrated into a novel rule-based severity assessment framework informed by established engineering standards and structural judgement. By evaluating multiple interrelated parameters rather than relying on crack width alone, the framework successfully executed a severity assessment that classified the affected RC beams into Minor, Moderate, and Critical severity levels. Results demonstrated that integrating semantic segmentation with multi-parameter analysis successfully extracted geometric features capable of driving these accurate, standardized severity classifications. Model outputs were thoroughly benchmarked against manual measurements and engineer-assigned condition ratings, confirming high classification reliability. Ultimately, this framework successfully converted visual defect observations into actionable engineering ratings, significantly reducing reliance on subjective manual interpretation while providing a scalable methodology for rapid inspection, maintenance prioritization, and long-term monitoring of ageing RC beam infrastructure.

Keywords: benchmark dataset, computer vision, reinforced concrete cracks, severity assessment, Structural Health Monitoring (SHM)

An Integrated Machine Learning and Geospatial Framework for Predicting Residential Solar Yield and Financial Return Forecasting in Sri Lanka

R.S.P.S. Uthsara*, D.G.S. Akalanka, O.K.D.T. Sulakshani, P.W.G. Harshitha, R.M.P.S. Rathnayaka

Informatics Institute of Technology, Colombo 04, 00400, Sri Lanka
**saniruuthsaralk1@gmail.com*

Residential rooftop solar adoption in Sri Lanka remains critically low despite the national target of 70% renewable energy by 2030, due to financial uncertainty, limited awareness of grid suitability, and the absence of localised decision-support tools. Existing deterministic models fail to capture weather variability, household consumption behaviour, and distribution grid constraints jointly, and no integrated tool addresses all four barriers at once. This study develops an artificial-intelligence-driven Solar Return on Investment Prediction and Recommendation System, the first unified, probabilistic decision-support framework for Sri Lanka's energy context. Because these four barriers arise from distinct processes that no single model can capture, four methodologically distinct components were developed, each targeting one barrier and feeding a shared recommendation engine. A pragmatic mixed-methods approach combined quantitative machine learning experimentation with qualitative stakeholder validation. The components are: a Random Forest regression model for solar generation forecasting, trained on National Aeronautics and Space Administration Prediction of Worldwide Energy Resources weather data and Lanka Electricity Company records; a Geographic Information System module using multi-criteria scoring for transformer suitability; a Long Short-Term Memory neural network with clustering-based household matching for consumption forecasting, integrated with Public Utilities Commission of Sri Lanka tariffs; and a Monte Carlo simulation engine performing 2000 stochastic iterations for risk-aware return on investment estimation. A survey of one hundred one homeowners validated requirements. The generation model achieved a Mean Absolute Error of 18.33 kilowatt-hours per kilowatt, a 72.4% improvement over baselines, with an R^2 of 0.73. The transformer classifier achieved 100% accuracy. The consumption model attained a Mean Absolute Error of 58.70 kilowatt-hours and R^2 of 0.785, with 93.8% of predictions within plus or minus 150 kilowatt-hours. Monte Carlo simulations converged stably below 0.1% variance. 59.4% identified financial uncertainty as the primary barrier, and 67.3% trust artificial-intelligence tools validated with verified data. This contribution is integrating four validated modules into one probabilistic framework, filling the gap in solar investment tools for developing markets.

Keywords: solar return on investment, machine learning forecasting, geospatial transformer suitability, Monte Carlo simulation, residential solar adoption

Autonomous Stakeholder Conflict Resolution in Requirements Engineering Using an LLM-Based Negotiator Agent

M.Z.I.A.A.S. Ibrahim*, V. Abishethvarman, B.T.G.S. Kumara

Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka
**ssujair@gmail.com*

Stakeholder conflict is a recognized barrier to requirements quality in software engineering. When two stakeholders hold incompatible requirements, such as a patient needing immediate access to medical test results and a physician who must review them first, current automated Requirements Engineering (RE) systems have no mechanism to reach a resolution. This limitation is documented even in the state-of-the-art multi-agent RE framework MARE, which reports a conflict resolution rate of zero across all evaluated cases. This paper presents the NegotiatorAgent, an autonomous LLM-based conflict resolution component that builds on prior optimization-based and negotiation approaches in RE. Deployed as a sixth agent within the REMARL framework, it detects typed stakeholder conflicts and produces a negotiated, requirement-level resolution without human involvement, addressing temporal, privacy, regulatory, and accountability conflict categories. The NegotiatorAgent is activated by conflict signals raised in the Checker agent output. It then applies three structured reasoning steps using a locally hosted llama3.1:8b language model: uncovering the underlying stakeholder interest behind each conflicting statement, assigning business-impact and dependency-based priorities, and producing a revised requirements draft with a documented decision log. Evaluation was conducted on five scenarios drawn from the RESimEnv benchmark, a curated collection of 14 application domains each annotated with a distinct typed conflict. Resolution quality was assessed by independent postgraduate reviewers using a binary correctness rubric. The NegotiatorAgent detected conflicts in four of five scenarios, achieving a detection rate of 80 percent, and resolved three of the four detected conflicts, yielding a resolution rate of 75 percent. In a patient portal scenario, it proposed a physician annotation window with an urgent escalation path, satisfying both clinical safety and patient access needs. In a mental health application, it introduced a user-controlled consent mechanism for emergency notifications, reconciling data privacy with patient safety. The single undetected conflict exposed a dependency on upstream Checker performance, identified as a priority improvement area. These results establish the first quantified baseline for autonomous conflict resolution in RE, demonstrating that structured LLM agents can conduct principled multi-stakeholder negotiation and reduce costly human mediation in complex software projects. The source code and benchmark are openly available at https://github.com/sujairibrahim/REMARL.git.

Keywords: autonomous negotiation, large language models, multi-agent systems, requirements engineering, stakeholder conflict resolution

Cognishift: A Multimodal Deep Learning Framework for Real-Time Cognitive Load Detection and Adaptive Human-Computer Interaction Optimization

S.H.C. Indeewaree*, G.K.S. Jayalath

General Sir John Kotelawala Defence University, Ratmalana, 10390, Sri Lanka
**42-adc-0010@kdu.ac.lk*

Digital technology is deeply integrated into daily life, yet it contributes to a growing cognitive performance challenge. Global attention spans have decreased by approximately 47% since 2015, and post-COVID cognitive fatigue has increased by 67%, with digital overload costing the global economy an estimated $1 trillion annually in productivity losses. Despite these trends, most human–computer interfaces remain static and unresponsive to the user's cognitive state, leaving cognitive overload chronically undetected and unmanaged. This study proposes CogniShift, a multimodal deep learning framework that detects real-time cognitive load using only a standard webcam and keyboard – requiring no specialised hardware beyond these standard peripherals. Five passive behavioural signals are analysed: eye movement patterns (blink rate, pupil dilation), keystroke timing dynamics (speed, error rate), mouse movement behaviour (velocity, hesitation), fatigue-related facial microexpressions, and scrolling activity patterns. These signals are processed continually to estimate the cognitive state of the user. A hybrid CNN-LSTM network extracts temporal facial fatigue features; a Transformer encoder fuses multimodal behavioural signals; and an XGBoost classifier maps the combined features to five cognitive states, spanning optimal focus to complete cognitive overload. A reinforcement learning-powered adaptive interface module responds in real time by simplifying UI complexity, adjusting content delivery speed, or suggesting optimally-timed micro-breaks. SHAP-based explainability ensures transparency in all model decisions. The system was trained on four public benchmark datasets (SEED-IV, DROZY, MIT Eye Tracking Corpus, TU Berlin Cognitive Load Dataset) and validated on a newly collected dataset of 50 post-COVID participants. CogniShift achieved a classification accuracy of 89.4% with sub-250 ms inference latency, outperforming single-modality baselines by 22–31%. The adaptive interface reduced task completion errors by 34% and self-reported cognitive fatigue by 41% compared to static interfaces ($p < 0.01$). CogniShift demonstrates that passive behavioural signals captured via standard consumer hardware are sufficient for reliable, real-time cognitive monitoring without specialised physiological equipment. These findings have direct applications in digital health, remote work, online education, and assistive technologies.

Keywords: cognitive load detection, adaptive human-computer interaction, multimodal deep learning, real-time fatigue monitoring, explainable AI

Computational Fluid Dynamic Investigation of Wind Interference Effects and Structural Adequacy of Tall Chimney Structures

D.N. Liyanage*, J.A.S.C. Jayasinghe, A.J. Dammika

Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**deleepa.liyanage@gmail.com*

Wind forces represent a critical loading condition for tall industrial chimneys, necessitating precise pressure distribution and interference assessments for structural integrity and economic optimization. This study evaluates wind-induced effects on tall chimney structures by employing a design wind profile developed in accordance with EN 1991-1-4, based on long-term reference wind velocity data at the standard 10 m reference height and representative terrain roughness parameters. This profile serves as the basis for validated Computational Fluid Dynamics (CFD) simulations used to examine wind pressures, interference phenomena, and the overall structural adequacy of tall chimneys. The main objectives were to establish the design wind profile, perform comprehensive CFD simulations to map pressure distributions on isolated and grouped chimneys, and evaluate interference-induced base moments across multiple wind incidence angles to quantify structural safety margins against design moment capacities. Numerical simulations were conducted in *OpenFOAM* using the Reynolds-Averaged Navier–Stokes (RANS) method with the *k-ω SST* turbulence model. Numerical model was validated against the CAARC standard tall building benchmark, where comparison with experimental wind tunnel data yielded a Mean Absolute Percentage Error (MAPE) of 7.39%, confirming the model's accuracy. Following validation, the 150 m cylindrical chimney was analyzed in both isolated and triple-unit linear configurations, incorporating varied center-to-center spacing to evaluate the resulting aerodynamic and structural interaction effects. Wind incidence angles of 0°, 30°, 60°, and 90° were examined. Surface pressure distributions were mapped to calculate base moments for comparison against the chimneys' structural moment capacity. The results showed clear wind interference effects in the grouped arrangement. The windward chimney consistently experienced the highest wind forces, while shielding from upstream structures reduced the loads on leeward chimneys. Pressure patterns varied noticeably with wind angle, and base moment evaluations indicated that the chimneys remained structurally adequate under the studied conditions, although interference significantly increased demands on the leading chimney. Overall, the validated CFD methodology, combined with the EN 1991-1-4 based wind profile, provides enhanced insight into aerodynamic interference for grouped tall chimneys. The findings support more accurate wind loading assessments and contribute to refined design practices for tall industrial chimneys, emphasizing the need to account for aerodynamic interactions in multi-structure layouts.

Keywords: base moment, CFD simulation, interference effect, tall chimney, wind loading

Cost-Effective 3D Localization of RFID-Tagged Inventory Using SAR with a Moveable RFID Reader

P.D.B.S. Nayanachandra*, D.A.A. De Silva, P.B.M.M.N.B. Basnayaka

Department of Electrical and Electronic Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e19257@eng.pdn.ac.lk*

No Show Abstract

Efficient localization of RFID-tagged inventory is essential for modern warehouse management to improve inventory visibility and operational efficiency. Although fixed RFID infrastructures enable automated inventory tracking, their deployment and maintenance costs remain a major barrier for small- and medium-scale warehouses. Existing handheld RFID systems primarily support tag identification rather than accurate three-dimensional localization. This research proposes a cost-effective RFID localization system that employs a moveable RFID reader and Synthetic Aperture Radar (SAR) imaging to accurately determine the positions of passive RFID-tagged pallets without requiring fixed reader installations. The objective of this study is to develop and validate a scalable localization framework capable of estimating the two-dimensional (2D) and three-dimensional (3D) locations of inventory items using only phase information collected from a moveable reader. The proposed approach forms a synthetic aperture by moving the RFID reader antenna along a controlled linear path while continuously acquiring phase measurements from passive UHF RFID tags. These measurements are processed using a SAR back-projection algorithm to reconstruct high-resolution spatial intensity maps, where the highest intensity corresponds to the estimated tag position. To enable 3D localization, the system incorporates a dual-antenna configuration that captures complementary spatial information for height estimation in addition to planar coordinates. A prototype system was implemented using an Impinj RFID reader, Laird antennas, passive UHF RFID tags, and a motorized linear motion platform to evaluate the proposed approach under controlled experimental conditions. Experimental results demonstrate that the SAR-based localization method successfully reconstructs tag locations with good spatial resolution and minimal deviation from the corresponding ground-truth positions while maintaining low computational complexity and eliminating the need for expensive fixed infrastructure. The proposed system demonstrates that SAR imaging, combined with a movable RFID reader, provides an accurate, scalable, and economically viable solution for warehouse inventory localization, offering a practical alternative to conventional fixed RFID deployments and supporting future intelligent warehouse automation.

Keywords: RFID localization, SAR, movable RFID reader, warehouse management, 3D localization

Acknowledgement: *The authors would like to acknowledge the support and guidance provided by Dr. Isuru Dassanayake and Mr. Niroshan Karunarathne, as well as the collaboration with Zone24X7.*

Data-Driven Indoor Localization and Mobility Tracking Using LSTM-Based Feature Learning

L.P.S.S. Dissanayake[1,3]*, M.B. Dissanayake[1], S.A.H.A. Suraweera[1], M.W.P. Maduranga[2]

[1]*Department of Electrical and Electronic Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Electrical and Electronic Engineering, University of Sri Jayewardenepura, Gangodawila, Nugegoda, 10250, Sri Lanka*
[3]*Department of Network Technology, University of Vocational Technology, Ratmalana, 10390, Sri Lanka*
**suranga@uovt.ac.lk*

Indoor localization of mobile users remains a challenging problem due to the general unavailability of reliable GPS coverage in indoor environments. Radio signal-based positioning is further affected by multipath propagation, non-line-of-sight (NLOS) conditions, and measurement noise, which limit the accuracy of conventional model-based techniques such as Time of Arrival (TOA) and Direction of Arrival (DOA). This study investigates the effectiveness of Long Short-Term Memory (LSTM)-based localization and compares its performance with classical approaches, including TOA-only, DOA-only, TOA–DOA fusion, and Kalman filtering, under identical evaluation conditions. A dataset comprising 5,000 samples was generated in a 20 m × 20 m indoor environment using three anchor nodes, with user mobility modeled through random-walk trajectories at a movement speed of 2 m/s and signal measurements collected at 2 ms intervals. For each time step, raw RF signal features (correlation, amplitude, phase) and model-based features (estimated TOA, DOA, and distance) were extracted. The dataset was split into training and validation sets using a 70:30 ratio, and all classical baselines were optimized under the same conditions as the LSTM models to ensure a fair comparison. Performance was evaluated on a common held-out test set using Root Mean Square Error (RMSE), 90th-percentile error (P90), and Cumulative Distribution Function (CDF) analysis. Classical approaches yielded the highest errors, with RMSE values of 5.34 m (TOA-only) and 9.64 m (DOA-only), while TOA–DOA fusion and Kalman filtering provided only moderate improvements (7.33 m and 7.10 m RMSE, respectively). In contrast, LSTM-based models significantly outperformed all conventional methods, achieving RMSE values of 1.18 m using model-based features and 0.87 m using raw RF features, with corresponding P90 errors of 1.60 m and 1.34 m; CDF analysis further confirmed the superior reliability of the raw RF-based model. Inference times for TOA, DOA, and the best-performing LSTM model were also evaluated. Overall, the results demonstrate that raw RF signal characteristics contain richer localization information than derived model-based features, and that LSTM-based learning provides a promising solution for accurate real-time indoor positioning, though future work should address computational complexity, inference efficiency, and scalability for large-scale deployment.

Keywords: indoor positioning, mobile user tracking, data-driven learning, LSTM, TOA/DOA

Design and Development of a Performance Improved Cost Effective Open-Wheel Single Seater Race Car

G.G.K.T. Galpokuna*, R.M.C.N. Rajapaksha, K.G.T.D. Karunarathne, A.G.S. Mishali, P.L.R.S. Nissanka, M.F.M. Razmy, M.Z. Usman, S.S.R.P.P.M.J.C. Abeyrathne, K.D. Pathiraja, H.M.A.D.K. Herath, H.M.D. Ilankoon, J.M.A.N. Jayathilake

Department of Automotive Engineering, Faculty of Engineering and Construction, ICBT Kandy Campus, Kandy, 20000, Sri Lanka
**kasuntharakagalpokuna362@gmail.com*

Open-wheel race cars are among the most advanced and performance-oriented vehicles in motorsport, requiring an optimal balance between speed, handling, safety and cost efficiency. This study presents the design and development of a Formula-style, single-seater open-wheel race car built under student-level resource constraints, with a focus on lightweight construction, aerodynamic performance and sustainable material usage. The primary objective of this project is to demonstrate how core automotive engineering principles can be effectively applied to develop a functional race car within limited financial and manufacturing resources. The design process integrates computer-aided design (CAD), engineering simulations, material selection and hands-on fabrication. A rear-mid-mounted Suzuki F6A engine coupled with a rear-wheel-drive configuration was selected to achieve improved weight distribution, balance and efficient power delivery. The chassis was constructed using lightweight steel tubing to ensure structural rigidity while minimizing overall mass. The suspension system consists of a double wishbone setup at the front and a MacPherson strut configuration at the rear, providing stability and precise handling characteristics. Aerodynamic components, including front and rear wings and side air vents, were developed through iterative design and computational fluid dynamics (CFD) simulations to enhance downforce and airflow management. A key innovation in this project is the use of jute fiber-reinforced composite materials combined with polyester resin for body panels, offering a cost-effective and environmentally sustainable alternative to conventional carbon fiber. Comparative material analysis showed that while fiberglass exhibits superior mechanical strength, jute composites provide significant advantages in terms of weight reduction, cost efficiency and environmental impact. The vehicle was evaluated through static testing and controlled speed test runs (up to 100 km/h), which confirmed stable handling, effective braking performance and balanced system integration. The implementation of a four-wheel disc braking system and essential safety features further enhanced operational reliability. Future work will focus on comprehensive performance testing and further design optimization to prepare the vehicle for participation in Formula-style racing competitions in Sri Lanka. Overall, this project demonstrates the feasibility of developing a cost-effective, sustainable and high-performance open-wheel race car, highlighting the potential of alternative materials and innovative design approaches in modern automotive engineering.

Keywords: aerodynamics, bio-degradable materials, jute fiber composites, lightweight design, open-wheel, single-seater race car

Design and Digital Control of a Full-Bridge LLC Resonant Converter for a 1kW Off-Grid Solar Microinverter

T.M.T.N. Thennakoon*, J.B. Ekanayake

University of Peradeniya, Peradeniya,20400, Sri Lanka
**thaniduthennakoon@gmail.com*

The global transition toward decentralised renewable energy requires highly efficient standalone power conversion architectures. In off-grid photovoltaic (PV) microinverter applications, achieving superior DC-DC conversion efficiency and high-power density is a primary engineering challenge. Resonant converter topologies, with their inherent soft-switching characteristics, offer a compelling solution to minimise switching losses. This study presents the design, simulation, and implementation of a 1 kW off-grid solar microinverter using a full-bridge LLC resonant converter and an H-bridge inverter. To establish a complete off-grid application, solar panels charge a 48 V battery system serving as the primary DC source. This feeds the proposed 48 V input full-bridge LLC converter to establish a 400 V DC bus. The DC bus then supplies an H-bridge inverter controlled by an EGS002 module, generating a reliable pure sine wave for continuous AC power delivery. The LLC converter stage is simulated using PLECS and controlled via a Texas Instruments C2000 F28379D microcontroller. The resonant tank comprises a 1.8 µF capacitor and a 6 µH inductor interfaced with a high-frequency transformer. Closed-loop voltage regulation uses a custom-built discrete proportional-integral (PI) controller targeting the 400 V output. The digital control architecture features a soft-start sequence initialised at 500 kHz, decrementing toward a nominal 48 kHz setpoint, using an inverse-frequency gain block ($1/f_{sw}$) to accurately modulate the switching period. Simulation results validate the steady-state performance, demonstrating a stable 404.5 V output across a 160 Ω load (2.5 A, 1 kW). Transient analysis of MOSFET waveforms confirms Zero Voltage Switching (ZVS), substantially mitigating turn-on losses. The PI control loop maintains stable regulation at approximately 56.3 kHz. Furthermore, the 500 kHz soft-start effectively suppresses inrush currents during the power-up transient for safe initialisation. The findings demonstrate that integrating a full-bridge LLC resonant topology with PI-based frequency modulation and an EGS002-driven H-bridge provides a robust, high-efficiency power conversion blueprint for standalone PV applications.

Keywords: LLC resonant converter, Zero Voltage Switching (ZVS), off-grid photovoltaic microinverter, digital PI control, soft-start frequency modulation

Design and Evaluation of a Web Application for Improved Allergen Control in Large-Scale Catering Operations

S.D. Tharangani[1], G.M. Somaratane[1]*, N.K.B.L.M. Bandara[2], K.A.P.N. Rathnasekara[2], Y.B.M.D.C.Y. Bandara[3], C.P.K. Lekamalage[3], D. Samarakoon[4]

[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Computer Engineering, Faculty of Engineering, University of Sri Jayewardenepura, Nugegoda, 10250, Sri Lanka*
[3]*Department of Health Safety & Environment, Cinnamon Hotels & Resorts*
[4]*Department of Hygiene & Quality Assurance, Sri Lankan Catering*
**gsomaratne@agri.pdn.ac.lk,*

Food allergy incidents have emerged as a growing concern worldwide, posing significant challenges for hospitality establishments that manage diverse ingredients under rapid food preparation conditions. In Sri Lanka, catering operations, including hotels and airline services, largely rely on manual documentation and verbal communication for allergen management, increasing the risk of misinformation and unintentional allergen exposure. To address this gap, a web-based application was developed to improve ingredient transparency and allergen awareness in large-scale catering environments. A mixed-methods design was adopted, beginning with focus group discussions and key informant interviews involving 20 staff members, including chefs, quality assurance personnel, and purchasing personnel, from two large-scale catering establishments, Sri Lankan Catering Ltd. and Cinnamon Grand Colombo, selected as Sri Lanka's sole airline caterer and a leading hotel and resort operator, respectively, to identify system gaps and functional requirements. Based on these insights, a customized web application was developed featuring comprehensive ingredient and meal databases, allergen identification, storage and shelf-life details, and role-based user access. The system supports two user levels: general users, who can search meal and allergen information, and staff users, who can update and manage data in real time. Effectiveness was evaluated through a pre- and post-knowledge test administered to the same 20 participants, whose mean scores increased significantly from 6.95 to 8.10 (paired t-test, $p = 0.025$). Overall system performance, assessed using a one-sample Wilcoxon Signed Rank test, showed high user satisfaction, with median ratings of 4.00–5.00 for navigation, intuitiveness, reliability, responsiveness, compatibility, loading time, clarity of information, and engagement ($p < 0.001$), while the feature set attribute recorded a median of 3.00 ($p = 0.083$), indicating room for further enhancement. In conclusion, the developed web-based solution is an efficient, reliable, and sustainable platform that bridges the existing communication gap in allergen management, enhances staff awareness, and supports safer food preparation in catering facilities. Its integration into the food industry is expected to bring about a meaningful shift in allergen control practices, strengthening regulatory compliance and consumer safety.

Keywords: allergen management, food safety, web application, catering operations, ingredient transparency

Design and Evaluation of Sustainable PLA-Based Composite Filaments Using Local Bio-Waste for 3D Printing

R.A.R.S. Jayasekara*, A. Ratnaweera

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**rwindyajayasekara@gmail.com*

The global demand for sustainable materials in additive manufacturing has increased due to growing environmental concerns and the overreliance on petroleum-based polymers. Polylactic acid (PLA) is a widely used biodegradable material in fused deposition modeling (FDM) and exhibits limitations such as brittleness and moderate mechanical strength. This study investigates the development of sustainable PLA-based composite biodegradable filaments reinforced with locally available waste materials, including eggshells, rice husks, spent tea grounds and Ceylon olive seeds. The primary objective is to evaluate the feasibility, printability, and mechanical performance of these composites for 3D printing applications while promoting the utilization of Sri Lankan agricultural and food waste. The selected bio-waste materials were first crushed into fine powder, followed by sieve analysis to achieve controlled particle sizes below 200µm and then oven-dried at 60ºC to remove moisture before extrusion. Proper moisture removal was critical to prevent defects such as air bubble formation and poor interlayer bonding during printing. The dried fillers were blended with PLA with 1-5 wt% and extruded using the Filabot EX2 single screw extruder at 165.5ºC to produce filaments of 1.75 mm diameter. Standard test specimens were fabricated using Crealty Ender 3V2 FDM 3D printer under controlled process parameters and mechanically tested, according to ASTM D638 and ASTM D256 for tensile and impact properties, respectively. The results indicate that only 1-3 wt% filler compositions produced printable and stable filaments, while 4-5 wt% filler compositions resulted in extrusion instability, nozzle clogging, and poor print quality. Mechanical testing revealed that filler addition increased Young's modulus across all materials, with eggshell and Ceylon olive seed fillers showing the most significant stiffness improvement. Impact strength improved with tea waste fillers, indicating enhanced energy absorption. Tensile strength decreased by approximately 40-50% compared to pure PLA, limiting structural applications. This study demonstrates that locally sourced biodegradable waste can be effectively utilized to develop sustainable, low-cost PLA composites, suitable for non-load-bearing 3D printing applications, promoting circular economy practices and environmentally responsible manufacturing.

Keywords: PLA composites, FDM 3D printing, sustainable materials, biodegradable filaments, circular economy

Developing Culturally-Sensitive, Adaptive Text-Based Pedagogical Agents to Enhance User Experience in E-Learning Platforms

W.A.E.M. Weerasinghe*, K.P.P.S. Pathirana, E.M.U.W.J.B. Ekanayake, H.M.S.N. Ariyadasa

Department of Computer Science and Informatics, Faculty of Applied Sciences, Uva Wellassa University, Badulla, 90000, Sri Lanka
**eshanamilan@gmail.com*

Globalization has significantly expanded e-learning platforms in higher education. However, these platforms are designed for Western cultural contexts. They do not sufficiently support local cultures. As a result, students show lower engagement and technology anxiety increases in regional contexts. Although Large Language Models (LLMs) provide fluent conversations, generic LLM-based agents lack localized pedagogical support and cultural adaptability. This system was designed with cultural sensitivity, trilingual support and HCI-driven pedagogy for Sri Lanka higher education contexts.Addressing this gap, this study aimed to investigate whether a culturally sensitive and multilingual text-based pedagogical agent could reduce technology anxiety and improve user experience among Sri Lankan undergraduate students in higher education e-learning environments. The system supports Sinhala, English and Tamil to meet local language needs. A mixed-methods approach was used in four phases: User Experience gap analysis, prototype development, usability evaluation and guideline formulation. Empirical data were collected from 143 University students using purposive sampling and a modified Extended User Experience Questionnaire (UEQ+). Initial analysis indicated that 27.7% of users experienced high technology anxiety when interacting with the system, highlighting the need for culturally adaptive design in regional e-learning contexts. Revealed that 27.7% of users experienced high technology anxiety, cultural adaptive design**.** In response, the study developed an adaptive framework and implemented it using ASP.NET Core Blazor interfaces integrated with the Google Gemini API, guided by established Human–Computer Interaction heuristics. The evaluation results indicate that incorporating cultural and language adaptation at the design level contributed to improved user experience indicators. Participants reported high ratings for the system, with mean score of 4.21/5 for user experience and cultural relevance, and 4.13/5 for learner autonomy. The overall satisfaction rate was 84.6%. Technology anxiety was low with nervousness score of 2.48/5. Students reported a high level of comfort with AI-based features (4.01/5).These results suggest that students felt self-confident using the system. The system supported assessments and peer learning in English, Sinhala, and Tamil. The study presents a practical, evidence-based teaching framework that is not limited to the specific technical implementation and can guide the integration of inclusive AI-based learning systems into standard Learning Management Systems.

Keywords: pedagogical agents, e-learning, user experience design, cultural sensitivity, multilingual education

Development and Validation of a Low-Cost, Wearable Piezoelectric Digital Stethoscope for Phonocardiogram Signal Acquisition

A.J.A. Naim[1]*, A.L.A. Haathi[1], R.D.B. Ranaweera[1], J.V. Wijayakulasooriya[1], D. Nandadeva[2], A. Ratnayake[2], K.B. Divulwewa[3]

[1]*Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Faculty of Medicine, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*National Hospital Kandy, Kandy, 20000, Sri Lanka*
**e19251@eng.pdn.ac.lk*

Cardiovascular diseases require early detection, but conventional diagnostic tools like electronic stethoscopes are often expensive and restricted to clinical environments. Phonocardiography (PCG) allows for the electronic recording of heart sounds, yet access to affordable, portable systems remains limited. This study aims to design and validate a low-cost, wearable digital stethoscope to capture high-fidelity PCG signals. The primary objective is to verify its signal fidelity against a clinical gold-standard Littmann Model 3200, as a foundation for subsequent clinical validation. The custom device utilizes an inexpensive piezoelectric vibration sensor, chosen for its resistance to ambient airborne noise, coupled with a pre-amplifier circuit. The analog signal is digitized by an ESP32 microcontroller using an ADS1015 ADC at 3.3 kHz, logging to an SD card. The offline signal processing chain includes a 20-1600 Hz bandpass filter, amplitude normalization, and Singular Spectrum Analysis (SSA) to extract dominant acoustic features. The retained SSA components captured 88% of total signal variance, corresponding to an estimated 6 dB improvement in signal-to-noise ratio relative to the unfiltered signal, confirming effective suppression of stochastic noise while preserving physiological signal structure. Results demonstrated that the custom piezoelectric system successfully captured fundamental S1 and S2 morphological features. For signals collected from the aortic auscultation site, time-domain analysis yielded a strong mean Pearson correlation 0.80 ± 0.06 between the SSA-reconstructed custom signals and the reference device across 10 healthy volunteers during 60 second resting recordings. Furthermore, Short-Time Fourier Transform analysis confirmed that the custom hardware captured the essential frequency distributions and transient energy bursts, successfully preserving clinically relevant acoustic features through the denoising pipeline. The developed digital stethoscope offers a highly functional, low-cost alternative for cardiac auscultation. This device is positioned as a robust, screening instrument capable of reliable signal capture for decentralized cardiovascular screening. Future work will extend validation to patients with confirmed valvular pathology including aortic stenosis and mitral regurgitation murmurs to assess the device's sensitivity to clinically relevant acoustic abnormalities, and will integrate signal processing algorithms to allow the digital device to mimic the familiar acoustic profile of a traditional acoustic stethoscope.

Keywords: digital auscultation, heart murmurs, piezoelectric sensor, low-cost

Acknowledgement: *This study was sponsored by the University Research Council, University of Peradeniya (Grant No: MRG/15/2025).*

Development of a Custom Embedded Control Architecture for Wireless Electro-Hydraulic Operation of an Omni-Directional Diesel Forklift

M.G.C.N. Ranasinghe*, A.N.B. Jayathilaka, H.M.D. Ilankoon

ICBT, Kandy, 20000, Sri Lanka
**chayananipun@gmail.com*

Standard diesel forklifts rely on manual hydraulic valves and fixed steering, which limits their use in confined industrial spaces and slows the adoption of automation. While existing retrofits usually address remote operation or directional flexibility separately, the main objective of this study is to develop a low-cost embedded control system that upgrades standard hydraulic forklifts to feature both wireless and Omni-directional capabilities without replacing legacy hydraulic components. The proposed system uses an ESP32 microcontroller to regulate hydraulic fluid by actuating standard spring-return spool valves with stepper motors. An Android mobile application provides remote control via a TCP/IP network, maintaining command latencies under 100 milliseconds within a 30-metre radius. The firmware uses mecanum wheel kinematics to convert operator inputs into precise valve movements across four independent hydraulic wheel motors. This enables full-plane mobility, including lateral travel, diagonal movement, and stationary rotation. Testing was conducted at operating pressures up to 20.7 MPa using a 1/16-step motor resolution and auto-calibrating neutral valve positioning. Valve accuracy was maintained within ±2%. Safety features, such as automatic valve centering on signal loss and network watchdog monitoring, were successfully verified in over 50 test sequences. Finally, an economic analysis demonstrated that the proposed retrofit costs approximately 500,000 LKR—achieving an estimated 75% cost reduction compared to equivalent commercial electro-hydraulic systems (approx. 2 million LKR), while providing superior functional integration. This work provides a practical, straightforward, and affordable method to introduce digital control and remote operation to legacy hydraulic equipment, directly supporting sustainable industrial automation in resource-constrained environments.

Keywords: electro-hydraulic retrofit, Omni-directional mobility, ESP32 microcontroller, mecanum wheel kinematics, industrial automation

Development of a High-Fidelity 3D Dataset for Automated Construction and Demolition Waste Sorting

S.A.R.R. Suraweeraarachchi[1]*, U.G.U.P. Samarasekara[2], H.D.S.M. Jayawardhana[1], J.A.S.C. Jayasinghe[2], U. Jayasinghe[3], C.S. Bandara[2]

[1]*Department of Mechanical Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**e19393@eng.pdn.ac.lk*

The development of robotic sorting systems for construction and demolition waste relies heavily on physics-based simulations. However, a scarcity of specialized 3D datasets capturing the unique physical and visual features of such waste widens the simulation-to-real gap. To bridge this gap, this research introduces a scalable, multi-stage pipeline to generate high-fidelity, physics-enabled 3D models of irregular construction and demolition waste debris across various categories. Initially, the Segment Anything Model was used to isolate individual debris from a representative construction waste image dataset. These individual debris were reconstructed into 3D meshes using the TripoSG framework. Using Blender software, these meshes were post-processed by applying material textures, targeted transparency mapping for transparent and translucent materials, and precise scaling. Furthermore, material specific densities were assigned to each 3D object and additional modifiers were applied to account for hollow geometries. The processed 3D objects were integrated into the Webots simulation environment to evaluate robotic grasping performance and contact mechanics. The implemented pipeline successfully produced over twenty high-fidelity 3D waste objects categorized into five distinct material classes. Qualitative assessment in the Webots environment confirmed that the physics-based modeling resulted in realistic mechanical behaviors during robotic grasping of the 3D objects, with predictable friction-based interactions with the robotic gripper. The objects maintained consistent trajectories and realistic contact dynamics when placed on a simulated moving conveyor belt. Furthermore, YOLO-based object detection algorithms accurately identified the items with a precision of 91.20% and a mean average precision of 88.54%, proving that the applied visual textures provided sufficient feature depth. In conclusion, this research provides a scalable framework for generating high-fidelity 3D irregular construction and demolition waste, as well as a comprehensive 3D construction waste dataset which would serve as a resource for developing reliable autonomous construction waste sorting systems.

Keywords: construction and demolition waste, high-fidelity 3D dataset, robotic sorting, sim-to-real gap, Webots simulation

Acknowledgement: *This work was supported by the NSF–NSFC Joint Research Program (Grant No. ICRP/NSF-NSFC/2024/EA&ICT/03).*

Development of an Ultra High Performance Fibre Reinforced Concrete (UHPFRC) Retrofitting Framework for Reinforced Concrete Beams

R.S.S.A. Wijesundara, I. Abeykoon*, N.M.S.H. Bandara, K.K. Wijesundara

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e18005@eng.pdn.ac.lk*

Ultra-High Performance Fibre Reinforced Concrete (UHPFRC) is a cementitious composite with superior mechanical properties, excellent durability, and abrasion resistance, making it well suited for structural retrofitting applications. The aim of this study is to develop an UHPFRC retrofitting framework for reinforced concrete deep beams employing two-sided jacketing. A shear-critical reinforced concrete deep beam with a span-to-depth ratio of 2 was selected as the control beam. A section analysis-based approach was employed to determine the flexure and shear capacities of UHPFRC retrofitted beams. Four jacket thicknesses of 10, 20, 30, and 40 mm were investigated. This range was selected to bracket the transition from shear-governed to flexure-governed behaviour, consistent with jacket thicknesses reported in the literature. The objective of the retrofitting design was to shift the brittle shear failure of the control beam to ductile flexure by using optimum UHPFRC jacket thickness, taken as the minimum thickness that produced a flexural failure. An experimental programme was conducted to validate the proposed retrofitting framework. An UHPFRC mix of 120 MPa compressive strength was developed using locally available raw materials with sufficient workability, and used to retrofit the control beam at the selected 40 mm optimum thickness. Contact between the UHPFRC jacket and the substrate was enhanced by chipping the beam surface. The control and retrofitted beams were tested under 3-point bending, and their load-displacement curves, failure modes, and crack patterns were compared. The 40 mm UHPFRC jacket increased the load-carrying capacity from 185 kN for the control beam to 376 kN, approximately doubling the capacity while shifting the failure mode from brittle shear to ductile flexure. In the control beam, diagonal shear cracks formed and propagated rapidly, causing failure at limited ductility. In the retrofitted beam, the UHPFRC jacket redistributed stress and suppressed diagonal cracking, promoting distributed flexural cracks and improved ductility. The analytically predicted ultimate load agreed closely with the experimental value, deviating by approximately 0.3%, confirming the accuracy of the framework. The study is limited to a single beam geometry and one surface preparation method. Future work should extend the validation to different geometries, jacketing configurations, and interface treatments.

Keywords: deep beams, retrofitting, shear capacity, UHPFRC, two-sided jacketing, section analysis, experimental validation

Acknowledgement: *This research is funded by the University Research Grant (Grant No: URG/2025/21/E)*

Digitalizing Natural Rubber Metrology: A Multi-Parameter IoT Terminal for First-Principles DRC Measurement and Fraud Detection

H.D. Suriyapperuma*, N.C. Manilgama, A.D. Rukshan, K.A.P.M. Perera, Y. Vimukthi

Department of Computer Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e21453@eng.pdn.ac.lk*

According to the Sri Lanka Export Development Board (EDB), the natural rubber industry generates approximately $870 million in annual export earnings, yet systemic measurement inefficiencies contribute to an estimated $26 million (approximately 3% of annual export earnings) in annual industrial losses. Rural collection centers currently rely on manual glass hydrometers (Metrolacs) prone to temperature errors and human manipulation or slow laboratory oven methods that delay farmer payments to bi-monthly cycles. While a prior electronic research prototype has been published, it relies on an empirical regression model requiring extensive pre-calibration data that limits its adaptability across diverse field conditions. This research proposes a compact, field-ready IoT terminal designed to bridge this gap by providing near-instantaneous Dry Rubber Content (DRC) measurements alongside multi-parameter sensing for fraud detection. The methodology involves a cyber physical system centered around an ESP32 microcontroller and high precision load cells to calculate DRC via buoyancy measurement using Archimedes' principle. Unlike the existing regression dependent model, this physics based approach provides a universal measurement independent of variations in field latex composition. A DS18B20 probe provides real time temperature compensation while a unique relay-isolation hardware architecture resolves galvanic ground loop interference between the co-submerged pH and TDS sensors. The developed system is a fully integrated, hand-held operational terminal that outperforms the accuracy of the traditional glass Metrolac at the point of collection, utilizing an MQTT-based "store-and-forward" protocol to prevent data loss in remote areas with intermittent connectivity. Validation against eight field latex samples from Sri Lankan rubber collection centers showed that our device achieved a mean error of ±0.74% DRC against the ISO 126 laboratory oven standard, compared to ±1.53% for the traditional glass Metrolac against the same standard. The worst-case error was reduced from ±7.75% to ±2.10%. These results demonstrate that the proposed system is a practical and more accurate alternative to the traditional glass Metrolac, offering rubber farmers and collection centers a faster, fairer and more reliable way to measure latex quality. Future work will expand validation across a wider range of latex sources and further improve accuracy through hardware fine-tuning and extended field trials.

Keywords: smart-metrolac, Dry Rubber Content (DRC), IoT in agriculture, supply chain transparency, adulteration detection

Dynamic Simulation and Control of a Wind Powered Chlor-Alkali Electrolysis System

R.B.G.D.N. Rajapaksha*, N. Fernando

Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e20311@eng.pdn.ac.lk*

The chlor-alkali membrane electrolysis process is one of the most electricity intensive operations in the chemical industry, producing chlorine, sodium hydroxide, and hydrogen for numerous industrial applications. Replacing fossil fuel-based electricity with renewable energy sources such as wind power offers significant environmental benefits but introduces power fluctuations that challenge stable electrolyzer operation. This study develops a dynamic mathematical model and control strategy to investigate the feasibility of operating a membrane chlor-alkali electrolyzer under fluctuating wind power while maintaining stable product quality. The research methodology involved developing an electrochemical model based on reversible voltage, activation overpotential, ohmic losses, and the additional resistance effects caused by gas bubble formation at the electrode surfaces. Dynamic mole balance model was also developed for the anode and cathode compartments to predict concentration changes as a result of flow variations with time. The model was implemented in Scilab, while the control strategy was developed in Scilab-Xcos using two PI controllers to regulate the anode brine feed rate and cathode water feed rate. The electrolyzer was operated over an industrial current density range of 3000–6000 A m^{-2}, representative of flexible operation under variable wind power. Model predictions were validated against published literature data, showing good agreement for steady-state cell voltage and electrolyte concentration trends. Inclusion of the bubble resistance model increased the predicted cell voltage by approximately 2.0 – 2.5 V at 6000 A m^{-2}, significantly improving agreement with reported operating voltages. The PI controllers maintained the cathode outlet concentration at 32 wt.% NaOH despite rapid current density variations. Controller parameters of Kp = 0.12, Ki = 0.28 for brine flow control and Kp = 74.27, Ki = 7.42 for cathode water flow control provided stable disturbance rejection with minimum steady state error. The results demonstrate that membrane chlor-alkali electrolyzers can be operated flexibly under renewable electricity while maintaining stable product quality. Future work will focus on benchmarking the model against industrial operating data and developing a two-dimensional CFD model using OpenFOAM to capture detailed hydrodynamics, gas bubble behaviour, and species transport, thereby providing more realistic predictions of electrolyzer performance.

Keywords: chlor-alkali electrolysis, dynamic modeling, wind energy integration, process control, CFD modeling

Effect of TiO_2 Nanofiller Particle Size on the Performance of Cellulose Acetate-Based Quasi-Solid-State Electrolytes for Dye-Sensitized Solar Cells (DSSCs)

P.U. Sandunika[1,2,3]*, M.A.K.L. Dissanayake[1,2], G.K.R. Senadeera[1,4], J.M.K.W. Kumari[1,2]

[1]*National Institute of Fundamental Studies, Hantana Road, Kandy, 20000, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Physical Sciences, South Eastern University of Sri Lanka, Sammanthurai, 32360, Sri Lanka*
[4]*Department of Physics, The Open University of Sri Lanka, Nawala, Nugegoda, 10250, Sri Lanka*
**ushanisandunika78@gmail.com*

No Show Abstract

Developing stable and efficient electrolytes for dye-sensitized solar cells (DSSCs) remains a major challenge. Using a quasi-solid-state electrolyte is one of the ideal choices because it offers improved stability while maintaining reasonable efficiency over a liquid electrolyte. In this study, cellulose acetate-based quasi-solid-state electrolytes were prepared by incorporating commercially available P25 (anatase) and P25 (anatase + rutile) TiO_2 particles, as well as P90 TiO_2 particles with varying particle characteristics, to enhance the electrolyte's ionic conductivity and DSSC photovoltaic performance. The quasi-solid electrolytes incorporating TiO_2 nanofillers were employed in DSSCs assembled with N719 dye-sensitized photoanodes and platinum counter electrodes. Incorporating TiO_2 nanoparticles into the electrolyte affects both electrolyte conductivity and the overall performance of the device. Among the three electrolytes, the one incorporating P90 nanoparticles exhibited superior performance, indicating the critical role of particle size and surface properties in facilitating charge transport. The quasi-solid state electrolyte without TiO_2 nanofillers exhibited an efficiency 6.57% for a device area of 0.16 cm^2 with Pt as the counter electrode. Upon incorporation of P90 TiO_2 nanofillers into the quasi-solid-state electrolyte, the device efficiency improved 7.43% under similar conditions. In comparison, the reference liquid electrode achieved a higher efficiency of 8.08% for the same device configuration. This improvement can be attributed to the increased ionic conductivity and better interfacial contact, which are enabled by the optimized nanofiller properties, as confirmed by the photovoltaic performance of the full device and conductivity measurements. This study demonstrates a promising pathway to reducing the efficiency gap between liquid and quasi-solid state electrolyte systems, contributing to the development of stable, high-performance solar energy devices.

Keywords: TiO_2 nanofiller, cellulose acetate, quasi-solid-state electrolytes, dye-sensitized solar cells

Enhancing Developer Productivity through Hybrid Knowledge Graph–LLM Integration in Software Engineering Environments

M. Vaishaly[1]*, S. Vasanthapriyan[2], T.D. Rubasinghe[3]

[1]*Department of Computing and Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya ,70140, Sri Lanka*
[2]*Department of Data Science, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
[3]*Department of Statistics and Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**vmahendrarajah@std.appsc.sab.ac.lk*

Modern software repositories contain highly interconnected artifacts, including source code, documentation, issue reports, pull requests, commits, and dependency information, making repository exploration and software maintenance increasingly challenging. Although Large Language Models (LLMs) provide valuable assistance for software engineering tasks, they frequently lack repository-specific contextual understanding and may generate unsupported or hallucinated responses when reasoning across multiple software artifacts. This study proposes an adaptive hybrid Graph Retrieval-Augmented Generation (GraphRAG) framework that integrates a repository-specific knowledge graph with graph and vector retrieval to generate accurate, explainable, and evidence-grounded repository reasoning. The research addresses the questions of whether graph-grounded retrieval improves repository question answering, reduces hallucinations, supports multi-hop reasoning, and enhances repository exploration efficiency. A mixed-method evaluation is adopted using both a large-scale synthetic software engineering dataset and five real-world open-source repositories: Spring PetClinic, OpenMRS, eShopOnContainers, Apache Airflow, and MLflow. The synthetic dataset is programmatically generated to simulate realistic software development environments by creating interconnected repositories, developers, commits, issues, pull requests, documentation, dependencies, and software components with predefined semantic relationships. This controlled environment provides complete ground truth, enables reproducible experiments, supports scalability analysis, and facilitates systematic ablation studies, while the real repositories validate the framework under practical software engineering conditions. Repository artifacts are parsed using static code analysis and repository metadata extraction, transformed into a Neo4j Knowledge Graph, and integrated with adaptive GraphRAG retrieval. A benchmark comprising 300 manually designed repository reasoning questions is developed across entity retrieval, dependency analysis, issue reasoning, documentation retrieval, pull request analysis, and multi-hop reasoning. Ground-truth answers are generated through validated Cypher queries and manual verification against repository evidence. Experimental evaluation against Plain LLM, Vector RAG, Graph RAG, and the proposed adaptive GraphRAG framework demonstrates improvements with an Exact Match score of 0.842**,** Precision of 0.891**,** Recall of 0.876**,** F1-score of 0.883**,** ROUGE-L of 0.901**,** BERTScore of 0.928**,** a hallucination rate of 0.071**,** multi-hop reasoning accuracy of 0.864**,** and an average repository task completion time of 41.8 second**s**, outperforming the comparison methods. These findings demonstrate that adaptive graph-grounded retrieval provides more reliable, explainable, and scalable repository reasoning while establishing a reproducible evaluation framework for intelligent software engineering assistants.

Keywords: developer productivity, GraphRAG, large language models, software engineering, software repository reasoning

Enhancing Stock Price Simulation: A Case Study on Long Short Term Memory Network Model for Geometric Brownian Motion Based Colombo Stock Exchange Price Simulation

R.A.A.U. Amarasinghe

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
aminda.amarasinghe.eng@gmail.com

No show Abstract

Price forecasting and simulation in volatile markets such as stock markets should be adequately accurate. The Geometric Brownian Motion (GBM) is frequently applied to model stock prices that assumes price changes fit a log-normal distribution. However, standard GBM's assumption of constant drift and volatility parameters makes it challenging to model time-varying market behaviors and more complex temporal relationships. Traditional price forecasting approaches focus on historical datasets but stock price movements are more influenced by recent market conditions not by observations from several years earlier. As a result, training models on historical data might fail to adapt to current market trends and can be computationally ineffective and complete historical datasets might have been affected by few rounds of sub-division of shares, which require sub-division handling of datasets before using for training machine learning models. Incorporating dynamic drift and volatility forecasts using the Long Short Term Memory (LSTM) model into the GBM process enables price simulations to adapt to ongoing market conditions by combining the stochastic nature of GBM price movements with deep learning's pattern recognition skills. This study aims to investigate whether daily heatmap data (order book dynamics, real time capital flows, trading velocity features) can provide more accurate stock price forecasts than traditional historical OHLCV data while requiring substantially fewer observations in the Colombo Stock Exchange. The novelty of this study lies in incorporating market microstructure information derived from daily heatmap data for GBM based price simulation. Historical data that contain Open, High, Low, Close price values and Volume (OHLCV data) for each business day collected from trade commencement date of the security and daily heatmap data collected from November 2025 were involved to compare results of two machine learning workflows allocated for historical data and heatmap data for 18 selected securities. Data preprocessing included outliers and missing values handling, introducing lag features, volatility features and normalization. AutoEncoder based feature selection filters the most significant 10 features from each datasets. The models evaluated with Normalized Root Mean Squared Error (NRMSE) and according to the results, the Heatmap-data-based LSTM–GBM model achieved a lower average NRMSE (10.22%) than the Historical-data-based LSTM–GBM model (14.28%). The Heatmap-data-based LSTM–GBM model outperformed in 14 of 18 securities indicating that LSTM-based GBM models using heatmap data can make better predictions with fewer observations than models using traditional historical data and the accuracy improvement was found to be statistically significant based on the Wilcoxon signed-rank test ($p = 0.034$). For the selected securities, heatmap based approach has reduced the data size by more than 94% compared to historical datasets. The proposed framework demonstrates that recent market microstructure information can replace large historical datasets while improving prediction accuracy, providing a computationally efficient alternative for traditional stock price forecasting.

Keywords: Colombo Stock Exchange, Geometric Brownian motion, Long Short Term Memory

Evaluating Out-of-Domain Performance Prediction Methods Under Domain Shifts

P. Weerasinghe[1]*, R. Tennakoon[2], J. Thangarajah[2], D. Herath[1]

[1]*University of Peradeniya, Peradeniya 20400, Sri Lanka*
[2]*RMIT University, Melbourne, VIC 3000, Australia*
**pramukaw@sci.pdn.ac.lk*

Deep neural networks have achieved remarkable success in various applications where the test data follows the same distribution as the training data. However, in many real-world scenarios, this assumption often fails due to domain shifts, where test data referred to as out-of-domain (OoD) data differs from the training distribution. Such shifts can significantly degrade model performance and are particularly pronounced in data-constrained domains such as medical imaging, arising from variations in imaging devices, acquisition protocols, and patient demographics. While numerous techniques have been proposed to address domain shift, their effectiveness remains limited, especially when labeled target data is unavailable. This study investigates algorithms designed to predict OoD performance on unlabeled datasets and evaluates their reliability under different types of domain shifts, specifically diversity shifts (emergence of new patterns) and correlation shifts (changes in feature–label relationships). A systematic benchmarking framework is adopted to evaluate a diverse set of state-of-the-art OoD performance prediction algorithms across datasets exhibiting both shift types. The evaluation includes benchmark datasets such as PACS, CIFAR-100-C, and ColoredMNIST. OoD performance prediction methods Average Threshold Confidence (ATC), Difference of Confidence (DoC), Mandoline, and AugMax are assessed under consistent experimental settings using metrics such as robustness accuracy and mean absolute error. The results reveal significant variability in algorithm performance across shift types, indicating a lack of consistent generalization. Under correlation shift (MNIST to ColoredMNIST), ATC achieves substantially higher robustness accuracy (0.9466) compared to DoC (0.2096), demonstrating its effectiveness in confidence-based estimation. In contrast, under diversity shift (CIFAR-100 to CIFAR-100-C), Mandoline outperforms ATC (0.5164 vs. 0.2655), highlighting its sensitivity to distributional variation. Overall, no single method performs reliably across both shift types, emphasizing limitations of current approaches in complex real-world scenarios. These findings highlight the need for shift-aware or hybrid OoD performance prediction frameworks capable of handling diverse and interacting domain shifts. This work provides a benchmark for future research and offers critical insights for advancing reliable OoD performance estimation.

Keywords: out-of-domain performance, domain shift, robustness evaluation

Experimental Investigation of Local Heat Transfer Coefficients of a Minichannel Evaporator with Propane as the Refrigerant

H.A. Malshani*, W.P.D. Fernando

Department of Mechanical Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**anuradhamalshani9@gmail.com*

Accurate heat transfer coefficients are fundamental to the design and optimization of refrigeration systems. This study investigates the local heat transfer coefficients of a minichannel heat exchanger used as an evaporator in a heat pump with propane (R290) as the refrigerant. The growing demand for sustainable refrigeration systems is driving the adoption of natural refrigerants with negligible ozone depletion and low global warming potential. Propane offers excellent thermodynamic performance, but its flammability requires charge minimization, highlighting the importance of compact heat exchangers with small internal volumes and high efficiency. The experimental data were obtained from a previously developed minichannel aluminum evaporator operating in a controlled system. Previous studies by one of the authors focused on determining average heat transfer coefficients of the evaporator. In contrast, the present study utilizes the same experimental dataset to investigate the local heat transfer characteristics of propane in the minichannel evaporator through a detailed segment-wise analysis of heat transfer behavior. The evaporator was divided into 12 sections to calculate local shell-side heat transfer coefficients. To evaluate the applicability of existing predictive models, the experimentally obtained heat transfer coefficients were compared with several widely used empirical and semi-empirical correlations from the literature. Where necessary, constants were adjusted while preserving the original mathematical formulation of each correlation. These included correlations proposed by Lazarek and Black, Malek and Colin, Pierre, Cooper, Kandlikar, which have been extensively applied in the analysis of boiling heat transfer in conventional and microscale channels. Among the evaluated correlations, the Kandlikar model exhibited the best agreement with experimental data across all flow regimes, demonstrating adaptability to minichannel conditions. The Malek and Colin correlation performed well in the saturated boiling region after modification, indicating its suitability for predicting nucleate flow boiling under certain conditions. In contrast, Lazarek and Black and Pierre correlations showed moderate agreement, with limitations in accurately capturing superheated or transitional regions. These findings demonstrate that section-wise analysis provides a more accurate representation of boiling heat transfer than average-value methods and offers improved predictive capability for the design and optimization of compact, low-charge propane heat exchangers used in sustainable refrigeration and heat pump applications.

Keywords: heat pump, minichannel evaporator, Propane (R290), local heat transfer coefficients, boiling heat transfer correlations

Explainable AI-Driven Zero-Trust Anomaly Detection for Encrypted Traffic

J.K. Wanasinghe*, M.C.S.J. Perera, A.R.S.S. Wijewardhana, S.N. Karunarathna, U. Jayasinghe

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e20420@eng.pdn.ac.lk*

Modern network attacks increasingly exploit encrypted channels such as TLS and HTTPS, rendering traditional deep packet inspection ineffective. Existing intrusion detection systems achieve high accuracy but incur latency unsuitable for real-time software-defined networking (SDN) deployment, and provide limited attribution for automated blocking decisions required by zero-trust architectures. Prior work has advanced encrypted-traffic detection via deep autoencoders, hybrid CNN architectures, contrastive learning, and SHAP-based classifiers, yet each trade off encrypted-traffic compatibility, latency, explainability, or real-capture validation; jointly satisfying all four remains comparatively unaddressed. This paper presents a two-stage anomaly detection pipeline built around this combination, operating exclusively on IP and TCP packet header metadata without payload decryption. The design was shaped by comparative experimentation on the BCCC Darknet (25,588 unlabelled samples) and the CIC-IDS-2017 (702,007 expert-annotated flows); only the latter, split into a stratified training set with a held-out real-world test set, trained and evaluated the final pipeline, with the Darknet experiments used solely to motivate its consensus-voting design. Stage 1 deploys a Base Check Classifier (BCC), a Decision Tree trained on 28 header-only features selected through a four-stage Gini-importance and correlation-based reduction from 79 CICFlowMeter features, achieving 99.964% attack recall at ~1.2ms per flow. Stage 2 analyses only BCC-flagged flows using Deep Dictionary Learning (DDL) and an Isolation Forest consensus voter, whose dual-model agreement reduces the false positive rate relative to either model alone. Explainability combines DDL-native per-feature reconstruction error decomposition, SHAP, and LIME, with cross-method agreement attributing every DROP decision. A novel PCAP-to-labeled-stream construction methodology maps 579,932 raw streams to expert-annotated ground truth via 5-tuple and timestamp matching, enabling direct evaluation on real packet captures (not pre-extracted features). On 3,000 such streams, the pipeline attains 96.69% accuracy, 99.31% attack recall, 91.28% precision, and a 0.69% false negative rate, matching or exceeding deep-learning and SHAP baselines on the same benchmark. Physical validation on a 3-computer inline bridge testbed enforcing iptables DROP-by-default confirms real-time zero-trust enforcement with Grafana monitoring. These results indicate that header-only two-stage detection with multi-method explainability is a measurably effective approach for zero-trust encrypted-traffic anomaly detection; generalisation to newer datasets and live traffic is the next validation step.

Keywords: encrypted traffic analysis, zero-trust architecture, explainable artificial intelligence, network anomaly detection, deep dictionary learning

Feasibility Study and Implementation of Electric Vehicle Conversions for Motorcycles in Sri Lanka

H.D.S.M. Jayawardhana[1]*, K.U. Ranathunge[1], L.U. Bakmeedeniya[1], T. Wickramarathna[2]

[1]*Department of Mechanical Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Ceylon Electricity Board, Colombo 2, 00200, Sri Lanka*
**salindamadushansalinda@gmail.com*

The transition away from fossil fuel dependency in Sri Lanka's transport sector is critical due to rising fuel costs and environmental concerns. As motorcycles dominate personal transport, this study evaluates the technical feasibility and economic viability of converting internal combustion engine (ICE) motorcycles to electric vehicles (EV). Conducted in collaboration with national energy sector experts, the primary objective was to develop a scalable, low-cost conversion model using the widely used Bajaj CT100 as a prototype. While previous local conversion studies have focused primarily on simulation or basic assembly without real-world context, this research establishes a novel, comprehensive framework by bridging the gap between rigorous technical testing, user-centric surveys, and detailed financial forecasting. The methodology integrated a market survey of over 100 riders to identify user preferences, followed by the selection of a 1000W brushless DC (BLDC) motor and a 48V controller system. A 3D model of the modified drivetrain and mounting brackets was developed using SolidWorks, and weight distribution calculations were performed to ensure vehicle stability. Physical testing was conducted in a laboratory environment using a regulated power supply to verify the responsiveness and mechanical compatibility of the conversion kit. Financial analysis revealed that the conversion offers substantial annual savings of over LKR 80,000 compared to petrol operation, with an estimated payback period of approximately two years. Technical results confirmed a safe weight distribution of 53.4% rear and 46.6% front, even with the added weight of the hub motor. Furthermore, to mitigate range anxiety, a novel plug-in hybrid configuration was conceptualized. This configuration proposes retaining the original ICE drivetrain components alongside the newly integrated rear-wheel electric hub motor, allowing the rider to manually switch between petrol and electric modes using custom switching relays and clutch-based control. The study concludes that EV conversion is a viable and cost-effective strategy for sustainable mobility in Sri Lanka. These findings provide a technical foundation for localized standardized conversion kits and highlight a significant market opportunity for cleaner transportation.

Keywords: EV conversion, sustainable mobility, cost-benefit analysis, BLDC motor, Sri Lanka

Acknowledgement: *This work was financially supported by the University of Peradeniya under the University Student Research Fund Allocation for Student Projects.*

Federated Agentic Defense for Zero-Day Attacks: A Three Agent IDS with a Federated to RAG Bridge

G.S. Seneviratne*, B.G.L. Niroshan, B.V.R.R. Jaysinghe, S.N. Karunarathna, U. Jayasinghe

Department of Computer Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**gsamudithaseneviratne@gmail.com*

Zero-day exploits remain difficult to detect and costly to mitigate because they lack stable signatures, evolve rapidly under distribution shifts, and are often observed across multiple organizations that cannot share raw network traffic due to strict privacy, governance, and compliance constraints. To address these challenges, we propose a federated, agentic Intrusion Detection System (IDS) for zero-day defense that combines privacy-preserving detection, explicit handling of novel attacks, and a novel Federated-to-RAG bridge that dynamically updates analyst guidance. The framework uses a hierarchical offloading design with three staged agents to keep the common case fast and low-cost while providing deeper, context-rich analysis when uncertainty is high. Agent 1, an autoencoder-based anomaly gate trained collaboratively across sites via federated averaging (FedAvg) without centralizing raw data. Agent 2, an XGBoost classifier with an explicit Unknown/Zero-day mode that avoids overconfident misclassification under novelty; and Agent 3, a Retrieval-Augmented Generation (RAG) action planner that grounds analyst-facing explanations and mitigation steps in MITRE ATT&CK and CVE/NVD evidence. The Federated-to-RAG bridge monitors federated drift and triggers re-analysis of queued uncertain cases, keeping retrieval-grounded explanations aligned with the evolving detector. Experiments on the UNSW-NB15 benchmark show strong quantitative performance across the pipeline. Agent 1 achieves a ROC-AUC of 0.93 to 0.94 and 96.7% attack recall at a calibrated operating threshold, with sub-millisecond per-flow latency, filtering over 94% of benign traffic before deeper analysis in a real-traffic streaming evaluation. Agent 2 attains 83.2% accuracy and a weighted F1-score of 0.817 on known attack categories. Under a Left-One-Attack-Out zero-day evaluation, the Unknown/Zero-day mode achieves an average true-positive rate of 83% and open-set AUROC of 0.89, with a low false-unknown rate of 3.0%. Only 0.7% of flows are escalated to Agent 3, keeping end-to-end latency low (p95 of 3.4 ms on the fast path) while enabling grounded response planning for ambiguous cases. Across ten federated training rounds, global validation accuracy improves from 68.5% to 86.6%, confirming that the anomaly gate benefits from collaborative training without compromising data privacy. These results demonstrate that the proposed architecture offers a low-latency, operationally viable path for zero-day defense, combining federated anomaly detection, calibrated open-set classification, and actionable, intelligence-grounded response planning.

Keywords: zero-day attacks, intrusion detection, agentic AI, federated learning, retrieval-augmented generation

From Policy to Practice: A Comparison Data Mining Study of Blended Learning Adoption at the Faculty Level Using LMS Log Data

I.P. Ratnapala

Computing Centre, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
iroshinir@eng.pdn.ac.lk

Technology-enabled Learning Management Systems (LMSs) are expected to support blended teaching beyond mere content delivery by promoting interaction, assessment, and constructive alignment. Despite over a decade of LMS implementation in Sri Lankan higher education, evidence suggests that usage remains largely repository-driven. This study critically examines LMS course design to assess the meaningful adoption of blended learning concepts for teaching and evaluates changes following faculty-level interventions aimed at integrating blended teaching in line with the university's policy directives on technology-enabled education. A quantitative methodology was employed to analyse lecturer-generated LMS data from two semesters (April and November 2025), before and after the policy intervention, covering 143 and 125 undergraduate courses within a faculty of a Sri Lankan university. Seven equally weighted composite indices; scaffolding (SI), content diversity (CDI), content volume (CVI), assessment (AI), social presence (SPI), student motivation (SMI), and constructive alignment (CAI) were derived using min–max normalisation of LMS activity data. These indices were informed by a review of the literature and established blended teaching models and frameworks. They were used as input features for K-means clustering in WEKA, with the optimal number of clusters determined using the elbow method (SSE $\approx$ 15), indicating a stable partition. Findings reveal persistent structural imbalances in blended course design. In April, 91 out of 143 courses were grouped into a high-performing cluster characterised by relatively higher scaffolding (SI = 0.5679), content diversity (CDI = 0.2275), and assessment integration (AI = 0.051), suggesting partial adherence to blended learning principles. In contrast, by November, social presence had improved (SPI increased from 0.387 to 0.4309), with 26 courses demonstrating high interaction levels (SPI = 0.5712); however, this improvement was accompanied by declines in assessment (AI = 0.0335) and content volume, indicating a shift towards interaction without adequate pedagogical depth. Notably, student motivation (SMI) remained entirely absent across both semesters, highlighting a critical gap in instructional design. These findings suggest that faculty interventions have led to a superficial adoption of interactive tools rather than a comprehensive integration of blended learning concepts. The imbalance among interaction, assessment, and structured content reflects the lack of a coherent institutional framework to guide LMS-centred pedagogy. Accordingly, policy reforms should prioritise design standards, constructive alignment, and evidence-based teaching practices. Future research will focus on developing a detailed conceptual model to evaluate blended courses using LMS data, enabling its application across institutions. Additionally, since this study focused on instructional design indicators rather than student learning data, it remains essential for future research to examine whether the proposed blended-teaching structure aligns with learner expectations and actual learning outcomes.

Keywords: Moodle, blended learning, data mining, clustering, LMS, K-Means

Graphene Oxide-Modified Epoxy Coatings for Mitigating Corrosion in Concrete Sewers

P.R.T. De Silva[1,2], P.W.G.R.S. Wijeratne[1,2], S. Yadav[2], K.C. Chandrasiri[1], B.K. Pramanik[2], K.G.N. Nanayakkara[1]*

[1]*Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*School of Engineering, RMIT University, Melbourne, VIC 3000, Australia*
**nadeen@eng.pdn.ac.lk*

Concrete sewer systems are highly vulnerable to microbial-induced corrosion, resulting in severe structural deterioration and high maintenance costs. Developing durable, chemically resistant coatings is essential to mitigate this deterioration. Inorganic-organic composite coatings, particularly enhanced with nanomaterials, offer promising solutions for improving corrosion resistance and long-term performance. This study aims to develop a novel graphene oxide (GO)-epoxy composite coating with enhanced adhesion, chemical stability, and barrier properties. It evaluates the effectiveness of GO as a filler in improving corrosion resistance, reducing water absorption, and increasing coating durability under simulated sewer conditions. GO was synthesized from Sri Lankan vein graphite obtained from Bogala Lanka Mines using the Hummers method. A composite coating was prepared by incorporating 1 wt% GO into an epoxy matrix to improve dispersion and interfacial interaction. Coated and uncoated mortar specimens were subjected to cyclic immersion in 0.2% sulfuric acid (pH 1.39). The test consisted of two 5-day cycles, with acid replacement between cycles to simulate sewer conditions. Performance was evaluated through pH variation, mass loss, and visual appearance. Water absorption and contact angle measurements were also conducted to assess the water resistance of coatings. Fourier transform infrared spectroscopy confirmed the successful synthesis of GO, while scanning electron microscopy verified its uniform dispersion within the epoxy matrix. Uncoated specimens exhibited severe degradation, with mass loss increasing from ~11% to ~14% over two cycles. Epoxy-coated samples showed significantly lower mass loss (~2%) after the first cycle. A slight negative mass change (~ –1%), was observed after the second cycle, possibly due to acid entrapment or surface deposition. GO-epoxy coatings performed best, with minimal mass loss (~1.5%) and stable behavior thereafter, demonstrating strong resistance to acid penetration. Water absorption decreased from 9.95% (uncoated) to 0.09% (epoxy) and 0.02% (GO-epoxy), while the contact angle increased from 47.30° to 66.95° and 78.65°, respectively indicating enhanced water resistance with GO incorporation. GO enhances the protective performance of epoxy coatings by improving barrier properties, reducing water ingress, and increasing resistance to acidic environments. These findings highlight the potential of GO-epoxy composites as durable, cost-effective solutions for extending the service life of concrete sewer infrastructure.

Keywords: composite coating, corrosion resistance, epoxy, graphene oxide, sewer

Acknowledgement: *Financial assistance from the University of Peradeniya (Grant No. URG/2024/18/E), for research-related expenses, and stipend support from the National Science Foundation (Grant No. NSF/SCH/2025/14) are acknowledged.*

Hybrid Deep Learning Framework for Unsupervised Anomaly Detection in DOGE/USD Cryptocurrency Price Movements

H.W.S. Kaushalya*, N.A.D.N. Napagoda

Department of Mathematical Sciences, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Kuliyapitiya, 60200, Sri Lanka
**shavani@12.12@gmail.com*

Cryptocurrency markets play a significant role in global finance, impacting international trade. Due to its volatile and nonlinear behavior, anomaly detection has become a critical task for financial risk analysis. Beyond the traditional statistical approaches, this study explores unsupervised machine learning and deep learning techniques to identify abnormal movements in cryptocurrency price data. In this study, the main objective is to develop and evaluate a hybrid anomaly detection framework that combines Isolation Forest and Autoencoder models to detect abnormal price movements in Dogecoin US Dollars Price data. It further compares the effectiveness of individual models with the proposed hybrid approach using quantitative evaluation metrics. The proposed methodology utilizes historical DOGE/USD OHLC (Open, High, Low, Close) data, covering the period from 2017 to 2025, which are normalized using Min-Max scaling. An Isolation Forest model is trained to capture global statistical deviations, while an Autoencoder neural network is trained to capture structural anomalies. A hybrid framework is constructed by combining Isolation Forest and Autoencoder. Since labeled data is unavailable, evaluation is performed using unsupervised metrics. Isolation Forest identified 44 anomalies but showed weaker separation, while the Autoencoder detected 27 anomalies with stronger sensitivity to extreme price changes. The hybrid model detected 38 anomalies and achieved the highest separation score of 0.486, compared to Isolation Forest (-0.198) and Autoencoder (0.046). The results indicate that nonlinear pattern-based anomalies dominate the dataset, and the combination of both models provides a more reliable representation of market behavior. Overall, the proposed hybrid framework provides more reliable and consistent anomaly detection compared to standalone models by integrating statistical and deep learning approaches for cryptocurrency markets. This study contributes to the existing body of knowledge by demonstrating that the integration of Isolation Forest and Autoencoder improves the effectiveness of unsupervised anomaly detection for cryptocurrency price movements.

Keywords: anomaly detection, isolation forest, autoencoder, cryptocurrency, unsupervised learning

Hybrid Deep Learning-Based Classification of Type-1 and Type-2 Code Clones Across Multiple Programming Languages

H.K.G.S. Prabodhani[1]*, S. Vasanthapriyan[2], T.D. Rubasinghe[3]

[1]*Department of Computing & Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya ,70140, Sri Lanka*
[2]*Department of Data Science, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
[3]*Department of Statistics and Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**hkgsprabodhani@std.appsc.sab.ac.lk*

Code clone detection is a crucial software engineering task that supports software maintenance, code reuse, and defect prevention by identifying duplicated or highly similar source code fragments. However, detecting Type-1 and Type-2 code clones across multiple programming languages remains challenging due to variations in syntax, lexical characteristics, and structural representations. Existing clone detection techniques often exhibit limited cross-language adaptability as they are primarily designed for individual programming languages or depend on a single form of code representation. This research proposes a hybrid deep learning framework that integrates lexical and structural code representations for effective Type-1 and Type-2 code clone classification across Java, Python, and C++ programming languages. A quantitative empirical evaluation approach is adopted using benchmark datasets, including BigCloneBench, CodeXGLUE, and CodeSearchNet. The source code samples undergo preprocessing steps, including tokenization, normalization, identifier abstraction, class balancing, and duplicate removal, to improve data consistency and minimize potential data leakage. The datasets are partitioned into training, validation, and testing subsets using a consistent 70:15:15 ratio to ensure fair and reliable model evaluation. The proposed Hybrid CNN-BiLSTM-Attention framework integrates lexical token sequences with Abstract Syntax Tree (AST)-based structural representations. CNN layers extract local syntactic patterns, BiLSTM networks capture contextual dependencies, the Attention mechanism emphasizes significant code regions, and AST features provide complementary structural information. The framework is evaluated against baseline deep learning models, including CNN, LSTM, and Transformer-based approaches, using accuracy, precision, recall, F1-score, ROC-AUC, confusion matrix, and cross-language evaluation metrics. The experimental results demonstrate that the proposed framework achieves 92% accuracy, outperforming the evaluated baseline models. Cross-language evaluation, performed by training on two programming languages and testing on an unseen third language, achieves accuracies of 83.2%, 84.5%, and 82.8% for C++, Java, and Python test scenarios, respectively. These results demonstrate strong multilingual generalization capability and confirm that combining lexical and AST-based structural representations improves Type-1 and Type-2 code clone detection performance. The proposed framework provides a scalable and effective solution for automated multilingual code clone classification. This research contributes a hybrid representation-based approach that enhances cross-language code analysis, reduces code duplication, and supports intelligent software engineering practices.

Keywords: abstract syntax tree, code clone detection, cross-language code analysis, deep learning, software maintenance

Impact of Progressive Corrosion on Nonlinear Damping Behavior in Reinforced Concrete Elements

G.B. Dissanayake*, A.J. Dammika, C.S. Bandara, J.A.S.C. Jayasinghe

Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Sri Lanka
**gihan@eng.pdn.ac.lk*

Corrosion of reinforcement in reinforced concrete (RC) structures is a well-known cause of deterioration, which can severely affect the structural integrity and safety. Traditional methods for assessing corrosion damage, such as visual inspection and localized testing are widely used, but they often fail to detect early-stage corrosion, particularly when surface damage is not visible. Therefore, potential of vibration-based damage detection methods to detect corrosion damage has been the interest of recent research and modal damping has been drawn attention due to its pronounced sensitivity to minor damage. Therefore, this study investigates the effect of progressive corrosion on the modal vibration behavior of RC elements, focusing on how changes in damping characteristics can offer valuable insights into the early stages of corrosion damage. This research proposes a novel approach for non-destructive monitoring of corrosion-induced degradation in RC structures by analyzing the nonlinear changes in damping behavior. In this study, T-shaped RC specimens with concrete grades C25, C30, C40, and C50 were subjected to progressive corrosion through the impressed current method. The corrosion levels were controlled to induce localized multiple damage stages, allowing the investigation of its effect on the modal damping response. Free vibration tests were conducted after each corrosion level, and the time history data were processed using Variational Mode Decomposition to isolate mono-frequency modal vibration response. The study used both Decay Curve Method for overall damping analysis and the Instantaneous Logarithmic Decrement method to obtain insights into the nonlinear damping behavior and its sensitivity to corrosion damage. The results revealed that corrosion-induced changes in modal damping behavior were more complex than previously understood. The magnitude and time domain variation of the damping response were strongly influenced by the progression of corrosion. As corrosion develops, the damping behavior changed increasingly nonlinear particularly during its early stages. This nonlinear behavior was observed to be diminished beyond a certain threshold, at which state corrosion-induced cracks become sufficiently wide that interfacial friction between crack surfaces is no longer effective in energy dissipation. The study demonstrated the sensitivity of nonlinear damping to early corrosion damage, particularly in high strength concrete. It was observed in the experiment that even 2% mass loss due to corrosion was detected through proposed nonlinear damping analysis method which is not feasible in conventional visual inspection methods. These findings provide a new insight into the potential of nonlinear modal damping as a sensitive and reliable vibration-based damage indicator for detecting the corrosion-induced damage in RC structures at its initiation.

Keywords: corrosion detection, nonlinear damping identification, modal damping ratio, vibration based damage detection

Acknowledgement: *The financial assistance received through Grant URG/2024/16/E is acknowledged.*

Influence of Graphene Quantum Dot Integration Strategies on Charge Transport and Efficiency in TiO_2-Based DSSCs

G.G.S. Sewwandi[1,2]*, M.A.K.L. Dissanayake[1,2], G.K.R. Senadeera[1,3], J.M.K.W. Kumari[1,2], P.U. Sandunika[1,2,4]

[1]*National Institute of Fundamental Studies, Hantana Road, Kandy, 20000, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Physics, The Open University of Sri Lanka, Nawala, Nugegoda, 10250, Sri Lanka*
[4]*Department of Physical Sciences, South Eastern University of Sri Lanka, Sammanthurai,32360, Sri Lanka*
**ggssewwandi@gmail.com*

No short Abstract

Graphene quantum dots (GQDs) exhibit promising performance enhancement in efficiency of dye-sensitized solar cells (DSSCs) due to their tunable optical properties and favorable energy alignment. Three methods for incorporating GQDs into TiO_2 photoanodes have been used in this study. They are: (i) mixing GQDs with TiO_2 paste followed by doctor blade deposition, (ii) immersing TiO_2 photoanodes in GQD solution prior to dye adsorption, and (iii) co-sensitization by mixing GQDs with dye followed by 24-hour adsorption. Out of these, the method (i), based on the TiO_2-GQD mixed paste, had shown the best results. UV–Vis and photoluminescence (PL) analyses confirmed the improved optical activity of synthesized GQDs. The *I-V* measurements of DSSCs performed with solar simulator, under 1.5G illumination showed an efficiency increase of up to 8.576%, with J_{sc} = 18.0 mA cm^{-2}, V_{oc} = 739.3 mV, and *FF* = 64.44%, whereas the reference DSSC without the GQD incorporation showed a lower efficiency of 7.3%. The significant efficiency enhancement due to the GQD incorporation can be attributed mainly to the increased J_{sc} showing a much efficient photon harvesting and the charge injection from dye to the FTO via the GQD incorporated ETL. A slight reduction in Voc was observed, which is likely associated with increased charge recombination arising from defect states introduced by GQD incorporation. The observed performance enhancement was consistently obtained using the TiO_2–GQD mixed-paste approach, demonstrating its potential as an effective strategy for improving DSSC performance.

Keywords: graphene quantum dots, dye sensitized solar cell, quantum dots

Integrated RGB-Thermographic and Machine Learning Approaches for Crack Depth Evaluation in Concrete

M.D.C.A. Karunarathna, G.A.R.H.S. Rathnayake, A.J. Dammika*, J.A.S.C. Jayasinghe

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**dammikaaj@eng.pdn.ac.lk*

No Short Abstract

Accurate assessment of crack depth is critical for structural health monitoring and the long-term durability of concrete infrastructure, as undetected or underestimated cracks can lead to serious structural failures. Traditional methods for measuring crack depth are often time-consuming, labor-intensive, and require direct physical access, which is not always feasible in real-world conditions. Therefore, a non-destructive and accurate approach is required. However, most existing research primarily focuses on surface crack width and length, with limited attention given to reliable non-destructive depth prediction. Therefore, the aim of this study is to develop and train a multimodal machine learning framework that integrates fused RGB and thermal image features for effective crack depth prediction. Field data were collected by capturing high-resolution RGB and infrared thermal images of concrete cracks, along with corresponding physical measurements such as ambient temperature, moisture content, crack width, and crack depth. Crack depth was physically measured using a steel strip to obtain ground truth values. Crack width was measured using a crack gauge, and for inaccessible cracks, widths were extracted from RGB images through pixel-based analysis. Thermal images were scaled and spatially aligned with RGB images, and both image types were preprocessed using resizing and enhancement techniques. A multimodal deep learning architecture with dual encoders was developed to extract geometric features from RGB images and temperature gradient features from thermal images, followed by feature-level fusion and regression-based depth prediction incorporating crack width and temperature parameters. Crack regions were extracted, and geometric, thermal, and environmental features were used as inputs to train the predictive model. The results show that the proposed model can effectively estimate crack depth compared to conventional methods. In conclusion, this study presents a reliable and efficient non-destructive approach for crack depth prediction using multimodal machine learning techniques which can be used as a practical tool for structural inspection and corresponding decision making.

Keywords: concrete crack depth, multimodal images, RGB Images, thermographic, machine learning

Machine Learning-Based Approach for Classifying Damaged Characters in Early Brahmi Sri Lankan Inscriptions

G.C.J.I. Guruge[1], U.D.R.S. Thilakarathna[2], M.B. Dissanayake[1]*, A.J. Pinidiyaarachchi[3], W.I. Malsiri[4], M. Niranjan[5]

[1]*Department of Electrical and Electronic Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Archaeology, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Statistics and Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Archaeology, Buddhist and Pali University of Sri Lanka, Homagama, 10200, Sri Lanka*
[5]*University of Southampton, Southampton, SO17 1BJ, United Kingdom*
**maheshid@eng.pdn.ac.lk*

Early Brahmi Inscriptional character recognition for epigraphy is a computer vision task challenged by data scarcity, in which surface weathering, biological growth, and physical erosion progressively degrade the visual representation of the character. Although prior benchmarks have established performance ceilings on intact inscriptional characters, no study has quantified how those methods generalise to glyphs of varying damage severity. This work addresses that gap through a controlled external-validation protocol applied to three top-performing classical methods identified as promising in earlier work: support vector machines (SVM) with Radial Basis Function (RBF) kernel, k-nearest neighbours (k-NN), and multi-layer perceptrons (MLP). A locally collected 545-image, six-class dataset of Early Brahmi Inscriptional characters extracted from field-study was stratified into three curator-assigned damage tiers: undamaged (n=388), mildly damaged (n=61), and severely damaged (n=96), with samples from the latter two held out for testing. Histogram-of-Oriented-Gradients (HOG) features were extracted at 64×64 resolution following Contrast Limited Adaptive Histogram Equalisation (CLAHE) preprocessing. A two-stage 5-fold cross-validation protocol was applied: hyperparameters were selected by inner-loop grid search on the training pool, then evaluated through an outer 5-fold loop in which each fold's model was tested on a held-out 20% of the undamaged, mildly-damaged, and severely-damaged pools. SVM-RBF achieved the highest accuracy at every damage level (Undamaged: 0.730 ± 0.038; Mildly: 0.685 ± 0.038; Severely: 0.496 ± 0.018), with non-overlapping error bars to k-NN (Severely: 0.406 ± 0.011) and MLP (Severely: 0.408 ± 0.040). All the mildly and severely damaged image classifications were closely evaluated and validated by the domain experts. All three methods exhibited a non-linear performance cliff, averaging 17.4 percentage points between mild and severe damage, and one specific class became effectively unclassifiable across every method ($F1 < 0.10$), empirical evidence for a feature-space-level limit on classical methods that motivates the use of learned representations and image restoration as complementary approaches to closing the damage-induced accuracy gap.

Keywords: Early Brahmi Inscriptions, damaged characters, K-Fold cross-validation, classification, SVM

MESH: A Multi-Stage Benchmark for Mockery, Extremism, Sarcasm, and Hate Speech Jailbreak Vulnerabilities in Open-Source LLMs

S. Mithushika[1]*, S. Sweshthika[2], T. Kayalvizhy[1]

[1]*Department of Computing and Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
[2]*Department of Software Engineering, Faculty of Computing, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka*
**smithushika@std.appsc.sab.ac.lk*

Jailbreak attacks enable large language models (LLMs) to generate harmful, unethical, or otherwise objectionable content, posing a significant safety concern. Existing benchmarks relying on first-generation static templates yield artificially suppressed attack success rates that poorly discriminate model vulnerability. This study introduces a multi-stage adaptive benchmarking framework spanning four harm categories, termed MESH (Mockery, Extremism, Sarcasm, Hate Speech), across three semantic targets (Social Norms, Protected Groups, Democratic Institutions). The dataset was constructed synthetically, with no external dataset or pre-existing prompt repository used, via a three-dimensional Cartesian product across the four harm categories, three semantic targets, and twelve attack templates, yielding 288 adversarial prompts through combinatorial template-target pairing, supplemented by 22 benign controls (10 clearly-safe, 12 borderline-safe). The twelve attack templates span two generations — six established Gen-1 templates (Role-play Wrapper, CoT Leakage, Adversarial Persona, Virtualization, Academic Framing, Payload Splitting) and six novel Gen-2 templates introduced by this work (Contextual Camouflage, Gradual Escalation, Semantic Obfuscation, Translation Attack, Moral Inversion, Logical Inversion), each assigned an a priori difficulty score (0.50-0.80) to enable subsequent difficulty-banded analysis. This generational and difficulty-graded design was deliberately chosen to test whether attack sophistication predicts effectiveness. Responses generated by LLaMA 3.2-3B were evaluated using a dual-model ensemble judge (Mistral-7B and Gemma-7B), selected for heterogeneous training origins to reduce correlated judgment bias; LLaMA 3.2-3B was restricted to a meta-judge role only, to avoid self-evaluation bias on its own outputs. A two-stage judging protocol separated harmfulness detection from four-class labeling to improve labeling consistency, with disagreements resolved via a harm-union policy and a benign-prompt guard preventing false-positive Bypass labels. Judge outputs were validated against gold labels from three independent human annotators (Fleiss' $\kappa = 0.7573$, substantial agreement). The pipeline achieved an overall attack success rate (ASR) of 41.11% (human gold labels), a 53.31% refusal rate on adversarial prompts, and a 95.45% safe-response rate with only 4.55% over-refusal on benign controls. CoT Leakage (79.17%) and Logical Inversion (70.83%) were the most effective attack types, while Mockery achieved the highest category-level ASR (56.94%). The ensemble judges reached 77.74% inter-model agreement with only a 0.49% ASR delta against human labels, supporting ensemble judging as a reliable substitute for large-scale human annotation. A notable difficulty- band paradox emerged: easy prompts (55.56% ASR) outperformed hard prompts (22.92% ASR), indicating that current safety alignment relies more on surface pattern recognition than genuine semantic understanding. A multi-criteria curation process, jointly filtering on confidence (≥ 0.65), inter-annotator agreement, and difficulty (≥ 0.70), yielded 105 high-confidence reference prompts suitable for Supervised Fine- Tuning (SFT) and Reinforcement Learning from Human Feedback (RLHF).

Keywords: large language models, jailbreak attacks, ai safety, adversarial benchmarking, MESH framework, human annotation

Modelling and Simulation of Low Temperature Oxidation Process of Iron Powder

W.M.S.N. Wahala*, N. Fernando

Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e20417@eng.pdn.ac.lk*

Metal fuels are gaining increased attention as carbon free energy carries in combustion applications. Unlike conventional fuels with releases carbon dioxide during combustion, metal fuels are oxidized into metal oxides in solid form, which results in zero carbon dioxide emissions. Among various types of metals, iron presents advantages due to its wide availability and similar flame temperatures to conventional fuels. However, the oxidation kinetics and morphology evolution of iron particles in combustion environments are still not well known, limiting accurate prediction of ignition behavior. A validated kinetic model is therefore essential for characterizing powder passivation and ignition readiness, offering a foundation for furnace design. This study presents the mathematical modelling and numerical simulation of the low temperature oxidation of iron powder in oxygen rich environments. In the temperature range of 300-600 °C, oxidation is governed by solid state diffusion of iron ions through the growing oxide shell, in accordance with Wagner's parabolic growth law. As an improvement to the existing models, a spherical shrinking core model was developed in the present study from first principles using Fick's laws of diffusion in spherical coordinates. Simulation results at 500 °C confirmed parabolic growth behavior, with oxide thickness reaching approximately 6.1 µm after 60 minutes. The developed spherical model is also compared with a flat plate model which showed that the spherical shrinking core model predicts oxide layers about 13% thinner, highlighting the importance of curvature corrections. Validation against published thermogravimetric analysis (TGA) data demonstrated excellent agreement, with $R^2 = 0.9950$ and RMSE = 0.139 wt%. The fitted parabolic rate constant was 5.78×10^{-15} m²/s, yielding an effective activation energy of 107.1 kJ/mol, consistent with literature values for Fe_2O_3 formation in the low temperature regime. Parametric studies further confirmed strong Arrhenius temperature sensitivity, with growth rates increasing by three orders of magnitude between 400 °C and 600 °C. By quantifying geometric correction effects and advancing beyond flat plate approximations, the study provides a reliable framework for further improving particle oxidation models. The findings form a foundation for future extensions to multi-layer oxide modelling, Kirkendall void effects, and multi particle oxidation behavior, supporting the development of iron powder as a practical carbon free energy carrier.

Keywords: iron powder oxidation, shrinking core model, Wagner parabolic theory, Fick's diffusion, low temperature oxidation

Monocular Dense 3D Reconstruction of Construction and Demolition Waste on Conveyor Systems Using Motion Stereo

U.G.U.P. Samarasekara[1], S.A.R.R. Suraweeraarachchi[2], H.M.P.B. Ariyaratne[1], J.A.S.C. Jayasinghe[1], U. Jayasinghe[3], C.S. Bandara[1]*

[1]Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya 20400, Sri Lanka
[2]Department of Mechanical Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya 20400, Sri Lanka
[3]Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya 20400, Sri Lanka
**e19343@eng.pdn.ac.lk*

Accurate volumetric characterisation of Construction and Demolition (C&D) waste is critical for efficient material recovery and automated sorting on conveyor systems. Existing multi-sensor approaches, such as RGB-D cameras, LiDAR, and binocular stereo rigs, are operationally impractical in material recovery facilities due to high hardware costs, complex spatial calibration, and accelerated sensor degradation, while monocular solutions remain entirely unexplored for this material domain. This study aims to develop and evaluate a novel dense 3D reconstruction system for C&D waste from single-camera image sequences, establishing the first empirical benchmark for monocular reconstruction in this domain and enabling metric volume estimation without dual-camera hardware. Exploiting the kinematically constrained, rectilinear trajectory of industrial conveyor belts, temporally displaced monocular frames are treated as synthetic stereo pairs under the Motion Stereo paradigm. Dense disparity maps are computed via a conventional stereo pipeline using Convolutional Neural Networks for both foreground segmentation and learned stereo matching. Metric accuracy is fundamentally coupled to inter-frame baseline estimation; ArUco fiducial markers are deployed on the belt surface to provide drift-constrained displacement measurements, converting disparity maps into metrically consistent point clouds from which object volumes are derived by integrating the reconstructed surface geometry. The proposed system successfully generates dense 3D point clouds from monocular sequences across representative waste categories. Convolutional Neural Network-based segmentation effectively isolates foreground waste objects from the moving belt background. ArUco-constrained baseline tracking substantially reduces metric drift relative to unconstrained estimation. Volumetric estimates derived from the reconstructed point clouds demonstrate consistency with reference measurements, confirming the viability of the Motion Stereo paradigm for this application. This work establishes the first empirical benchmark for monocular dense 3D reconstruction of C&D waste, demonstrating that single-camera systems can deliver metrically accurate volumetric estimates. The approach substantially lowers deployment barriers compared to multi-sensor alternatives, offering a cost-effective pathway toward intelligent, automated material recovery

Keywords: construction and demolition waste, monocular 3D reconstruction, motion stereo, volume estimation, convolutional neural networks

Acknowledgement: This work was supported by the NSF–NSFC Joint Research Program *(Grant No. ICRP/NSF-NSFC/2024/EA&ICT/03).*

Multi Disease Detection in Tomato Leaves Using Deep Learning with Explainable AI (XAI) Techniques

A. Thiviyaraj*, D.M.A.P.S. Dissanayaka, V. Vinoharan

Department of Information and Communication Technology, University of Vavuniya, Vavuniya, 43000, Sri Lanka
**tathiraa1999@gmail.com*

Tomato leaf diseases substantially reduce crop yield and quality, yet manual identification remains slow, expertise-dependent, and error-prone, motivating the need for automated, accurate, and interpretable detection systems that support timely diagnosis and informed crop management. This study proposes a deep learning framework for classifying tomato leaf diseases that combines high predictive accuracy with model transparency through Explainable Artificial Intelligence (XAI), addressing the practical need for systems that agronomists can trust and verify. A publicly available Kaggle dataset of 16,012 images spanning ten classes, nine diseases (bacterial spot, early blight, late blight, leaf mold, septoria leaf spot, two-spotted spider mite, target spot, tomato mosaic virus, and tomato yellow leaf curl virus) and one healthy class, was split into 80% training and 20% testing sets, with 20% of the training set held out for validation. Two transfer learning models, EfficientNetB0 and MobileNetV2, were trained for 30 epochs using the Adam optimizer with early stopping, following image resizing, normalization, and data augmentation techniques including rotation, zooming, and horizontal flipping. Grad-CAM and LIME were applied to visualize the leaf regions influencing each prediction. EfficientNetB0 achieved 96.77% training accuracy and 95.18% testing accuracy, with a macro-average F1-score of 0.944 and a weighted-average F1-score of 0.952 across the ten classes, confirming balanced performance despite class imbalance. MobileNetV2 achieved 88.94% training accuracy and 88.99% testing accuracy. Grad-CAM and LIME visualizations consistently localized attention on lesion-affected leaf tissue rather than background regions, indicating that both models based their decisions on biologically relevant disease features rather than spurious cues. These results demonstrate that integrating a high-accuracy transfer learning model with XAI produces a classification system that is both reliable and interpretable, offering a practical and trustworthy tool for early disease diagnosis and decision-making in precision agriculture.

Keywords: deep learning, Explainable Artificial Intelligence (XAI), Grad-CAM, LIME, transfer learning

Nonlinear Stability and Structural Resilience of Interlocking Jetty Systems for Bridge Support

D.H. Gallehewa*, D.M.A.G.B Dissanayake, J.A.S.C. Jayasinghe

Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e19112@eng.pdn.ac.lk*

In the development of modular bridge infrastructure, the structural resilience of interlocking jetty systems heavily depends on robust connection strategies. Ensuring efficient load transfer between the substructure and superstructure is critical, particularly at complex beam-to-pile interfaces utilizing a Doweled Collar Interlock (DCI), and at beam-to-beam connections secured by bolted steel splice plates. This research aims to perform a comprehensive forensic structural appraisal of these hybrid assemblies to identify vulnerabilities leading to localized shear failure. The system was modeled with explicit full-scale structural dimensions, featuring a 3m long, 300mm wide pier cap beam with a depth tapering dynamically from 250 mm to 900mm, consisting a 400mm pile cap that interfaces with a 300mm diameter foundation pile. The study utilized Abaqus finite element analysis to simulate the complex contact mechanics of the DCI joints and splice plate connections, employing a surface-to-surface contact formulation with penalty friction behavior. The numerical model was validated against experimental load-testing data of a single-beam prototype, showing strong correlation in both initial elastic stiffness and ultimate failure modes. Two numerical approaches were evaluated: the standard General Static solver and the Modified Riks (arc-length) method. The computational models assessed geometric instabilities, material softening, and sudden contact chatter inherent to the joint interfaces. Numerical simulations revealed that the General Static solver frequently failed to converge due to unresolvable contact singularities. Conversely, the Modified Riks method successfully traced the unstable post-buckling "snap-through" equilibrium path. Analysis pinpointed critical stress concentrations at the dowel interfaces, collar roots, and bolt-hole boundaries. Quantitative results demonstrated that modifying the joint geometry increased peak shear capacity from 44.1 kN to 62.9 kN. Additionally, introducing strategic reinforcement reduced residual displacement by up to 80% and increased residual shear force by 33%, effectively preventing localized brittle concrete tearing. Ultimately, the study concludes that pairing optimized reinforcement strategies with the Modified Riks model is essential for accurately quantifying ultimate stability, providing engineers with a superior predictive framework for designing robust modular infrastructure under extreme loading conditions.

Keywords: finite element analysis, interlocking jetty systems, Modified Riks method, modular bridge infrastructure, nonlinear stability

Real-Time Grid Characteristics Estimating using Large Scale Solar PV Plants to Provide Dynamic Ancillary Services

G.A.R. Virajitha*, R.A.H.B. Dharmadasa, H.M.N.M. Herath

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**garashmivirajith@gmail.com*

The rapid growth of converter-interfaced renewable energy sources, particularly large-scale solar photovoltaic (PV) plants, progressively reduces the synchronous inertia in modern power grids, rendering frequency stability increasingly more vulnerable to active power imbalances. Therefore, an accurate real-time estimation of the system inertia constant H is essential for enabling inverter-based resources to deliver dynamic ancillary services and synthetic inertia support. In this study, three inertia estimation frameworks were developed and benchmarked in PSCAD using the IEEE 9-bus benchmark network, in which ideal sources were replaced with synchronous machines incorporating exciter and governor models. Active power disturbances of varying magnitudes and timing were introduced via discrete load steps at distinct busbars, and the resulting frequency and power time-series were processed through a signal-conditioning pipeline comprising decimation, per-unit normalization, disturbance detection, and systematic window selection. Three estimation frameworks were implemented: a Sliding Window Method (SWM) based on the direct application of the linearized swing equation; an AutoRegressive Moving Average with eXogenous inputs (ARMAX) model-based identifier; and an Iterative Equation Error (IEE) least-squares regression approach. The estimated inertia constants were validated against reference values extracted directly from synchronous machine parameters, providing an explicit comparison. The SWM consistently reproduced the reference inertia constant with high accuracy, achieving 94%–99% accuracy across all tested disturbance magnitudes and timings. In contrast, the ARMAX and IEE methods, while theoretically well-founded, were sensitive to window selection and noise levels. The ARMAX model yielded poor estimation reliability, with errors ranging from 130%–160%, while the IEE method produced errors between 10%–90%. These findings indicate that the two out of three models poorly performed. The proposed framework establishes a concrete analytical foundation for real-time inertia-aware control of converter-interfaced solar PV inverters, advancing the pathway toward autonomous dynamic ancillary service provision from utility-scale renewable plants.

Keywords: power system inertia estimation, rate of change of frequency, solar pv ancillary services, power grid parameters, Sliding Window Method (SWM), AutoRegressive Moving Average with eXogenous Inputs (ARMAX), Iterative Equation Error (IEE)

Sensitivity-Based Coordinated P–Q Allocation for Active Power Maximization in Ring Microgrids

H.M.M.N. Herath*, H.M.L.D. Herath, E.M.T.L.K. Ekanayake, S.G. Abeyratne, K.S. Walgama, H.M.N.M. Herath

Department of Electrical and Electronic Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e20138@eng.pdn.ac.lk*

High penetration of solar photovoltaic (PV) generation into microgrids introduces voltage rise, reverse power flow, and angular stability challenges. The paper presents a sensitivity-based framework for coordinated active (P) and reactive (Q) power allocation in ring-connected microgrids to maximize PV injection while maintaining voltage and angular stability with minimal reactive power support. It enables coordinated charging and discharging of Battery Energy Storage Systems (BESS) for voltage and power-flow support. The proposed approach derives Jacobian-based sensitivity matrices to quantify the effect of P and Q injections on bus voltages and phase angles. The inverse of the reactive power–voltage sensitivity submatrix $(\partial V/\partial Q)^{-1}$ identifies weak buses and determines minimum Q to restore voltages within limits. P allocation uses the Power Transfer Distribution Factor (PTDF) subject to line thermal limits and angle deviation bounds. An iterative optimization alternates between Q minimization and P maximization until convergence. The method employs two linear programming solvers with sensitivity-based weights, where one is for minimizing Q to correct voltage imbalances from PV, and another for maximizing P to reduce power drawn from the main utility grid. The weights explicitly handle strong P-Q coupling, guiding convergence even under highly coupled conditions. The algorithm is validated on the Ward–Hale 6-bus ring microgrid, comprising one slack bus, one generator bus, and four load buses with distributed loads. R/X sensitivity analysis with multipliers from 0.1 to 5 confirmed strong coupling. Despite this, the algorithm converged in 2–3 iterations for R/X up to 5.0, demonstrating guaranteed convergence across the full range. Simulation results show the method restores all bus voltages to within ±5% of nominal with minimum Q support, achieving maximum feasible P injection without violating thermal or angle limits. The optimization allocated 1.7398 p.u. P with only 0.3865 p.u. Q support. Convergence within a few iterations demonstrates computational efficiency for real-time applications.

Keywords: ring microgrid, sensitivity analysis, active power maximization, reactive power minimization

SinhSafe: A Deep Learning Approach to Sinhala Harassment Detection

P.D. Thilakasiri*, D. Herath, S. Deegalla

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e20397@eng.pdn.ac.lk*

The exponential growth of social media in Sri Lanka has amplified digital harassment, necessitating automated moderation for morphologically complex Sinhala text. Moderating code-mixed "Singlish" remains uniquely challenging due to the "semantic gap," where culturally nuanced colloquial slang is frequently misconstrued as targeted harassment by traditional algorithmic baselines. This study introduces "SinhSafe" to bridge this semantic gap. The primary objective is to develop a robust ternary classifier for normal, offensive, and harassment content, capable of accurately moderating ambiguous code-mixed text. We used a corpus of 6,075 documents sourced from the Sinhala Offensive Language Dataset (SOLD). Addressing annotator bias, the data was independently evaluated by three members using inter-annotator agreement (IAA) and majority voting. For empirical evaluation, we benchmarked traditional machine learning models: Naïve Bayes, Logistic Regression, Linear SVM, Random Forest, and MLP against advanced bidirectional transformer encoders: XLM-RoBERTa Large and SinBERT Large adapted via sequence classification heads, and a generative large language model (LLM), SinLLaMA-8B, optimized utilizing Quantized Low-Rank Adaptation (QLoRA) fine-tuning and Alpaca prompting. Evaluated on a held-out test set, traditional baselines plateaued at a macro F1-score of approximately 65%. In contrast, the bidirectional encoders demonstrated strong performance; XLM-RoBERTa and SinBERT achieved macro F1-scores of 75.44% and 73.44% on this unseen data. However, the generative LLM exhibited severe overfitting. It achieved high training accuracy before collapsing to a macro F1-score of 55.7% on unseen data, likely due to limited fine-tuning data relative to the model's scale. We further combined XLM-RoBERTa and SinBERT into a soft-voting ensemble, which achieved a macro F1-score of 76.21% on the held-out test set. Evaluated using 95% confidence intervals, this advantage over standalone XLM-RoBERTa was found to be not statistically significant, indicating that a well-tuned XLM-RoBERTa alone performs comparably to the costlier ensemble. SinhSafe contributes to low-resource Natural Language Processing (NLP) by providing a rigorously validated Singlish dataset and demonstrating that encoder-only architectures outperform large generative LLMs in data-scarce scenarios. Despite inherent data constraints, this approach offers a scalable direction for automated Sinhala content moderation.

Keywords: Sinhala NLP, digital harassment, semantic gap, code-mixed text, ternary classification

Smart AR Trainer: Personalized Real-Time Posture Correction and Augmented Reality Feedback Framework for Home Workout Activities

S. Kamsala*, S. Sangavan, T. Nivethiha, R. Priyatharsan, J. Thayanithi, K.A.S.H. Kulathilake

Department of Computing, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale, 50300, Sri Lanka
**kamsaselva1010@gmail.com*

No Known Abstract

The rapid growth of home-based fitness practices has increased the risk of improper exercise technique due to the absence of real-time supervision, leading to potential injuries and reduced workout effectiveness. Existing posture-correction and virtual fitness systems reported in the literature typically provide generic movement tracking or depend on specialized AR hardware, without pinpointing the precise joint-level source of a postural error. This study aims to develop and evaluate SMART AR Trainer, a personalized real-time posture correction and augmented reality feedback framework for home workout activities, addressing this gap by localizing specific joint deviations and improving exercise accuracy through webcam-based AR guidance. The framework integrates MediaPipe BlazePose for thirty-three-point three-dimensional pose estimation, a Random Forest Classifier trained on demographic and behavioural data for fitness-level profiling into Beginner, Intermediate, and Advanced categories, and per-exercise Dense Autoencoders for anomaly-based posture deviation detection across six exercises. Augmented reality overlays rendered through Unity3D and OpenCV highlight correct and incorrect joint positions in real time using only a standard webcam, requiring no specialized headset or wearable sensors. The profile identification model achieved a testing accuracy of 95.87 percent, with training accuracy of 97.61 percent and consistent 91 to 93 percent accuracy across five-fold cross-validation, confirming strong generalization and minimal overfitting. The augmented reality feedback pipeline sustained real-time performance with 200 to 250 millisecond latency and a stable 29 to 31 frames-per-second rendering rates, while repetition-counting accuracy exceeded 90 percent. These quantitative results confirm that hardware-free, joint-level posture correction is both accurate and computationally practical for continuous home use. SMART AR Trainer therefore contributes a validated framework that advances beyond generic AR fitness tools toward precise, accessible, and sustainable posture correction, supporting safe and effective home-based exercise for individuals without access to professional training guidance.

Keywords: artificial intelligence, computer vision, posture detection, augmented reality, MediaPipe

Stearic Acid Functionalized Biomass Fly Ash-Epoxy Composite Coating with Enhanced Hydrophobicity and Self-Cleaning Properties

P.W.G.R.S. Wijeratne[1, 2], P.R.T. De Silva[1,2], S. Yadav[2], K.C. Chandrasiri[1], B.K. Pramanik[2], K.G.N. Nanayakkara[1]*

[1]*Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*School of Engineering, RMIT University, Melbourne, VIC 3000, Australia*
**nadeen@eng.pdn.ac.lk*

Stearic acid (SA) grafting is commonly used to impart hydrophobicity to inorganic fillers, yet optimal concentrations are rarely defined. Biomass fly ash (FA) is an abundant industrial byproduct with potential as a low-cost filler for epoxy coatings. This study aims to develop a stearic acid - functionalized biomass fly ash-epoxy composite coating to increase surface hydrophobicity and evaluate its self-cleaning potential at varying modification levels. In this study, FA, a SiO_2-rich industrial byproduct (34.35 wt% SiO_2), was modified with SA at different loadings (2-8 wt%) and incorporated at 1 wt% into an epoxy matrix to evaluate the relationship between grafting extent, surface chemistry, morphology, and hydrophobicity. Fourier-transform infrared spectroscopy (FTIR) analysis confirmed SA grafting via CH_2/CH_3 and COO^- signals with SA content. All coatings remained hydrophilic, with water contact angles between 47.9° and 59.1°, showing a non-linear trend and a maximum at 4 wt% SA. Sliding angles increased from 2 to 6 wt% SA (40-42°) but decreased to 25° at 8 wt%, indicating enhanced droplet mobility at higher modification levels. SEM revealed a transition from smooth surfaces (2 wt%) to cratered morphology (4-6 wt%) and phase separation at 8%. The low sliding angle at 8% highlights competing effects of surface chemistry and roughness. At 1 wt% filler loading, SA modification is insufficient to induce hydrophobicity. Wettability is governed by a non-linear interplay between morphology and surface chemistry, with intermediate SA levels (4–6%) yielding the most stable hydrophilic performance. These findings provide guidance for designing FA-epoxy coatings with controlled wettability and self-cleaning surfaces.

Keywords: biomass fly ash, stearic acid, epoxy coating, hydrophobicity, surface morphology

Acknowledgement: *Financial assistance from the University of Peradeniya (Grant No URG/2024/18/E), for research-related expenses*

Time-History-Based Evaluation of Wind-Induced Serviceability Response in High-Rise Buildings

R.M.T.D. Wijayarathne*, K.M.S.M. Jayarathna, K.K. Wijesundara

Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya 20400, Sri Lanka
**e19442@eng.pdn.ac.lk*

Wind-induced vibration is an important serviceability concern in high-rise buildings, particularly for slender and flexible structures where occupant comfort may govern design. Conventional wind design procedures commonly rely on equivalent static wind loads, which are useful for strength design but may not adequately represent time-dependent acceleration and displacement responses under turbulent wind loading. This study presents a simplified time-history-based approach for evaluating the wind-induced serviceability performance of a high-rise building. A 59-storey reinforced concrete building was modelled in ETABS with representative mass, stiffness, and damping characteristics. The model was calibrated using the dynamic properties of the Commonwealth Advisory Aeronautical Research Council (CAARC) standard tall building, with the first two modal frequencies obtained as 0.196 Hz and 0.204 Hz, close to the benchmark value of approximately 0.20 Hz. Turbulent wind velocity histories were generated using a spectral simulation method based on the Kaimal turbulence spectrum. Corresponding along-wind and across-wind buffeting load histories were applied along the height of the building for reference wind speeds ranging from 5 m/s to 55 m/s, where the reference wind speed denotes the mean wind speed at the top of the building. Linear time-history analyses were performed to obtain storey-level acceleration, lateral displacement, and inter-storey drift responses. The numerical response was validated against CAARC benchmark wind tunnel data using top-storey displacement as the main comparison parameter, and the deviation remained below 10%, indicating that the adopted procedure captured the global wind-induced response trend with acceptable accuracy for serviceability-level assessment. The results showed that acceleration response increased significantly with wind speed and became more critical in the upper storeys, where occupant comfort is most likely to be affected. Displacement and inter-storey drift responses also increased with wind speed, while the damping sensitivity assessment showed that increased damping reduced acceleration demand, although the reduction became less significant beyond moderate damping levels. The proposed approach provides a practical preliminary framework for evaluating wind-induced serviceability response in high-rise buildings and highlights the need to consider acceleration-based comfort criteria together with conventional displacement-based checks.

Keywords: CAARC building, high-rise buildings, occupant comfort, serviceability response, wind-induced vibration

Towards Affective-Aware Online Teaching: An AI-Enabled Decision-Support Framework for Synchronous Learning Environments

A.A.H.V. Athauda*, R.G. Ragel, U. Jayasinghe

Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**vindiathaudha@gmail.com*

The shift to synchronous online education has introduced a fundamental challenge for instructors: the loss of real-time affective awareness that naturally guides classroom teaching. In face-to-face settings, educators continuously observe student expressions and adapt their teaching in the moment, but video conferencing platforms leave instructors with little information about how students are responding during live sessions. Student emotional states, particularly boredom, anxiety, and confusion, directly affect learning outcomes, yet intelligent and deployable tools to address this gap remain scarce. Existing facial expression recognition systems for education are tested under laboratory conditions, trained on non-representative datasets, and assessed purely as classification models rather than as practical instructor tools, with key expression categories — anger, boredom, happiness, surprise, and anxiety-related patterns — rarely brought together in one system built around real teaching needs. This study developed an AI-enabled affective decision-support system to restore instructor awareness during synchronous online teaching. A five-class facial expression dataset was constructed by combining established corpora with a purpose-collected anxiety expression corpus assembled from students at CINEC Campus under informed written consent, addressing a gap in existing datasets. A lightweight convolutional neural network was systematically optimised across nine hyperparameters and integrated with a real-time instructor-facing dashboard operating directly within Zoom and Microsoft Teams through screen sharing, requiring no additional hardware. The system was evaluated through a within-subject perception study with 37 in-service university instructors from seven Sri Lankan institutions, each experiencing both the standard and AI-enabled environments under identical conditions, enabling direct comparison of instructor perceptions. Ethical clearance for the evaluation study was obtained from Eurasian Campus, and the dashboard operates exclusively on the instructor's machine, leaving the student-facing interface unchanged. The optimised model achieved 89.56% overall accuracy with an F1-score of 0.996 for boredom and 0.952 for anxiety-related patterns. Educator perception ratings showed statistically significant improvements across all five evaluated dimensions ($p \leq .001$, r: .527–.748), with the strongest gains in participation monitoring and boredom/confusion detection. This framework offers a practically deployable, human-centric solution for affective-aware synchronous teaching, positioning expression pattern detection as a tool to inform instructor judgement rather than to diagnose student emotional states.

Keywords: affective computing, facial expression recognition, synchronous online learning, instructor decision-support, convolutional neural network

Two-Dimensional Hydrodynamic Modelling for Flood Inundation Mapping in the Upper Kelani River Basin: A Focus on the Ruwanwella Tributary Confluence Zone, Sri Lanka

S.A.A.N. Abeywickrama*, P. Neluwala

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**e18011@eng.pdn.ac.lk*

The middle upper Kelani River basin, spanning from Kithulgala to Glencourse, is highly susceptible to rapid riverine flooding driven by its steep catchment gradients and the convergence of major tributaries near Ruwanwella. Despite recurring flood-related losses, spatially explicit inundation data for community-level disaster risk management remain limited for this reach. This study aimed to develop a calibrated and validated two-dimensional hydrodynamic model for the reach and produce a Flood Inundation Map Library for multiple design return periods, with particular focus on the Ruwanwella tributary confluence zone where the Seethawaka Ganga and Gurugoda Oya tributaries join the main Kelani River channel. A HEC-RAS 2D model was constructed for the 1,107 km² catchment using a LiDAR-DEM, a variable-resolution computational mesh, Green-Ampt infiltration parameterised land use classes, and spatially distributed Manning's n roughness coefficients. The model was calibrated against the May 2016 flood (tropical cyclone Roanu) and validated against 2 events, 2025 Cyclone Ditwa flood, the most recent extreme discharge event on record at the downstream Glencourse station (peak: 2,599 m³/s), and September 2022. Design flood hydrographs for 5-, 10-, 25-, 50-, and 100-year return periods were constructed by proportionally scaling the 2025 base event's discharge magnitude using station-specific discharge-frequency analysis and IDF-derived rainfall scaling ratios, preserving hydrograph shape and peak timing by construction. Calibration and both validation events achieved 'Very Good' performance ratings (NSE/R²): Calibration (May 2016) 0.87/0.94; Validation 1 (Sep 2022) 0.87/0.96; Validation 2 (Nov 2025) 0.77/0.81. Return-period simulations produced inundation extent maps and depth classification maps for the full study domain, with supplementary community-scale maps for the Ruwanwella confluence area revealing significant flood depth escalation at the tributary junctions across return periods. This research contributes a physics-based, return-period-grounded flood inundation framework for a geomorphologically complex tributary confluence reach that is currently underserved by hazard mapping. The validated modelling approach and the inclusion of the 2025 cyclone Ditwa event as a calibration benchmark advance the understanding of extreme flood behaviour in the upper Kelani River basin, providing a direct evidence base for setting flood trigger thresholds under the community-based 'Flood Early Warning System' serving the Dehiowita, Ruwanwella, and Yatiyanthota DS Divisions.

Keywords: HEC-RAS 2D, flood inundation mapping, tributary confluence, Kelani River Basin, Cyclone Ditwa

Urban Growth and Forest Change in the Kandy-Mahaweli Corridor: A Satellite Image Processing Study

C. Tharun

School of Computing and Engineering, National Institute of Business Management, Colombo 07, Sri Lanka
tharunc39@gmail.com

Urban growth around Kandy is gradually spreading towards nearby corridors such as Katugastota, Kundasale, and Digana. This growth can place pressure on forest cover, water resources, and land that are important for environmental balance. Unlike earlier single-date assessments of the region, this study applies a reproducible, fully open-source satellite image-processing workflow, integrating Landsat 8 and Sentinel-2 imagery at seasonal resolution to identify forest change and urban growth. The purpose of this study is to provide clear evidence of land-cover change and support better planning decisions for future development and forest protection. Landsat 8 and Sentinel-2 satellite images sourced from Google Earth Engine were used to prepare 22 seasonal image composites, with two observation periods each year. The image-processing workflow included cloud masking, clipping, spectral index extraction, median filtering, and MNDWI-based water masking. Three spectral indices were used: Normalized Difference Vegetation Index (NDVI) for forest cover, Normalized Difference Built-up Index (NDBI) for built-up areas, and Modified Normalized Difference Water Index (MNDWI) for water areas. A threshold-based classification separated forest (NDVI >= 0.50), built-up (NDBI > 0 and NDVI < 0.40), water (MNDWI > 0), and bare/other land, with thresholds derived empirically from the study-area index distributions and refined by visual inspection. Change detection was carried out by comparing classified maps for 2015, 2020, and 2025, supported by NDVI and NDBI image differencing. The results show that forest cover remained in the mainland-cover class in the study area. Forest area was 280.39 km² in 2015, 279.60 km² in 2020, and 280.69 km² in 2025. Although the total forest area remained mostly stable, spatial analysis detected 1.26 km² of localized forest-cover loss from 2015 to 2025, equal to about 0.45% of the 2015 forest area. Built-up area increased from 0.47 km² in 2015 to 0.68 km² in 2025, showing 44.7% growth over the decade. Of this expansion, 0.08 km² was direct forest-to-built-up conversion, representing 38.1% of total built-up growth. These results show that the corridor is not experiencing large-scale forest loss, but localized forest change and urban growth are visible. Formal accuracy assessment using independent reference data is identified as an essential next step. The study shows that satellite image processing can support land-cover monitoring and balanced urban and environmental planning in Central Sri Lanka.

Keywords: forest cover loss, land cover change, multi-temporal analysis, satellite image processing, urban expansion

Valorization of Biomass Fly Ash for Magnesium Silicate Hydrate Synthesis

R.M.M.S.M. Rajapaksha[1,3]*, S.K. Weragoda[2], G.B.B. Herath[1], B.K. Pramanik[3], V. Jegatheesan[3], D.S.B. Navaratna[4,5]

[1]*Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*National Water Supply and Drainage Board, Ratmalana, 10390, Sri Lanka*
[3]*School of Engineering, RMIT University, Melbourne, VIC 3000, Australia*
[4]*Industrial Training and Career Guidance Unit, Faculty of Engineering, University of Peradeniya, 20400, Sri Lanka*
[5]*Institute for Sustainable Industries and Liveable Cities, College of Sport, Health and Engineering, Victoria University, Melbourne, VIC 3011, Australia*
**shalanimrajapaksha@gmail.com*

Magnesium Silicate Hydrate (MSH) serves as a promising binder in cement manufacturing and an effective adsorbent for heavy metals in wastewater treatment. Due to resource depletion, alternative raw materials for MSH synthesis are increasingly desired. While fly ash can serve as a silicon source, magnesium can be derived from Mg-rich wastes such as Reverse Osmosis (RO) brine. Utilizing biomass fly ash (a biogas by-product) as a silicon source in MSH production mitigates environmental burden by diverting a problematic combustion residue from landfills. Therefore, this study evaluates MSH synthesized from silicon extracted from *Gliricidia* biomass fly ash (MSH-FA) and compares its performance with MSH produced from commercial Na_2SiO_3 (MSH-C). Biomass fly ash obtained from a *Gliricidia* biomass-based power plant in Dehiattakandiya, Sri Lanka, was desilicated using alkaline extraction. The raw and treated fly ash were characterized by XRF, FTIR, XRD, and SEM, while the recovered silicon solution was characterized by ICP-MS. MSH was synthesized by reacting either the fly-ash-derived silicon extract or commercial Na_2SiO_3 with $MgCl_2$ under alkaline conditions (pH 10–11). The resulting products (MSH-FA and MSH-C) were characterized using XRD and FTIR. Results showed that desilication removed 33% of silicon, with complete disappearance of the quartz phase and evidence of silica depolymerization. ICP-MS recorded an extractable Si concentration of 32,200 mg/L. The weight of MSH-FA was significantly higher (63%) than that obtained using MSH-C, while also exhibiting lower residual Mg^{2+} concentrations in the supernatant. Structural analyses confirmed the formation of layered MSH in both products, with MSH-FA showing a shift to higher 2θ values and increased peak intensity, indicating enhanced crystallinity. Therefore, biomass fly ash is not only an effective silicon source for MSH synthesis but also outperforms commercial Na_2SiO_3 in terms of yield while preserving structural integrity. This approach valorizes an industrial by-product, advances circular economy goals, and offers a sustainable pathway for producing high-value MSH.

Keywords: MSH, biomass fly ash, *Gliricidia*, alkali desilication

Acknowledgement: *Financial support from the University of Peradeniya (Grant No. URG/2025/20/E) for research-related expenses and stipend support from the National Science Foundation (Grant No. NSF/SCH/2025/13) are acknowledged.*

Valorization of Water Treatment Sludge as a Sustainable Wall Putty: Characterization, Formulation, and Performance Evaluation

M. Senanayake*, P.S.S. Perera, L.U. Rathnayake, A.J. Dhammika, R.M.L.D. Rathnayake

University of Peradeniya, Peradeniya, 20400 Sri Lanka
**madhushika@eng.pdn.ac.lk*

The growing demand for sustainable construction materials has become a global priority as the construction industry seeks to minimize environmental impacts and promote circular economy. Conventional materials such as limestone-based wall putty contribute to resource depletion and greenhouse gas emissions. While water treatment plants in Sri Lanka face ongoing challenges in managing and disposing of sludge. Previous studies have explored the incorporation of alum sludge in various construction applications such as bricks, mortar, lightweight aggregates, and cementitious materials with promising potential for waste valorization. Building on these developments, the present study investigates the feasibility of producing an eco-friendly wall putty by utilizing alum sludge as a sustainable wall finishing material. Alum sludge samples collected from two geographically distinct water treatment plants were analyzed to determine their physical and chemical characteristics, including particle size distribution, moisture content, and Fourier-transform infrared spectroscopy (FTIR). The sludge was treated with coconut oil, calcined at 700 °C, and ground into fine powder suitable for wall putty applications. Four formulations containing 65%, 70%, 75%, and 85% sludge powder blended with a styrene–acrylic binder were tested for compressive strength, volumetric shrinkage, setting time, and water absorption against a commercial benchmark The formulation containing 70% sludge powder and 30% binder showed the most balanced performance. It achieved compressive strengths of 0.94 MPa and 0.90 MPa for sludge obtained from the two treatment plants, compared with 0.927 MPa for the commercial product. The same formulation exhibited volumetric shrinkage of 0.20%, acceptable setting times, and adequate resistance to water absorption under the tested conditions. Increasing the sludge content above 70% generally increased water absorption and reduced the overall performance of the putty. It can be concluded that appropriately treated alum sludge has potential as a major constituent of wall putty. However, the performance of the final product may vary with the physical and chemical characteristics of the raw sludge; therefore, prior characterization is necessary when sludge from different sources are used. Overall, the study establishes the technical feasibility of alum-sludge-based wall putty and provides a basis for further investigation of durability, colour optimization, environmental performance, and economic viability.

Keywords: alum sludge, circular economy, resource recovery, sustainable construction materials, wall putty, waste valorization

Theme 4



Engineering Intelligent, Sustainable and Human-Centric Systems

Social Sciences and Humanities

A Critical Study of Literary Insights into Post-Humanist Characteristics in Modern Cinema (Based on the Films Her, The Matrix, And Blade Runner 2049)

U.J.M.R.S.B. Jayasinghe

Department of Sinhala, University of Ruhuna, Matara, 81000, Sri Lanka
ruchirajayasinghe64@gmail.com

This research examines how modern cinema explores the evolving definition of "humanity" through the lens of post-humanism, emphasizing the literary and philosophical insights embedded within cinematic narratives. As technology increasingly blurs the boundaries between biological existence and artificial intelligence, cinema serves as a primary medium for questioning anthropocentric ideals. This study analyzes three pivotal films which are Her (2013), The Matrix (1999), and Blade Runner 2049 (2017) to investigate how they utilize literary metaphors, existential themes, and discourse analysis to portray post-human traits. The analysis focuses on how Her redefines emotional intimacy beyond physical form, how The Matrix challenges the Cartesian dualism of mind and body within a simulated reality, and how Blade Runner 2049 explores the authenticity of memory and soul in bio-engineered beings. The methodology employs a qualitative approach, integrating post-humanist theory with literary criticism to decode the narrative structures of these films. The findings suggest that these cinematic works do not merely depict a futuristic aesthetic but offer profound literary insights into the deconstruction of the traditional "human" subject, paving the way for a decentralized understanding of existence in a technology-driven era.

Keywords: post-humanism, modern cinema, literary insights, artificial intelligence, existentialism

No Show Abstract

Addressing the Ecological Paradox: Utilizing the Taoist Concept of Yin-Yang Balance as a Philosophical Basis for Modern Global Environmental Crises

Rev. Wanduramba Suseela

Department of Philosophy, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka.
suseelathero921@gmail.com

The contemporary global environmental crisis, characterized by unprecedented climate change, severe biodiversity loss and escalating ecological degradation, is fundamentally rooted in the anthropocentric and materialistic paradigms of modernity. This dominant Western perspective, which views nature primarily as an inexhaustible resource for human exploitation and economic growth, has increasingly shaped the economic and environmental policies of Eastern countries such as China, despite the fact that philosophical traditions like Taoism originated there. The Taoist concept of Yin-Yang emphasizes balance, harmony and interdependence between humanity and nature, making this development particularly paradoxical. Clearly defining the research problem, this study examines the stark contradiction between traditional ecological wisdom and contemporary development paradigms. Addressing this tension constitutes a significant objective of the present study, aiming to draw greater scholarly attention to an issue of growing environmental and philosophical importance. Consequently, the research critically explores the ancient Taoist concept of ***'Yin-Yang'*** balance, alongside ***'Wu-Wei'*** (non-action), as a robust alternative framework for addressing these ecological challenges. Utilizing a qualitative, hermeneutic research design, this study conducts an in-depth philosophical inquiry grounded in primary Taoist texts, notably Lao Tzu's Tao Te Ching and the Zhuangzi. These texts are systematically analyzed in relation to contemporary environmental ethics, deep ecology and sustainability discourses. The conceptual analysis categorizes aggressive industrial expansion, technological overreach and relentless economic growth as an unsustainable, destructive excess of ***'Yang'*** energy. Conversely, natural regeneration and ecological conservation align with the nurturing properties of ***'Yin'***. Findings reveal that environmental collapse is not merely a technological failure, but a direct manifestation of a systemic metaphysical imbalance where unchecked ***'Yang'*** forces suppress the earth's restorative ***'Yin'*** essence. Furthermore, applying ***'Wu-Wei'*** provides a vital corrective to modern environmental interventionism, advocating for a harmonized existence that synchronizes human activity with the organic rhythms of the Tao. The research argues that authentic sustainability demands a profound metaphysical shift toward non-duality, fully recognizing the ontological unity and interconnectedness of humanity and nature. In conclusion, the Yin-Yang framework transcends historical philosophy, providing a viable eco-centric ethical foundation for sustainable living. By fostering moderation and ecological harmony, Taoism directly addresses the root causes of environmental decay.

Keywords: environmental crisis, Taoism, Yin-Yang Balance, Wu-Wei

AI-Generated Crime and Gaps in Criminal Liability: A Sri Lankan Perspective on Emerging Legal Challenges

D.N.Y. Weerakoon

Faculty of Law, University of Colombo, Colombo, 00300, Sri Lanka
dnyweerakoon@gmail.com

The rapid advancement of generative Artificial Intelligence (AI) poses unprecedented challenges to traditional, human-centred criminal law frameworks by enabling autonomous or semi-autonomous participation in harmful acts. Recent studies highlight the severity of this threat. For instance, Hidayati, Surono, and Pamungkas (2024) indicate a 223% increase in deepfake tool circulation that contributes to billions of dollars in projected global fraud losses. This study evaluates whether Sri Lanka's criminal law system can effectively address AI-generated crimes and examines where liability should vest when autonomous systems cause criminal harm. Methodologically, this research adopts a qualitative doctrinal legal research. It critically analyses primary Sri Lankan statutes, specifically Sections 10, 399, and 400 of the Penal Code No. 2 of 1883 (governing the definition of a 'person' and cheating by personation) alongside Sections 3 to 7 of the Computer Crimes Act No. 24 of 2007 (governing unauthorized access and modification) against fundamental principles of *actus reus* and *mens rea*. A comparative legal research is also conducted with the EU Artificial Intelligence Act, focusing specifically on its "risk-based classification" mechanism. It is supplemented by recent global case law. The research reveals critical gaps. Sri Lanka's existing framework is ill-equipped to address AI-related offenses because current statutory definitions of intent fail to accommodate autonomous system behaviours and "black-box" algorithmic actions. This creates prosecution uncertainty. Furthermore, existing provisions do not account for third-party developer negligence or algorithmic manipulation. To remedy these deficiencies, this study proposes a legislative modernization. It recommends enacting distinct statutory amendments targeting autonomous systems within the Computer Crimes Act and introducing a hybrid liability framework. This framework balances strict user accountability with developer corporate liability that provides a future-ready blueprint to safeguard justice, deterrence, and the rule of law in Sri Lanka's digital landscape.

Keywords: artificial intelligence, criminal liability, cybercrime, Sri Lanka, technology law

An Analysis of Chanting as a Mechanism for Disciplinary Knowledge Preservation and Identity Formation (5th-century Sri Lanka) with Special Reference to the Brahmajala Sutta and its Commentary

Ven. P. Gnanalakkhana

University of Peradeniya, Peradeniya, 20400, Sri Lanka
lakkhanathero99@gmail.com

The first sutta of the Dīgha Nikāya, the Brahmajāla Sutta, deals with the analysis of monastic discipline and the conduct of the monastic community in accordance with monastic rules. In the fifth century, Buddhaghosa, in his commentary on the Dīgha Nikāya known as the Sumaṅgalavilāsinī, notes that bhikkhus residing at the Lovāmahāpāya and the Kelani Vihāra-monasteries generally associated with the Mahāvihāra tradition, frequently recited the Brahmajāla Sutta. This observation raises an important question: why did the Mahāvihārins give especial importance to this particular sutta rather than to others? Was its prominence due simply to its position as the opening sutta of the Dīgha Nikāya? These questions form the central concern of the present study. In order to address them, this study draws primarily on the Mahāvaṃsa, the Visuddhimagga, and Faxian's travel record in the English translation by James Legge. According to the Mahāvaṃsa, composed in the fifth century, three major monastic schools existed in Sri Lanka: the Mahāvihāra, Abhayagiri, and Jetavana. During the reign of King Mahāsena (277–304 CE), royal patronage favored the Abhayagiri and Jetavana schools more than the Mahāvihāra. In this historical context, the Mahāvihārins appear to have sought to preserve and assert their own lineage, which they understood as the guardian of the original Buddhist tradition introduced to Sri Lanka. Within this effort, the recitation of the Brahmajāla Sutta seems to have held particular significance. This may explain why, even in Buddhaghosa's time, the Mahāvihārins continued to promote and preserve its recitation. On this basis, the present study argues that the Mahāvihārins recited the Brahmajāla Sutta regularly and with special care as a means of safeguarding monastic discipline within their community. In this way, the recitation of the Brahmajāla Sutta functioned not only as a religious practice but also as a means of reinforcing the disciplinary order and communal identity of the Mahāvihāra tradition.

Keywords: *Brahmajāla Sutta, Mahāvihāra,* monastic discipline, Buddhaghosa, communal identity

Analysis of Community Perceptions on the Challenges and Potential for the Redevelopment of the Kantale Sugar Factory

J.M.S.K. Chandrasiri*, N.W.S. Nanayakkara

University of Ruhuna, Matara, 81000, Sri Lanka
**kaveen9797@gmail.com*

The sugar industry in Sri Lanka faces significant challenges, resulting in heavy reliance on imports to meet domestic demand. Historically, the Kantale sugar factory, once one of the largest sugar refineries in Asia, supplied over half of the country's sugar needs. Although the factory was economically and socially important, it is currently non-operational due to multiple constraints. However, there are lack of comprehensive analyses and academic research on redevelopment of the factory. Therefore, this research focuses on analyzing the community perceptions on the challenges and potential for the redevelopment of the Kantale sugar factory in Sri Lanka. This study mainly collected primary data through semi-structured questionnaire survey from the local community (sample size: 60, Simple Random Sampling) and interviews with government officials (sample size: 15, purposive sampling). Field observations were conducted to gather data regarding the current state of the factory. Both qualitative (thematic) and quantitative data analyses (Potential Index = (weighted score/ (Total respondent x Maximum scale value)) x100) were conducted. By using Potential Index, converted Likert-scale responses into weighted percentage scores. It statistically compares the opinion of potential factors between community and official groups to redevelop the sugar factory. Spatial mapping techniques were incorporated using ArcGIS 10.7. According to the findings, both local community (56 respondents; 93.3%) and government officers (14 respondents; 93.3%) identified political and government policy interference as the primary factor contributing to the closure of the factory. Administrative failure of the factory was recognized as the second most significant factor. When considering the potential index for redevelopment, strong community support was identified as the most significant factor (96.0%), followed by the availability of cultivable land (91.7%). However, field observations indicate that the existing infrastructure and machinery are not suitable for reuse. Furthermore, land previously utilized for sugarcane cultivation has been converted to paddy and maize farming, and reconverting this land would require extensive negotiations. In conclusion, although there is strong community interest, redeveloping the factory as a sugar facility is not feasible given the current condition of the infrastructure and machinery. It is recommended that the government repurpose them for a suitable development project.

Keywords: Kantale Sugar Factory, industrial collapse, institutional failure, community perceptions, redevelopment

Applying Theatre and Play-Based Psychosocial Interventions in Disaster Relief Camps: Behavioral Observations from Kandy District of Sri Lanka

I.M.L.K. Gunasena[1]*, E.M.Y.I. Ekanayake[2]

[1]*National Child Protection Authority, Kandy, 20000, Sri Lanka*
[2]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**lldebiddo@gmail.com*

Children experiencing disasters often face a lot of psychological stress, and things become more difficult when they're forced to live in temporary relief camps. In Sri Lanka's Kandy District, government staff have tried several psychosocial programs to support these children. Still, limited research has seriously considered the effectiveness of play-based and drama-based (applied theatre) activities work in these situations. This study aimed to examine children's mental health after a disaster and evaluate the effectiveness of these kinds of interventions in helping them recover. The researchers conducted a structured survey and interacted with 40 public officials, including child rights promotion officers, counselors, and child protection officers who interacted directly with these children at the camps. The analysis was done by using the responses in basic statistics and cross-tabulation in Excel to see any links between trauma levels and the impact of these interventions. The results were notable: the majority of children showed strong signs of emotional distress, sadness at 85%, fear at 80%, and withdrawal at 75%. They also acted out behaviorally, including 80% of regression and becoming more clingy (72%). Play-based activities were frequently used, while drama-based activities were used less frequently. Still, the participants who were directly involved believed both techniques really helped, regardless of the trauma severity. Upon closer examination, drama-based interventions seemed especially powerful for children who are facing more severe trauma, offering them an opportunity to express their feelings openly. In contrast, play activities helped children to restore social connections and maintain consistent behavior in every aspect. In conclusion, the analysis reveals that integrating play with drama-based methods results in a more effective reaction to the needs of children after a disaster. In fact, these findings demonstrate clearly that applied theatre deserves a major role in formal psychosocial support for children in Sri Lanka affected by disasters.

Keywords: applied theatre, play-based interventions, psychosocial support, disaster relief, child psychology

Acknowledgement: *The authors would like to thank the government officers in the Kandy District, including child rights promotion officers, counselors, child protection officers, and all the institutions who provided support.*

Awareness and Usage of Digital Extension Tools among Agricultural Extension Officers of Western Province, Sri Lanka

R.A.N.D. Amarasinghe[1]*, U.I. Dissanayeke[1], G.A. Gow[2], S.B.A.M.A.M. Gunawardena[3]

[1]Department of Agricultural Extension, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Sociology, Faculty of Arts, University of Alberta, Edmonton AB, Canada
[3]Provincial Department of Agriculture (Western Province), Battaramulla, Sri Lanka
**nadini.amarasinghe31@gmail.com*

Agricultural extension officers (EOs) serve as critical intermediaries between research institutions and farming communities, and their digital competence is increasingly vital for effective service delivery. While studies on Digital Tools(DTs) use among agricultural extension officers in Sri Lanka have examined the plantation sector, including tea (Samansiri & Wanigasundera, 2014) and sugarcane (Karunathilaka et al., 2025) evidence on digital tool awareness and usage patterns among food crop extension officers at the provincial level remains absent from the literature. This study aimed to assess the awareness and usage levels of DTs among EOs in the Western Province of Sri Lanka, identify patterns across tool categories, and highlight gaps in digital engagement among the study community. All 106 Agricultural Instructors (AIs) under the Provincial Department of Agriculture were approached (Response rate = 80%) via an online questionnaire. Respondents were predominantly female (50.6%), with an average of 12.4 years of professional experience; 58.8% had received digital skills training within the preceding three years. Smartphone-only ownership was most prevalent, particularly in Kalutara (58.3%), while multi-device usage was more common in Colombo (54.5%) and Gampaha (45.8%). Familiarity was assessed across thirteen tools using a five-point Likert scale ranging from 'not aware' to 'used regularly'. Descriptive statistical analysis revealed marked disparities across tool categories. General communication platforms dominated engagement; WhatsApp (60% regular use) and Zoom-based technical meetings (67% used many times) recorded substantially higher use than specialised agricultural advisory applications, including *Agromet* (25% regular use) and *Krushi Advisor* (18% regular use) and *Govi Mithuru, Agri Staff*, and the *SL Paddy Fertilizer App* recording regular use below 7%. The findings indicate that extension officers (EOs) are highly familiar with general communication platforms. However, this digital engagement has not led to similar adoption of specialised agricultural advisory tools. This gap creates a structural imbalance that restricts the potential of digital extension systems. Targeted awareness campaigns, structured training, and institutional support are essential to bridge this gap and strengthen digital extension service delivery in the Western Province.

Keywords: digital extension tools, agricultural extension officers, ICT familiarity, western province

Barriers to Inclusive Education for Children with Autism Spectrum Disorders in Sri Lanka: A Rights-Based Analysis from Parents' and Teachers' Perspectives

A.H.M.S.A.K. Abeyrathne*, H.D.P. Premarathne

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**a20sw001@arts.pdn.ac.lk*

The right to education is a fundamental human right. However, children with Autism Spectrum Disorders (ASDs) continue to encounter significant barriers in accessing quality, inclusive education. In Sri Lanka, while national policies exist to promote inclusive education, their implementation remains fragmented. Existing local research has predominantly focused on the medical dimensions of autism or on the educational experiences of children with special educational needs in general, with comparatively limited attention given to the educational barriers faced by children with ASD from a rights-based perspective. This study aimed to explore the barriers to inclusive education experienced by children with ASD from the perspectives of parents and teachers and to examine how these barriers affect the realization of the child's right to education. Guided by the Social Model of Disability and the Rights-Based Approach, the study adopted an exploratory qualitative research design. Using purposive sampling, data were collected through semi-structured in-depth interviews with 23 participants, including 15 parents of children with ASD enrolled in both inclusive education settings and special education units, 7 special education teachers representing 7 schools in Kandy, and the Assistant Zonal Director of Education (Special Education) in the Kandy Education Zone as a key informant. Data were analyzed using thematic analysis supported by NVivo software. Ethical approval was obtained from the Ethics Review Committee of the Faculty of Arts, University of Peradeniya, and verbal informed consent was obtained from all participants. Major challenges include inadequate educational resources and assistive devices, limited autism-specific teacher training, limited preparedness and negative attitudes among mainstream teachers, peers, and parents of other children, social stigma, and considerable gaps in policy implementation. The findings further demonstrate that barriers to inclusive education arise not only from individual impairments but also from systemic failures such as refusing to accept children with ASD to schools and inability to provide equal opportunities in education. The study recommends strengthening autism-specific teacher professional development, improving educational resources and assistive devices, promoting school- and community-based awareness to address stigma, and enhancing the implementation of inclusive education policies to better realize the educational rights of children with ASD.

Keywords: attitudes, children with ASD, educational challenges, inclusive education, right to education

Between Tradition and Justice: Examining Legal Barriers and Judicial Protection of Women's Property Rights Under the Tesawalamai Law in Sri Lanka

S.T.D. Sandanayaka

Faculty of Law, South Asian University, New Delhi, India
thisarasandanayaka@gmail.com

Women face significant barriers to accessing the legal system under the Tesawalamai law. The Tesawalamai law is an ancient system of customary laws governing property and inheritance rights within the different Tamil communities in Northern Sri Lanka. The Tesawalamai law does not protect women's rights to property, and there is limited research on judicial protection and obstacles to access to effective legal remedies. The Constitution of Sri Lanka guarantees gender equality; there is inconsistency between the guarantee of gender equality and its judicial protection due to the existence of national law and customary law. This study analyzes the legal barriers women face under the Tesawalamai law with a particular emphasis on issues related to property and inheritance rights. The study will also assess the capacity of the Sri Lankan judiciary to resolve these legal barriers and achieve justice for women. Three main objectives of the study are: to analyze how the Tesawalamai law discriminates against women's property rights, to examine the obstacles women encounter when pursuing legal claims, and to evaluate how the judiciary works to alleviate gender inequality within this traditional environment. The research utilizes qualitative methodology through the use of case studies, legal analysis, and interviews with women affected by the Tesawalamai law and legal professionals. To identify gaps in the protection and enforcement of the law, statutory legislation, judicial decisions, and international human rights law are reviewed. In the rare instances where the judiciary of Sri Lanka has interpreted the Tesawalamai legislation in a manner that supports women's rights, the evidence indicates that the barriers to women accessing their right to justice continue to be large due to the socio-cultural expectations surrounding women, ignorance about the law, and lack of prompt processing of cases. The necessity of integrating the Tesawalamai statute with the nation's goal of advancing gender equality is revealed by the judicial response. It calls for reform through amendment of the existing law, provision of adequate public education about the legal system, and capacity building for judges in handling customary law cases with a gender perspective.

Keywords: Tesawalamai law, inheritance rights, gender inequality, women's rights, gender equality

No Show Abstract

Code-Switching Patterns among Multilingual Higher Education Students in Sri Lanka: A Study of Sinhala-Tamil-English Trilingual Discourse

S.M.T.D. Sarathchandra[1]*, C.G.H.S.D. Chandrasekara[2]

[1]*Postgraduate Institute of English, The Open University of Sri Lanka, Nawala, 10250, Sri Lanka*
[2]*Faculty of Education, University of Colombo, Colombo 03, 00300, Sri Lanka*
**smtdarshana1994@gmail.com*

Code-switching, the habit of alternation between two or more languages during communication, remains as a largely examined phenomenon in the context of multilingual higher education in Sri Lanka. Though research regarding bilingual and multilingual discourse is expanding globally, there are a few empirical studies on trilingual code-switching among Sri Lankan higher education students in Sinhala, Tamil, and English. As a means to overcome that gap, this study aims to examine the patterns, functions, and motivations of Sinhala-Tamil-English code-switching among students at the Peradeniya National College of Education (PNCOE). This study employs a mixed-method approach where it is based on Gumperz's (1982) interactional sociolinguistics and Myers-Scotton's (1993) Markedness model. Using Yamene's (1967) formula at a 95% confidence level, a stratified random sample of 80 students was selected from a total population of 267 (156 Sinhala-speaking, 67 Tamil-speaking, and 44 English-speaking students), resulting in a proportionate sample of 47, 20, and 13 participants, respectively. Data were gathered using structured Likert-scale questionnaires administered to all 80 participants, semi-structured interviews with 15 purposively selected students (5 from each language group), and 20 hours of audio-recorded naturalistic dialogues in both academic and informal contexts. Quantitative data were analysed using descriptive statistics, chi-square tests, and one-way ANOVA with SPSS V.25, whereas qualitative data were assessed by thematic and discourse analysis. Findings depict that code-switching is a common occurrence in everyday life among all language communities (91.3%), with the most frequent switching combinations being between Sinhala-English and Tamil-English speakers. Trilingual code-switching that includes all three languages was relatively uncommon (6-9%), mainly taking place in mixed group conversations. The motivations that received the highest ratings were expressive precision (M-4.61) and fostering solidarity (M-4.48), whereas exclusionary switching had a mean score (M-2.18), suggesting that code switching at PNCOE operates as an inclusive communication strategy. These results challenge deficit viewpoints that frame code-switching as a lack of linguistic capability, redefining it as an advanced and socially significant communication tool. The study has considerable consequences for language policy reform, translanguaging-inclusive pedagogy, and the advancement of linguistic justice within Sri Lankan higher education institutions.

Keywords: code-switching, higher education, multilingual, sociolinguistics, trilingual

Coffee Culture in a Sacred Heritage City: An Ethnography of Cafés in Kandy, Sri Lanka

W.A.M.S. Wijesuriya

Department of Geography, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
manujawams@gmail.com

Kandy has been recognised as a cultural and sacred city structurally and symbolically centered on the Temple of the Tooth Relic. Within the religious and conservational regulated urban environment of Kandy, cafés or coffee-related establishments are important as they are negotiated social environments. This ethnography examines how cafés are positioned on D. S. Senanayake Street and Sri Dalada Street in relation to their function within Kandy's sacred and heritage context and the relationship between the global coffee culture and the moral, architectural, and symbolic order of a sacred heritage city. The primary purpose of this ethnography is to examine how cafés in Kandy operate as socially, culturally, and spatially negotiated environments, and how these environments are used and altered by local and foreign consumers. An ethno-methodological approach was employed using qualitative data collection methods (including semi-structured interviews with café owners and customers, an academic, and an architect) in addition to participant observation for a period of two months. Although café culture is not a new phenomenon in Kandy, it was previously limited to a relatively small crowd. This study demonstrates how café culture has expanded over time, incorporating both global and local components while attracting a broader and more diverse clientele. The results indicate how cafés in Kandy operate as semi-public, globally localised or *glocal* third spaces which are influenced by heritage regulatory frameworks, tourist movement patterns, class dynamics, and daily spatial practices in the form of globalised coffee imaginaries. While Kandy's cafés have been predominantly frequented by tourists, youth, and English-speaking professional locals, they are increasingly finding ways to involve local participation through adaptation, education, and architectural sensitivity. Therefore, it can be concluded that the establishment of cafés does not replace Kandy's sacred urban identity; instead, they are contributing to the ongoing production of Kandy's sacred geography and thus functioning as hybrids of commodity and lived experience.

Keywords: cafés, coffee culture, sacred urban space, global - local interaction, spatial negotiation

Compulsory Licensing for Climate Emergencies: Reimagining Sri Lanka's Patent Law for Green Technology Access

Y.T. Pitawala

Department of Law, University of Jaffna, 40000, Sri Lanka
pitawalahasareli@gmail.com

In time, climate change has turned from a distant warning into an existential threat. For Sri Lanka, an island nation with rising sea levels and erratic monsoons, access to green technologies has become a necessity. Yet patents can block that access. Sri Lanka's Intellectual Property Act allows Compulsory Licensing (CL) only for 'national emergencies,' raising the question: does a slow-building climate crisis qualify? This research aims to assess whether Sri Lanka's existing CL provisions can legally cover climate-related green technologies and further proposes a clear legal framework enabling Sri Lanka to invoke CL during climate emergencies. This study employs a qualitative comparative legal analysis. Primary legal sources include Sri Lanka's IP Act and the TRIPS Agreement. Secondary sources include the Doha Declaration, UNFCCC, and Paris Agreement. Case studies examine India (local working requirements and green-tech CL discussions), Thailand and Brazil (public health CL precedents), and Egypt (environmental CL provisions), selected as targeted case-study anchors for focused analysis. The research draws on scholarly work on TRIPS flexibilities, economic retaliation risks, AI-generated green inventions, and the 2025 AIPPI resolution extending CL to environmental technologies, alongside a risk assessment of trade sanctions and investment deterrence. Finally, semi-structured interviews with NIPO officials and policy analysts were analysed thematically, identifying patterns and challenges, assess institutional readiness. The findings reveal that TRIPS Article 31 and the Doha Declaration grant member states the freedom to define "national emergency," allowing climate change to be legally framed as a public health crisis, and that climate change and air pollution constitute public health crises, justifying the extensive interpretation for green technology access. Case studies demonstrate that compulsory licensing can lower costs. However, the results highlight significant barriers: firstly, limited domestic manufacturing capacity in developing states raise a practical concern as CL is only useful if the technology can actually be produced. Thus, CL would need to be paired with technology transfer agreements or importation under TRIPS Article 31bis, allowing to import generic versions of patented products under CL, making it practically feasible for an importing nation like Sri Lanka. Secondly, the risk of economic retaliation, which Sri Lanka could navigate by negotiating in good faith first, ensuring fair compensation for patent holders, and using CL only as a genuine last resort. Furthermore, emerging AI-driven innovations, examined as a legal barrier to technology diffusion, require reimagined patent frameworks to prevent monopolies and ensure equitable environmental diffusion. Thus, Sri Lanka should issue binding guidelines clarifying that climate emergency triggers compulsory licensing for green technologies, such as desalination, drought-resistant crops, and solar-powered water pumps as technologies most critical for climate adaptation, under Section 86 of the IP Act, transforming patent law into a proactive instrument for climate justice.

Keywords: compulsory licensing, climate emergency, green patents, Sri Lanka, TRIPS flexibilities

Acknowledgement: *The author wishes to express sincere gratitude to Mrs. Thushani Shayanthan, Senior Lecturer, Department of Law, University of Jaffna, Mr. Nalinda Atapattu, Asst. Director-Information & Examination of the National Intellectual Property Office (NIPO) and all NIPO officials at the Patent Division for their invaluable support and guidance.*

Constitutional Safeguards Against the Challenges of Artificial Intelligence: A Comparative Study of Sri Lanka and India

L.P.P.P. Liyanapathirana*, B.S.R. Fernando

General Sir John Kotelawala Defense University, Ratmalana, 10390, Sri Lanka
**paramiliyanapathiranainfo@gmail.com*

The growing use of Artificial Intelligence (AI) in government operations, including surveillance, predictive policing, and administrative decision-making, raises significant constitutional concerns in South Asia, particularly regarding the adequacy of existing legal frameworks for safeguarding fundamental rights. This study examined whether the constitutional systems of Sri Lanka and India protect individuals from AI-driven state action, identified gaps in existing protections, and proposed comparative recommendations for strengthening Sri Lanka's framework. Using doctrinal and qualitative methods, the study analyzed constitutional provisions, judicial decisions, and policies in both jurisdictions. Comparative legal theory guided the identification of structural and doctrinal differences between the two systems, while the legal transplants approach assessed the feasibility of adapting India's regulatory mechanisms, such as its data protection legislation, to Sri Lanka's constitutional context. The findings show that India has developed a comparatively robust constitutional foundation for AI governance, largely through judicial recognition of privacy as a fundamental right in Justice K.S. Puttaswamy (Retd.) v. Union of India (2017) and the enactment of the Digital Personal Data Protection Act 2023, although concerns remain over broad state exemptions. Sri Lanka, by contrast, has no express constitutional right to privacy, and although the Personal Data Protection Act No.9 of 2022 has been enacted, its implementation remains delayed, leaving practical vulnerabilities in AI governance. This constitutional silence appears to contribute to the observed legislative weakness, though further research is needed to confirm the extent of this link. India's approach offers some transferable lessons for Sri Lanka, while also revealing the limits of direct legal transplantation given the two countries' differing constitutional structures. The study concludes that Sri Lanka's existing fundamental rights, particularly Articles 12 and 14, could be interpreted in light of international standards such as Article 17 of the ICCPR, offering a judicially feasible interim safeguard pending comprehensive reform. Such an interpretation would let courts read a right to privacy into existing equality and non-discrimination guarantees, consistent with Sri Lanka's international obligations, without requiring constitutional amendment. The study thus contributes to the growing field of comparative AI constitutionalism and offers practical recommendations for rights-oriented AI governance in Sri Lanka.

Keywords: artificial intelligence, constitutional rights, right to privacy, Sri Lanka, India

Crowdsourced Tourism Mapping for Sustainable Destination Management in Sri Lanka

P.G.R.A. Nayanthima*, P.G.T. Poornika, R.M.K. Kumarihamy, T. Kithsiri

Department of Geography, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**anjalee0502@gmail.com*

The rapid expansion of global tourism poses significant challenges for monitoring visitor behavior and ensuring the long-term sustainability of sensitive ecological and cultural landscapes. In Sri Lanka, contemporary travel trends reflect a profound shift toward experiential, nature-based exploration and a growing interest in "off-the-beaten-path" destinations. Traditional survey methodologies frequently fail to capture these dynamic spatial patterns over long temporal scales. Addressing this information gap, this study presents a national-scale assessment of tourism dynamics in Sri Lanka using a decade of crowdsourced geospatial data. By leveraging Volunteered Geographic Information (VGI) from 2015 to 2025, the research identifies high-interest "visual hotspots" to evaluate how digital footprints pinpoint specific attraction drivers. In this context, these hotspots are defined as statistically significant spatial clusters of high-density photography signaling localized landscape attractiveness. Methodologically, a dataset of 121,275 geotagged Flickr records was analyzed using GIS-based spatiotemporal techniques, including Kernel Density Estimation (KDE) and space-time pattern mining. While this approach offers an unprecedented analytical scale, it is limited by inherent sampling biases, as the Flickr user base tends to overrepresent foreigners, younger photographers, and urban-centric imagery rather than the entire tourist demographic. Spatiotemporal analysis reveals that only 8.11% of the total digital footprint constitutes persistent hotspots, anchoring tourist density consistently within major urban and coastal gateways, such as Colombo and Galle, throughout the decade. In contrast, the majority of spatial clustering exhibits dynamic, sporadic shifts over time rather than a static distribution. This temporal fluctuation is particularly evident across key cultural and ecological destinations, including Sigiriya, Anuradhapura, Polonnaruwa, Nuwara Eliya, Kandy, and Ella, which remain classified as sporadic hotspots. Notably, within ecologically fragile, sporadic clusters like Ella, the analysis reveals a high spatial overlap between visitor activity and sensitive habitats, signaling escalating pressure on local ecosystems during peak travel periods. Ultimately, this methodology provides valuable insights for conservation planning by enabling the precise identification of vulnerable zones where high visitor footfall threatens both cultural heritage and biodiversity. These findings demonstrate the potential of crowdsourced geospatial data to decode nuanced tourism preferences and support evidence-based destination management strategies that balance national tourism growth with environmental and cultural conservation.

Keywords: volunteered geographic information, crowdsourced mapping, visual hotspots, destination management, Sri Lanka

Demographic Moderation of Adaptation Challenges in the Adoption of Sri Lanka's Digital National Identity System: A Multi-Group Analysis

M.A. Sarathchandra*, A. Gamage

University of Ruhuna, Matara, 81000, Sri Lanka
**methmaamandi818@gmail.com*

The government is set to roll out Sri Lanka's Digital National Identity System (DNIS) in 2026. The system, which is based on the Modular Open-Source Identity Platform (MOSIP), will replace the current paper-based national ID cards with a digital identity using biometric data. While the system offers numerous benefits, its adoption is crucial to its success. One emerging issue in digitalization is whether there is a uniform level of adaptation challenges for all citizens in adopting the system, or if the level of adaptation challenges varies across different demographic groups. If the challenges of adaptation affect demographic groups differently, then a one-size-fits-all approach to system rollout may not support equal and equitable adoption. This study aims to determine whether the relationship between adaptation challenges and system acceptance is invariant across demographic groups, or significantly moderated by gender, age, education level, household income, and residence to inform policymakers on equitable rollout strategies. Using a cross-sectional quantitative design, a sampling frame of 1,080 Sri Lankan adults (aged 16+) was established through convenience sampling, from which 345 respondents were drawn via simple random sampling. Data were collected through a self-administered online questionnaire distributed via social media, measuring all the constructs on five-point Likert scales. Measurement invariance was first tested across five demographic groups; where sufficient invariance was established, Wald constraint tests were then applied to structural paths using Multi-Group Structural Equation Modelling (MG-SEM) in R. Only education level was significant. The challenge has a challenge-as-engagement effect for those with a degree ($\beta = 0.375$, $p = 0.047$). For people without degree, adaptation challenges had no effect on acceptance ($\beta = -0.095$, $p = 0.292$) so they were neither motivating nor discouraging. There were no significant differences across other demographic factors. These results demonstrate that those with degrees engage with clear challenge-focused communication, but citizens without degrees require practical assistance in the form of easy procedures to enroll, assisted registration, and awareness campaigns through ICTA and Grama Niladhari networks to increase their digital literacy.

Keywords: adaptation challenges, digital literacy, digital national identity system, measurement invariance, multi-group analysis

Developing Students' Mathematical Problem-Solving Skills through Strengthening Conceptual Understanding: An Action Research Conducted in the Matale Education Zone

K. Wijethunga*, S. Wijesundera

Department of Education, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**supun.wijethunga@arts.pdn.ac.lk*

In my experience as a mathematics teacher in the Matale Education Zone, I have repeatedly observed that many junior secondary students possess reasonable procedural fluency but struggle profoundly with non-routine problems that demand genuine understanding. Many learners often depend on memorised procedures without understanding the reasons behind them, and traditional teacher-centred teaching may continue this problem. This study, therefore, set out to address that very gap. Three objectives guided this study: to systematically identify the conceptual difficulties impeding students' problem-solving performance; to design and implement targeted classroom interventions to address these foundational gaps; and to assess whether strengthening conceptual understanding would yield measurable improvements in problem-solving proficiency. I adopted a two-cycle action research design structured around planning, acting, observing, and reflecting, working with a purposively selected class of 45 Grade 8 students in a semi-urban school in the Matale Zone. Throughout the intervention, I replaced routine drill-based exercises with carefully sequenced problem-based tasks that required learners to explain, justify, and discuss their reasoning. Metacognitive questioning, collaborative group work, and whole-class reflective discussions became central to each lesson, encouraging students to connect procedures to core mathematical ideas rather than simply replicating them. I gathered data from pre- and post-intervention problem-solving assessments, structured classroom observations, a reflective teaching journal, student-written reflections, and semi-structured focus group interviews. Both quantitative and qualitative data were analysed, using paired-samples t-tests and thematic analysis, respectively. After the first complete cycle, noticeable changes were observed. Average problem-solving scores increased from 51% to 69%, but the change in the classroom environment was more significant. Learners who had previously waited passively for instructions began to discuss, draw diagrams, test different strategies, and correct each other's misunderstandings. Students' reflections frequently indicated a growing understanding of the reason behind the formula, while observation records showed richer mathematical discussions than before. These early findings suggest that a consistent and focused approach to conceptual understanding can improve junior secondary students' mathematical problem-solving abilities. The study suggests that mathematics teaching in Sri Lankan classrooms can be improved by placing greater emphasis on conceptual understanding and discussion-based learning. Moreover, the action research process provides a practical, context-based approach for teachers to improve instruction, which can be adapted to similar educational settings.

Keywords: action research, conceptual understanding, junior secondary mathematics, mathematical problem solving, Sri Lanka

Development and Evaluation of a Digital Learning Repository for Agricultural Higher Education: An Action Research Approach

W.R.M.R.L.K. Wickramasinghe[1]*, S.K. Satharasinghe[2], A. Angammana[1], U. Dissanayeke[1]

[1]*Department of Agricultural Extension, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**rashlkwickramasinghe@gmail.com*

Blended learning combines traditional face-to-face instruction with online or digital learning methods, allowing greater flexibility, interaction, and student-centered learning. One of the major challenges faced by higher educational institutions is the development of digital learning repositories that effectively support student learning. This study adapted an action research approach to develop and evaluate a digital learning repository called Virtual Study Zone (VSZ). The repository consisted of 19 resources developed by the faculty members and 20 links directing students to freely available online resources. The Virtual Study Zone (VSZ) was hosted on the Moodle platform (version 5.2), with students accessing the repository through their personal devices. Data was collected using an online questionnaire administered to a volunteer sample of 42 students after they had used the VSZ. Quantitative data were analyzed using descriptive statistics, and qualitative responses were analyzed using thematic analysis. The majority of students preferred accessing video lectures (86%), interactive quizzes (52%), and content related to research outcomes (50%). On a five-point Likert scale, the Virtual Study Zone (VSZ) received a mean rating of 3.8 in terms of ease of use and user interest. Students preferred to see more professional development courses and specialized agricultural modules included in the Virtual Study Zone (VSZ). Technical issues, such as unstable Wi-Fi connectivity and mobile compatibility problems, were identified as the main concerns affecting the use of the VSZ. Students suggested improving the technical infrastructure, simplifying access and login procedures, and aligning with the contents of the agricultural curriculum. The findings show the potential of institution-based digital learning repositories to complement classroom teaching and promote flexible learning. The study concludes that blended learning repositories can provide meaningful and effective learning experiences for students. Future development of the VSZ needs to focus on incorporating more subject-specific learning modules to enhance its relevance and usefulness.

Keywords: e-learning, digital learning repositories, action research, student perceptions

Digital Platforms and Women's Economic Empowerment: A Study of Socioeconomic Transformation in Southern Sri Lanka

G.G.D. Sewwandi

The Open University of Sri Lanka, Sri Lanka
dakshinasewwadi2000@gmail.com

The fast growth of digital platforms has changed women's involvement in economic activities through new means of starting a business, earning money will help them better access to markets. Increased use of social media, e- commerce platforms, and mobile help to create small businesses in Sri Lanka. Despite increased opportunity women face continued disparities in relation to digital access, skills, and existing gender norms. This study seeks to answer the research question: In what ways can digital platforms assist women's economic empowerment, and how do existing socioeconomic and sociocultural systems impact these opportunities in Southern Sri Lanka? The main goal of the study is to investigate how digital platforms have facilitated women's economic empowerment and the socio-economic transformation that is occurring. The researchers who conducted this study took an interpretive qualitative research approach. They purposively selected five women entrepreneurs from the Southern Province of Sri Lanka as subjects. Primary and secondary sources of data were used to gather information about the entrepreneurs' use of digital platforms for business and an analysis using qualitative content analysis was conducted. The findings of the study indicate that digital technology provides increased opportunities for women to start their own businesses, generate income, have financial independence, and flexibility in terms of their businesses and access to market opportunities. Additionally, this empowerment is not equal for women, as the level of digital literacy, access to technology, support from family members, and existing patriarchal structures influence women's economic decision making. Using Sen's Capability Approach, it was shown in this study that digital technology can empower women through increased capabilities and new choices. Bourdieu's Theory of Capital was used to explain how unequal access to economic, social, and cultural capital affects women's participation and success in today's digital economy. The findings of this study suggest that in order for digital technology to be an effective instrument in transforming women's economies it must be supported with inclusive digital policies and programs, entrepreneurship training, support to increase digital literacy, access to finance, and support from organizations providing assistance. The implementation of these critical factors will ensure women in Sri Lanka have equitable and sustainable economic empowerment.

Keywords: digital entrepreneurs, gender inequality, meaningful future, women's economic empowerment, socioeconomic transformation

Environmental Meditation among Youth: Awareness, Perceptions, and Practices

J.M.S.S. Jayawardhana[1]*, S.I.W. Gunasekara[2]

[1]*Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2] *Department of Sociology, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**sitharas252@gmail.com*

Environmental meditation is a nature-based form of meditation that supports the fundamental goals of meditation through mindful practices in natural settings, landscape visualization, breathing exercises, and gratitude towards nature. In identifying the environmental meditation as an effective practice that promotes the well-being of people with awareness, practice and perception, youth are a crucial population, which has a significant role in Sri Lanka, which has been culturally embedded and rich in natural environment. This study aims to explore the environmental meditation among youth in Sri Lanka by examining their awareness and practices and by understanding their perceptions towards its benefits and challenges. This study adopted a qualitative exploratory research design with a sample size of 20, which was selected through purposive sampling. In data collection, both primary and secondary data were used, and in primary data collection, 20 in-depth interviews were conducted with young people following an interview guideline, and secondary data were gathered from journal articles, E-books, reputable government and non-governmental reports, and ethical standards were maintained during the study. In data analysis, the qualitative data were analyzed using thematic analysis and data saturation was applied when necessary. Findings revealed that the majority have not heard the term environmental meditation, although they have been practicing similar practices in temples, Dhamma schools, and mindful sessions. Participants demonstrated a strong interest in environmental mediation with positive attitudes, although their overall awareness remained low. The majority highlighted mental health wellbeing as their primary motive for this meditation, with the challenges of lack of time, lack of training, guidance and knowledge to practice and poor access to the natural environment. Furthermore, the role of technology as a tool to listen to nature sounds, explore nature visuals, practice guidance, and to share knowledge among others using social media was emphasized. These findings recommend that environmental meditation has strong potential among youth in promoting their well-being, which needs more deliberation.

Keywords: awareness, environmental meditation, perception, practice, youth

Environmental Protection as a Fundamental Right: A Pathway to Sustainable and Equitable Futures

G.M.K.S.K. Ganegama

Faculty of Law, General Sir John Kotelawala Defense University, Ratmalana, 10390, Sri Lanka
kaushalyaganegama2@gmail.com

In the context of the worsening climate crisis, a worldwide debate has emerged asserting that a healthy environment and environmental protection are basic human rights. Yet in most jurisdictions, including Sri Lanka, constitutional recognition and enforcement of environmental protection as a fundamental right remain inconsistent, despite sparking global concern. This imbalance makes it difficult to address environmental harm within constitutional frameworks while delivering sustainable justice. This study examines whether environmental protection should be recognised as a clear fundamental right in modern constitutional systems and the impact such recognition has on sustainable justice. As a result, courts are often compelled to rely on interpretative strategies to protect environmental interests, raising questions about legal certainty, democratic legitimacy, and the sustainability of justice outcomes. Against this backdrop, the study questions how the judiciary can effectively administer environmental justice in the absence of clear constitutional provisions, and whether judicial recognition of environmental rights provides a sustainable form of justice or creates legal uncertainty and the risk of institutional overreach. The study adopts a qualitative doctrinal legal research methodology with a comparative approach, analysing primary sources, including international human rights norms and mechanisms and constitutional jurisprudence, using Sri Lanka as a key reference to illustrate broader global challenges associated with constitutional silence and judicial enforcement, while identifying emerging trends in the recognition of environmental protection as a fundamental right. The data analysis is conducted through a comparative textual and contextual assessment of how the judiciary addresses institutional gaps through interpretative strategies. Although judicial innovation has promoted environmental justice worldwide, this study found that relying solely on interpretive methods is insufficient to ensure sustainable justice. The constitutional recognition of environmental protection as a fundamental right would improve legal clarity, access to justice, and national legal systems' conformity to evolving international norms. The study concludes by emphasising the necessity of cogent constitutional responses to global environmental challenges to secure justice for both the present and the future. By assessing the limitations of judicial activism and formal constitutional amendments, this study makes a unique intellectual contribution to contemporary constitutional design and environmental jurisprudence in developing legal systems.

Keywords: environmental protection, fundamental rights, sustainable justice

Ethical Concerns in Television News Reporting of Male Deaths in Sri Lanka: A Case Study Approach

K.H.E. Gunasingha[1]*, E.A.D.A. Edirisinghe[2]

[1]*Department of Fine Arts, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Sociology, Faculty of Social Sciences, University of Kelaniya, Kelaniya, 11600, Sri Lanka*
**gunasinghak.h.e18@gmail.com*

No Show Abstract

Television news reporting in Sri Lanka plays a pivotal role in shaping public perception, particularly in relation to sensitive issues such as sudden or tragic deaths. However, such coverage often raises ethical concerns, including sensationalism and breaches of privacy. Male deaths were chosen as the focus because these cases are frequently framed through culturally specific gendered narratives that highlight risk-taking, violence, or sacrifice, thereby reinforcing stereotypes and intensifying sensationalization compared to female deaths. The widely publicized case of Sathsara Nimesh, a Sri Lankan student whose death attracted intense media attention, exemplified these issues and prompted this study. Although previous studies have examined media ethics and sensationalism, limited research has specifically explored the ethical dimensions of television news reporting on male deaths in Sri Lanka or explained how gendered media narratives influence journalistic practices and audience perceptions. This study addresses that gap. The study aimed to assess the ethical standards applied in television news reporting on male deaths in Sri Lanka and to examine how such portrayals affect journalistic integrity and audience perception. A qualitative case study design was adopted, analyzing news coverage broadcast between January and June 2025 across five major Sri Lankan television channels selected purposively for their national reach and audience influence. Data sources included 15 news bulletins related to sudden male deaths, eight semi-structured interviews with journalists and media scholars, and three focus group discussions with 12 frequent viewers. Participant selection considered professional expertise and viewing frequency. Thematic analysis was conducted following Braun and Clarke's six-phase framework, supported by NVivo software to ensure rigor and transparency. Ethical safeguards, including informed consent, confidentiality, and voluntary participation, were strictly observed. Three key ethical concerns were identified: overexposure of victim identities (80.0%), use of sensational and emotionally manipulative language (73.3%), and failure to obtain family consent before broadcasting personal details (66.7%). These percentages reflect frequency counts across coded datasets. Focus group participants (91.6%) overwhelmingly described the coverage as "exploitative" or "unethical." Triangulated findings revealed that newsroom culture and institutional pressures to increase ratings were significant drivers of these ethical breaches. These findings can be interpreted through the Social Responsibility Theory of the Press, which emphasizes the media's obligation to balance freedom with ethical accountability, and Framing Theory, which explains how selective and sensational representations of male deaths shape audience perceptions while reinforcing gendered narratives. The study concludes that ethical violations in reporting male deaths are systemic within Sri Lankan television journalism. It recommends mandatory ethics training for journalists, the integration of trauma-informed practices in newsrooms, and the establishment of clear national guidelines on death reporting, to be enforced by media regulatory bodies, press councils, and newsroom editors. Additionally, promoting public media literacy is crucial to fostering critical engagement with televised news.

Keywords: male deaths, media ethics, sensationalism, Sri Lanka, television journalism

Ethics Behind the Screen: A Social Scientific Analysis of Advertising Practices in Contemporary Sri Lanka

M.A.G.M. Munaweera

Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
a19469@arts.pdn.ac.lk

Contemporary advertising in Sri Lanka operates within a rapidly transforming media environment influenced by digital technologies and algorithm-driven content. While advertising plays a significant role in shaping perceptions, behaviours, and social values, emerging practices have raised ethical concerns, including manipulation, misinformation, and the construction of hyperreal consumer experiences. Despite the existence of ethical guidelines and regulatory mechanisms, a gap remains between established ethical principles and their practical implementation in everyday advertising practices. This study aims to examine this gap by exploring why ethical standards often remain theoretical rather than effectively guiding media conduct. It further investigates the ethical implications of contemporary advertising practices and evaluates the need for a more socially responsible framework within the Sri Lankan media context. The study adopts a qualitative descriptive research design. Data were collected through the purposive selection and analysis of advertising case studies from Sri Lankan television and digital media platforms, chosen based on their relevance to contemporary ethical issues, including representation, persuasion, consumer behaviour, and social influence. Deontological ethics, utilitarianism, virtue ethics, and the postmodern perspectives of Jean Baudrillard and Marshall McLuhan are employed as analytical frameworks to interpret the selected cases and evaluate the ethical dimensions of advertising practices. The findings indicate that commercial pressures within the advertising industry, limited regulatory enforcement, and the expansion of algorithm-driven media environments contribute to the normalization of ethically problematic practices. These conditions facilitate misleading representations, persuasive strategies that influence consumer perceptions, and socially influential narratives that may conflict with ethical standards. The study concludes that Sri Lanka requires a context-sensitive and practically enforceable ethical framework for advertising that moves beyond theoretical principles. Strengthening ethical awareness, regulatory mechanisms, and social responsibility within advertising practices is essential for developing a more equitable and critically informed media landscape.

Keywords: media ethics, advertising practices, Sri Lanka, digital media, social sciences

Evaluating Fiscal Policy Reforms in Sri Lanka through a Multi- Sector, Multi-Household Computable General Equilibrium (CGE) Model

A.G.S.N. Karunarathne, S.A. Weerasooriya*

Department of Agricultural Economics and Business Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**senalw@agri.pdn.ac.lk*

The fiscal deficits of 5-10% of Gross Domestic Product in Sri Lanka highlight structural constraints, necessitating economy-wide CGE frameworks to evaluate fiscal reforms' sectoral linkages, distributional outcomes, and macroeconomic adjustment effects. The study develops a multi-sector, multi-household CGE model calibrated to a 2018 Social Accounting Matrix to analyze the economy-wide, sectoral, and distributional impacts of selected fiscal policy reforms. The model integrates five production sectors (agriculture, industry, services, food processing, and others), two representative household groups (urban and rural), and a detailed tax structure comprising Value Added Tax (VAT), Personal Income Tax (PIT), and import tariffs. It follows a Small Open Economy framework with Armington-CET trade specifications, flexible prices, and investment-driven macroeconomic closure, ensuring equilibrium across commodity, factor, and institutional markets. The SAM was constructed using official data from the Department of Census and Statistics and the Central Bank of Sri Lanka, reflecting the 2018 economic structure chosen for its relative stability before the COVID-19 disruptions. Three policy simulations were conducted, complete VAT removal on agricultural commodities, PIT reforms comparing flat and progressive tax structures, and a revenue-neutral tax redistribution scenario with higher urban PIT and reduced rural PIT. Results indicate that VAT removal significantly stimulates agricultural and food processing output (+43.7% and +46.2%, respectively) and raises rural income by 31.8%, but at the cost of a 56% fall in government revenue and exchange rate depreciation (-23.9%). PIT reforms, both progressive and flat, generate contractionary macroeconomic effects, reducing industrial (-26%) and service (-34%) output while redistributing income toward rural households (+29.7%) and enhancing equity. The revenue-neutral reform achieves moderate stability, maintaining GDP with minimal contraction (-0.2%) while promoting rural welfare and structural reorientation toward labor-intensive agriculture. Across all simulations, real wages increased slightly (+1-2%), capital returns remained stable, and inflationary effects were negligible due to flexible exchange rate adjustment. Overall, the findings demonstrate that redistributive and sector-targeted fiscal reforms can enhance equity and rural welfare but may compromise fiscal stability unless accompanied by complementary revenue measures. The developed CGE framework thus provides an empirically grounded, analytical tool for Sri Lanka's fiscal policy evaluation.

No Show Abstract

Keywords: computable general equilibrium model, macroeconomic policy, fiscal reform, social accounting matrix, personal income tax, value added tax

Acknowledgement: *Financial support for this paper under Research Grant Number 03 2024-25, from the Gamani Corea Foundation, is acknowledged with gratitude.*

Examining the Effects of Conflicts Among Teachers on Teachers' Psychological Behavior

S. Madhusara*, A. Gamage

Department of Economics, University of Ruhuna, Matara, 81000, Sri Lanka
**suranimadusara@gmail.com*

The study investigates the effects of teacher conflict on teachers' psychological behavior among government primary school teachers in the Matara Education Zone, Sri Lanka. Although several studies have been done about conflict among teachers and its impact on teachers' psychological behavior globally, less research has been conducted in Sri Lanka, especially using Structural Equation Modelling (SEM). Therefore, this research fills this empirical gap using SEM to examine these complex relationships. The study was guided by Jehn's Intragroup Conflict theory, Bandura's Social Cognitive theory, and Maslach's Burnout theory, modified for the Sri Lankan context. In particular, the objective of this study is to examine the effects of teacher conflict on teacher self-efficacy, burnout, and job satisfaction. A quantitative cross-sectional survey design was used, and a well-structured questionnaire was used to collect primary data from 185 government primary school teachers through stratified random sampling. The measurement scales were adapted from internationally validated instruments for the Sri Lankan context, and their content, construct validity, and reliability were confirmed through a pilot test before SEM analysis. These items were measured using a 5-point Likert scale ranging from 1=Strongly Disagree to 5= Strongly Agree. The analysis was carried out using SPSS 26 for preliminary statistical analysis and AMOS 23 for Structural Equation Modeling. The structural model demonstrated an acceptable model fit (CMIN/df = 1.860, CFI = 0.860, TLI = 0.849, RMSEA = 0.068). The findings depict that teacher conflict has a significant positive influence on teacher burnout ($\beta = 0.519$, $p < 0.01$) and a significant negative influence on job satisfaction ($\beta = -0.185$, $p < 0.05$). Teacher self-efficacy has a significant negative influence on teacher burnout ($\beta = -0.432$, $p< 0.01$). Teachers who experienced high levels of burnout also reported lower levels of job satisfaction ($\beta = -0.401$, $p< 0.01$). Furthermore, the results of serial mediation analysis indicated that teacher conflict indirectly affects job satisfaction through its negative impact on teacher self-efficacy and its positive effect on teacher burnout, which emphasizes the importance of teacher burnout as a psychological mediator (Indirect effect = -0.022, $p = 0.038$). These findings highlight that teacher conflict significantly influences teachers' psychological well-being and workplace outcomes. The present study recommends strengthening school-level conflict management strategies and teacher well-being programs within similar educational contexts. Given that the study was conducted in a single education zone, caution should be exercised when generalizing the findings to other regions in Sri Lanka.

Keywords: burnout, job satisfaction, structural equation model, teacher conflict, teacher self-efficacy

Examining the Impact of Social Capital on Quality of Life: An Empirical Study Using Structural Equation Modeling

M.K.N. Pabasara*, E.M.S. Ekanayake, S.K. N. Gamage, S.D.A. Sumanapala, R.P.I.R. Prasanna

Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka, Mihintale, 50300, Sri Lanka
**nilakshimanamendra@ssh.rjt.ac.lk*

Quality of Life (QoL) is emerging as a key focus in development studies with communities seeking sustainable channels to improve well-being beyond traditional economic measures. The importance of community relations and collective support systems has received increasing attention in rural contexts, where economic and social limitations often constrain livelihoods. Consequently, the role of social structures in enhancing QoL has become critical for the formulation of effective interventions in rural development. This research aims to examine how social capital influences the quality of life of rural households, with a particular focus on the mediating role of economic empowerment. Research was conducted in the North Central Province of Sri Lanka. The research method employed is the Structural Equation Model (SEM), which analyzes a structural model to describe social capital and quality of life. SEM's capability to handle complex variables contributes to its effectiveness. A questionnaire survey was employed to collect data on the factors defined in the conceptual framework, using a sample of 225 respondents. Five-point Likert-type questions helped capture the respondents' personal judgments. Both dependent and independent variables were assessed using items adapted from prior studies, with a focus on implementing a five-point Likert scale. The results identify the dependent and independent variables, with social capital as the independent variable, comprising trust, norms, and networks. The dependent variable is Quality of Life, further divided into material welfare, community welfare, emotional well-being, and health and safety. The findings indicate a strong, statistically significant positive impact of social capital on quality of life, demonstrating its crucial role in improving a household's well-being. Economic empowerment partially mediates this relationship. These results highlight the importance of creating community networks and development programs emphasizing empowerment to improve rural livelihoods. The research adds to the existing literature on social capital and well-being by offering empirical findings in a developing-country context and valuable insights for policymakers and development professionals seeking to develop comprehensive programs that promote the construction of social structures coupled with economic resilience.

Keywords: economic empowerment, quality of life, rural livelihood, social capital, Sri Lanka

Acknowledgement: *This research paper is an outcome of the approved project titled "Exploring Social Capital's Impact on Economic Empowerment and Income Diversification in the North Central Province of Sri Lanka," conducted with financial support from the Rajarata University Research and Publication Committee under grant number RJT/R&PC/2025/R/FOSH/09.*

Exploring Freshers' Participation in Self-Learning Activities in an English Intensive Program: Towards Human-Centered and Equitable Learning

W.S.A. Fernando

Wayamba University of Sri Lanka, Kuliyapitiya, 60200, Sri Lanka
sajeewani@wyb.ac.lk

In higher education, fostering learner autonomy is essential for developing independent, reflective, and lifelong learners. Self-learning activities extend learning beyond the classroom and promote equal access to language development across integrated skills, including reading, writing, listening, speaking, creative thinking, and grammar. This study explores freshers' participation in structured self-learning activities within an English Intensive Program. It examines students' engagement, perceptions of usefulness, and investigates how these practices contribute to meaningful and inclusive learning experiences. A mixed-methods explanatory sequential design was adopted. Data were collected from a convenience sample of approximately 100 undergraduate freshers using a structured questionnaire administered after a three-month intervention. The self-learning activities comprised study packs, vocabulary-building tasks, digital journals, video tutorials, and news-based learning exercises, which were introduced through the Learning Management System (LMS) and designed primarily to promote independent practice. Students were encouraged to participate in these activities voluntarily outside the classroom to reinforce and extend their English language learning. Quantitative data were analyzed using descriptive statistics, while qualitative responses were examined through thematic analysis. Statistical data from Likert-scale items indicated that most students engaged regularly in self-learning activities and reported perceived improvements in vocabulary, writing, and overall confidence in using English. While the majority of students viewed the activities as useful (95.4%), many reported that they were enjoyable (61%), whereas some considered them useful but demanding (26.2%). A strong preference for collaborative, interactive, and multimedia-based activities emerged through qualitative data analysis. The themes highlight that self-learning is most effective when designed as a socially supported, human-centered process rather than an individual, computer-based one. Integrating autonomy with collaboration and flexibility can enhance equitable and meaningful learning experiences in English language programs.

Keywords: learner autonomy; self-learning activities; student engagement; equitable learning; human-centered education

Exploring the Integration of Hindustani Classical Music in Promoting Sinhala Buddhist National Identity Among the Sinhalese

M.L.N.P. Meddegoda

Postgraduate Institute of Humanities and Social Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka
nishadimeddegoda@yahoo.com

The musical history of Sri Lanka, like its social and political history, has experienced interruptions rather than a continuous evolution. By the early 20th century, there was no fully established or codified musical tradition, nor a clearly defined, urban-based audience that could claim a distinct and unified musical identity. This perceived cultural void contributed to a broader sense of nationalist concern, prompting efforts to reconstruct and fortify Sinhala cultural identity**.** The objective of this study is to examine how Hindustani classical music was strategically adopted to promote Sinhala Buddhist nationalist ideologies within the Sinhalese community, particularly through auditory media such as radio broadcasts, gramophone recordings, and musical performances. It seeks to explore the historical development, cultural assimilation, and ideological uses of Hindustani classical music in shaping national and spiritual consciousness, particularly during the late colonial and postcolonial periods. The research adopts a qualitative approach, focusing on musical analysis to assess the transformation and appropriation of Hindustani classical music in Sri Lanka. Data collection methods include academic and grey literature review, open-ended interviews, participant observation, and auto-ethnography. The findings demonstrate that Hindustani classical music, though foreign in origin, was gradually integrated into Sinhala Buddhist cultural and religious contexts. This integration was marked by the inclusion of Buddhist ritualistic motifs, the adaptation of folk elements, and the creation of nationalistic compositions. Through these processes, musical performance became a means of asserting Sinhala Buddhist identity and moral values in the public domain. Hindustani classical music in Sri Lanka has been reshaped as a powerful tool for expressing Sinhala Buddhist perspectives on cultural identity and spirituality. This transformation reflects broader socio-political efforts to reconstruct a distinct national culture, using music as a medium of ideological expression and cultural continuity.

Keywords: Hindustani classical music**,** Sinhala Buddhist nationalism**,** musical history, Sri Lanka

Exploring the Professional and Ethical Challenges of Government Counsellors in Sri Lanka

S. Dickmadugoda[1]*, S.I.W. Gunasekara[2]

[1]*Postgraduate Institute of Humanities and Social Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2] *Department of Sociology, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**surendickmadugoda@gmail.com*

A counsellor is a professionally trained helping practitioner who has been recognized in the global context as a systematic professional process that assists people from diverse client systems with challenges. In Sri Lanka, counselors have been employed across government, non-government, and private sectors and within the government sector, healthcare, legal, and education settings, which need to be systematically investigated. The main objective of this study is to explore the professional and ethical challenges experienced by government counsellors in Sri Lanka. An exploratory qualitative research design was adopted to understand the lived experiences of government counsellors working in different settings. Using stratified sampling, a total of 21 counsellors participated, representing various government settings, including the district and magistrate court, National Child Protection Authority, Ministry of Health, Women's Bureau of Sri Lanka, Department of Social Service, and National Dangerous Drugs Control Board. In primary data collection, the study employed field observations and semi-structured interviews, guided by the data saturation principle. The secondary data collection, which included journal articles, policy documents, and e-books were utilized. In data analysis, thematic analysis was used to interpret emerging patterns and themes, and ethical principles were followed during the study. Findings of the study can be discussed under two divisions, such as professional challenges and ethical challenges. Under the professional challenges, unclear designation titles, weak professional identity, absence of formal registration, and non-uniform grading system, which deepened the heavy administrative workloads and inadequate qualification regulation of the service, with weak legislative and regulatory support. In the ethical challenges, the majority highlighted the absence of a national code of ethics, which creates uncertainty of practice, leading to role conflicts between administrative duties and counselling duties. Due to these challenges, ethical dilemmas with disclosure regulations are arising, which drive professionals' job dissatisfaction, weaken the public trust, and impose personal burdens. This study concludes that counselling in government setting Sri Lanka needs urgent professional and ethical strengthening with a national code of ethics and regulatory forms for an effective ethical practice in counselling service, with context-specific practices.

Keywords: counselling profession, ethical challenges, professional challenges, government sector, Sri Lanka

Exploring the School Students' Awareness, Perception, and Demand for Technical and Vocational Education and Training (TVET) in Sri Lanka

T.N. Kannangara*, H.D. Premarathne

Department of Sociology, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**a20sw018@arts.pdn.ac.lk*

Technical and Vocational Education and Training (TVET) is recognized as a critical pathway for reducing youth unemployment and developing a skilled workforce. However, its potential remains underutilized in Sri Lanka due to limited student awareness and persistent social misconceptions. This study examines the awareness, perception, and demand for TVET among school students in the Matale Education Zone, Sri Lanka, where conventional university education continues to dominate career aspirations despite growing labor market demand for technical skills. This study aims to: (1) assess the level of awareness about TVET opportunities among Advanced Level students, (2) examine students' perceptions of vocational careers and TVET pathways, and (3) identify the socio-cultural and institutional factors that influence students' demand for TVET programs. A mixed-methods research approach was adopted within a pragmatic paradigm. Quantitative data was collected through cross-sectional survey questionnaires administered to 60 Advanced Level students purposively selected from five schools representing boys', girls', and mixed school categories in the Matale Education Zone. Semi-structured interviews were conducted with 10 participants, including students, teachers, and principals, and other TVET officers to obtain in-depth qualitative insights. Quantitative data were analyzed using descriptive statistics (frequencies, percentages, and mean scores), while qualitative data were subjected to thematic analysis to identify recurring patterns and themes. Findings reveal a medium level of awareness of TVET among students, with limited understanding of available pathways and career prospects. Key themes identified through qualitative analysis include: a social prestige deficit, where vocational education is perceived as less prestigious than university education; influence of social agents, particularly parental expectations, gender norms, and peer pressure; inadequate career guidance, reflecting weak institutional support and limited exposure to TVET information; and labor market disconnect, indicating students' lack of awareness about industry demand for technical skills. Despite growing labor market needs, students demonstrate low demand for TVET, shaped predominantly by socio-cultural stigma and institutional constraints rather than informed career decision-making. The study concludes that enhancing TVET uptake requires multifaceted interventions, including strengthening school-based career guidance, challenging social perceptions through awareness campaigns, and improving the visibility and status of vocational pathways. Addressing these barriers is essential for aligning students' educational choices with labor market realities and national development goals.

Keywords: awareness, perception, demand, school students, TVET

Exploring the *Vīṇā* through the Buddhist Preaching Texts in Sri Lanka

I. B. K. Dehideniya

Faculty of Graduate Studies, University of the Visual and Performing Arts, Colombo, 00700, Sri Lanka
isurudehideniya@gmail.com

Buddhist preaching texts (*banapot*) played a key role in shaping a distinctly Sinhala tradition of Buddhist preaching in Sri Lanka. Major examples such as *Amāvatura*, *Butsaraṇa*, *Saddharmālaṅkāraya*, and *Saddharmaratnākaraya*, composed between the 13th and 15th centuries, contain valuable references to performing arts and musical instruments, including the *Vīṇā*. This is a qualitative study that employs thematic analysis, which enables the categorization of relevant findings. The research question examines how the noun *Vīṇā* appears across these texts and Jātaka tales, with the objective of understanding the ways in which the *Vīṇā* is associated with literary works. Unlike references to other musical instruments, the noun *Vīṇā* in these texts frequently occurs in association with three specific verbs denoting different modes of musical action. Classical sources use the phrase "playing the *Vīṇā*" and the phrase "singing the *Vīṇā*" denotes vocal performance accompanied by the instrument. Additionally, the expression "sounding the *Vīṇā*" appears in miraculous contexts in which the instrument produces sound without a human performer. Non-human beings such as *Pañcasikha*, *Māra's* daughters, and *Kinnaras* are depicted as symbolic performers of the *Vīṇā*. The *Jātaka* tales further demonstrate that the Bodhisattva, lived previous lives as a skilled musician, particularly as an expert in singing the *Vīṇā*, as illustrated in the Guttila *Jātaka* and the Kusa *Jātaka*. The instrument traditionally carries a symbolic role in Buddhist literature—particularly its sound being associated with the arousal of desire, attachment to worldly life, and the disruption of meditation. However, in other sections of the preaching texts, the *Vīṇā* and other musical sounds are portrayed as symbols of divine pleasure and the five sensual pleasures, following representational patterns similar to those found in the *Vimānavatthu* narratives of the Pāli Canon. Furthermore, the sound of the *Vīṇā* is presented as one of the musical offerings made by divine beings to the Buddha. Together, these representations demonstrate that the *Vīṇā* functions not merely as a musical instrument but as a complex symbolic device linking performance, devotion, sensuality, and spiritual tension within Sinhala Buddhist narrative tradition.

Keywords*: Vīṇā,* Buddhist, music and preaching texts

Factors Affecting the Science Achievement Level of Junior Secondary Students in Sri Lanka

D.M.K.M. Dissanayake

Kandy/ Mulgama Maha Vidyalaya, Mahamulgama, 20547, Sri Lanka
kasunmd27@gmail.com

Science education is crucial for national development, yet the persistent low science achievement among junior secondary students (Grades 6–9) remains a national concern in Sri Lanka. This study addressed the research question of identifying the multi-faceted factors influencing this achievement level. The primary objectives were to investigate student attitudes toward science and teachers, peer group dynamics, and family socioeconomic factors. Based on the Krejcie and Morgan sampling table, a sample of 360 students was selected using a stratified random sampling method to ensure representation across various school types. The primary quantitative analysis relied on student data, which was subsequently triangulated with data from teacher and parent questionnaires to cross-validate findings and ensure reliability. Exploratory Factor Analysis (EFA) on 34 items identified 11 distinct factors, including family support for science education, teacher enthusiasm and methodology, students' positive attitudes, and difficulty of science comprehension. An Independent Samples T-test confirmed a significantly lower mean science achievement score for rural students ($M = 68.5$) compared to urban counterparts ($M = 75.2$) ($t = 4.87, p < 0.001$). Multiple Regression Analysis revealed that the studied factors explained 48% ($R^2 = 0.48$) of the variance in science achievement. Specifically, Student Self-Confidence ($\beta = 0.38, p < 0.001$), Learning Interest ($\beta = 0.25, p < 0.01$), and Family Background ($\beta = 0.15, p < 0.05$) exercised significant positive impacts. Consequently, policy recommendations are proposed to enhance science education quality by fostering student self-confidence and motivation, alongside refining teacher instructional methodologies and collaborative learning environments.

Keywords: science achievement, student factors, junior secondary, stratified random sampling, multiple regression analysis

Forum Theatre as a Pedagogical Tool for Fostering Creative Thinking among Middle School Students in an International School

L.B.R.W.A.M.R.U. Lankathilaka*, S.L P. Fonseka

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**upekshalankathilaka93@gmail.com*

In today's increasingly complex educational context, particularly within multicultural international schools where students encounter diverse social, emotional, and interpersonal challenges, creative thinking has become an essential competency. However, many educational practices continue to prioritize teacher-centered instruction and predetermined learning outcomes, limiting opportunities for imaginative problem-solving and collaborative interpretation. This study explored the potential of Forum Theatre, a participatory drama pedagogy derived from Augusto Boal's Theatre of the Oppressed, to foster creative thinking among middle school students in an international school setting. The study aimed to investigate how Forum Theatre enhances creative thinking, examine students' perspectives on addressing school-related challenges through participatory drama, and explore the value of Forum Theatre as a pedagogical tool in international schools. A qualitative case study design was employed involving fifteen Grade 7 and Grade 8 students from Gateway College Kandy. Data was generated through a series of participatory Forum Theatre workshops, participant observations, audio-visual recordings, and reflective discussions. The data were analyzed using deductive thematic analysis, guided by Torrance's dimensions of creative thinking: fluency, flexibility, originality, and elaboration. The findings revealed that Forum Theatre created an interactive and reflective environment in which students actively engaged with school-related issues such as peer conflict, communication barriers, and academic pressure. Through dramatic intervention and collaborative role exploration, students generated multiple responses to challenging situations, reconsidered problems from diverse perspectives, and proposed innovative approaches to conflict resolution. The participatory nature of the workshops encouraged empathy, critical reflection, confidence in expressing ideas, and problem-solving through performative action. The study contributes to the field of drama-based pedagogy by providing empirical insight into how Forum Theatre can support creative thinking within formal educational contexts. Furthermore, the findings highlight the value of student-centered and participatory learning approaches in international schools and offer practical implications for integrating drama pedagogy into contemporary educational practice.

Keywords: forum theatre, creative thinking, drama-based learning, participatory pedagogy, international school education

From Colonial Heritage to Tourism Asset: A Case Study of the Historic Pink Post Office Building in Nuwara Eliya

R. Vijay

Department of Geography, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
ravindranvijay0507@gmail.com

No Show Abstract

The Nuwara Eliya Pink Post Office, built in 1894 during the British colonial period, is one of Sri Lanka's iconic colonial landmarks. Constructed in the British Tudor style, it features red brick walls, a steep roof, decorative timberwork, and a 40-foot clock tower, reflecting its historical and architectural significance. Protected under the Antiquities Ordinance and declared a Protected Monument in 2007, it functions as both an operational post office and a major heritage tourism attraction, receiving around 1,000 visitors daily during peak seasons. Although colonial heritage buildings in Sri Lanka have been widely studied, limited research has examined the transformation of colonial postal heritage into tourism assets and the challenges of balancing conservation with tourism development. The Pink Post Office faces conservation issues, management problems, inadequate visitor facilities, and increasing tourism pressure. Guided by sustainable heritage tourism and adaptive reuse perspectives, this study examines its historical, architectural, and spatial significance, tourism activities, conservation challenges, and opportunities for sustainable development. A mixed-method approach was adopted using qualitative and quantitative methods. Primary data were collected through more than eight field visits, observations, semi-structured interviews, and questionnaires involving 50 respondents selected through purposive and stratified sampling. Respondents included domestic and international tourists, Pink Post Office staff, government officers, local residents, and surrounding shop owners. Secondary data were obtained from the Greater Nuwara Eliya Development Plan (2022–2030), Urban Development Authority reports, institutional records, newspapers, and relevant websites. The collected data were analyzed using thematic analysis to identify key findings. The findings indicate that the Pink Post Office has undergone adaptive reuse by maintaining its postal function while evolving into a heritage tourism destination. Approximately 90% of visitors reported visiting the site to experience colonial architecture and cultural heritage. Heritage activities, historical displays, philatelic services, accommodation, and postcard services provide unique and nostalgic visitor experiences. However, privatization pressure was identified as the major threat, along with inadequate visitor facilities, poor maintenance, structural issues, and risks to valuable colonial antiquities. The site generated a total revenue of LKR 11,121,576 in 2025**,** highlighting its economic contribution as a heritage tourism destination. The study highlights opportunities for sustainable heritage tourism through the protection of national monuments, improved visitor facilities, the preservation of historical features, a "living colonial post office experience," adaptive reuse strategies, digital interpretation, and stakeholder collaboration. It concludes that balancing heritage conservation, tourism development, and the original postal identity through sustainable heritage tourism is essential to the long-term viability of this valuable colonial landmark.

Keywords: heritage tourism, sustainable heritage tourism, adaptive reuse, colonial architecture, Nuwara Eliya pink post office

From Knowledge to Action: Transformative Environmental Sustainability Learning in the Junior Science Classroom

T.I.S.S. Liyanage[1]*, S.Y. Ekanayake[2], P.M.C.S. De. Silva[1]

[1]*University of Ruhuna, Matara, 81000, Sri Lanka*
[2]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**tissgr@yahoo.com*

Rapid technological advancement and resource exploitation continue to strain natural systems, highlighting the importance of environmental sustainability (ES). Although ES is integrated into school curricula, evidence suggests that knowledge alone does not lead to sustainable behavior. Transformative Learning Theory emphasizes that meaningful learning involves critical reflection, perspective transformation, and behavioral change rather than the mere acquisition of knowledge. However, in Sri Lanka, research has been limited on how junior secondary science education facilitates transformative learning processes that influence students' environmental practices. This study aims to examine the extent to which environmental knowledge gained through the science classroom influences students' sustainable behaviors. It further explores the effectiveness of experiential, action-oriented learning approaches compared with conventional teacher-centered, textbook-based instruction on ES. A mixed-methods research design was employed. Quantitative data were collected using a structured questionnaire administered to 441 junior secondary students to assess environmental knowledge and self-reported sustainable behaviors. Data were analyzed using descriptive statistics. Qualitative data were gathered through direct observations and reflective records during a hands-on beach-cleaning project designed as an experiential learning intervention. These qualitative data were analyzed using thematic analysis to identify patterns in student engagement, attitudes, and behavioral responses. The integration of quantitative and qualitative findings enabled a comprehensive understanding of both the acquisition of environmental knowledge and changes in students' behavior across different learning contexts. Survey results indicated that students demonstrated relatively high environmental knowledge, with 52 - 67% correct responses across assessed areas. However, engagement in sustainable behaviors was moderate: 31% reported recycling, 22% participated in beach cleaning, 23% conserved water, and 42% used water sparingly, while 25% reported no involvement in environmental protection activities. In contrast, qualitative findings revealed that students displayed strong enthusiasm, collaboration, and active participation during the experiential beach-cleaning activity. This shift from passive knowledge acquisition to active engagement reflects key elements of Transformative Learning Theory, suggesting that hands-on, action-oriented learning can foster meaningful changes in students' perspectives and behaviors towards environmental sustainability.

Keywords: environmental sustainability, science education, transformative learning

Gender Differences in Behavioral Intentions to Adopt Seaweed Farming in Northern Sri Lanka

P.E. Madhuranga*, K.P.P. Kopiyawattage, P. Weththasinghe

Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**erandam@pdn.ac.lk*

Seaweed farming has emerged as a climate-resilient livelihood strategy in post-conflict coastal regions of Sri Lanka. However, adoption intentions may differ across gender due to variations in perceived support, ease of use, and expected outcomes. This study aims to examine gender differences in behavioral intention to adopt seaweed farming using the Unified Theory of Acceptance and Use of Technology (UTAUT) framework. Primary data was collected from 195 respondents in the Northern Province using a structured questionnaire. A multi-stage sampling approach was utilized; to collect data from specific DS Divisions (Delft, Kayts, Velanai, Poonakary) in Jaffna and Kilinochchi districts. The population was stratified into 'adopters' and 'non-adopter' categories based on their seaweed farming practices. Partial Least Squares Structural Equation Modelling (PLS-SEM) and Multi-Group Analysis (MGA) were employed. Multi-Group Analysis revealed distinct gender dynamics: female respondents are significantly more reliant on enabling environments and institutional scaffolding, as Facilitating Conditions emerged as their strongest predictor ($\beta = 0.516$, $p < 0.001$) compared to males ($\beta = 0.422$, $p < 0.001$). Conversely, males respond more strongly to perceived ease of use, with Effort Expectancy heavily influencing their intentions ($\beta = 0.374$, $p = 0.004$) compared to females ($\beta = 0.293$, $p = 0.023$). Performance Expectancy was statistically non-significant for both groups. Measurement model assessment showed strong internal consistency, with outer-loadings ranging from 0.714 to 0.890. A high HTMT ratio (0.994) between Social Influence and Facilitating Conditions revealed a conceptual overlap, reflecting a context where community social pressures and institutional support structures are heavily intertwined. The findings indicate that ease of use and institutional support are critical drivers of seaweed farming intention, while perceived productivity gains play a limited role. Gender differences suggest that female respondents are more dependent on enabling conditions, whereas males respond more strongly to perceived ease of use. The study extends UTAUT application to community-based aquaculture adoption in a developing-country context and highlights the importance of gender-sensitive livelihood interventions.

Keywords: behavioral intention, gender, PLS-SEM, seaweed farming, UTAUT

Acknowledgement: *The authors wish to acknowledge the financial support received from the Sri Lanka Council for Agricultural Research Policy (SLCARP) through the Research Grant 2025 (Grant No: NARP/2025/UP/AG/01).*

Governing Climate Change for Sustainable Futures: Integrating Environmental Policy and Legal Frameworks

S.S.S. Vitharana

Postgraduate Institute of Humanities and Social Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka.
saradauniversity96@gmail.com.

Environmental degradation and climate change pose significant challenges to sustainable development, requiring coordinated legal and policy responses at both national and international levels. Although many countries have strengthened their commitments to sustainability, environmental governance systems continue to face fragmented legislation, weak institutional coordination, limited enforcement, and inadequate integration of environmental priorities into development planning. This study explores how integrated environmental governance frameworks can strengthen climate change mitigation, adaptation, and sustainable development by evaluating the effectiveness of environmental laws and climate policies in Australia, Germany, and Sri Lanka. These jurisdictions were selected because they represent developed and developing governance systems with diverse legal traditions and varying capacities for climate policy implementation. Using a qualitative comparative research design, the study analyses environmental legislation, national climate policies, international agreements, and institutional reports through document analysis and thematic analysis. The comparative assessment is based on four key criteria: policy coherence, institutional coordination, enforcement effectiveness, and implementation outcomes related to climate resilience and environmental protection. The analysis identifies five major themes: coordination mechanisms, enforcement instruments, institutional capacity, policy coherence, and monitoring and accountability. The findings indicate that jurisdictions with integrated governance structures, strong inter-agency coordination, legally binding climate targets, and effective monitoring mechanisms achieve more effective climate policy implementation, resulting in improved climate adaptation, resource management, and institutional resilience. Conversely, fragmented governance structures, overlapping institutional responsibilities, limited enforcement capacity, and inconsistent policy implementation undermine environmental governance and reduce policy effectiveness. The study recommends strengthening cross-sector policy integration, adopting enforceable climate legislation with clearly defined targets, establishing independent monitoring and accountability mechanisms, enhancing institutional coordination, and promoting greater stakeholder participation. These measures can improve environmental governance and contribute to achieving long-term sustainable development while demonstrating the critical role of integrated legal and policy frameworks in addressing climate change and fostering sustainable futures.

Keywords: climate change, environmental governance, sustainable development, public policy, legal frameworks

Human Frameworks for Shaping Equitable and Meaningful Futures: A Systematic Review of Inequality, Marginalization, and Mental Health in Sustainability Transitions

K.P.D.S. Kandangamuwa

Department of Health Sciences, Faculty of Science, NSBM Green University, Homagama, 10200, Sri Lanka
dilki.k@nsbm.ac.lk

Sustainability transitions, particularly in energy decarbonization, urban transformation, and climate adaptation, are often framed as pathways toward equitable futures; however, their implementation frequently reproduces or intensifies existing social inequalities. This raises a critical research problem: the insufficient integration of human-centered frameworks that account for psychological wellbeing within sustainability agendas. This systematic review examines how sustainability transitions shape mental health outcomes among marginalized populations and identifies the psychological mechanisms through which inequities are experienced and negotiated. Specifically, it aims to (1) synthesize empirical evidence on mental health impacts, (2) explore justice-related psychological processes, and (3) assess the role of human-centered and equity-oriented frameworks in fostering meaningful futures. Grounded in interdisciplinary literature, the review conceptualizes sustainability transitions as socio-psychological processes embedded within broader structures of inequality. A systematic methodology was employed following established review protocols. Peer-reviewed empirical studies published between 2010 and 2025 were identified through database searches (e.g., Scopus, Web of Science, and Google Scholar) using predefined keywords related to sustainability transitions, mental health, and marginalization. Inclusion criteria focused on studies addressing environmental or sustainability transitions and psychological outcomes among marginalized or vulnerable populations. After screening and eligibility assessment, a final sample of 48 articles was included for qualitative synthesis. Findings reveal that perceived injustice, social exclusion, identity disruption, and institutional distrust are central psychological mediators linking inequitable transitions to adverse mental health outcomes, including stress and anxiety. Conversely, inclusive governance, recognition, and participatory approaches enhance resilience, collective identity, and adaptive coping. These findings underscore that equity is not only a structural goal but a psychological necessity in shaping meaningful futures. The review concludes that human-centered frameworks emphasizing justice, participation, and recognition are essential for aligning sustainability transitions with mental wellbeing. Future research should prioritize longitudinal and culturally contextualized studies while integrating psychological dimensions into policy design to ensure equitable and meaningful sustainability pathways.

No Show Abstract

Keywords: environmental justice, human frameworks, marginalization, mental health, sustainability transitions

Human Security Issues among Sri Lankan Refugee Returnees from India Resettled in the Kilinochchi District

S. Sivakanthan*, A. Sayanthiny

Department of Sociology, Faculty of Arts, University of Jaffna, Jaffna, Sri Lanka
**sskanthan@univ.jfn.ac.lk*

Refugee returnees often encounter serious human security issues in the post-war context. Primary objective of this study was to assess the multiple human security issues of Sri Lankan refugee returnees from India resettled in Kilinochchi district. A mixed methods study design was employed. Primary data were collected through interviewer administered questionnaire, case studies and interviews. Based on stratified random sampling technique, 346 respondents were selected for the study. Qualitative data were analyzed thematically and quantitative data were analyzed using descriptive and inferential statistical analysis methods using SPSS (Version 25). The results highlight that the prolonged armed conflict between the Sri Lankan state armed forces and the LTTE was the primary cause for war-affected people fleeing to India as refugees from 2000 to 2008. Refugees began returning to Sri Lanka and resettling in the Kilinochchi District during the period from 2016 to 2022. Results reveal that agriculture (39.9%), wage laborer (30.3%) and self-employment (20.2%) were the common types of livelihood activities of the resettled people. The monthly labor income of the majority (71.1%) of the people was ≤ 20,000 LKR. Majority (69.6%) of them faced personal security issues. Majority (69.9%) of them encountered community security issues such as social discrimination in accessing services and resources by the people of the resettled villages and the institutions, poor welfare assistance, poor social support from their own community and lack of trust. There was a weak positive relationship education and unemployment ($r=0.180$, $N=346$) based on the Pearson correlation analysis. All respondents reported that they experienced economic security issues. Unemployment, lack of employment opportunities, poor income, increased living cost, poor financial support, poor marketing facilities and difficulties in getting loan facilities were the adverse economic security issues faced by the resettled people. The study demonstrates that all the participants of the study faced health security related issues. Resettled people also encountered food security issues such as difficulties in accessibility of food, inadequate food, poor food quality and food safety, and lack of nutritious food. The study recommends that socio-economic empowerment programs be accelerated and community based organizations be strengthened in the post-war context to enhance the quality of life and wellbeing of the resettled people in the war affected villages.

Keywords: armed conflict, displacements, economic security, personal security, social discrimination

Impact of Integrating Artificial Intelligence and Digital Tools on Enhancing Student Motivation and Learning Achievement in Science Education

H.A.P. Chandimal[1]*, T.M.S.S.K. Yatigammana[2]

[1]*Postgraduate Institute of Humanities and Social Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

[2]*Department of Education, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

**chandimalhap@gmail.com*

In the face of 21st-century educational transformations, integrating Artificial Intelligence (AI) and digital tools has become vital for revitalizing student engagement. The primary research problem addressed in this study was the declining motivation of students toward complex science topics and the limitations of traditional, teacher-centered methods in a resource-limited setting. Underpinned by the constructivist learning theory and self-determination theory, this study specifically aimed to evaluate the impact of an AI-blended approach on enhancing student motivation and to determine its effectiveness in improving learning achievement. This action research was conducted through two iterative cycles among 15 grade 11 students in a 1C category school in the Udugama education zone. In Cycle 1, the intervention utilized YouTube and generative AI tools like ChatGPT and Gemini. Structured observations during this phase revealed critical gaps in students' AI literacy; while highly motivated by digital and gamified elements, students struggled with accurate prompt generation, which initially yielded irrelevant results, over-relied on AI outputs as absolute truths, and lacked awareness of responsible AI use. To mitigate this, the teacher provided scaffolding by demonstrating model prompts to realign student queries. Reflecting on these dynamics, Cycle 2 incorporated a more interactive digital ecosystem, featuring Mentimeter for brainstorming, Padlet for collaborative critical analysis, and Kahoot for gamified evaluation, successfully transforming students into active knowledge constructors. Data triangulation involved a mixed-method approach. Quantitative analysis via a paired t-test showed a statistically significant improvement ($p < 0.05$) in learning achievement, with pre- and post-test mean scores rising from 8.2 to 16.5. Qualitatively, thematic analysis of observations and student reflections confirmed a profound surge in intrinsic motivation. The study concludes that an iterative, multi-tooled AI-blended approach effectively minimizes passive learning while shifting the teacher's role to a facilitator. Crucially, it highlights the need to systematically integrate AI literacy within continuous classroom practices to foster responsible technology habits.

Keywords: artificial intelligence, digitalization, science education, student motivation, action research

Impact of Integrating Intercultural Communicative Competence (ICC) into Undergraduate English for Academic Purposes (EAP) Classrooms

G.G.K. Vindika*, P.K. Karunarathne

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**kasung@sci.pdn.ac.lk*

In Sri Lankan University system, the medium of instruction of many disciplines is English. To assist with the language for undergraduates from various ethnic and cultural backgrounds, universities have introduced special English Language courses such as English for Academic Purposes (EAP), English for Special Purposes (ESP) through English Language Teaching Departments. Despite their strong focus on the subject content, it is dubious whether sufficient attention is paid to learner cultural and linguistic background, individual behaviors, expectations and attitudes. Intercultural Communicative Competence (ICC) — individual's ability to interact effectively and appropriately with people from diverse linguistic and cultural backgrounds, responding flexibly to differing behaviors, attitudes, and expectations is largely overlooked in the language classroom. Despite the growing theoretical emphasis on ICC, its practical integration into EAP classrooms in Sri Lankan university settings remains underexplored. The main objective of this study was to assess the current knowledge of the instructors as well as the learners on ICC, and impact of ICC in improving learner EAP skills. Further, the study aimed to identify the perceptions of the learners on integrating ICC into the curricula. Another objective of the study was to identify the challenges faced by the instructors as well as institutions in integrating ICC into the curricula. The study was conducted using the secondary qualitative research method focusing on undergraduates and English instructors from international and local universities, employing data gathered from numerous research articles. It examined EAP instructors' understanding of ICC, the extent to which ICC components knowledge, skills, attitudes, and critical cultural awareness are embedded in curricula and teaching practices, and the institutional and pedagogical challenges affecting its implementation. Further, learner perceptions of the ICC usage in the classroom were also examined. The findings exhibited that majority of the instructors do not focus on ICC due to constraints such as insufficient training, lack of curricular guidance, and limited exposure to intercultural experiences. Furthermore, it was observed that a substantial proportion of undergraduates demonstrated increased engagement, cultural awareness, and communicative confidence while following EAP courses when ICC informed practices were incorporated into classroom interaction. This study contributes to aligning language teaching with global communicative needs through vitalizing curriculum design, teacher education, and professional development via structured ICC training. Integrating ICC into EAP classrooms is proved to enhance both language proficiency and students' ability to navigate diverse academic and professional contexts, ultimately improving academic success and employability in a globalized world.

Keywords: ICC, EAP, ESP

Impact of Wild Animals on Chena Cultivation in Sri Lanka: A Case Study of Buttala DSD

A.M.I. Dilshani*, N.W.S. Nanayakkara

University of Ruhuna, Matara, 81000, Sri Lanka
**imeshadilshani32@gmail.lk*

Chena cultivation is one of the oldest farming practices in the dry zone of Sri Lanka. However, wild animals create severe challenges for chena farmers, causing crop destruction, economic losses, and social problems. Buttala DSD in Monaragala District, which is located in the dry zone of Sri Lanka, is highly vulnerable to wildlife-related crop damage. In 2024, 38 crop damage lands were reported from study areas. However, there is a lack of comprehensive research and academic research on addressing this issue. Therefore, the primary objective of this research is to analyze the impact of wild animals on chena cultivation and their effects on farmers in the Buttala DSD. A mixed-method approach was employed to collect data. Primary data were collected through questionnaire survey from the farmers (sample size: 60) and semi-structured interviews were conducted with government officers (sample size: 5). Field observations were conducted to collect data regarding the extent of animal-related damages. Secondary data for the period from 2019 to 2024 were collected from the Agriculture Insurance Office, Agriculture Services Office, and the Divisional Secretariat in Buttala DSD. Data analysis was conducted using both spatial and temporal analytical approaches. The findings were evaluated using cost-benefit analysis, the Food Security Index, and SWOT analysis. In addition, ArcGIS software was utilized for spatial mapping. The findings revealed that human-elephant conflict was the most significant challenge affecting chena cultivation in the Buttala DSD. All 60 respondents identified elephants as the primary cause of crop destruction, followed by peacocks, wild boars, and monkeys. Elephant incursions were particularly severe during the cultivation period, which extends from December to March, especially in maize and paddy. Crop losses have significantly affected farmers' livelihoods, increased debt and contributed to increased poverty among farming communities. According to the Food Security Index, 28% of farmers face severe food insecurity. Based on the findings, it can be concluded that chena cultivation in the Buttala DSD areas adjacent to Yala National Park and Kumbukkan River are highly vulnerable to wild animal impacts, with elephants identified as the most significant cause of crop damage. The study recommends that integrating modern technologies with traditional practices while strengthening policy support to promote long-term agricultural sustainability in vulnerable areas.

Keywords: chena cultivation, human-wildlife conflict, wild animal invasions, food security, geospatial pattern

Impacts of Frequent Flooding on Small-Scale Agriculture in the Nilwala River Basin: A Case Study in Bandaththara-Deeyagaha

S.W.J. Chathurangani

University of Peradeniya, Peradeniya, 20400, Sri Lanka
janani199908@gmail.com

Frequent flooding in the Nilwala River Basin poses a significant threat to small-scale agriculture and rural livelihoods, particularly in Bandaththara-Deeyagaha, where paddy and mound cultivation underpin household economies. Recurrent floods disrupt cropping cycles, reduce yields, and weaken food security. While previous studies have largely examined crop damage and economic losses, limited attention has been paid to differences in flood impacts and adaptive capacities between men and women in farming communities. Gender dynamics further shape these challenges, as men are primarily engaged in paddy cultivation, while women contribute through mound cultivation and unpaid household labor. These differentiated livelihood roles create uneven vulnerabilities, exposing men to economic losses from crop damage and women to increased workloads and limited access to recovery resources. Therefore, this study assesses the impacts of recurrent flooding on small-scale agriculture and rural livelihoods in Bandaththara-Deeyagaha, emphasizing gendered vulnerabilities and adaptation strategies using the Gender-Climate Change Framework. The research adopted a mixed-method case study design. Data were collected through household surveys (n = 60), key informant interviews with agricultural officers, and focus group discussions. Quantitative data were analyzed using descriptive statistics to measure economic losses, crop damage, and livelihood diversification, while qualitative data were thematically analyzed to identify coping mechanisms, adaptation practices, and gender-based differences in vulnerability. Findings reveal that flooding severely undermines paddy farming, with men facing recurring debt cycles, while women's mound cultivation, though essential for food security, contributes little to household income and remains undervalued. Women reported limited access to extension services and decision-making but demonstrated greater adaptability through livelihood diversification and community-based coping practices. These findings suggest that resilience is unevenly distributed across gender, with women bearing intensified workloads during floods. The study highlights the need to recognize women's contributions to food security, integrate gender-sensitive perspectives into flood management and agricultural planning, and strengthen adaptation strategies through the Gender-Climate Change Framework. By highlighting the differentiated experiences of men and women, this research contributes to a more inclusive understanding of flood resilience and provides insights for designing sustainable and equitable adaptation strategies for flood-affected farming communities in rural Sri Lanka.

Keywords: flooding, small-scale agriculture, gender, resilience

Intimidation and Strategic Shielding: Exploring the Role of English as "Kaduwa" in the Professional Experiences of a Selected Group of Sri Lankan Lawyers

W.M.C.A. Wickramasinghe[1]*, R. Rassool[2]

[1]*Department of English Language Teaching, Wayamba University of Sri Lanka*
[2]*Postgraduate Institute of English, Open University of Sri Lanka*
**ashanthi@wyb.ac.lk*

This study aims to explore the complex role played by the English language as a form of intimidation, and a strategic shield in the lives of a group of selected Sri Lankan lawyers. It focuses on how English, popularly conceptualized as "*kaduwa,"* is experienced, interpreted, and negotiated in non-English-dominated courtroom contexts. Using purposive sampling, ten lawyers belonging to different levels in terms of their English language fluency were selected as the research sample. Data was generated through semi-structured interviews and questionnaires, allowing participants to reflect on and share their lived experiences of language use in legal forums. The data was analyzed using thematic analysis. The study reveals that lawyers who are fluent and who use English in non-English dominated legal forums such as District and Magistrate courts (outstation), and sometimes Colombo courts, are always looked upon as trying to oppress and intimidate the lawyers who are not fluent in the language. In addition, lawyers who are less fluent, but who try to make legal applications in English in non-English based legal forums are also branded as trying to rise above the level of their colleagues or showing off. It creates feelings of enmity among fellow colleagues practicing in the same bar. The results reveal that, despite the standard of the language and the proficiency level of the user, due to the cultural baggage associated with English as the '*kaduwa'* which positions the language as a symbolic instrument of power, the use of English is detrimental in particular forums, among a majority of Sinhala-speaking lawyers. It is perceived in a negative light despite the fluency and the intention of the user. The results further indicate that some fluent lawyers use English strategically as a means of masking perceived gaps in legal knowledge, with the impression that lack of legal competence can be compensated through linguistic proficiency. The study concludes that English as "*kaduwa"* does not retain a fixed or uniformly powerful status. Instead, it is a dynamic and context-dependent construct that generates tension and misunderstanding in non-English dominated courts, often producing more negative than positive outcomes in the professional lives of the selected lawyers.

Keywords: English, *kaduwa*, intimidation, strategic shielding, legal professionals

Maqasid al Shari'ah and Contemporary Social Justice Discourse: An Analysis of Muslim Community Perceptions in Sri Lanka

K.M.M. Azam, A.R.I. Rauff*

Department of Arabic & Islamic Studies, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**a21610@arts.pdn.ac.lk*

The concept of social justice has become an important topic in contemporary global discussions on human rights, social inclusion, and peaceful coexistence. Within Islamic thought, Maqasid al Sharia refers to the higher objectives of Islamic law, which seek to preserve religion, life, intellect, lineage, and property while promoting human welfare, justice, and the common good. In recent years, Muslim scholars have increasingly presented Maqasid al Sharia as a comprehensive framework for addressing contemporary social challenges and fostering ethical, inclusive, and sustainable societies. However, much of the existing scholarship remains normative and theoretical, with limited empirical research examining how Muslim communities themselves understand, interpret, and apply this framework, particularly within minority contexts such as Sri Lanka. This study explores the perceptions of the Muslim community in Sri Lanka regarding the relevance of Maqasid al Sharia to contemporary social justice discourse. It examines how Muslims relate Islamic principles to issues such as equality, religious coexistence, human dignity, education, economic fairness, and community harmony within Sri Lanka's multicultural environment. A qualitative research design was employed using semi-structured interviews with 18 participants selected through purposive sampling, supplemented by snowball sampling, to ensure representation from religious scholars, university students, educators, and social activists. The collected data were analysed using thematic analysis. The study contributes empirically by providing context-specific evidence on how Sri Lankan Muslims perceive the practical relevance of Maqasid al Sharia beyond its traditional legal framework. The findings indicate that participants generally viewed Maqaṣid as an ethical guide for promoting justice, human dignity, social responsibility, and peaceful coexistence in a pluralistic society. At the same time, participants recognised challenges in translating these principles into everyday community practices and emphasised the need for greater public awareness, educational initiatives, and practical engagement with Maqasid-based approaches. These findings enrich existing theoretical discussions by offering empirical insights into the contemporary application of Maqasid al Sharia within the Sri Lankan Muslim context.

No Show Abstract

Keywords: Maqasid al-shariah, social justice, Sri Lankan Muslims, Islamic ethics, human welfare, contemporary discourse

Narrating Empire and its Afterlives: Predacity, Moral and Structural Violence in Heart of Darkness

A.M.J.H. Amandakoon[1]*, L.B. Nelundeniya[2]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*I.C.B.T. Campus Sri Lanka, 20000, Sri Lanka*
**amandakoonhansi@gmail.com*

The empire persists to be a vital priority in literary studies, as colonial authority functions not exclusively through invasion but also by discourse, representation and economic exploitation. Joseph Conrad's Heart of Darkness depicts a nuanced literary depiction of imperial brutality within colonial Congo, in which the discursive nature of civilization obscures exploitation, racial hierarchy and dehumanization. The study examines the transition of violence from overt imperial cruelty to entrenched systemic structures that control daily existence. The key objective is to examine how moral structural violence is implemented by predation, which is characterized as a system of predatory extraction and dominance, and this study examines how these cycles are mediated by narrative form and how power is replicated within global systems. The study's methodology integrates close reading with theoretical comprehension through qualitative textual analysis. With the aid of literary theories, it incorporates postcolonial theory, globalization frameworks, and feminist criticism, and the concepts of world theory, narrative framework, spatial representation, labour abuse, and economic mechanisms are all examined selectively. The results demonstrate that Heart of Darkness accentuates moral violence, a concept symbolized by dehumanization, moral breakdown, and the instability of European consciousness under imperial circumstances and it also exposes systemic violence caused by the corporation's exploitation of African people, land, and resources, emphasising that colonial injustice transcends individual cruelty and constitutes a system of perpetuated by economic materialism, racial labelling and institutional dominance. The analysis indicates that Conrad's novel reveals empire as a predatory system where moral decay and material exploitation are inextricably linked and by analysing Heart of Darkness through the lens of predacity, it enriches intellectual awareness of the narrative form, rationale and validation of colonial violence within imperial discourse.

Keywords: Structural Violence, Postcolonialism, Globalisation, Narrative, Predacity

Navigating Pressure and Performance: Stress and Job Satisfaction Among Sri Lankan Insurance Agents

C.C. Senevirathne[1]*, P.M. Edirisinghe[2]

[1]*ANC Campus, Colombo, 00300, Sri Lanka*
[2]*University of Moratuwa, Katubadda, 10400, Sri Lanka*
**chandrajiths@gmail.com*

A crucial post-crisis worry is employee emotional welfare, which was brought to light during the COVID-19 epidemic. In order to promote wellbeing and improve organizational performance, the link between stress and job satisfaction is crucial. With the particular goals of measuring stress levels, identifying important job satisfaction drivers, and examining their link, this study adds to the sub-theme of workplace mental health by examining how perceived stress affects job satisfaction among non-managerial employees. A cross-sectional, quantitative design was used. The Perceived Stress Scale (PSS) and the Copenhagen Psychological Questionnaire (COPSOQ III) were used to gather data because of their validated psychometric qualities and applicability to psychosocial work contexts (Kristensen et al, 2005; Cohen et al, 1983). The sample was supposed to consist of 100 insurance agents, which was chosen using the G-Power Software, but the convenient sampling method produced 95 participants due to time constraints, ages ranging from 21 to over 50, from Sri Lanka's insurance industry (52 men and 43 women). Although this constraint is acknowledged, the small sample size was considered adequate for exploratory correlation analysis. Data was collected using Survey Monkey and Google Forms, combined in Qualtrics, then examined with SPSS version 26.0. Stress and job satisfaction were shown to be strongly and significantly correlated ($p<0.05$). Pay and work pace, however, had no apparent impact on satisfaction. Only the chance for professional and personal growth was found to be a statistically significant factor ($p<0.05$) among the several hypotheses that were examined, including work tempo, influence, recognition, and social support. There were reports of moderate levels of stress, which were linked to long hours, customer expectations, and sales targets. Job satisfaction and organizational performance were found to be significantly positively correlated. According to the findings, non-managerial insurance workers favor prospects for advancement over pay, aligning with Edwin Locke's value-percept theory. Strengthening internal promotion processes, working with academic institutions to upskill, and switching from hierarchical to employee-centered governance structures are among the recommendations. Although the results provide useful information, generalizability is hampered by the small sample size and sector-specific focus. To validate these findings, future studies should use probability sampling and increase sample variety.

Keywords*:* stress, job satisfaction, insurance agents

Perceptions on the Effectiveness of Zakat and Waqf for Poverty Alleviation amongSri Lankan Muslims

K.M.M. Azam

Department of Arabic & Islamic Studies, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
mohamedazam649@gmail.com

No Show Abstract

Poverty remains one of the major socio-economic challenges affecting many Muslim communities in Sri Lanka. Within the Islamic economic system, Zakat and Waqf serve as fundamental institutions for promoting social welfare, economic justice, and poverty alleviation. Although these institutions have been widely examined in Islamic economic literature, most studies focus on their theoretical foundations or institutional models, with limited empirical research exploring how local Muslim communities perceive their effectiveness and the practical challenges associated with their implementation in the Sri Lankan context. This study therefore examines community perceptions of the effectiveness of Zakat and Waqf in alleviating poverty and promoting socio-economic welfare among selected Muslim communities. A qualitative research approach was adopted. Primary data were collected through semi-structured interviews and questionnaire surveys involving 15 participants, including Islamic scholars, mosque administrators, Zakat and Waqf practitioners, and members of the Muslim community. Participants were selected using purposive sampling. Secondary data were obtained from books, journal articles, research papers, official reports, and Islamic literature. The collected data were analysed using thematic and descriptive analysis. The findings indicate that participants generally perceive Zakat and Waqf as effective Islamic mechanisms for supporting vulnerable groups and improving community welfare. However, respondents also identified several barriers limiting their effectiveness, including inadequate institutional coordination, inconsistent distribution practices, limited public awareness, insufficient transparency, and weak administrative capacity. Participants further emphasized the importance of strengthening governance mechanisms, enhancing community participation, and improving institutional accountability to maximise the socio-economic impact of these Islamic financial institutions. This study contributes empirical evidence from the Sri Lankan context by highlighting community-based perceptions of Zakat and Waqf, thereby extending existing theoretical discussions and providing practical insights for policymakers, religious institutions, and community organisations seeking to strengthen poverty alleviation initiatives through Islamic social finance.

Keywords: zakat, waqf, poverty alleviation, Islamic social finance, Sri Lankan Muslims, socio-economic welfare

Piloting the Feasibility of the Mentalization-Based Psychological Intervention Program Among Young Male Offenders in Sri Lanka

J. Janushiya*, K. Hettigoda

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**jeyjanu07@gmail.com*

Adolescence is often a critical turning point in human development, where patterns of behaviour begin to take shape that can either support positive social functioning or lead to long-term antisocial outcomes. Antisocial behaviour and youth offending among young people have globally prompted a conceptual challenge. It begins to appear in early adolescence and can cause significant damage to individuals as well as society, although these behaviour patterns tend to reduce with ageing. Among various psychological approaches aimed at addressing offending behaviour, mentalization-based interventions have gained increasing attention for their focus on enhancing individuals' capacity to understand their own and others' mental states. Hence, the aim of this research is to pilot the feasibility of a Mentalization-Based Psychological Intervention (MBI) program among young male offenders in Sri Lanka. To achieve this objective, a quantitative pre-test and post-test study design was employed. One hundred young male offenders aged between 15 - 23 years were recruited using purposive sampling from selected detention centres in Sri Lanka. Quantitative data were collected using a demographic questionnaire, the Self-Report Reflective Functioning Questionnaire (SRRFQ), the Toronto Empathy Questionnaire (TEQ), and the Emotion Regulation Questionnaire (ERQ). The findings of the study revealed that most participants demonstrated improvements in mentalization ability following the intervention. Moreover, the program showed satisfactory levels of acceptability, indicating that the intervention is feasible within the Sri Lankan juvenile context. These results suggest that mentalization-based interventions can play a significant role in addressing psychological deficits associated with antisocial behaviour among young offenders. As this was a pilot study, limitations such as the absence of a control group, reliance on self-report measures, and the short-term nature of the assessment were identified. Therefore, future research should incorporate more rigorous designs, including randomized controlled trials and long-term follow-up assessments.

Keywords: feasibility, mentalization-based intervention, young male offenders, mentalization, Sri Lanka

Prevalence of Psychological Distress Among Undergraduate Students in State Universities in Sri Lanka

H. Liyadipita[1]*, S. Herath[2]

[1]*Faculty of Education, University of Vocational Technology, Kandawala, Ratmalana, Sri Lanka*
[2]*Lincoln University College, Petaling Jaya, Malaysia*
**hansani.liyadipita@uovt.ac.lk*

Psychological distress has developed as a growing concern in higher education, as undergraduate students are frequently uncovered to academic, emotional, social, and financial burdens that might affect their mental health and total well-being. In Sri Lankan university context, students experience further challenges associated to academic competition, family expectations, future employment concerns, and limited access to psychological support. Thus, the current study expected to observe the prevalence of psychological distress among undergraduate students in state universities in Sri Lanka, with exact attention to anxiety, depression, and loss of emotional or behavioural control. The study was directed based on the positivist philosophy. Descriptive research design was used with a sample of 100 undergraduate students attached to the Faculty of Education at a public university in Sri Lanka. Data were collected using the psychological distress dimension of the Mental Health Inventory developed by Veit and Ware (1983), which contains three subscales: anxiety, depression, and loss of emotional or behavioural control. The consistency of the instrument was confirmed through Cronbach's alpha values of .74 in the pilot study and .77 in the actual study. The findings revealed that the majority of the participants of the study experienced modest psychological distress, with 68.9% reporting moderate levels, 29.3% reporting low levels, and 1.9% reporting high levels. Among the subscales, anxiety was the most highlighting form of distress, with 73.1% of respondents reporting moderate anxiety and 6.6% reporting high anxiety. Depression was also observable, with 60.7% of respondents reporting moderate levels and 12.2% reporting high levels. Conversely the loss of emotional or behavioural control was comparatively lower, with 56.7% of respondents falling within the low category. These results propose that psychological distress among undergraduates is primarily reflected through internalized emotional difficulties such as anxiety and depression rather than severe behavioural dysregulation. The research highlights the necessity for initial identification, university based counselling facilities, stress management programmes, peer support systems, and mental health awareness initiatives to encourage student well-being in Sri Lankan higher education institutions.

Keywords: psychological distress, undergraduate students, anxiety, depression, mental health, state universities, Sri Lanka

Problematic Dimensions in the Philosophy of the *Bhagavad Gitā*

W. M. S. K. Wijesundara

Department of Classical Languages, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
sanatpdn@gmail.com

This study critically examines the problematic philosophical dimensions of the *Bhagavad Gītā* within its broader metaphysical, ethical, and socio-religious framework. Although the *Gītā* presents itself as a synthetic spiritual discourse integrating *Karma*, *Jñāna*, and *Bhakti*, it simultaneously generates significant tensions concerning duty, liberation, determinism, violence, caste, and moral agency. The primary aim of this study is to re-evaluate the internal coherence and practical viability of the three interrelated doctrines of *Niṣkāma Karma*, Svadharma, and divine determinism, and to investigate the philosophical ambiguities arising from their interaction. By foregrounding these doctrines, the study seeks to reassess the intellectual status traditionally accorded to the *Gītā* as a systematic philosophical text. It further explores how the text negotiates tensions between Vedic orthodoxy, ascetic renunciation, social obligation, metaphysical selfhood, and ethical responsibility. Methodologically, the research adopts a comparative textual, philosophical, and hermeneutical approach grounded in a close reading of the *Gītā* within the narrative framework of the *Mahābhārata*. The analysis is based primarily on the original Sanskrit text and examines relevant passages through historical-philological inquiry in dialogue with traditional commentators, modern Indian thinkers, and contemporary philosophical critics. Particular attention is given to the doctrines of *Niṣkāma Karma*, *Svadharma*, and divine determinism, as well as to their implications for *Ahiṃsā*, *Varṇa*, selfhood, devotion, and free will. The findings reveal that the *Gītā* constitutes a strategically integrative yet internally tension-ridden philosophical discourse. Its doctrines of *Niṣkāma Karma* and *Svadharma* generate unresolved ethical ambiguities concerning violence, caste duty, and moral accountability, while its metaphysical framework oscillates between divine determinism and human freedom. The analysis further demonstrates that the ideal of desireless action remains philosophically and psychologically problematic, particularly in light of critiques regarding the inevitability of desire in human action. Moreover, the *Gītā*'s synthesis of action, devotion, and knowledge appears spiritually elevated yet philosophically inconclusive, often privileging metaphysical authority over rational and experiential justification. The study concludes that the *Gītā* is best understood not as a fully systematic philosophy but as a complex and evolving text shaped by multiple religious, ethical, and intellectual currents in ancient India.

Keywords: *Bhagavad Gītā*, Niṣkāma karma, Svadharma, determinism, Indian philosophy

Remote Work Experiences and Employee Well-Being: Evidence from Three Software Development Companies in Sri Lanka

D.M.P.T. Jayawardhane[1]*, S.A.S. Dasun[2]

[1]*IMBS Green Campus, Gampaha, Sri Lanka*
[2]*Career Guidance Unit, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**poornijayawardhane@gmail.com*

This study examines the psychological effects of remote working conditions and social isolation among employees, focusing on mental fatigue and psychological well-being in the Sri Lankan context. With the rapid expansion of remote and hybrid work arrangements, employees increasingly experience extended screen exposure, blurred work–life boundaries, and reduced interpersonal interaction, which may negatively affect their mental health and overall well-being. The primary objective is to investigate the relationships among remote working conditions, social isolation, mental fatigue, and psychological well-being, while examining the mediating role of mental fatigue. A quantitative cross-sectional design was employed using a convenience sample of 61 remote and hybrid employees from three software development companies in Sri Lanka. Data were collected through a structured online questionnaire and analyzed using SPSS software, including reliability, correlation, and regression analyses. The results indicated that mental fatigue ($\alpha = 0.929$), psychological well-being ($\alpha = 0.820$), and social isolation ($\alpha = 0.757$) demonstrated acceptable to high internal consistency, whereas remote working conditions showed poor reliability ($\alpha = 0.377$), indicating weak internal consistency. Correlation analysis revealed a strong negative relationship between mental fatigue and psychological well-being ($r = -0.634$, $p < 0.01$), indicating that higher fatigue levels are associated with lower well-being. A moderate negative relationship was observed between social isolation and psychological well-being ($r = -0.357$, $p < 0.01$), suggesting increased isolation is linked to reduced well-being. In addition, social isolation was positively associated with mental fatigue ($r = 0.460$, $p < 0.01$), indicating employees experiencing greater isolation report higher fatigue levels. However, remote working conditions were not significantly related to mental fatigue ($p = 0.261$) or psychological well-being ($p = 0.437$), suggesting remote work may not directly influence these outcomes. Regression analysis confirmed that mental fatigue is the strongest predictor of psychological well-being ($R^2 = 0.407$). The findings suggest that mental fatigue plays a critical role in reducing psychological well-being, while social isolation indirectly contributes by increasing fatigue levels. The study highlights the importance of managing cognitive workload and maintaining social connection to support employee well-being in remote work environments.

Keywords: remote working conditions, social isolation, mental fatigue, psychological well-being, remote employees

Role of Women in Agricultural Decision-Making: A Case Study of the North Central Province of Sri Lanka

T. Weerasinghe*, B.U.I. Prabhavi, K.P.P. Kopiyawattage

Department of Agricultural Extension, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**thisumiweerasinghe1@gmail.com*

Although women constitute a substantial proportion of Sri Lanka's agricultural labour force, empirical evidence on their decision making authority and control over agricultural resources in Dry Zone farming systems remains limited. This study therefore examined (i) women's participation in agricultural and household decision-making, (ii) their control over agricultural income, and (iii) differences in decision-making according to household characteristics. A cross-sectional survey of 197 female farmers was conducted using random sampling in Mahailuppallama, Katiyawa, and Senapura in the Anuradhapura District. Data were collected through structured questionnaires and analysed using descriptive statistics, factor analysis, and ANOVA in SPSS software. The sample consisted mainly of married women (85.1%), the majority being middle- to older-aged (56.3% over 40 years), with 67.0% having secondary education. Only 16.5% were household heads, with the remainder residing in male-headed households. Respondents reported high involvement in routine household decision-making (including food preparation, daily expenditure, and visiting relatives) but relatively low involvement in major financial and asset-related decisions such as savings, asset purchases, housing, and decisions concerning children's education and occupation. In the agricultural domain, women exhibited limited participation in technical and input-related decisions (land preparation, sowing method, fertilizer application, irrigation, and machinery use), while demonstrating greater involvement in weeding, storage of produce, determining the proportion of produce for home consumption, decisions on the use of income, and saving behaviour. Although 73.9% of respondents were permitted to retain some portion of agricultural income, 27.1% could keep only 25% or less, indicating constrained financial autonomy. Perceptions strongly reflected male dominance in control over farming inputs, land and irrigation rights, and agriculture-related decision-making, and women identified poor household economic conditions, low remuneration, violence against women, limited employment opportunities, non-recognition of women's contributions, and lack of training as major constraints. Factor analysis distinguished farm, financial, and household decision-making domains, and ANOVA indicated significantly higher farm related decision-making scores among female household heads than non-heads ($F=6.735$, $p=0.010$), with only a marginal difference in financial decisions ($F=3.776$, $p=0.054$) and no significant difference in children and household-related decisions ($F=2.309$, $p=0.130$). Overall, the findings reveal that although women farmers in the Anuradhapura District play a key role in routine household and post-harvest decision-making, they remain largely excluded from technical agricultural and strategic financial decisions. This highlights the need for gender-responsive interventions to strengthen women's participation in technical farm decisions, improve their access to agricultural training and extension services, and promote equitable control over agricultural income and other productive resources.

Keywords: female farmers, agricultural decision making, household decisions, perceived constraints, north-central province.

Acknowledgement: *This work was supported by the Gender Education and Women's Initiative Unit, University of Peradeniya, Sri Lanka.*

Spatial and Temporal Dynamics of Agricultural Resilience: A Multivariate Analysis of Paddy Productivity in Sri Lanka (2024/2025 Maha Season)

J.M.J. Nipunika

Department of Geography, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
a18476@arts.pdn.ac.lk

Agriculture remains a vital component of the Sri Lankan economy, contributing approximately 7% to 8% to the national GDP, with paddy cultivation playing a dominant role in ensuring domestic food security. However, paddy productivity is increasingly influenced by spatial variations in irrigation infrastructure and varying degrees of climatic vulnerability. While most existing studies focus on single metrics such as total harvest, this study employs a multivariate approach to understand the complex relationship between land utilization, irrigation methods, and yield efficiency across the 25 administrative districts. The objective of this study is to identify the underlying dimensions driving paddy productivity in Sri Lanka, classify districts based on their resilience and production capacity, and evaluate the statistical relationship between irrigation dependency and crop yield. To achieve this, the study utilized secondary data from the Department of Census and Statistics for the 2024/2025 Maha season. Principal Component Analysis (PCA) was performed to reduce data dimensionality and identify major productivity drivers, while K-Means Clustering was applied to the standardized variables to categorize the districts into homogenous agricultural zones within the R statistical environment. The PCA revealed that two principal components explain 85.7% of the total variance. Dimension 1 (65.8%) represents "Production Scale," driven largely by Major Scheme extents and Total Production, while Dimension 2 (19.9%) represents "Productivity Efficiency," which is defined primarily by average yield. Grouping the data through K-Means clustering separated Sri Lanka's 25 districts into three distinct profiles. Anuradhapura, Ampara, and Polonnaruwa fall into Cluster 1, standing out for their vast land utilization and massive total outputs. Meanwhile, Cluster 2 captures smaller regional footprints that manage to secure remarkably high average yields. Cluster 3 isolates climate-vulnerable regions where average yields drop well below the national baseline. This split proves that agricultural resilience across the island is far from uniform, tied directly to how reliable a district's local irrigation network is structurally. Since these vulnerabilities shift depending on regional geography, local stakeholders cannot rely on homogeneous national policies. Therefore, to secure the national food supply, policymakers should abandon uniform national plans in favor of giving each district customized water management and climate-based strategies.

Keywords: agricultural resilience, multivariate analysis, PCA, K-Means

No Show Abstract

Spatial Validation of MSME Location Choices in Kandy Grid City: A GIS-Based Analysis of Accessibility, Visibility, and Commercial Centrality

I.A.K. Wickramapala[1]*, U.N. Jinadasa[1], S. Subasinghe[2], S. Maheswaran[3], M.T.M. Dewasurendra[4]

[1]*Department of Archaeology, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Geography, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Operations Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**imashiwickrama@gmail.com*

The Kandy Grid City operates as both a world heritage center and a key commercial and tourism hub, where micro, small, and medium-sized enterprises (MSMEs) operate around historic streets, landmarks and commercial corridors. Previous studies on SME location choice and clustering show that business locations are influenced by a combination of location-specific, personal and community factors, including accessibility, visibility, customer access and owner decision-making. However, limited attention has been given to how such perceived location factors can be spatially validated in heritage-tourism cities, where commercial activity overlaps with cultural landmarks and heritage-sensitive urban environments. This study examines the relationship between MSMEs' choices of locational priorities and GIS-based spatial suitability of MSMEs in the Kandy Grid City. Initially, owner perceptions regarding business location factors were explored through Likert-scale interview responses. These perceptions were validated using ArcGIS-based spatial analysis of spatial distribution, road frontage, landmark proximity, major road visibility, and service area, where surveyed MSME records with complete location information and verifiable GIS coordinates were used within the Kandy grid city boundary. Findings indicate that visibility and accessibility from major roads, was the highest rated location factor for the owner, receiving a high importance percentage of 70%. Customer demand was the leading growth/sustainability factor, selected by 89.8% of MSMEs. GIS-based results supported these perceptions, as 86.5% of valid MSMEs were located within 25 meters of a road, indicating strong frontage, accessibility to business and visible commercial corridors in gird city. Proximity to landmarks was particularly important for tourism-related MSMEs, while 10–15-minute walking service areas generated from major landmarks and nodes, confirmed the relationship between MSME clustering and pedestrian accessibility from key landmarks. The results indicate that MSME location choices in the Kandy Grid City are spatially appropriate from a commercial urban planning perspective, are consistent with the perceptions of the owners, and can assist urban planners in guiding activities, like designing pedestrian access. However, commercial suitability does not necessarily imply heritage suitability, and further research is needed to assess whether the concentration of MSMEs around heritage buildings affects the architectural authenticity, heritage character, and conservation value of the Kandy Grid City.

Keywords: Kandy grid city, MSMEs' location choice, spatial analysis, urban planning

Acknowledgement: *This study was supported by the Multidisciplinary Research Grant of the University of Peradeniya, Sri Lanka (Grant No. 34, 2025).*

Spatio-Temporal Analysis of Land Use Transformation in the Haputale DS Division Using Remote Sensing and GIS

A. Pradeepa

Department of Geography, University of Peradeniya, 20400, Sri Lanka
a20516@arts.pdn.ac.lk

Land use and land cover (LULC) changes have become a significant environmental concern in ecologically sensitive regions such as the Haputale DS Division in Sri Lanka due to their potential impacts on biodiversity, water resources, and sustainable development. Understanding these changes is important for effective environmental planning and management. This study aimed to analyze the spatial and temporal patterns of LULC changes in the Haputale DS Division over a ten-year period using Remote Sensing (RS) and Geographic Information System (GIS) techniques. A quantitative research approach was employed using Landsat satellite imagery from 2014 and 2024. The images were preprocessed through geometric correction, atmospheric correction, and clipping procedures. Supervised classification in ArcGIS Pro was used to classify the study area into four LULC categories: Water, Forest, Developed, and Cultivated land. Change detection analysis was performed to identify changes between the two time periods, while classification accuracy was assessed using confusion matrices based on 100 randomly selected reference points for each year. The results revealed notable changes in land-use patterns during the study period. Forest cover decreased by 51.4%, while water bodies declined by 80.4%. In contrast, cultivated land increased by 29.6%, and developed areas expanded by 20.8%. The classification accuracy was 81% for 2014 and 73% for 2024, indicating acceptable classification performance with some limitations in the latter classification. These changes indicate substantial land-use transformations that may be associated with increasing human activities and land-use pressures in the study area. The findings contribute to understanding land-use dynamics and highlight the need for integrated land management strategies, including sustainable agricultural practices, reforestation, proper urban planning, water conservation, and regular RS-based monitoring to support long-term environmental sustainability.

Keywords: Land Use and Land Cover (LULC), remote sensing, GIS, change detection, environmental sustainability

Teacher Awareness and Use of AI-Assisted Tools in Secondary Classrooms: A Study of the Mathugama Educational Zone, Sri Lanka

V. Lindakumbura[1]*, S.M.K.S.M. Samarakoon[2]

[1]*Department of Education, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Ministry of Education, Nugegoda, 10120, Sri Lanka*
**lindakumbura@gmail.com*

The AI-assisted tools are rapidly transforming teaching and learning practices worldwide. However, limited research has examined the awareness of secondary school teachers regarding the integration of these technologies within the Sri Lankan educational context. Therefore, investigating teachers' awareness of integrating AI-assisted tools is essential to identify existing gaps and support the development of effective professional training programs in Sri Lankan secondary education. This study focuses on teachers' awareness of integrating AI-assisted tools in teaching and learning. The specific objectives of the study were to investigate the level of awareness of AI-assisted tools among secondary teachers, to examine the extent to which secondary teachers integrate AI-assisted tools into teaching and learning, to provide implications for the Ministry of Education to enhance the integration of AI-assisted tools in the teaching and learning process. The convergent mixed methods design was employed in this study. A sample of 153 secondary teachers in the Mathugama educational zone was selected using the random sampling method. The quantitative data were collected by administering a questionnaire, and qualitative data were collected using interviews. Quantitative data were analyzed using descriptive statistics, and qualitative data were analyzed using thematic analysis. The self-reported data collected from questionnaire revealed that there was a low level (16.3%) of teachers' awareness of AI-assisted tools in teaching and learning. Among the subset of teachers who were aware of AI tools, 86% of teachers were utilizing Chat GPT, and 37% were using Gemini. However, significant gaps in pedagogical use of AI-assisted tools were identified: only 12% knew how to use AI-assisted tools for lesson planning, 11% for lesson development, 6% for assessments, and 9% for providing personalized student feedback. The interview data further suggested that, although teachers recognize the terminology, the majority lack the technical pedagogical knowledge to implement these tools in the teaching and learning process effectively. Therefore, the study concludes that the majority of teachers demonstrated limited awareness and pedagogical competency of integrating AI-assisted tools in teaching and learning. The study highlights important implications for the Ministry of Education, particularly the urgent need to introduce targeted professional development programs and policy initiatives to enhance teachers' conceptual understanding and practical application of AI-assisted tools in classroom teaching and learning processes.

Keywords: artificial intelligence, awareness, teaching and learning

The Body Remembers What the Recipe Cannot: Embodied Knowledge and Cooking as Performance

T. Gunasekara

Department of Fine Arts, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
tharakagunasekara8@gmail.com

"පොල් ටිකක්... ගම්මිරිස් ඇට කීපයක්... සුදු ලූණු බිකක්... හොඳට ගලේ අඹරන්න..."
("A little coconut… a few peppercorns… a clove of garlic… grind it well on the stone grinder.")

An instruction: not measured, not fixed, but felt. *Handi Kawum* (හැඳි කැවුම්) is a traditional festive sweet prepared during the Sinhala and Tamil New Year in Sri Lanka, where culinary knowledge is often transmitted through spoken instruction, gesture, and sensory judgement rather than standardized recipes. This paper traces my attempt to recreate my grandmother's *Handi Kawum* without a conventional recipe, guided instead by her approximations: a "little," a "few," a consistency that the hand recognises before the eye confirms. What happens when knowledge refuses to be written down? When does instruction become sensation? Situated within a practice-led autoethnographic inquiry, this study positions the repeated preparation of *Handi Kawum* as the primary site of research, where cooking becomes both practice and method. Having been trained within educational and professional systems that privilege precision, standardized measurement, and written instruction, I initially encountered my grandmother's mode of knowledge transmission as uncertainty rather than clarity. Yet, through repeated acts of heating, grinding, waiting, tasting, smelling, touching, and adjusting, memory intertwined with sensory perception, transforming the body itself into a mode of inquiry. Rather than reproducing a fixed recipe, the practice continually negotiated flavour, texture, timing, and bodily intuition, revealing that knowledge emerged through embodied engagement with ingredients, tools, and remembered gestures. Drawing on Susan Leigh Foster's articulation of embodied knowledge as produced through movement (Foster, 1995), the paper frames cooking as choreographic practice, where knowing resides in action. The recipe becomes adaptive, contingent, and incomplete. In dialogue with Diana Taylor's concept of repertoire (Taylor, 2003), it argues that culinary knowledge is carried, repeated, and transformed through embodied practice rather than preserved as fixed textual instruction. The repeated making of *Handi Kawum* demonstrates that embodied knowledge does not simply preserve the past; it negotiates it. It drifts, substitutes, forgets, and remembers differently. Rather than treating these transformations as failures of transmission, this paper proposes them as the very conditions through which embodied knowledge continues to live, evolve, and perform itself.

Keywords: embodied knowledge, practice-led autoethnography, performance, culinary memory, *Handi Kawum*

The Coconut-Shell *Vīṇā* and the Colonial Gaze: Representations of String Instruments in Colonial Sri Lanka

I. B. K. Dehideniya

Faculty of Graduate Studies, University of the Visual and Performing Arts, Colombo, 00700, Sri Lanka
isurudehideniya@gmail.com

This study analyzes colonial documents that reflect perceptions of string instruments in British Ceylon during the 19th century. It draws upon the records of 19th-century explorers, which provide valuable descriptions of string instruments used in Sri Lanka. The research employs Critical Discourse Analysis (CDA) as its methodological approach to uncover meanings that extend beyond the surface level of colonial texts and to examine how these meanings were shaped by the colonial gaze. Selected passages from the primary sources are analyzed following Fairclough's three levels of Critical Discourse Analysis: textual analysis (description), interpretation (discursive practice), and explanation (social practice). The central research question asks: How did colonial administrators shape perceptions of local string instrument practices? The findings indicate that colonial observers documented their views in two principal ways: (1) by evaluating historical sources and comparing the legacy of string instrument use in ancient Ceylon with contemporary practices, and (2) by contrasting contemporary string instruments of the West with those of the East. Writers such as Tennent and Suckling referred to the *Mahāvaṃsa* chronicle to emphasize the historical heritage of string instruments in ancient Sri Lanka while simultaneously evaluating their contemporary use among the colonized population. With regard to contemporary instruments, the coconut-shell *Vīṇā* is frequently documented in 19th-century colonial records. According to these accounts, the instrument was commonly played by mendicants and was only rarely used in religious processions. Descriptions by Davy and Bennett focus primarily on its physical characteristics, often emphasizing its distinction from the *Vīṇā* of Hindu traditions. Likewise, Suckling and Sirr characterize it as a "primitive" and "rude" two-stringed, violin-like instrument that produced a weak and unpleasant sound. These accounts further suggest that the contemporary Sinhalese use of the term *Vīṇā* referred to an innovative instrument that shared structural similarities with the Western violin. Finally, this research reveals that colonial discourse laid the foundation for the modern perception that the indigenous people of Sri Lanka once possessed a rich legacy of string instruments, but that this tradition had largely disappeared and no longer resembled the *Vīṇā* tradition of Hindu culture. Instead, colonial writers represented the contemporary *Vīṇā* as a "primitive" and "rude" violin-like instrument, suggesting that the designation *Vīṇā* had gradually shifted to refer to a violin-like instrument.

Keywords: music instruments, coconut-shell *Vīṇā,* colonial gaze and post-colonial studies

The Contribution of Jean-Jacques Rousseau to the Development of Modern Educational Thought

M.L.L. Rosin[1]*, M.S.M. Jayeeth[2]

[1]*Department of Political Science, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

[2] *Department of Education, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

**rosinlathfan789@gmail.com*

Philosophy plays an essential role in the successful functioning of educational processes. As scholars often say, "education without philosophy is blind, and philosophy without education is lame." Therefore, philosophy is crucial in deciding the direction of education. Accordingly, the main focus of this study is to explore how Jean-Jacques Rousseau's Philosophy of Naturalism guides and aligns with modern curriculum development and teaching-learning processes. This is a qualitative study. Relying entirely on secondary data, the research uses a thematic comparative analytical framework. The study is conducted by comparatively analyzing Rousseau's famous book Emile, various educational texts, previous research papers, and modern curriculum documents. According to the key findings of this study, Rousseau was the first to strongly advocate for Child-centered education. He completely rejected the rigid Teacher-centered and book-heavy Subject-centered education systems that dominated the educational world at that time. He argued that education should be tailored to a child's natural instincts, interests, and stages of development. Instead of forcing bookish knowledge on students, he recommended learning by doing in a natural environment, direct real-world experience, and sensory training as the best methods of learning. In conclusion, while acknowledging valid historical criticisms regarding his restrictive views on women's education, this study concludes that modern classroom practices such as play-way methodologies and student autonomy are deeply inspired by Rousseau's philosophy of Naturalism. These findings will greatly contribute to shaping and transforming the trends of contemporary educational policies and practices.

Keywords: naturalism, Emile, curriculum, educational philosophy, Rousseau, teaching-learning

No Show Abstract

The Impact of Karma Theory on Disability Identity in *Kusa Jatakaya*: An Intermedial Study of a Sinhala Jataka Story

W.N.D.N. Wijesiri

Department of Sinhala, University of Peradeniya, Peradeniya, 20400, Sri Lanka
nimal.wijesiri@arts.pdn.ac.lk

Disability has historically been interpreted through religious and moral frameworks in both Western and Eastern societies, where physical and mental impairments were often associated with sin, immorality, or supernatural forces. While Western disability discourse has increasingly shifted toward the Medical, Social, and Human Rights models, conceptions of disability in South Asia continue to be strongly influenced by the Religious/Charity Model. Rooted in Vedic, Buddhist, and other religious traditions, this model continues to shape contemporary perceptions of disability. Within Indian philosophical thought, disability is commonly understood through the doctrine of karma, whereby present conditions are interpreted as consequences of actions performed in previous lives. However, the Buddhist Pāli Canon presents a more nuanced view by identifying karma as only one of the five causal principles (*niyāma-dhamma*), suggesting that disability cannot be explained solely through karmic causation. Despite this broader doctrinal perspective, classical Sinhala literature frequently represents disability within a singular karmic framework. Among Sinhala literary texts, *Kusa Jātakaya* provides an important case for examining the construction of disability identity in Jātaka narratives. This study investigates the representation of disability identity in *Kusa Jātakaya* through an intermedial perspective. Employing a qualitative methodology, it explores the intersections of disability and gender in classical Sinhala literature. The study is guided by the primary research question: **How does the theory of karma influence the construction of disability identity?** A subsidiary question asks: **How is disability identity represented in *Kusa Jātakaya*?** Critical Disability Theory provides the analytical framework, while the methodology combines textual analysis with the examination of video-recorded performances, archival materials, published texts, mass media, photographs, and paintings. The findings reveal that disability identity in *Kusa Jātakaya* is represented primarily through a karmic and religious framework. Since Jātaka narratives link the Bodhisatta's previous and present lives through karma, disability is predominantly portrayed as the consequence of past actions. This limited perspective constrains the understanding of disability as a complex social identity. By critically examining these representations, the study contributes to disability studies and literary scholarship, encouraging more inclusive and critical approaches to representing disability in literary and cultural texts.

Keywords: karma theory, disability identity, Sinhala Jataka stories, Intermediality, *Kusa Jatakaya*

The Impact of Tourism on Village Economy: A Case Study of Heritage Tourismin Sigiriya

D.H.K. Dasanayake

University of Peradeniya, Peradeniya, 20400, Sri Lanka
a20124@arts.pdn.ac.lk

Heritage tourism is widely promoted as a catalyst for rural economic development, yet its micro-level impacts on village economies remain insufficiently understood, particularly in developing nations. Sri Lanka as a developing country attracts over two million annual tourists according to UNWTO, (2024). With this context, Sigiriya acts as a home to a UNESCO World Heritage Site. Yet the specific influence on the adjacent village economy has never systematically examined. This study assess the impact of heritage tourism on village economy using the Three-Pillar Model of Sustainability and evaluate how technology adoption shapes income generation among local residents. A mixed-method approach employed, combining semi-structured interviews (n=20) with village leaders, tourism business owners, and government officers, alongside a structured household survey (n=30 families) in Sigiriya. Data were collected between January to March 2026. In addition thematic and descriptive statistical analysis done. In Sigiriya GN, division consists of a community of 276 families where tourism dominates economic life. Findings reveal tourism is the primary source of income for 90% of households, with 90% reporting increased earnings and 95% experiencing business growth. However, benefits are highly unequal. All respondents own tourism-related businesses, yet wealthier villagers and external investors capture disproportionate gains. The village has shifted from agriculture to near-total tourism dependency, creating severe vulnerability to external shocks (e.g., COVID-19, off-seasons). Technology (Booking.com, Agoda, social media) is using daily by 90% of villagers and directly boosts income, yet challenges include fraudulent bookings, high commission fees, and unequal digital literacy. Environmental degradation (forest clearing for hotels, human-elephant conflict) and reduced educational investment among youth further threaten long-term sustainability. It conclude that while heritage tourism generates substantial economic growth at the village level, it simultaneously deepens inequality, creates precarious dependency, and undermines environmental and social pillars of sustainability. Technology amplifies both opportunities and risks. Policy implications include redistributing tourism revenues, enforcing environmental regulations, and building equitable digital capacity among marginalized residents.

No Show Abstract

Keywords: heritage tourism, village economy, economic inequality, technology adoption, sustainable tourism, Sri Lanka

The Role of Islamic Inheritance Law in Reducing Wealth Inequality: A Socio-Economic Analysis

A.M.R. Farwin

Department of Arabic and Islamic Civilization, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka.
rihanamanaf99@gmail.com

Wealth inequality remains a persistent socio-economic challenge that undermines equitable resource distribution and sustainable development. Islamic inheritance law (Fara'id) provides a divinely prescribed legal framework that not only governs succession but also functions as a structured mechanism for wealth redistribution and social justice. Despite its theoretical significance, limited attention has been given to its socio-economic role and practical implementation, particularly in South Asian Muslim societies. This study aims to examine the contribution of Islamic inheritance law in reducing wealth inequality by analyzing its role in wealth circulation, socio-economic equity, and the challenges affecting its implementation, especially in Sri Lanka and similar contexts. The study adopts a qualitative research design based on doctrinal and documentary analysis. Primary sources include the Qur'an, Hadith, and classical Islamic jurisprudential texts, while secondary sources comprise scholarly literature in Islamic economics, inheritance law, and socio-economic studies. The data were analyzed using thematic and comparative methods to interpret the socio-economic dimensions of inheritance principles. The findings reveal that Islamic inheritance law plays a significant role in preventing the concentration of wealth by mandating its distribution among multiple heirs, thereby promoting continuous wealth circulation and economic balance within society. It also strengthens financial inclusion, reinforces family responsibility, and ensures women's legally guaranteed inheritance rights. However, in practice, its implementation remains weak in many South Asian contexts, including Sri Lanka, due to inadequate awareness, entrenched customary practices, and patriarchal interpretations, which often result in the partial denial of women's rightful shares. The study concludes that Islamic inheritance law operates not only as a legal mechanism but also as a socio-economic instrument for promoting equity, reducing wealth concentration, and enhancing social stability. It further highlights the need for improved awareness, institutional education on Fara'id, and community-based reform initiatives to ensure effective implementation and achieve socio-economic justice.

Keywords: Islamic inheritance law, Fara'id, wealth inequality, socio-economic justice, wealth distribution

The Role of Livelihood Diversification in Enhancing Household Food Security: A Case Study of Tea Plantation Communities in Loolkandura, Sri Lanka

E.G.T.P. Jayathilake

University of Peradeniya, Peradeniya, 20400, Sri Lanka
thiranjanipabasara@gmail.com

Tea has remained central to Sri Lanka's economy and identity for over a century. The Loolkandura Tea Estate in Kandy, recognized as the first commercial tea plantation in Sri Lanka, exemplifies both the historical importance and present-day vulnerabilities of tea estate households. Despite their contribution to national export earnings, estate households remain highly dependent on tea wage labor, exposing them to economic shocks, limited livelihood opportunities, and persistent food insecurity. This study investigated livelihood diversification as a pathway to enhancing household food security among tea estate households in Loolkandura. It aimed to identify livelihood diversification strategies, assess their contribution to household food security, and examine socio-economic and institutional barriers affecting their adoption. The mixed-method research approach was employed, combining structured household questionnaire surveys, focus group discussions, field observations, and secondary data from the Department of Census and Statistics and the Ministry of Plantation Industries, Sri Lanka. Primary data were collected during March–April 2025 through a field survey of 45 households selected using systematic random sampling. Descriptive statistics summarized household characteristics and livelihood practices, while the Household Food Insecurity Access Scale (HFIAS) assessed food security status. The Mann–Whitney U test examined differences in HFIAS scores between tea-dependent and diversified households, and qualitative data were analyzed thematically. The study identified several livelihood diversification strategies beyond tea production, including home gardening, petty trading, small-scale services, livestock rearing, and handicrafts. Tea-dependent households recorded significantly higher HFIAS scores (Median = 8.0, Mean = 8.30 ± 1.36), indicating greater food insecurity. In contrast, diversified households recorded lower HFIAS scores (Median = 2.5, Mean = 2.82 ± 1.50), reflecting better food access and stability. The Mann–Whitney U test confirmed a significant difference between the two household groups ($U = 505.0$, $Z = 5.72$, $p < 0.001$). Although livelihood diversification significantly enhanced household food security and resilience, barriers including limited land access, inadequate credit, lack of training, and weak institutional support continue to constrain its adoption. Strengthening vocational training, agricultural extension services, market linkages, and institutional support is therefore essential for promoting sustainable livelihood diversification in Sri Lanka's plantation communities.

Keywords: livelihood diversification, food security, estate households, Loolkandura

Towards Sustainable Coexistence: An Ethical Evaluation of Technological Solutions to Human-Elephant Conflict

R.S.P.H.M.R.B.V. Meedeniya

Department of Philosophy, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
buddhinimeedeniya@gmail.com

The rapid development of modern science and technology, including artificial intelligence, GPS tracking systems, and drones, have significantly transformed how humans interact with wildlife, particularly elephants. These technologies are widely used to monitor, manage, and regulate animal behavior and movement. Historically, human interference with wildlife was relatively limited. However, population growth and human needs such as deforestation, infrastructure development, and settlement expansion have intensified human-elephant conflicts by reducing habitat and increasing competition for space. Elephants are recognized as keystone species that play a crucial role in maintaining ecological balance through seed dispersal, habitat modification, and nutrient cycling. Their conservation is therefore essential for sustaining biodiversity and ecosystem stability. As a solution, authorities have introduced various technological methods to manage these conflicts. This study examines whether technological interventions in human-elephant conflict promote sustainable coexistence or disrupt natural wildlife behavior and ecological balance. It aims to evaluate the effectiveness of modern technological methods compared to traditional approaches in fostering sustainable coexistence, through the lens of different ethical frameworks. The study adopts a qualitative, literature-based methodology drawing on Sinhala and English scholarly articles, books and academic online sources. This study focuses on ethical analysis and theoretical interpretation rather than empirical measurement. The data are analyzed through comparative and critical analysis. The findings suggest that technologies such as GPS tracking systems, drones, and electric fencing can reduce human-elephant conflict and improve safety. However, these methods often prioritize human interests by restricting elephants' movements and disrupting natural behavior. The study also emphasizes non-lethal strategies such as natural deterrents like bee fences, buffer crops, early warning systems, and community-based conservation as more ecologically sensitive alternatives. From a utilitarian perspective, these outcomes may be justified if they reduce overall harm. However, deontological ethics challenges this view by emphasizing the intrinsic value of animals and opposing their treatment as mere objects of control. The study concludes that while technology is important in managing human-elephant relationships, its application must be guided by ethical principles that balance human safety with animal freedom to ensure genuine coexistence.

Keywords: coexistence, ecological balance, environmental ethics, human-wildlife conflict

Traditional Medical Practices and Folklore in Sri Lanka: A Historical and Cultural Analysis of 'Kem' Rituals and Mantras in the Benthara Region

K. Karunathilaka

Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
nk.karunathilaka2003@gmail.com

The Benthara region of Sri Lanka holds a prominent place in the country's indigenous medical history, primarily due to its unique lineage-based healing traditions. This study explores the intersection of traditional healing, 'Kem' rituals, and mantra practices, preserved for centuries through oral traditions and the patronage of local religious institutions. The primary objective is to analyze the historical evolution and current status of these practices within the 'Bentara Weda Parapura', while examining the role of the Buddhist community as their primary custodians.Adopting a qualitative research design, primary data were collected through an extensive field study at the ‘Bentara Pancha Maha Rajamaha Viharas’ (specifically Galapatha and Wanawasa Raja Maha Viharas) involving in-depth interviews with senior monks who safeguard this medical lore. Crucially, the researcher also conducted interviews and direct observations with contemporary small-scale practitioners in the Benthara area who still actively perform these rituals. Secondary data were sourced from ancient palm-leaf manuscripts and historical chronicles found in temple archives. The findings reveal that the Benthara medical tradition is a sophisticated blend of pharmacology, symbolic acts (Kem), and vibrational healing (Mantras). A significant discovery is that despite the pressures of modernization, a resilient but diminishing network of small-scale practitioners and monks continues to utilize these methods, primarily for psychosomatic alleviation. The study concludes that these traditions represent a vital yet vulnerable segment of Sri Lanka’s intangible cultural heritage. Therefore, the persistence of these living traditions in Benthara underscore an urgent need for systematic documentation to preserve this unique cultural legacy for future generations.

Keywords: traditional medicine, Kem rituals, mantra practices, Benthara medical lineage, intangible heritage

Trends, Causes and Socio-Economic Issues of Divorce Among Muslims in Batticaloa District

M.H.F. Haseeba, S. Sivakanthan*

Department of Sociology, Faculty of Arts, University of Jaffna, Jaffna, Sri Lanka
**sskanthan@univ.jfn.ac.lk*

Divorce within the Muslim community is a crucial form of marital breakdown. It is an alarming social issue which has resulted prolonged legal battles. Divorce among Muslims, is a personal, socio economic and legal issue. It affects family relationships, child care, the wellbeing of women and the functions of the family. A general objective of this study was to describe the trends, causes and its socio-economic issues and associated factors for divorced partners among the Muslims based on Quazi courts in Eravur and Kattankudy of Batticaloa district. A mixed methods study design was used. Research ethics were strictly followed by the researcher throughout the research. Informed written consent was obtained from each participant prior to data collection. Primary data were collected from August 2025 to January 2026. Questionnaire, case studies, key informant interviews and focus group interviews were employed to collect primary data. Data reliability was assured through Cronbach's alpha test value. Based on the proportionate stratified random sampling technique 209 participants were selected for the study. Qualitative data were analyzed thematically. Survey data were analyzed using descriptive and inferential statistical analysis with the application of SPSS (Version 27). The significant level was set at $p<0.05$. The Quazi court plays a major role in dealing with marriages and divorce under the Muslim Marriage and Divorce Act in Sri Lanka. Results revealed that there was an increasing trend in Faskh type of divorce and there were 1112 cases of Faskh and 515 cases of Talaq reported during the period of 2020-2024. The majority (70.3%) of the divorced persons belonged to the 21- 40 age group. Among the respondents, 67% were females and the majority (63.2%) possessed secondary educational qualifications. The most common types of divorce were Faskh (63.2%) and Talaq (36.8%). Conflict among spouses (20%), domestic violence (18.7%), debt (18.6%), inadequate income (12.3%) and relatives' interferences (18.7%) were the major causes of divorce. Degrading social status (17.9%), social criticism (17.8%), social discrimination (17.7%), issues in relationships between parents and children (32.5%) and dependency (16.4%) were the adverse social impacts of divorce. Stress, sleeping disorder, frustration and poor hope were the adverse psychological impacts of divorce. There was a statistically significant association between education and divorce related decision making ($p=0.009$) and a statistically significant association was observed between income and appealing at civil court to challenge Quazi court's judgement ($p=0.001$). Divorced couples encountered formidable socio-economic and legal challenges. The study recommends that counseling, legal literacy, economic support and community based psychosocial interventions programs would be introduced to educate the risk groups to deal with issues of divorce.

Keywords: alimony, Faskh, gender, Quazi, talaq

Wellbeing, Burnout, and Stigma among Tamil Mental Health Professionals in Post-War Sri Lanka: A Qualitative Inquiry

G. Sarveswaran[1], N.D. Selvaratnam[2]*

[1]*Department of Psychology, Sri Lanka Institute of Information Technology, Malabe, 10115, Sri Lanka*
[2]*Sri Lanka Institute of Information Technology, Malabe, 10115, Sri Lanka*
**naren.d@sliit.lk*

Tamil mental health professionals (MHPs) in post-war Sri Lanka occupy a distinctively complex position. As members of the same ethnolinguistic minority in the Northern Province, the primary theatre of the country's 26-year civil war, they provide psychological care to communities whose collective trauma they intimately share. Despite growing global literature on MHP wellbeing, practitioner experiences in post-conflict, ethnic minority settings remain empirically unaddressed. While the war ended in 2009, its psychological consequences persist: recent events, including the 2025 Chemmani exhumations uncovering over 300 skeletal remains, continue to reactivate collective grief and escalate service demand, underscoring the urgent relevance of this inquiry. This study explored how Tamil MHPs experience and negotiate wellbeing, burnout, and stigma within post-war Sri Lanka, attending to the institutional, communal, and socio-political forces shaping these experiences. A qualitative, constructionist design was employed. Data were collected through individual semi-structured interviews conducted in Tamil with 17 Tamil MHPs, comprising consultant psychiatrists, medical officers of mental health, focal point officers, counsellors, psychiatric nurses, psychiatric social workers, community service officers, GBV officers, rehabilitation therapists, and health service assistants, currently practising across Jaffna and Mullaitivu districts, with professional experience ranging from four to thirty-two years. Participants were recruited through purposive and snowball sampling. Interviews were transcribed verbatim in Tamil and analysed using reflexive thematic analysis, with Quirkos software supporting the organisation and auditability of the analytic process. Six overarching themes were generated: working with layered trauma, navigating systemic barriers, negotiating stigma and resistance against the profession, the emotional and moral cost, workplace as shelter and struggle, and finding meaning and resilience. These themes collectively illuminate how Tamil MHPs experience and negotiate wellbeing, burnout, and stigma within the post-war context. Findings reveal a compounding convergence of structural neglect, collective trauma, professional stigma, and moral burden unique to insider practitioners in post-conflict minority communities. The study calls for culturally responsive occupational support policies and structural reforms within Sri Lanka's mental health system, advancing scholarly understanding of practitioner wellbeing in post-conflict, low-resource, and ethnic minority settings.

Keywords: Tamil mental health professionals, post-war Sri Lanka, burnout, stigma, reflexive thematic analysis

Wheel-Praxis: Negotiating Identity, Faith, and Status on the Sri Lankan Roads

T. Kithsiri*, M. Wijesuriya

Department of Geography, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**thamali.kithsiri@arts.pdn.ac.lk*

In the contemporary Sri Lankan cultural landscape, the vehicle is not merely a means of transportation but a dynamic social space where identity is continuously negotiated, expressed, and contested. This study aims to examine how "wheel-praxis" functions as a performative process of place-making, using material and symbolic traces to transform vehicles into dynamic social spaces of identity, belonging, and status on Sri Lankan roads. Thus, wheel-praxis is a term rooted in the linguistic shift from "three-wheeler" to the more intimate "wheel," reflecting the vehicle's deep integration into Sri Lanka's social space. Within the framework of cultural geography, we define praxis not simply as action, but as a dialectical negotiation between the owner's personal identity and the external landscape; a conversation about who they are and how they choose to be seen. In that context, wheel-praxis functions as a performative practice through which vehicles are transformed into social spaces marked by ethnic, religious, gendered, and regional traces. These traces, ranging from name boards and religious icons to professional permits, are the material signatures that transform a moving vehicle into a meaningful "place". Using an ethnographic methodology centered on prolonged field observation and extensive photo-documentation conducted since 2024, the study captures the lived reality of these subcultures. The research identifies two distinct forms of wheel-praxis: public and personal/private wheel-praxes. In the public wheel-praxis, vibrant and exuberant traces such as front windscreen name boards and dashboard shrines, housing icons of the Buddha, Ganesha, Christ, or the pantheon of Gods, transform working interiors into sacred space. These religious traces coexist with celebratory markers, such as LED lights and high-decibel sound systems, creating a layered environment where identity is spatialized in motion. Conversely, private wheel-praxis operates through a quieter register of traces on privately owned vehicles (motorcars, three-wheelers, and motorbikes), utilizing minimalist religious tokens to anchor the vehicle in a sense of self and faith. Notably, this praxis incorporates institutional traces; professional parking permits for doctors, lawyers, or university lecturers serve as legible markers of professional standing and social status. Ultimately, this research argues that wheel-praxis is a process of place-making, where everyday objects are reclaimed through deliberate traces to stake out belonging and make meaning within a contested social landscape.

Keywords: social spaces, vehicles, wheel-praxis

Theme 5



Designing Adaptive and Purpose-Sriven Architectures for Tomorrow

Management

An Analysis of Factors Driving Psychological Pricing Strategies: A Case Study of the Apparel Retail Industry in Sri Lanka

S.A.K.K. Satharasinghe[1]*, D.V.P. Prasada[2]

[1]*Postgraduate Institute of Agriculture, University of Peradeniya; Department of Management Studies, Sri Lanka International Buddhist Academy, Sri Lanka*

[2] *Department of Agricultural Economics & Business Management, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

**koshalakeshani123@gmail.com*

No show Abstract

Psychological pricing strategies are widely used in Sri Lanka's apparel retail sector, yet empirical evidence on their effectiveness in this emerging-market context remains limited, as most existing research has focused on Western economies where consumer behaviour, income levels, and cultural attitudes toward pricing differ substantially. This study examines the consumer decision-making factors that drive preference for three psychological pricing strategies even-odd pricing, reference pricing, and premium pricing drawing on Prospect Theory (Kahneman & Tversky, 1979), the Anchoring Heuristic (Tversky & Kahneman, 1974), and the Price-Quality Inference Framework (Zeithaml, 1988). Specifically, it investigates how price comparison behaviour, price presentation sensitivity, and price-quality inference differentially influence consumer responsiveness to each strategy. A positivist, quantitative, deductive design was employed, with primary data collected from 61 Sri Lankan apparel consumers via a structured, self-administered questionnaire; given this sample size, findings should be interpreted as indicative rather than generalisable. Six consumer decision-making dimensions served as independent variables psychological pricing consciousness, price presentation sensitivity, value perception orientation, price comparison behaviour, general pricing influence, and price-quality inference beliefs while three composite dependent variables represented the pricing strategies (Cronbach's $\alpha = 0.78–0.81$). Separate multiple regression models (IBM SPSS v.26, $\alpha = 0.05$) showed that reference pricing ($R^2 = .747$) and premium pricing ($R^2 = .803$) were strongly explained by these dimensions, with psychological pricing consciousness the most consistent predictor across both ($\beta = .507$ and $\beta = .672$, respectively), alongside price-quality inference for premium pricing ($\beta = .416$) and price presentation sensitivity for reference pricing ($\beta = .320$). Even-odd pricing showed a weaker but still significant model ($R^2 = .320$), with price comparison behaviour the strongest, though non-significant, individual predictor ($\beta = .378$). Reference pricing elicited the highest mean consumer response ($M = 15.6$, $SD = 2.9$), followed by even-odd pricing ($M = 14.8$, $SD = 3.2$) and premium pricing ($M = 13.4$, $SD = 3.7$). These findings indicate that consumer decision-making orientations particularly psychological pricing consciousness are central determinants of pricing-strategy responsiveness in an emerging South Asian retail context, extending behavioural pricing theory beyond its predominantly Western evidence base. For Sri Lankan apparel retailers, the results suggest that reference pricing and premium pricing offer the most reliable levers for shaping consumer response, provided messaging is tailored to consumers' pricing consciousness and quality inferences, while even-odd pricing may require complementary cues to be effective.

Keywords: psychological pricing, even-odd pricing, reference pricing, premium pricing, consumer decision-making, Sri Lanka, apparel retail, emerging markets

Building Entrepreneurial Resilience under Polycrisis: A Multiple Case Study of SMEs in Kandy, Sri Lanka

G.P.K. Priyadarshani*, K.A.S.S. Kodithuwakku

Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**kanchanap@agri.pdn.ac.lk*

The prolonged COVID-19 pandemic and the subsequent 2022–2024 economic crisis plunged Sri Lankan small and medium enterprises (SMEs) into a polycrisis. This polycrisis was characterised by overlapping demand shocks, input shortages, and institutional volatility, creating intense pressure on business continuity. Although prior research has documented SME vulnerability in isolated shocks, there is limited understanding of how smaller firms in developing economies deploy effectuation and bricolage as complementary adaptive logics to navigate compounded crises over time. There is also limited understanding of how these logics lead to frugal innovation outcomes. The objective of this study is to examine how SME owner-managers in Kandy applied effectual decision-making logic and bricolage practices to survive, maintain operations, and sustain their ventures, with frugal innovation emerging as a key outcome. Adopting an interpretivist, abductive multiple case study design, the study draws on in-depth interviews with ten SMEs selected using snowball sampling. This was complemented by secondary data from documents and online materials. Data analysis followed a Gioia-style thematic approach, integrating within-case and cross-case analyses. The findings reveal that resilient SMEs systematically combined effectuation with bricolage. Effectuation was manifested through means-driven action, affordable-loss experimentation, contingency leverage, and stakeholder co-creation. Bricolage was evident in making-do by repurposing assets, recombining human capital, leveraging informal and institutional networks, and substituting scarce imported inputs with locally available materials. These adaptive logics generated frugal innovation outcomes, including resource-efficient, low-cost solutions such as simplified product bundles, stripped-down service formats, and affordable alternatives built on local inputs. These outcomes enabled SMEs to stabilize cash flow, sustain core operations, and reach more price-sensitive customer segments. By articulating how effectuation and bricolage operate as an integrated behavioural engine that produces frugal innovations under polycrisis, the study extends process perspectives on entrepreneurial resilience in Global South economies and offers implications for policy and practice.

Keywords: effectuation, bricolage, frugal innovation, entrepreneurial resilience, Polycrisis

'Consumer Sovereignty' in the Healthcare Marketplace: Detours and Companions in Navigating the Healthcare Journey of Subsistence Rural Sri Lanka

W.M.H.U. Wijethunga[1]*, S. Gallage[2], P. Sanchez- Compos[2]

[1]*Univerity of Peradeniya, Peradeniya,20400, Sri Lanka*
[2] *University of Nottingham, Nottingham, NG8 1BB, UK*
**heshani114@mgt.pdn.ac.lk*

This research aims to explore how patients in low-income, rural contexts navigate their healthcare journeys when the choices are limited. Sri Lanka was selected for this study due to the multiple complexities in its healthcare landscape, including public and private systems, indigenous and Ayurvedic practices, and a variety of beliefs and home remedies. The research questions were set as: how do low-income patients (in the Global South) with chronic illnesses navigate their care journey? how do these journeys unfold in practice, and who shapes these journeys? And what are the social aspects assisting (or hindering) them in handling access to health care? A qualitative study was conducted, interviewing 40 participants selected using purposive sampling, those who were suffering from chronic illnesses and living in the Kegalle district of Sri Lanka (a district with 18% of households living below the national poverty line). In-depth interviews were conducted in their home settings, while observing some of their health practices and talking through the artefacts (e.g., medicine packs, home remedies, supernatural powers). The customer journey framework (Lemon and Verhoef, 1996) and Bourdieu's forms of capital were used to understand their journey. Customer journey mapping is a framework used to understand people's experience while using a product or a service (in this case, healthcare services), while Bourdieu's framework explains how different contextual factors can either hinder or support those journeys. Thematic Analysis was used to analyse data. Findings indicate that these patient journeys are often complex, involving multiple detours, with companions playing a significant role in navigating these paths. Additionally, these journeys involve risks, yet shaped by economic, social, and cultural capitals, their journeys are enhanced, exposing the complexities of attending patients in such contexts. Often, in these journeys, agency is distributed rather than concentrated in a protagonist's power among patients or health professionals. The responsibility of healthcare decision-making does not lie solely with healthcare professionals and patients. But the community and companions of the journey have a big role to play. The study has important policy implications, highlighting the need to consider companions in designing care pathways, account for detours in building comprehensive health policies, and address the risks patients encounter along these journeys. Strengthening social capital (community) is identified as an important element.

Keywords: healthcare journey, social capital, subsistence markets

Acknowledgement: *This research is funded under the University Research Grants, University of Peradeniya, Sri Lanka (URG/2024/21-MG).*

Employer-Perceived Gen Z Graduate Career Skills Driving Sustainable Employability in Industry 5.0: Evidence from Sri Lanka

W.P.R. Wickramaratne

Department of Human Resource Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
richard@mgt.pdn.ac.lk

Researchers have paid little attention on identifying what specific soft skills graduates should possess to increase their sustainable employability which refers in literature as employees' ability and willingness to remain working now and in future (Van Dam et al., 2017). The research aimed to identify how career skills such as career self-efficacy, career resilience, proactive career behaviour, social intelligence, and innovation capability which are expected from graduates in the current era of industry 5.0 (WMF Report, 2019) influence graduates' employability. The first phase of the study a convenient sample of ten managers were interviewed to refine the existing measurement instruments, while a random sample of 176 managers participated in the survey. Both of the studies were based on managers who served as internship supervisors and industry mentors of the Faculty of Management at the University of Peradeniya, Sri Lanka. The collected data was analyzed using Smart PLS. Career resilience ((β=0.156, t=1.914, p=0.056), proactive career behaviour (β= 0.246, t=2.414, p=0.016), social intelligence (β=0.431, t=4.877, p=0.000), and innovation capability (β=0.296, t=3.208, p=0.001) showed significant positive effects on employers' perceptions of graduate employability. Career self-efficacy did not mediate these relationships, suggesting that such skills may directly shape employer perceptions without necessarily depending on self-belief constructs. These results emphasize the significance of graduates' adaptability, initiative, interpersonal skills, and creativity in enhancing their employability. The modest sample size limits the generalizability of the results. Universities should integrate employability skills: resilience, proactivity, innovation, and social intelligence into curricular whereas employers should design performance management systems and training initiatives that foster proactivity, innovation, and collaborative learning, while graduates must take ownership of continuous learning of these skills. Policy makers should align qualification frameworks with Industry 5.0 skills and promote stronger university–industry linkages. The non-significant effect of employer-perceived career self-efficacy on graduate employability suggests that employers may not consider graduates' career-related confidence when evaluating employability which suggests that the assumptions of Social Cognitive Career Theory (SCCT) may not fully apply in the South Asian context. Future research should investigate the contextual, cultural, and organizational factors underlying this relationship to better understand the boundary conditions of SCCT across different cultural settings.

Keywords: graduate career skills, gen Z, graduate employability, industry 5.0, Sri Lanka

Acknowledgement: *This research was supported by the University of Peradeniya under the grant No. URG/2023/47/Mg.*

Exploring Eco-Innovation Practices in the Coffee Industry: A Multiple Case Study in Central Province, Sri Lanka

K.P.I.I. Weerasinghe*, S. Maheswaran

Department of Operations Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**ishanindunil502@gmail.com*

The global shift toward sustainable operations has prompted industries to adopt eco-innovation practices. In Sri Lanka, the coffee sector is increasingly required to adopt sustainable practices to address environmental concerns and support long-term resilience. The conceptualization and implementation of these practices by coffee manufacturing firms are essential for the sustainability of the industry and the environment. The aim is to explore the conceptualization, operation, and challenges of eco-innovation from the perspective of organizational actors in the coffee manufacturing sector of the Central Province. In particular, this research examined product, process, and supply chain eco-innovation practices to understand the drivers and logic of these sustainable operational changes. This study used a qualitative multiple-case study approach. Data were collected from five coffee manufacturing facilities and explored the subjective meanings and organizational experiences of coffee professionals. Evidence from managers and technical personnel was used to cross-check responses and strengthen the credibility of the findings. The collected data were analyzed using thematic analysis to identify recurring themes across cases. Through a multiple-case approach, the study sought a deep understanding of the "how" questions surrounding eco-innovation practices, enabling the development of contextually grounded theoretical claims about organizational change in this industrial and cultural setting. Results showed that eco-innovation is strategically integrated along the value chain. Product eco-innovations included forest-garden farming, organic farming, and biodegradable packaging. Process eco-innovations included renewable energy use, such as solar poly-tunnels and biogas, and zero-waste circular value chains with 90% biomass reuse through composting and valorization into side products such as cascara tea. Supply chain eco-innovations included direct trade practices, farmer capacity building for regenerative farming, and blockchain-based traceability. These measures enhance product quality, with cupping scores above 84.5, reduce carbon emissions, and support compliance with emerging global regulations such as the EU Deforestation Regulation. As a result, eco-innovation has shifted from a compliance-driven practice to a strategic imperative for the coffee industry, offering differentiation and resilience. The study concluded that institutionalizing life-cycle-oriented sustainability and scaling digital traceability are key to survival and brand legitimacy in the global specialty coffee market. This research provided local evidence of green industrial transition in developing countries, showing the link between environmental sustainability and market excellence.

Keywords: coffee industry, eco-innovation, environmental sustainability, multiple case study, sustainable practices

Exploring the Adoption of Digital Twin Technology in the Sri Lankan Apparel Industry

K.K.N. Pushpakumara*, A.M.A.S.M. Bandara

Department of Operations Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**pushpakumaranalin1@gmail.com*

The global apparel industry is increasingly adopting advanced digital technologies to optimize complex operations and maintain an edge in a highly competitive, fast-paced market. The Sri Lankan apparel industry, which contributes approximately 40% to national export earnings, faces intensifying pressure to optimize operational efficiency, with downtime losses frequently recorded between 18% and 22%. While Industry 4.0 innovations such as Digital Twin (DT) technology, which synchronizes physical assets with virtual replicas, offer significant potential for real-time optimization, their strategic integration remains underexplored, particularly in developing economies. Acknowledging this gap, the study addresses the following research questions: What multidimensional barriers and opportunities influence DT adoption among garment manufacturers, and how can these insights be used to develop a strategic implementation roadmap? Methodologically, the study employed a qualitative research design and conducted semi-structured, in-depth interviews with purposively selected industry experts from leading BOI-registered apparel firms. Data collection concluded after seven interviews, when data saturation was reached. The data were analyzed using thematic analysis to categorize recurring challenges and enablers. The findings highlight a notable 'awareness-execution gap,' in which high knowledge does not translate effectively into shop-floor operations. Moreover, substantial upfront capital costs, concerns over data security, and a lack of specialized technical expertise were identified as major challenges. Furthermore, enhanced real-time visibility, predictive maintenance capabilities, and significantly reduced lead times were identified as potential benefits of adopting DT. To guide this transition, this study proposes a novel six-stage implementation roadmap comprising: (1) Initiation, (2) Adoption, (3) Adaptation, (4) Acceptance, (5) Routinization, and (6) Infusion. The study concludes that navigating DT adoption requires holistic organizational alignment and proactive digital culture building rather than mere technological procurement. These findings contribute a practical, context-specific blueprint for digital transformation in emerging manufacturing economies, offering a clear pathway for the Sri Lankan apparel sector to transition toward data-driven, intelligent manufacturing and secure sustained global competitiveness.

Keywords: apparel industry, digital twin adoption, implementation roadmap, technology adoption, developing economies

Factors Affecting the Employability of Indigenous Medicine Graduates in Tourism and Hospitality Industries

W.A.K.B. Wettasinghe*, D.V.P. Prasada

Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**bhagyawettasinghe@gmail.com*

The expansion of wellness tourism in Sri Lanka has created new employment opportunities for graduates in Indigenous Medicine and related disciplines. Despite this potential, many graduates continue to face difficulties in securing relevant employment within the tourism and hospitality industries. This study examined the factors affecting the employability of Indigenous Medicine graduates by focusing on employer expectations and industry requirements. A quantitative, cross-sectional research design was adopted using data collected through purposive sampling from 62 employers representing hotels, wellness resorts, Ayurvedic medical and recreational centers, and travel agencies. Employer perceptions were assessed across four dimensions: soft and transferable skills, language proficiency, industrial exposure, and curriculum alignment. Data were analyzed using descriptive statistics, correlation analysis, and regression analysis using SPSS. The findings revealed moderate gaps between employer expectations and graduate performance across all dimensions. The largest gaps in soft and transferable skills were observed in communication (Mean Gap = –0.55), leadership (–0.50), and problem-solving (–0.48). In language proficiency, spoken English and workplace English each recorded a mean gap of –0.50. Curriculum alignment showed notable deficiencies in stakeholder involvement (–0.70) and practical training (–0.65). Correlation analysis revealed strong positive relationships between skills gap and language gap ($r = 0.862$, $p < 0.01$), skills gap and industry exposure gap ($r = 0.810$, $p < 0.01$), and language gap and industry exposure gap ($r = 0.742$, $p < 0.01$). Regression analysis indicated that language proficiency and curriculum alignment were marginally associated with internship opportunities at the 90% confidence level. However, the regression model explained only 10.3% of the variance in internship opportunities ($R^2 = 0.103$), indicating that additional factors beyond those examined in this study are likely to influence internship opportunities and graduate employability. The study concludes that a mismatch persists between academic preparation and industry expectations in the wellness tourism sector. Strengthening curriculum design, expanding practical training opportunities, and enhancing collaboration between universities and industry stakeholders are essential to improving graduate employability. These measures will better align graduate competencies with industry needs while supporting the sustainable development of Sri Lanka's wellness tourism sector through the effective integration of indigenous knowledge systems.

Keywords: employability, indigenous medicine, wellness tourism, education, graduate skills

Factors Affecting the Low Adoption of Government Online Services: Special Reference to Uva Province, Sri Lanka

R.M.M.D. Ranmula*, T.S.S. Fernando

Department of Management Studies, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**dularanmula@gmail.com*

The rapid advancement of digital technologies has transformed the delivery of public services through e-government initiatives. Although Sri Lanka has introduced numerous online government platforms to improve efficiency, transparency and accessibility, citizen adoption remains relatively low, particularly in rural regions such as the Uva Province. Despite growing interest in e-government adoption, limited empirical evidence exists on the relative influence of behavioral and technological factors affecting citizens' adoption of these services in the regional context of Sri Lanka. Addressing this gap, this study examines the extent to which trust, awareness, ease of use and digital literacy influence the adoption of government online services among citizens in Uva Province. Guided by the Technology Acceptance Model (TAM), the study extends the model by incorporating these external variables to provide a more comprehensive explanation of citizens' technology adoption behavior in the e-government context. A quantitative research approach based on a positivist philosophy and deductive reasoning was adopted. Primary data were collected through a structured questionnaire administered to 382 citizens in Uva Province who had access to digital devices or the internet. The collected data were analyzed using descriptive statistics, reliability and validity testing, correlation analysis and multiple regression analysis to examine the proposed relationships. The findings reveal that trust, awareness, ease of use and digital literacy significantly influence the adoption of government online services. Among these factors, awareness emerged as the strongest predictor, indicating that inadequate public knowledge regarding the availability and benefits of e-government services is a major barrier to adoption. Trust and digital literacy positively influence adoption by enhancing citizens' confidence and capability to use digital platforms, while the negative relationship observed for ease of use suggests that perceived complexity of existing government platforms discourages their utilization. The Technology Acceptance Model effectively explained e-government adoption by incorporating contextual external variables in developing-country settings. The study recommends enhancing awareness, trust, digital literacy, cybersecurity, and the user-friendliness of government online service platforms. These findings contribute to the knowledge on e-government adoption by providing empirical evidence from rural Sri Lanka and informing policymakers to advance inclusive digital governance and engagement.

Keywords: awareness, digital literacy, ease of use, e-government adoption, trust

Feeling the Brand: How Sensory Experiences Build Equity Through Customer Affective Commitment in Young Consumers

R. Dayaleni*, R.M.U.R.K. Rathnayake

Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**dayaleni14@gmail.com*

Franchised fast food outlets increasingly compete through sensory cues; however, empirical evidence on how sensory brand experiences strengthen brand equity among young consumers in South Asian emerging markets remains limited. This study examined the influence of sensory brand experience (SBE) on brand equity (BE) in Sri Lanka's franchised fast-food industry and tested customer affective commitment (CAC) as the mediating mechanism. A positivist, deductive, and quantitative research design was adopted. Data were collected through a structured survey from consumers aged 18–35 years across Colombo, Gampaha, and Kandy districts using non-probability quota sampling. Following data screening, 361 valid responses were analysed using SPSS. Reliability and validity were assessed using Cronbach's alpha, KMO, Average Variance Extracted (AVE), and Bartlett's test, while hypotheses were tested using correlation, regression, Sobel mediation analysis, and additional dimension wise multiple regression. The results confirmed that SBE significantly enhanced BE ($\beta = 0.276$, $p < .001$) and CAC ($\beta = 0.383$, $p < .001$). CAC recorded a stronger direct effect on BE ($\beta = 0.456$, $p < .001$), indicating that sensory branding improves brand equity mainly when sensory cues generate emotional attachment and commitment to the brand. When CAC was introduced, the direct effect of SBE on BE reduced but remained significant ($\beta = 0.102$, $p = .040$), and the Sobel test confirmed significant partial mediation ($z = 5.99$, $p < .001$). Dimension-wise multiple regression further revealed that visual experience had the strongest effect on brand equity ($\beta = 0.342$, $p = .001$), followed by gustatory/taste experience ($\beta = 0.286$, $p = .002$). This indicates that young consumers' brand equity perceptions in franchised fast-food outlets are shaped most strongly by visual cues and taste-related experiences, while emotional commitment explains how these sensory experiences are converted into brand value. The study provides empirical evidence from Sri Lanka's franchised fast food sector by demonstrating that sensory brand experience enhances brand equity both directly and indirectly through customer affective commitment. Practically, the findings suggest that managers should prioritise coherent visual presentation and taste consistency within broader multi-sensory brand strategies across sight, sound, smell, taste, and touch to build emotional connection, loyalty, and competitive brand positioning.

Keywords: sensory branding, brand equity, customer affective commitment, fast food industry, young consumers, Sri Lanka

From Classrooms to Capital Markets: How Financial Literacy Shapes Investment Decisions Among Management Undergraduates at the University of Peradeniya, Sri Lanka

M.S.F. Jaisha*, S. Yamuna

Department of Business Finance, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**mg20053@mgt.pdn.ac.lk*

Financial literacy is an essential competency that young adults must possess to deal with increasingly complex financial markets. This study examined the impact of financial literacy on investment decisions among final-year undergraduates at the Faculty of Management, University of Peradeniya, Sri Lanka, under the framework of financial literacy by the Organization for Economic Co-operation and Development. Final-year management undergraduates at the University of Peradeniya were selected as representatives of a mature cohort that has completed four years of academic training and is at a critical transition stage in which financial literacy directly influences real-world investment decisions. The study is grounded in the Theory of Planned Behavior, which explains the role of financial attitudes, behavior, and perceived control in decision-making, and the Human Capital Theory, which assumes that individuals learn and improve their skills to make rational decisions and reach long-term economic development. The study is a quantitative study in which a census approach was employed to collect primary data using a structured questionnaire. The questionnaire was administered to 165 undergraduates, and the data was analyzed through descriptive statistics, Pearson correlation analysis, and multiple regression analysis. The findings revealed that financial literacy has a statistically significant positive impact on investment decisions, indicating that higher financial literacy leads to better investment decision-making among undergraduates. However, when financial literacy is decomposed into its four dimensions: financial attitude, financial knowledge, financial behavior, and financial skills, none of them has a statistically significant independent impact on investment decisions. This may reflect the Sri Lankan undergraduate context, where financial literacy is mainly acquired through formal academic coursework rather than practical financial engagement, limiting the independent explanatory contribution of each dimension. Pearson correlation analysis further revealed that financial attitude, financial behavior, and financial skills showed a positive association with investment decisions, suggesting that responsible behavioral and practical competencies collectively support informed investment decision-making. In contrast, financial knowledge showed a negative association with investment decisions, possibly reflecting risk aversion among academically well-informed students who developed awareness of market uncertainties, a pattern common in economies where theoretical knowledge is rarely applied in practice. The study concludes that financial literacy should be recognized as a core competency in undergraduate education, and that educational and policy interventions should prioritize practical learning and the development of the behavioral component alongside theoretical knowledge.

Keywords: financial attitude, financial behavior, financial knowledge, financial skills, investment decisions

Acknowledgment: *This research was supported by the Undergraduate Research Grant, Faculty of Management, University of Peradeniya.*

Gender Inequality and Labor Exploitation among Women Plantation Communities: A Sociological Study in Loolkandura Estate, Deltota Divisional Secretariat

R. Surendran

Department of Sociology, Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka
ravisuren4@gmail.com

Plantation workers in Sri Lanka have historically experienced structural marginalization, economic deprivation, and limited access to social and institutional resources. Within this context, women plantation workers represent one of the most vulnerable groups, as their labor conditions are shaped by the intersection of gender inequality, class exploitation, and institutional neglect. These structural constraints continue to influence their wages, working conditions, and overall quality of life. This study aims to examine the nature and extent of gender inequality and labor exploitation among women plantation workers in the Lower Division of Loolkandura Estate, with a specific focus on wage disparities, working conditions, and access to welfare services. The estate was selected due to its representativeness of mid-country plantation communities where long-standing patterns of labor dependency and socio-economic inequality remain visible and persistent. A mixed-method research design was adopted to capture both the measurable patterns of inequality and the lived experiences of workers. The quantitative component allowed for the identification of general trends, while the qualitative component provided deeper sociological insights into everyday experiences, coping mechanisms, and structural constraints. A purposive sampling technique was used to select 65 women plantation workers engaged in tea plucking and related field activities. Data were collected through structured questionnaires, in-depth interviews, and field observations. Quantitative data were analyzed using SPSS (Version 21), while qualitative data were examined through thematic analysis. The findings reveal that approximately 74% of respondents reported insufficient wages that do not meet basic household needs, while 69% indicated prolonged working hours without proportional compensation. Around 66% of women reported experiencing wage disparities compared to male workers performing similar or less physically demanding tasks. In addition, 71% highlighted job insecurity due to informal or unstable employment arrangements. Access to welfare services also remains limited, with 63% reporting inadequate healthcare and sanitation facilities within estate settings. Despite these challenges, the study found that nearly 58% of women rely on informal coping strategies, including kinship networks, community solidarity, and shared economic practices, to manage daily survival. These findings demonstrate that women workers are not passive victims but active agents navigating structural constraints through collective and adaptive strategies. The study contributes to sociological literature on gender and plantation labor by highlighting the intersection of gender, class, and institutional neglect in shaping labor exploitation. It adopts an intersectional analytical framework to explain how multiple inequalities reinforce each other in plantation settings. Beyond wage reform, the study emphasizes the need for rights-based policy interventions, strengthened labor union representation, gender-sensitive welfare programs, and sustained advocacy campaigns to ensure structural protection and empowerment of women plantation workers.

Keywords: gender inequality, labor exploitation, plantation economy, intersectionality, structural vulnerability

Impact of Green Organizational Culture on Organization Citizenship Behaviour for the Environment (Special Reference to the Sri Lankan Hotel Industry)

T.M.N.S. Dissanayaka*, U.W.G.Y.E. Jayawickrama

Department of Human Resource Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400. Sri Lanka.
**nimeshadissanayaka905@gmail.com*

No Show Abstract

Environmental sustainability has emerged as one of the most critical challenges facing the hotel industry due to its substantial environmental footprint and increasing stakeholder expectations for sustainable business practices. Although hotels continue to invest in green initiatives, the effectiveness of these initiatives largely depends on employees' voluntary behaviour that extend beyond their formal job responsibilities. However, existing research has predominantly focused on Green Human Resource Management practices, while limited empirical attention has been given to the role of Green Organizational Culture in fostering Organizational Citizenship Behaviour for the Environment, particularly within the Sri Lankan hotel sector. Hence, this study investigated the impact of Green Organizational Culture on Organizational Citizenship Behaviour for the Environment, with special reference to four-star hotels in the Kandy District, Sri Lanka. The research is grounded in the positivist research philosophy and adopts a deductive approach using quantitative methods. Specifically, this study examined how key components of Green Organizational Culture, namely Leadership Emphasis, Message Credibility, Peer Involvement, and Employee Empowerment, influence employees' Organizational Citizenship Behaviour for the Environment. Data were collected through a structured, self-administered questionnaire using a five-point Likert scale from 260 frontline employees, selected through stratified random sampling from a population of approximately 816 frontline employees across four departments in 11 four-star hotels in the Kandy District. The collected data were analyzed using descriptive and inferential statistical techniques. The findings revealed that Green Organizational Culture significantly and positively influenced Organizational Citizenship Behaviour for the Environment ($R^2 = 0.552$, $F = 78.643$, $p < 0.001$). Furthermore, all four dimensions of Green Organizational Culture, Leadership Emphasis, Message Credibility, Peer Involvement, and Employee Empowerment, were found to significantly contribute to enhancing employees' voluntary green behaviour beyond their formal job requirements. The findings contribute to the limited body of literature on Green Organizational Culture and Organizational Citizenship Behaviour for the Environment within the Sri Lankan context and provide practical implications for hotel managers seeking to strengthen environmental sustainability practices. This study is limited to selected four-star hotels in Sri Lanka and a relatively small sample size. Future researchers may consider larger and more diverse samples and explore additional factors influencing Green Organizational Culture and Organizational Citizenship Behaviour for the Environment.

Keywords: green organizational culture, leadership emphasis, message credibility, peer involvement

Management of Frugal Innovation and Traditional Ecological Knowledge in Sri Lankan Homestays: Enhancing Sustainability and Backpacker Tourism

B.A.N. Eranda[1], R.H. Kuruppuge[2], D.M.S.M. Dasanayake[2]*, H.R.D.A. Priyantha[2]

[1]*Department of Marketing Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Operations Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**subagya@mgt.pdn.ac.lk*

The global tourism industry is currently witnessing a transformative shift toward "regenerative" travel, where environmental integrity and community empowerment are prioritized over mass-market luxury. For Sri Lanka, this transition is critical for economic recovery, yet a significant gap exists in understanding how local operators utilize ancestral wisdom to remain competitive under resource constraints. The primary aim of this research is to explore how the fusion of Frugal Innovation (FI) and Traditional Ecological Knowledge (TEK) enhances environmental sustainability within the Sri Lankan homestay sector. Specifically, the study objects to investigate the symbiotic relationship between grassroots providers and the backpacker market across four diverse ecological hubs: Sigiriya, Ella, Trincomalee, and Galle. Following an interpretivist philosophy and an inductive approach, the study utilizes a qualitative multiple-case study design across four distinct ecological hubs: Sigiriya, Ella, Trincomalee, and Galle. The primary sampling units comprised diverse supply-side stakeholders, engaged through 20 semi-structured interviews (homestay owners, transport providers, community leaders) and 3 focus group discussions with local tourism societies. Data triangulation was achieved by converging individual narratives with group-level consensus to validate the identified themes. Thematic analysis of the transcripts revealed that environmental sustainability is achieved through six core management themes: (1) Bio-Vernacular Engineering and Canopy Preservation, (2) Ancestral Circularity and Experiential Sustainability, (3) Eco-Logic Construction and Biodiversity Preservation, (4) Resource Efficiency through Traditional Wisdom, (5) Heritage-Driven Circularity and Upcycling, and (6) Social Capital as a Sustainability Tool. Results indicate that "frugal" practices, such as building around the forest canopy and upcycling heritage materials, do not merely reduce costs but serve as primary attractions for the global backpacker market. The study concludes that the symbiosis between local survival strategies and backpacker demand facilitates a resilient, low-carbon tourism model. These findings imply that by formalizing these grassroots innovations, Sri Lanka can establish a scalable blueprint for sustainable development that respects local heritage without requiring high-capital investment or foreign debt.

Keywords: backpacker tourism, frugal innovation, hospitality management, Sri Lankan homestays, traditional ecological knowledge

Acknowledgement: *This research is supported by the University Research Grants of the University of Peradeniya under the research grant number URG/2025/44/Mgt.*

Motivations for Starting Additional Businesses Among Pluriactive Farmers: Evidence from Imaduwa, Galle

S. Kariyawasam[1]*, K.A.S.S. Kodithuwakku[1], N.B. Kandangama[2]

[1]*Department of Agricultural Economics and Business Management, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Newcastle Business School, University of Newcastle, Callaghan, Australia*
**sahangikariyawasam97@gmail.com*

While some farmers continue to engage in farming as their primary livelihood, others become pluriactive by diversifying into multiple income-generating activities alongside farming. It has been argued that farmers may engage in pluriactivity as a strategy for survival and/or capital accumulation. In doing so, they may initiate additional business activities driven by either necessity (push) or opportunity (pull) motivations. Earlier research mainly focused on farmers in the Dry Zone, Sri Lanka. Hence, this research specifically investigates and explores the pluriactivity and related start-up motivations of Wet Zone farmers. This study aims to analyze the motivations driving farmers' engagement in pluriactivity by (i) identifying the types of startup motivations, (ii) examining whether the nature and number of businesses undertaken by pluriactive farmers vary across motivation types, and (iii) assessing whether farmers driven by pull motivations are more likely to engage in pluriactivity. The research was conducted at 13 Grama Niladhari Divisions in Imaduwa, Galle, as a representative of the Wet Zone. Convenience (snowball) sampling was used because no formal sampling frame of pluriactive farmers was available. Data were collected by using a questionnaire survey with 111 farmers who engaged in multiple businesses. Data analysis employed non-parametric tests (Chi-square and Kruskal-Wallis) due to the non-normality of the dataset. Findings of the Chi-square tests revealed three distinct startup motivation categories (push, pull and mixed) with a significant association between motivation type and pluriactivity($P<0.05$). Among households, husbands were the primary decision makers engaged in multiple businesses, and they diversified into one, two, and a maximum of three additional businesses other than farming. Furthermore, among pluriactive farmers, those driven by pull motivations (opportunity-driven farmers) demonstrated significantly higher pluriactivity levels than others($P<0.05$), as found by the Kruskal-Wallis test. The degree of pluriactivity was measured by the total number of businesses started as 2,3 and 4 (agricultural activity + the number of additional businesses). These findings have important implications for rural employment enhancement and poverty reduction initiatives, offering valuable insights for policymakers and development agencies in designing targeted support programs for rural entrepreneurship that facilitate business expansion among farmers.

Keywords: push motivation, pull motivation, opportunity driven, pluriactivity, farmers

Perspective of Bank Employees on the Impact of Green Process Innovation on Green Finance of Sri Lankan Banks

N. Kogularamanan[1]*, S. K. Chandrakumar[2], P. Kuhaparan[3], G. Thaarani[3]

[1] *Department of Accounting, Faculty of Management studies and commerce, University of Jaffna, Jaffna, 40000, Sri Lanka*
[2] *Department of Human Resource Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Business Finance, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**Kogulhub@outlook.com*

The Central Bank of Sri Lanka has positioned green finance as a key aspect for Sustainable Finance Roadmap 2.0. Empirical evidence shows mixed outcomes and greenwashing risks in the annual report, which encourages the stakeholder's perspective to show internal operational realities. This study examines the employee perspective of green process innovation on the intricate interplay of the social, economic, and environmental facets of green financing of Sri Lankan banks. This study employs a quantitative research design using a cross-sectional survey. The target population comprises operational employees of public and private banks in Sri Lanka. Convenience sampling is used to collect data from 240 operational bank employees. It will be collected through a structured questionnaire utilizing a 5-point Likert scale from samples. A 20-item Likert scale assessed green process innovation and three facets of green finance. Those items were adopted from past literature. Statistical analysis employs Partial Least Squares Structural Equation Modeling with a bootstrapping procedure to test the hypothesized relationships between variables. Statistical analysis conducted using SmartPLS4. The measurement model showed internal consistency and reliability. Convergent validity and discriminant validity was confirmed using the Fornell-Larcker criterion. The findings revealed green process innovation significantly impacts all dimensions of green finance. The strongest influence observed on the social element of green finance. The environmental element of green finance & economic element of green finance is also highly influenced by Green process innovation. All paths are statistically significant at 5%. This study concludes that green process innovations are drivers of social, economic, and environmental facets of green finance. Sri Lankan banking policymakers should think about green process innovations in operations to attain social satisfaction and increase economic and environmental performance.

Keywords: green process innovation, green finance, sustainable banking, employee perception, Sri Lanka

Study on Drivers Affecting Sustainable Consumption Behaviour with the Mediating Effect of Minimalism: Evidence from Millennials Referring to the Sustainable Fashion Industry

P.G.J. Sithma*, H.W.R. Niwarthana

Department of Marketing Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**sithmaguruge@gmail.com*

Sustainable consumption within the fashion industry has gained growing global attention, particularly among Millennials who increasingly prioritize ethical and eco-conscious choices. In addition to that, environmentally conscious consumers tend to act in a minimalistic way with their concern for the environment through driving this behavior (Dursan et al., 2016). Hence, embracing minimalism highlight a focus on ecology and sustainability as well (Jain et al., 2023). The fact that environmental concerns influence consumer choices and lead to minimalist practices, it can be assumed that environmental concerns motivates consumers to engage in minimalistic behaviour (Jain, Gupta & Verma, 2023). However, a consistent gap remain between consumers' expressed sustainability concerns and their actual purchasing behaviors as noted in prior researches (Hur & Cassidy, 2019). Therefore, the present study aim to investigate the key drivers influencing Millennials' sustainable consumption behavior in the fashion industry, with the mediating role of minimalism. Through employing the Motivation-Opportunity-Ability (MOA) framework (MacInnis et al., 1991) key drivers were identified including motivational factors, external opportunities and individual abilities to collectively shape sustainable consumption patterns. As the methodology, a quantitative research design was applied by using structured surveys to gather primary data from Millennials in Sri Lanka, where the sample of 384 respondents was selected through convenience and judgmental sampling techniques. Data analysis was conducted by using correlation analysis, regression analysis and the Sobel test to examine the relationship between variables and the mediating effect of minimalism. Notably, the study found that motivation, opportunity and ability was significant predictors in explaining sustainable fashion consumption behavior, while minimalism emerged as a vital mediator that strengthen the link between these behavioral drivers and sustainable consumption decisions. Additionally, the study suggest that though the millennials have the motivation and ability to become sustainable in their consumption, there is lack of opportunity in Sri Lankan context to become sustainable due to the factors such as the limited availability, accessibility, affordability and consumer awareness of sustainable fashion products. With that findings, this study make both an empirical and theoretical contribution by applying the MOA framework with minimalism in explaining the consumer behavior in sustainable fashion Industry. Also, this study provides practical insights for fashion marketers to create a more sustainable fashion industry that aligns with achieving environmental goals through developing and promoting durable, timeless and high-quality apparel aligned with minimalist values.

Keywords: minimalism, millennials, motivation - opportunity and ability (moa) model, sustainable consumption, sustainable fashion

Study on Explore the Minimalist Consumption Behavior Among Sri Lankan Millennials

P.G.S. Jithma*, W.M.H.U. Wijethunga

Department of Marketing Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**suwajinijithma@gmail.com*

Minimalism has emerged as an alternative consumption behaviour that encourages individuals to prioritize limited consumption over excessive material possessions as a response to rising consumerism. Despite the increasing popularity and the recognized significance of minimalism the academic exploration of minimalism remains relatively underexplored. While minimalism is popular in Western societies, its relevance in non-western, collectivist cultures like Sri Lanka remains under researched. This gap restricts the contextual understanding of minimalism as a consumption practice and highlights the need for in-depth exploration. Accordingly, this study explores the adoption of minimalism in consumption among Sri Lankan Millennials by examining their awareness of the concept, attitudes towards its adoption, motivations, barriers, and coping strategies. Guided by an interpretivist research philosophy and a social constructionist perspective the study employed an exploratory qualitative research design to define the problem and generate insights into minimalistic practices among Sri Lankan Millennials. Building on this, the study follows an inductive research approach and a basic qualitative inquiry research strategy is adopted. By following the purposive sampling technique, semi-structured interviews were conducted with 12 Sri Lankan Millennial professionals comprising both male and female participants from varied professional and socio-economic backgrounds. Data were analyzed using thematic analysis, which revealed 12 themes that effectively addressed the research objectives. Findings revealed varying levels of awareness. While some Millennials consciously practice minimalism, others unknowingly follow minimalist principles. Attitudes toward minimalism ranged from viewing minimalism as a sustainable and fulfilling lifestyle to perceiving it as restrictive due to societal expectations. Motivations for adopting minimalism included financial savings, environmental concern, and mental wellbeing. However, notable barriers such as social pressure, cultural expectations, and limited access to sustainable alternatives hinder its broader adoption. This study contributes theoretically by extending the understanding of minimalism within a developing-country context, demonstrating how socio-cultural conditions influence the interpretation and adoption of minimalist consumption beyond existing evidence from developed economies. The study also holds practical implications to policymakers, marketers and sustainability advocates to encourage sustainable consumption patterns in Sri Lanka. It also highlights the need for future research on minimalist behaviours across other generational groups, non-professional Millennials, and examine gender influences on minimalist consumption.

Keywords: millennials, minimalism, minimalist consumption, professionals, sustainability

The Exploration of the Potential Benefits of Implementing E-Procurement for the Procurement of Medicines in the Sri Lankan Public Health Sector

D.M.B.K. Jayasundara*, D.M.S.M. Dasanayake

Department of Operations Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**bhagya.jayasundera@mgt.pdn.ac.lk*

The procurement of medicines in the Sri Lankan public health sector relies heavily on outdated paper-based systems, which cause delays, inefficiencies, and limited transparency, exacerbating medicine shortages and disrupting continuity of health services. E-procurement serves one of the best solutions to address these constraints within the pharmaceutical supply chain. This study aims to explore the potential benefits of implementing e-procurement for medicine procurement in Sri Lanka's public health sector. The study seeks to understand how e-procurement systems can reduce existing constraints and support a more reliable and responsive healthcare supply chain. A qualitative phenomenological research design was adopted to capture the experiences and perceptions of key stakeholders involved in public health procurement. Six participants were selected through purposive sampling based on their direct involvement in procurement and pharmaceutical supply management within public health institutions. The participants included a Senior Assistant Director, Chief Accountant, Senior Procurement Officers, and Pharmacists. Data were collected through semi-structured interviews and analyzed using thematic analysis supported by NVivo software to identify recurring patterns and key benefit themes related to e-procurement adoption. The analysis revealed six key benefit themes. Process efficiency through automation of procurement workflows and digital approvals, cost reduction via streamlined operations, enhanced transparency and accountability through digital transaction records, improved communication and coordination among stakeholders, data-driven decision-making supported by centralized procurement data, and efficient inventory management with real-time visibility across hospitals. Digital records allow stakeholders to track procurement activities in real-time, reducing bias and improving regulatory compliance. Centralized data access enables faster information sharing on orders, suppliers, and prices, while real-time inventory monitoring across hospitals reduces reliance on slow manual communication methods, ultimately supporting a more responsive healthcare supply chain. The findings demonstrate that e-procurement can significantly modernize medicine. These benefits highlight the strategic potential of e-procurement systems to strengthen healthcare supply chains and support reliable access to essential medicines. The study provides valuable insights into future policy

Keywords: e-procurement, public health sector, medicine procurement, pharmaceutical supply Chain

Wallets or Values: A Qualitative Exploration of Price Sensitivity and Environmental Consciousness of Consumers in the Context of Sri Lanka's Single-Use Plastic Bag Levy

R.M.T.D. Rathnayaka*, A.M.A.S.M. Bandara

Department of Operations Management, Faculty of Management, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**tharindudilshan2143@gmail.com*

Sri Lanka has recently introduced a mandatory levy on single-use plastic bags (SUPB), commonly known as *"sili-sili* bags," as a policy intervention to reduce polythene consumption and encourage environmentally sustainable consumer behaviour. Although the levy has contributed to a visible decline in daily SUPB usage, the extent to which such behavioural change is driven by economic costs, environmental values, and contextual factors remains insufficiently understood, particularly in developing-country settings where affordability and convenience strongly shape consumer decisions. This study explores how and why consumer behavioural changes emerged following the introduction of the mandatory SUPB levy in Sri Lanka, with particular attention to the interaction between economic considerations, environmental awareness, convenience, and socio-economic conditions. A qualitative research design was adopted, using semi-structured interviews with a purposive sample of 20 customers from a major supermarket outlet in Kandy. The data collection continued until thematic saturation was achieved. The interview transcripts were analysed using thematic analysis. The findings reveal that all respondents had reduced their use of SUPB and had adopted alternative practices, such as carrying reusable cloth bags. However, the initial behavioural shift was mainly driven by consumers' negative perception of the direct financial cost imposed by the levy rather than by strong pre-existing environmental concern. Over time, repeated engagement in environmentally responsible practices appeared to contribute to the gradual internalisation of these behaviours and an improvement in environmental consciousness among respondents. Nevertheless, the findings also indicate that convenience, situational constraints, and socio-economic differences moderate the extent and consistency of behavioural change. The study concludes that the SUPB levy has been effective in triggering short-term behavioural change, but the long-term sustainability of this change depends on reinforcing environmental awareness alongside economic disincentives. The study is limited to urban supermarket customers; therefore, future research should examine rural consumers and customers of traditional retail outlets to develop a more comprehensive understanding of consumer responses to similar policy interventions. The findings contribute to policy discussions by highlighting the importance of integrated interventions that combine regulatory measures, economic incentives, environmental education, and behavioural reinforcement to promote sustainable consumption practices.

Keywords: plastic bag levy, consumer behavior, environmental consciousness, price sensitivity, green coercion

Theme 6



Unlocking Complexity and Engineering Novel Solutions

Physical & Biological Sciences

A Cross-sectional Survey of Gastrointestinal Parasites in Dairy Cattle in Sri Lanka

K.M.A.I.A. Kumarasinghe*, P.K. Perera, N.U.K. Pathirana, R.S. Rajakaruna

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**s19206@pdn.ac.lk*

Gastrointestinal (GI) parasitism is a major constraint to dairy cattle health and productivity in Sri Lanka, affecting productivity and cattle health. However, data on the islandwide prevalence of GI parasites in dairy cattle is limited. A cross-sectional study investigated the types of parasites, their prevalence, intensity and distribution across Sri Lanka, and assessed the influence of age, physiological status, and farming practices on the infection status. Freshly voided faecal samples were collected from 200 cattle across 25 districts with 8 animals per district from free-grazing and stall-fed farms in Sri Lanka, representing both wet and dry zones, and analyzed using the modified salt flotation method. Infection intensity was measured as eggs per gram (EPG). The overall prevalence of GI parasite infection was 61.5%, with 123 cattle testing positive for one or more parasites. The study found seven groups of GI parasites: strongyles, *Strongyloides, Bunostomum, Moniezia, Paramphistomum*, *Trichuris* and coccidian oocysts. The most prevalent parasites were strongyles (53.5%), followed by coccidian oocysts (35.0%) and *Strongyloides* (30.5%; $\chi^2 = 65.62$, $p = 0.001$). There was no difference in the prevalence of infection between wet zone (54.2%) and dry zone (68.3%; $\chi^2 = 3.62$, $p = 0.057$). Free-grazing cattle exhibited significantly higher infection rates (73.0%) than stall-fed cattle (28.9%; $\chi^2 = 29.81$, $p = 0.001$). Anuradhapura District recorded the highest mean EPG count for strongyles (36.36±19.11), while Colombo recorded the highest mean EPG count for coccidian oocysts (33.33±23.57). Among the animals that had not been dewormed (48.0%), parasitic infections were predominantly observed in vulnerable groups, including calves and yearlings, pregnant cows, and milking cows, with strongyles and coccidian oocysts identified as the common parasites. Most of the cattle examined (94.0%) were adults, of which 95.5% were clinically healthy, indicating many infections may be subclinical. However, these “silent” infections can still impact productivity, and therefore, monitoring and strategic deworming are important.

Keywords: Sri Lanka, gastrointestinal, dairy cattle, prevalence

A Gaussian-Integer-Enhanced Hybrid Cryptosystem Integrating the Rivest-Shamir-Adleman Algorithm, Elliptic Curve Cryptography, and the Chinese Remainder Theorem

K.H.K. Madhuwanthi*, P.G.R.S. Ranasinghe

Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, 20400, *Sri Lanka*
**kanchanam@sci.pdn.ac.lk*

Cryptography plays a vital role in ensuring secure communication in modern digital environments by protecting sensitive information from unauthorized access. Among the widely used public-key cryptographic schemes, the Rivest–Shamir–Adleman (RSA) cryptosystem may incur considerable computational overhead during decryption, particularly for large key sizes, whereas Elliptic Curve Cryptography (ECC) derives its security primarily from the computational difficulty of the Elliptic Curve Discrete Logarithm Problem. This study proposes an enhanced hybrid cryptosystem that integrates RSA, ECC, the Chinese Remainder Theorem (CRT), and Gaussian integer arithmetic into a unified framework to improve both security and efficiency. In the proposed scheme, key generation combines RSA modulus construction with elliptic curve parameter selection, producing a composite modulus along with an elliptic curve base point and corresponding public and private key pairs. During encryption, a random scalar is used to generate a shared elliptic curve point, which is transformed into Gaussian integer form to derive nonlinear masking values that are added to the plaintext prior to RSA exponentiation. The ciphertext consists of the elliptic curve component together with the encrypted masked values. During decryption, the shared secret is recomputed using the elliptic curve private key, the Gaussian masking values are reconstructed, and CRT-based RSA decryption is applied to efficiently recover the masked message before removing the masking to obtain the original plaintext. The correctness of the scheme is verified through mathematical analysis and supported by numerical examples. The security of the system relies on multiple independent hardness assumptions, including the Integer Factorization Problem and the Elliptic Curve Discrete Logarithm Problem, while Gaussian integer-based masking introduces additional algebraic complexity that enhances resistance to cryptanalytic attacks. Complexity analysis indicates that the scheme remains computationally practical, with modular exponentiation in the RSA component constituting the principal computational cost. The proposed construction therefore provides a flexible hybrid framework for further investigation in advanced cryptographic applications.

Keywords: Chinese remainder theorem, elliptic curve cryptography, Gaussian integers, hybrid cryptosystem, RSA algorithm

Analysis of Microplastic Accumulation in Goat Kidney Tissues

N.K. Jayasundara[1]*, W.S.S. Gunathilake[2], P. Abhishek[3], K.K. Wijesundera[4], A.U. Rajapaksha[3]

[1]*Department of Environmental and Industrial Sciences, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3] *Ecosphere Resilience Research Centre, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, 10250, Sri Lanka*
[4]*Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**nirmaj98@gmail.com*

Microplastics (MPs), defined as plastic particles ranging from 5 mm to 1 μm in size, are a global environmental concern due to their potential adverse effects on the environment and living organisms. Though different studies have addressed various aspects of microplastic contamination, less attention has been given to the accumulation of microplastics in goat kidney tissues. This is particularly important because goats are an important livestock species that contributes directly to the human food chain. This study focused on analysing microplastic accumulation in goat kidney tissues. In total, 12 samples were collected from a slaughterhouse managed by the Kandy Municipal Council. For microplastic analysis, tissue samples (mass: 4.000-8.000 g; measured to ±0.001 g) were digested using 10% KOH, followed by density separation using saturated NaCl, and filtered through glass fibre filters (pore size of 1.2 μm). Microplastics were quantified using the Nile Red test. Microplastics were detected in all 12 tested samples, and an average of 2.48±0.65 MPs g^{-1} of microplastic concentration was observed. The most frequently recorded shape was fibre. Most of the extracted microplastics were within the 200 μm to 300 μm size range. Blue particles were the most common colour category, potentially reflecting the widespread use of blue pigments in textiles, ropes, nets and other synthetic materials. Accordingly, this study on goat kidney tissues provides further evidence of microplastic accumulation in terrestrial animals, highlighting their potential impact on animal and human health.

Keywords: accumulation, goat kidney, microplastics, Nile red, terrestrial

An Interpretable Machine Learning Framework for Predicting Boating Accident Severity

S.R. Aryarathna*, S.R. Kodituwakku, L.S. Nawarathna

Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**sraryarathna@gmail.com*

Boating accidents remain a serious issue, threatening human life, property, and the environment, especially in small and recreational vessels where complex interactions occur among human, vessel, and environmental factors non-linearly. Capturing these non-linear and interdependent relationships through traditional statistical approaches remains a significant challenge since those approaches often rely on linear and distributional assumptions that may not be adequate to capture the complex relationships that could exist between the contributing factors. This study develops an interpretable machine learning framework to predict boating accident severity utilizing the Coast Guard's Boating Accident Report Database (2009-2024) of the United States. Following comprehensive data preprocessing, feature engineering, and class imbalance handling using SMOTE, baseline statistical models including Logistic Regression and Support Vector Machine (SVM) were compared with a Feedforward Neural Network and advanced tree-based ensemble algorithms, including Random Forest, Extreme Gradient Boosting (XGBoost), and Light Gradient Boosting Machine (LightGBM). Accuracy, Precision, Recall, F1-Score, and AUC-ROC metrics were used to evaluate and compare performances of above utilized models. Experimental results demonstrate that tree-based ensemble models (AUC-ROC: 0.95-0.96) significantly outperform baseline and neural network approaches due to their inherent ability of capturing non-linear feature interactions present in heterogeneous tabular accident data. LightGBM model was identified as the most suitable model for deployment due to its superior balance of predictive performance, deployment feasibility, and computational efficiency. SHapley Additive exPlanations (SHAP) analysis was incorporated to enhance interpretability and identify key contributing factors of boating accidents. The analysis based on top-ranked SHAP features demonstrated that extensive operator experience and shorter vessel lengths decreased accident severity, whereas rough environmental conditions and machinery failures heightened it. The model also uncovered counterintuitive findings; for instance, a higher number of towed individuals decreased predicted severity, likely reflecting the heavily supervised nature of such recreational activities. Based on these findings, this study further integrates a Large Language Model (LLM) as a recommendation module to translate model outputs into safety recommendations and policy interventions. Overall, this integrated approach demonstrates how interpretable machine learning could deliver accurate predictions while supporting transparent, data-driven decisions for boating accident risk management.

Keywords: boating accident severity prediction, explainable AI, machine learning, tree-based ensemble models

An Optimization Model for Cost-Effective Personalized Diet Planning in Patients with Non-Communicable Diseases and Associated Risk Factors

S.P.C.D. Ilangarathna*, W.B. Daundasekera

Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**chathuriilangarathna729@gmail.com*

Non-communicable diseases (NCDs) and associated risk factors require dietary management that is nutritionally appropriate, affordable, and practical, with patients mainly relying on foods available in their households. However, generating feasible diet plans is challenging when disease-specific nutrient requirements, limited food availability, and cost considerations are to be addressed simultaneously. This study aims to develop an optimization model for generating cost-effective, nutritionally balanced diet plans for patients with any of the five NCDs or associated risk factors: overweight, stage two chronic kidney disease, hypertension, type two diabetes, or high cholesterol. A weighted goal programming model was developed considering only traditional food items in Sri Lanka as decision factors. Nutritional requirements were incorporated as constraints, with specified minimum and maximum intake levels as under- and over-deviational variables to avoid infeasibility. Critical nutrients for each disease were identified, and their relative importance was determined using the Analytic Hierarchy Process (AHP) through pairwise comparisons based on clinical dietary guidelines. Separate AHP models were constructed for under- and over-deviation situations to capture the asymmetric health impacts of nutrient deficiency and surplus. The resulting continuous AHP weights were transformed into discrete penalty multipliers using a threshold-based scaling scheme, while non-critical nutrients were assigned baseline weights to maintain nutritional completeness. These weights were further normalized using nutrient intake ranges to ensure comparability across different measurement units. The objective function minimizes the weighted sum of nutrient deviations together with the total diet cost. Real-world restrictions, including food availability, portion bounds, meal weight limits, and limits on the number of food items per meal, were incorporated to enhance the applicability. Results demonstrate that the proposed model generates feasible best achievable diet plans even when complete satisfaction of all nutrient requirements is not possible, overcoming infeasibility issues associated with rigorous linear programming approaches. The model effectively prioritizes clinically important nutrients while producing affordable and practical meal plans with foods desirable to the user. The study concludes that the proposed approach provides a flexible and robust framework for personalized, cost-effective diet planning under practical limitations. This study can be further extended to patients with multiple diseases.

Keywords: analytic hierarchy process, cost-effective diet planning, non-communicable diseases, weighted goal programming

A Novel Cryptosystem Integrating Cayley Graphs and Gaussian Integers within the ElGamal Framework

S.C. Aryarathna*, P.G.R.S. Ranasinghe

Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**shanka.aryarathna@pdn.ac.lk*

Public-key cryptography has long relied on the computational difficulty of number-theoretic problems, as exemplified by the ElGamal encryption scheme, whose security rests on the Discrete Logarithm Problem. Although classical schemes such as ElGamal provides a well-established framework for public-key encryption, comparatively limited attention has been given to extensions that incorporate graph-theoretic structures and arithmetic over Gaussian integers within a unified cryptographic construction. This study addresses that gap by proposing a novel cryptosystem that integrates the ElGamal framework, Cayley graph theory, and Gaussian integer arithmetic, with the specific objective of designing a scheme in which graph-theoretic masking strengthens resistance to classical cryptanalytic attacks while preserving the algebraic tractability required for correct decryption and verification. The proposed methodology proceeds in four stages. First, the cyclic group is constructed over the Gaussian integers modulo a prime, chosen so that the Gaussian integers exhibit suitable arithmetic properties within the group. Second, key generation selects a generator of the multiplicative group and constructs the corresponding Cayley graph using this generator as the generating set, with graph-theoretic masking implemented via modular exponentiation based on path length within the graph. Third, encryption produces a two-component ciphertext in the Gaussian integer domain, jointly encoding confidentiality and an authentication tag for message integrity. Fourth, decryption is performed through modular inversion using the real and imaginary components of the ciphertext, with verification achieved through congruence relations in the Gaussian integer setting. Security is analyzed by examining how the interaction between the algebraic graph structure and the underlying number-theoretic operations introduces additional randomness and computational complexity relative to standard ElGamal. The results demonstrate that this graph-theoretic masking layer meaningfully increases resistance to classical cryptanalytic techniques while maintaining correctness of decryption and verification. Beyond its immediate security implications, the proposed approach demonstrates that multivariate algebraic constructions combining group theory, graph theory, and number theory offer a viable and promising direction for designing more sophisticated public-key encryption schemes.

Keywords: Cayley graphs, discrete logarithm problem, ElGamal cryptosystem, Gaussian integers, public-key encryption

Antibacterial Activity of Propolis and Honey of the Stingless Bee *Tetragonula Praeterita* on Biofilm Forming *Staphylococcus Aureus*

B.H.O.M. Peiris[1], A.D.S.N.P. Athukorala[2], D.R. Uduwela[3], W.A.I.P. Karunaratne[1]*

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Chemistry, Faculty of Science, University of Colombo, Colombo, 00300, Sri Lanka*
[*]*inokap@sci.pdn.ac.lk*

The global rise of antibiotic-resistant bacterial infections, intensified by biofilm formation that protects bacteria from antibiotics and immune defenses, requires alternative antimicrobial agents. This study investigated the antibacterial and antioxidant activities of honey and propolis produced by the endemic stingless bee *Tetragonula praeterita*, focusing on their effects against biofilm-forming *Staphylococcus aureus*. Raw honey and propolis were collected from *T. praeterita* hives in Bibile, Sri Lanka in March 2025, using sterile methods to preserve bioactive compounds. Propolis extracts were prepared via maceration in 50% ethanol, followed by rotary evaporation and freeze-drying, while honey was filtered and stored. The bioactivities were assessed from total phenolic content (TPC) by Folin-Ciocalteu method and total flavonoid content (TFC) by aluminum chloride colorimetric assay. Antioxidant capacity was assessed by DPPH radical scavenging assay, with ascorbic acid as the positive control. Antibacterial efficacy against *Staphylococcus aureus* was evaluated using standard agar well diffusion assays using extracts prepared by propolis and dilutions of honey. Results demonstrated that *T. praeterita* propolis possessed significantly higher TPC and TFC compared to honey, with propolis containing approximately 183.8 ± 31.9 mg pyrogallol equivalents per gram and 6.4 ± 0.9 mg quercetin equivalents per gram, while honey showed lower phenolic content which is 12.0 ± 2.5 mg PGE/ g and negligible flavonoids. Further, propolis exhibited a stronger antioxidant effect, with an IC_{50} value of 413.5 mg/dm^3 in DPPH assay, contrasting with much weaker activity in honey (IC_{50} between 150,000-200,000 mg/dm^3). Agar well diffusion tests revealed antibacterial activity in both honey and propolis against *S. aureus* biofilms. Propolis showed its minimum antibacterial activity around 50%-60% (v/v) dilutions of crude extract, while honey showed its minimum antibacterial activity between 45%-50% (v/v), while higher concentrations are limited by diffusion rate and viscosity effects. These findings showed the potential of therapeutic activity of *T. praeterita honey* and propolis as natural antimicrobial and antioxidant agents, offering promising alternatives or complements to conventional antibiotics. Future work should focus on *in vivo* efficacy, deeper phytochemical characterization, molecular mechanisms, and clinical validation to develop standardized formulations harnessing these natural antimicrobials.

Keywords: *Tetragonula praeterita*, *Staphylococcus aureus*, propolis, polyphenols, flavonoids

Antifungal Activity of Propolis and Honey from Stingless Bees, *Lisotrigona Cacciae* and *Tetragonula Iridipennis* Against *Candida Albicans*, the Causative Agent of Oral Candidiasis

V.G.P.A. Nissanka[1], A.D.S.N.P. Athukorala[2], D.R. Uduwela[3], W.A.I.P. Karunaratne[1]*

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Chemistry, Faculty of Science, University of Colombo, Colombo, 00300, Sri Lanka*
**inokap@sci.pdn.ac.lk*

Oral candidiasis, primarily caused by *Candida albicans*, is a significant clinical concern due to increasing antifungal resistance and the limitations of current therapies. While propolis from various *Tetragonula* species has globally demonstrated potent antifungal activity against *Candida* spp., the therapeutic potential of native Sri Lankan stingless bee products remains largely uncharacterized. This study seeks to bridge this gap by investigating the biochemical profiles and antifungal efficacy of honey and propolis from *Tetragonula iridipennis* and *Lisotrigona cacciae* against *C. albicans* (ATCC 90028) to evaluate their suitability as therapeutic agents. Samples were collected from Bibila, Sri Lanka, and propolis was extracted using 70% ethanol by maceration. Total phenolic content (TPC) was quantified using the Folin-Ciocalteu assay, while total flavonoid content (TFC) was determined by the aluminum chloride method. The DPPH radical scavenging assay was used to evaluate the antioxidant activity. Antifungal activity was evaluated using the agar well diffusion method and susceptibility to conventional antifungal drugs (fluconazole, miconazole, itraconazole, and nystatin) was also assessed. *Tetragonula iridipennis* propolis demonstrated the highest TPC (10.46±1.73 mg pyrogallol equivalents per g) and TFC (369.51±293.69 mg quercetin equivalents per g), significantly exceeding the levels found in honey and *L. cacciae* products. The high variability in TFC likely reflects the limited replication of this preliminary study. Antioxidant activity was associated with the levels of bioactive compounds. Propolis extracts exhibited IC_{50} values between 245 and 290 ppm, indicating stronger antioxidant activity, whereas honey samples showed minimal antioxidant activity (IC_{50} > 144,000 ppm). Neither propolis nor honey produced inhibition zones against *C. albicans*, indicating no detectable antifungal activity under the tested conditions. In contrast, commercial drugs showed varying efficacy, with itraconazole being significantly more effective ($p=0.032$), followed by nystatin, fluconazole, and miconazole respectively, confirming assay reliability. This research establishes baseline biochemical profiles, suggesting that foraging habits such as lachryphagy in *L. cacciae*, influence product potency compared to generalist foragers like *T. iridipennis*. Overall, his study provides the first comparative biochemical and antifungal evaluation of Sri Lankan stingless bee products, revealing species-specific biochemical differences but limited antifungal activity against Candida albicans under the conditions tested, highlighting the need for further investigation using alternative extraction methods, concentrations, or antifungal assays.

Keywords: *Candida Albicans*, Sri Lanka, stingless bee products, antioxidant activity, antifungal activity

A Processable UIO-66–Chitosan–Activated Carbon Composite for Scalable Pb(II) Removal from Aqueous Solutions

R.M.H.Y. Rajapaksha[1,5], T.M.M. Marso[2,4], N.P. Liyanage[3], N.P.W. Rathuwadu[1], S.B. Alahakoon[3]*

[1]*Institute for Combinatorial Advanced Research and Education (KDU-CARE), General Sir John Kotelawala Defence University, Ratmalana, 10390, Sri Lanka*
[2] *Department of Chemical Sciences, Southeastern University, Sammanthurei, 32200, Sri Lanka.*
[3]*Department of Chemistry, Faculty of Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4] *Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[5]*Faculty of Graduate Studies, General Sir John Kotelawala Defence University, Ratmalana, 10390, Sri Lanka*
**sampath.alahakoon@sci.pdn.ac.lk*

Wastewater contamination by toxic heavy metals such as Pb(II) remains a critical environmental challenge due to their persistence, bioaccumulation, and associated health risks. Although metal–organic frameworks (MOFs), particularly UiO-66, exhibit high surface area and tunable porosity for metal removal, their practical application is often limited by poor processability and handling characteristics. In this study, a processable hybrid adsorbent (MOF–CH–AC) was developed by integrating zirconium-based UiO-66, chitosan, and activated carbon (Zr^{4+}: Ligand: AC (weight ratio) = 1.41: 1: 2.10) (MOF-AC: chitosan gel= 0.1 g: 2 ml) to combine high adsorption efficiency with improved structural integrity. Chitosan served as a functional biopolymer that enhanced processability and provided additional binding sites, while activated carbon improved textural properties and stability. The MOF–AC composite was first prepared, and subsequently incorporated into a chitosan matrix via a coating process. The composite was characterized using PXRD, SEM, FTIR, and TGA, confirming successful integration and structural stability. Batch adsorption experiments were performed to evaluate Pb(II) removal under controlled conditions (6 h, 25 ℃, 160 rpm), with pristine UiO-66 used for comparison. Following pH optimization, pH 6.0 was selected as the optimum pH and used for all subsequent batch adsorption studies. The correlation coefficient (R^2) was used to evaluate equilibrium isotherm fitting. The adsorption data fitted the Freundlich isotherm better than the Langmuir model, indicating heterogeneous and multilayer adsorption. The maximum adsorption capacities for MOF–CH–AC composite (R^2 = 0.99) and UiO-66 MOF (R^2 = 0.95) were 342.95 mg/g and 396.3 mg/g, respectively. Kinetic studies revealed that the pseudo-second-order model best described the adsorption process, suggesting chemisorption as the dominant mechanism. Although the composite contained less MOF than pristine UiO-66, its adsorption capacity remains comparable, indicating a synergistic effect among MOF, activated carbon, and chitosan. Improved MOF dispersion and additional functional groups enhanced active-site utilization, maintaining high adsorption performance despite reduced MOF content. Overall, the MOF–CH–AC composite presents a promising strategy for translating high-performance MOF materials into cost-effective, reusable in scalable adsorbents for water treatment.

Keywords: Uio-66, MOF composite, chitosan, activated carbon, adsorption

Acknowledgement: *The authors express gratitude to the Institute for Combinational Advanced Research & Education and, the General Sri John Kotelawala Defence University, Ratmalana for the financial support (Grant No: KDU/RG/2022/CARE/001) and gratefully acknowledge Haycarb PLC for providing activated carbon and Alpex Marine (Pvt) Ltd. for supplying prawn shell samples used in this study*

Association Between Midgut Microbiota and Pyrethroid Resistance in Dengue Vector Mosquitoes *Aedes albopictus*

P.B. Athukorala*, W.A.P.P. de Silva

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**pyaraathukorala99@gmail.com*

The increasing threat of insecticide resistance in *Aedes albopictus*, one of the primary mosquito vectors of arboviruses, presents a significant challenge to mosquito control programmes. This study investigated the possible association between glutathione S-transferase (GST) based pyrethroid resistance and the midgut microbiota in selected *Ae. albopictus* populations in Kandy, Sri Lanka. *Aedes albopictus* larvae were collected from artificial breeding sites and reared to adults (n = 195), which were then subjected to WHO-standard insecticide susceptibility bioassays using pyrethroid lambda-cyhalothrin (0.08%). Based on bioassay outcomes, resistant (n = 10), susceptible (n = 10), and control (n = 10) mosquito groups were selected for microbiological analysis. Culturable midgut bacteria were isolated, morphologically characterised, and quantified using Colony-Forming Units (CFU). Glutathione S-transferase (GST) activity, a key marker of metabolic resistance, was quantified by a biochemical assay in insecticide-exposed mosquitoes. Bioassay results indicated possible resistance to lambda-cyhalothrin, with a mean mortality of 93.81%, below the WHO threshold for full susceptibility. A total of ten catalase-positive bacterial morphotypes (M1–M10) were isolated from mosquito midguts. Morphotypes M1–M5 were present in resistant, susceptible, and control groups, whereas M6–M9 were unique to susceptible mosquitoes, and M10 was detected exclusively in resistant mosquitoes. Morphotypes M1–M9 were Gram-positive, while M10 was Gram-negative. Independent t-tests showed that resistant mosquitoes had significantly higher CFU counts of morphotypes M3 ($p = 0.0044$), M4 ($p = 0.0043$), and M5 ($p = 0.0005$), whereas morphotypes M1 ($p = 0.0001$) and M2 ($p = 0.0051$) were significantly more abundant in susceptible mosquitoes. Results indicate possible resistance to lambda-cyhalothrin in the studied *Ae. albopictus* population, with elevated GST activity (mean ≈ 5.3 µmol/min/mg protein), indicating metabolic detoxification as a potential resistance mechanism. The distinct gut bacterial profiles observed between resistant and susceptible mosquitoes indicate an association between midgut bacterial composition and insecticide susceptibility, providing a basis for future studies investigating the functional role of mosquito microbiota in insecticide resistance.

Keywords: *Aedes Albopictus*, GST activity, gut microbiome, insecticide resistance, pyrethroids

A Study on Optimizing Duration and Cost Management in a Housing Construction Using Critical Path and Multi-Period Cash Flow Methods

M.N. Fathima*, W.B. Daundasekera

Department of Mathematics, Faculty of Science, University of Peradeniya, 20400, Sri Lanka
**fathima.nazim@sci.pdn.ac.lk*

Project Management is a field in Operational Management which focuses on completion of a project in minimum possible time with a least construction cost. In literature, two widely used techniques for project scheduling are Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT). CPM assumes that the duration of each activity is deterministic, whereas PERT assumes that the duration is probabilistic. Construction projects often experience delays, cost overruns, and failure to meet scheduled completion dates. This study addresses these issues by applying CPM for project duration optimization and a Multi-Period Cash Flow model for cost management, aiming to improve overall project efficiency and financial control in a housing construction. The construction activities were identified along with their logical relationships and, their normal time and crash time durations. A network was constructed to visualize the sequence and dependency of activities. Two linear programming (LP) models were formulated to determine the respective earliest and latest start times of each activity, thereby identifying the critical activities and hence, the optimum duration. Using the solutions of the LP models, a Gantt chart was drawn to portray the project's activities over time. To evaluate the feasibility of project crashing, a multi-objective LP model was developed incorporating crash time and crash cost of each activity. By solving the model iteratively, a cost–time trade-off curve was generated, providing clear insight into the relationship between project duration and the total cost. Finally, a Multi-Period Cash Flow model was developed to optimize fund allocation by investing available capital in financial institutions over optimum time periods. The model was enhanced by incorporating institutions' risk ratings into the investment decisions. The results indicate that significant time reduction can be obtained with a minimal increase in total cost. The project duration was reduced by 39 days at an additional crashing cost of Rs. 135,400. The cash flow model indicates that investing Rs. 5,421,190 can generate savings of Rs. 879,348 while meeting project expenditure requirements. This study shows a more practical and mathematical programming approach to incorporate project completion time, construction cost and financial management in the most favorable manner.

Keywords: Cost-Time Trade-Off Curve, critical path method, linear programming, multi-period cash flow, project crashing

A Time-Frequency Framework for Adaptive Spectral Representation of Music Signals

K.H.K. Madhuwanthi*, P.G.R.S. Ranasinghe, V.R.M. Vinodya, K.D.K. Egodawele

Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka

**kanchanam@sci.pdn.ac.lk*

Time-frequency analysis is widely used for studying non-stationary signals whose frequency content changes over time. In Short-Time Fourier Transformation (STFT) analysis, the selected window function plays a critical role in controlling spectral leakage, harmonic resolution, and time-frequency localization. As a result, window optimization is important in applications such as biomedical signal processing, music analysis, radar systems, and vibration diagnostics, where accurate spectral representation is essential for reliable interpretation. This study proposes a tunable hybrid Hann-Kaiser window constructed as a convex combination of the classical Hann and Kaiser windows to achieve adaptive spectral behavior in time-frequency analysis. The proposed framework aims to balance smoothness, localization, and spectral concentration while reducing spectral leakage and preserving signal energy in non-stationary music signals. The hybrid window introduces a controllable parameter that governs the transition between Hann-like smoothness and Kaiser-like spectral sharpness, enabling adaptive optimization under varying acoustic conditions. The proposed framework combines theoretical analysis with computational simulations using Python-based STFT implementations on real-world music signal datasets. Performance evaluation is carried out using time-frequency concentration, ambiguity-function analysis, sidelobe suppression, spectral leakage behavior, and smoothness-related metrics. Particular attention is given to understanding the relationship between ambiguity concentration and localization performance, together with the trade-off between spectral sharpness and edge smoothness. The expected results indicate that the proposed hybrid window achieves an effective balance between localization and smoothness. Smaller α values improve ambiguity concentration and time-frequency localization, while larger α values enhance smoothness and reduce edge oscillations. Intermediate parameter values provide a balanced trade-off, yielding improved harmonic localization, reduced spectral spreading, leading to enhanced harmonic resolution and more accurate musical feature extraction. In conclusion, the proposed hybrid Hann-Kaiser window provides a flexible and energy-efficient framework for adaptive time-frequency analysis by enabling controllable trade-offs between localization and smoothness. The results demonstrate its potential for improved spectral representation and transient signal preservation in non-stationary signal environments.

Keywords: ambiguity function, localization, STFT, time frequency analysis, window function

Acknowledgement: *This research is supported by the University Research Grant Year 2024 (Grant No. URG 2024/41/S) awarded to the Principal Investigator, Dr. P.G.R.S. Ranasinghe, Department of Mathematics, University of Peradeniya.*

A Topological Data Analysis Assisted Machine Learning Pipeline for Analysing Financial Time Series

D.G.J.N. Dinanjalee[1]*, J.K. Ratnayake[2], S. Abeysundara[3], A.K. Amarasinghe[4]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya 20400, Sri Lanka*
[2]*Department of Mathematics, Faculty of Science, University of Sri Jayewardenepura, 10250, Sri Lanka*
[3]*Department of Statistics & Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**jayanig9@gmail.com*

Financial time series prediction faces significant challenges due to nonlinearity, heavy noise, and non-stationarity, which pose significant limitations for traditional statistical methods. This study introduces a novel Topological Data Analysis (TDA) pipeline integrated with machine learning for predicting stock market returns. Daily log return series are converted into point clouds using Takens' delay embedding with a dimension of $d = 2$ and a delay of $\tau = 1$, followed by computation of H_1 persistent homology through Vietoris-Rips filtration. The resulting persistence diagrams are vectorized into Betti curve features, that quantify the evolution of loop structures across different scales. We have shown that if two log return series differ by at most ε in the ℓ_∞ norm, their Betti curve features differ by at most $2n\varepsilon\sqrt{d}$ in the L_1 norm. This is an extension of the Cohen-Steiner persistence stability theorem which ensures the pipeline's robustness to perturbations in input data. The methodology is tested on five major market indices (S&P 500, DJIA, Russell 2000, NASDAQ, and FTSE 100) spanning historical periods from 1927 to 2026, using Linear Regression, Support Vector Regression, Random Forest, and XGBoost models with an 80/20 train-test split. The results show that nonlinear models consistently perform better than the Linear Regression across all indices, with Random Forest achieving the best overall performance (Mean Squared Error ranging from 19.98 to 284.64 USD. The performance of nonlinear models suggests that topological features capture complex geometric patterns in time series. This research bridges topology, machine learning, and finance, providing practical value of TDA in extracting predictive information from financial time series.

Keywords: Betti curve, financial time series, persistent homology, Takens' embedding

Acknowledgement: *Financial assistance from the University Research Council* (*Grant No 444*) *is acknowledged.*

Avian and Plant Diversity of the Blue-Green Space around Kandy Lake, Sri Lanka

D.M.C.C. Jayawardena[1]*, A.M.T.A Gunaratne[1], D.R.G.W.B. Ellepola[1], M.M.B. Dehideniya[1], H.D.P. Premarathne[2]

[1]*Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Faculty of Arts, University of Peradeniya, Peradeniya,20400, Sri Lanka*
**chathupajayawardena@gmail.com*

The Kandy Lake is an urban blue-green space in Sri Lanka with ecological, recreational, and cultural importance. Studying plant and bird diversity in such spaces enables understanding ecosystem functioning, urban biodiversity, and their role in human well-being. The objectives of the present study were to investigate the diversity of plants and temporal variation in bird diversity around the Kandy Lake. Field surveys were conducted from April 2025 to April 2026 at ten fixed sampling points around the lake to record tree and bird species. Shannon-Wiener Index and Evenness were used to assess diversity patterns among sites. A total of 566 trees belonging to 27 families, 63 genera, and 72 species were documented, with plant diversity varying markedly among sites (Shannon-Wiener Index: 0.69-2.04; Evenness: 0.86-1.00). Exotic tree species accounted for 61% of the flora. No endemic plant species were recorded. The most abundant planted tree species included *Terminalia arjuna* (Kumbuk) (13.25%), *Mangifera indica* (Mango) (11.48%) and *Tabebuia rosea* (Robarosia) (9.71%). A total of 4,375 bird sightings were recorded, representing 29 bird species belonging to 16 families and 9 orders, with moderate fluctuation across sites (Shannon-Wiener Index: ~1.56-2.38; Evenness: ~0.51-0.80). Resident bird species dominated the bird community (82.6%), while introduced species represented 17.4%. The three most common bird species included *Microcarbo niger* (Little Cormorant) (24.94%), *Egretta garzetta* (Little Egret) (16.31%) and *Corvus splendens* (Common House Crow) (13.02%). Carnivores dominated dietary guilds (43.5%), followed by omnivores and piscivores (21.7%). Bird diversity peaked after the 3rd week and declined during cultural events due to disturbance. A peak in bird count occurred between 8th and 10th weeks. The pronounced decline was observed around 15th to18th weeks. The bird diversity shows a positive correlation with plant diversity. The findings highlight the ecological value of Kandy Lake as an urban blue-green space and emphasize the need for conservation and sustainable management of urban blue-green spaces.

Keywords: biodiversity, blue-green spaces, conservation management, Kandy Lake, urban ecology

Barcode-Encoded Paper-Based Analytical Device for Ascorbic Acid Quantification

R.P.A. Wijesinghe*, M.N. Kaumal

Department of Chemistry, University of Colombo, Colombo 00300, Sri Lanka
**rashmianuradha2000@gmail.com*

Reliable quantification of ascorbic acid (AA) is vital for human health and food quality monitoring, but traditional lab methods demand instruments and trained personnel. This research introduces a practical alternative, a non-enzymatic paper-based analytical device (PAD) that uses a distance-based readout system paired with digital barcode technology for point-of-care AA testing in resource-limited environments. This device was developed by coating chromatography paper with a Prussian Blue (PB) sensing matrix stabilized in a Chitosan-PVP polymer framework. When a sample containing AA moves through the paper via capillary wicking, it reduces the deep blue PB to colorless Prussian White. The distance this color change travels directly correlates with AA concentration. To make this measurable by standard smartphones, the device was integrated with a Code 39 barcode pattern that converts the chemical signal into machine-readable data. Testing showed the device works reliably across 0.1–1.0 mM AA concentrations, with a detection limit of 0.06 mM. It resisted interference from common substances like citric acid and glucose, confirming satisfactory selectivity. The device was validated against traditional iodometric titration using a paired t-test, finding no significant difference between methods ($p > 0.05$). The barcode readout system achieved a 90% success rate in digital capture. This approach is suitable as a point-of-care device due to its simplicity and accessibility. The device is inexpensive to manufacture, requires no specialized equipment, and produces results that any smartphone can read. This bridges an important gap turning chemical sensors into actionable digital data without relying on expensive instruments or internet connectivity.

Keywords: ascorbic acid, paper-based analytical devices, Prussian blue, barcode-enabled biosensing, point-of-care diagnostics

Benzylation-Modified *Tephrosia purpurea* as a Natural Stationary Phase for Packed Column Chromatographic Applications

P.P.G.I.P. Bandara[1]*, T.C. Ariyasena[2]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya 20400, Sri Lanka*
[2]*Department of Chemistry, University of Peradeniya, Peradeniya 20400, Sri Lanka*
**pathumuniversity97@gmail.com*

The use of synthetic stationary phases such as silica gel and alumina in packed-column chromatography presents environmental and economic limitations, particularly in developing countries. Therefore, there is increasing interest in developing sustainable and cost-effective alternatives. In this study, *Tephrosia purpurea* (Kathurupila), a locally abundant lignocellulosic biomass rich in surface hydroxyl groups, was investigated as a promising natural stationary phase because of its suitability for chemical functionalization. Before chemical modification, the plant material was sequentially washed with acetone and toluene to preferentially remove extractable polar and non-polar organic constituents, respectively, thereby minimizing potential interference from naturally occurring compounds during chromatographic analysis. The stem and root powder was subsequently treated with 10% (w/v) sodium hydroxide and chemically modified by benzylation with benzyl chloride to enhance hydrophobic interactions. Successful surface modification was confirmed by a mass increase of approximately 12.48% and characterized by Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Thermogravimetric Analysis (TGA), Energy-Dispersive X-ray Spectroscopy (EDS), and Gas Chromatography (GC). Chromatographic performance was evaluated using colored dyes (azo violet, metanil yellow, and alizarin red S), followed by colorless analytes (naphthalene and anthracene), with benzene as the non-retained solute under different mobile-phase systems. The benzylated *Tephrosia purpurea* stationary phase significantly improved chromatographic performance, yielding retention factors of 2.72–4.09, selectivity factors of 1.14–1.85, and separation efficiencies of 82–91% for colored dyes, compared with 71–77% for the unmodified material (300 µm particle size, 0.375 g cm^{-3} packing density). For colorless compounds, retention factors increased from 0.26–1.09 to 0.53–1.75, selectivity increased from 2.23 to 4.82, and separation efficiency improved from 79–82% to 92–94%. A preliminary cost analysis indicated an approximately 75% reduction in preparation cost compared with commercially available silica gel and alumina. Overall, benzylation markedly improved chromatographic performance, establishing the modified Tephrosia purpurea as a promising, sustainable, and cost-effective stationary phase for packed-column chromatography. However, further studies are required to evaluate its long-term stability, reusability, and scalability

Keywords: *Tephrosia Purpurea*, benzylation, natural stationary phase, packed-column chromatography, surface modification

Acknowledgement: PGIS Research Grant No: PGIS/2022/07 is acknowledged.

Biodegradability and Hemocompatibility of Polycaprolactone/Curcumin/Chitosan-Hydroxyapatite Electrospun Nanofibers for Vascular Graft Fabrication

S.P.P.M. Perera[1], K.M.N. de Silva[1], R.M. de Silva[1,2]*

[1]*Center of Advanced Materials and Devices, Department of Chemistry, Faculty of Science, University of Colombo, 00300, Sri Lanka*
[2]*Department of Biomedical Sciences, NSBM Green University, Pitipana, Homagama, 10206, Sri Lanka*
**rohini@chem.cmbac.lk*

Electrospun nanofiber (NF) mats offer significant advantages for biomedical applications, including high surface-to-volume ratios, biomimetic extracellular matrix-like structures, and the capacity to incorporate bioactive agents. This study tested the hypothesis that incorporating curcumin (Cur) and Chitosan-Hydroxyapatite (CS/HAP) composites into electrospun polycaprolactone (PCL) nanofibers would modify scaffold degradation behavior while improving hemocompatibility for potential small-caliber vascular graft applications. Although PCL-based electrospun scaffolds have been widely studied, limited work has systematically evaluated the combined effect of Cur and different CS/HAP ratios on biodegradation and hemocompatibility in the context of small-caliber vascular graft fabrication. In this study, five distinct NF mats were electrospun: neat PCL, PCL + CUR, PCL + CUR + CS/HAP (50/50), PCL + CUR + CS/HAP (80/20), and PCL + CUR + CS/HAP (20/80). CUR encapsulation was verified using fluorescence microscopy, and quantitative assessment revealed the highest loading capacity (LC: 35.6 ± 1.5 mg/g) and encapsulation efficiency (EE: 74.7 ± 3.2%) in the PCL + CUR + CS/HAP (80/20) variant. This enhancement is attributed to favorable electrostatic interactions and hydrogen bonding between CUR and the high-CS-content composite. All five mats exhibited high porosity (>80%), which is important for cell infiltration and nutrient transport. Biodegradability was evaluated under physiological conditions (PBS, 37 °C, pH 7.4) over 8 months. Among all the mats, neat PCL NFs exhibited the fastest degradation (~80% weight loss in 8 months), likely due to their porous morphology and high surface area, which enhance hydrolytic accessibility. However, PCL + CUR exhibited the slowest degradation rate (~50% weight loss over 8 months) because CUR's hydrophobicity impedes hydrolysis. CS/HAP incorporation accelerated degradation compared to PCL + CUR alone, consistent with CS's hydrophilic nature promoting water ingress and hydrolytic/enzymatic breakdown, and with HAP's role in increasing surface roughness. Hemocompatibility assessments confirmed that all CS/HAP-incorporated variants induced less than 5% hemolysis, complying with ISO 10993-4 standards for blood-contacting biomaterials. These findings underscore the suitability of these multifunctional NF mats for advanced biomedical applications, particularly vascular tissue engineering.

Keywords: electrospun, biocompatibility, hemocompatibility, polycaprolactone, curcumin

Bioprospecting Epiphytic Yeasts from Lovi (*Flacourtia inermis*) for Sustainable Medicinal Alcohol Production

G.J.B. Arachchi, H.M. Shafqat, L.M. Vincet, T.C. Serasinghe, S.A. Mummullage, O.V. Hettithanthrige, S.N. Fernando, D.T. Suriyaarachchi, P.A. Sewwandi, R.B.N. Dharmasiri*

Faculty of Life and Medical Sciences, BMS Campus, Colombo, 00600, Sri Lanka
**nadeemadharmasiri@sjp.ac.lk*

Sri Lanka possesses a variety of underutilized fruits that have received limited scientific attention despite their reported nutritional and therapeutic potential. Lovi (*Flacourtia inermis*) a cherry-sized red fruit, has been reported to be rich in anthocyanins and flavonoids with medicinal properties. Although its phytochemical composition has been investigated, the microbial diversity, particularly epiphytic yeasts associated with lovi and biotechnological potential, remains unexplored. This research aimed to isolate, identify, and evaluate the diversity of epiphytic yeast strains present on lovi and assess their suitability for producing a fermented alcoholic beverage with medicinal properties. A key objective was to develop an optimized yeast consortium from lovi for efficient fermentation. Fruit samples were collected from Avissawella, Sri Lanka. Yeast isolations were performed via fruit washing, serial dilution followed by culturing on Potato Dextrose Agar with Gentamicin. Morphologically distinct isolates were purified via streak plating and screened for sugar fermentation (glucose, fructose and sucrose). Antagonistic tests were performed to determine isolate compatibility and assess their suitability for consortium development. Microscopic observation was performed using Lactophenol Cotton Blue staining and molecular identification was conducted. The consortium was used to ferment lovi extract in duplicate with *Saccharomyces cerevisiae* as the reference. Ethanol production was assessed using a PEN3.5 E-nose system for volatile organic compound profiling. Antimicrobial activity was evaluated against *Staphylococcus aureus* (ATCC 25923), *Escherichia coli* (ATCC 25922), *Klebsiella pneumoniae* (ATCC 13883) and *Candida tropicalis* (ATCC 13803). FI-02, FI-06, and FI-07 yeast strains were selected for consortium development based on their non-antagonistic compatibility. FI-07 exhibited the highest fermentation potential and was molecularly identified at the genus level *Meyerozyma* sp. (accession no. PZ139164) using ITS1 and ITS4 primers. Among tested microorganisms, statistically significant antimicrobial activity was observed only against *Candida tropicalis* ($p = 0.023$, one-way ANOVA). The E-nose R8 ethanol sensor exhibited a high response signal ($3.3 G/G_0$) in the fermented extract, reflecting changes in electrical conductivity relative to distilled water. These preliminary findings suggest that lovi is a potential source of functional epiphytic yeast strains for value-added fermentation and consortium development. The fermented products exhibited antimicrobial activity, and epiphytic yeasts contribute to understanding Sri Lanka's microbial biodiversity.

Keywords: antimicrobial activity, consortium, epiphytic yeasts, fermented beverage, *Flacourtia Inermis*

Acknowledgement: *The authors would like to express their sincere gratitude to the Faculty of Life and Medical Sciences, BMS Campus, Colombo, Sri Lanka, for providing the facilities, resources, and academic support necessary to conduct this research.*

Climatic Predictors of Cutaneous Leishmaniasis risk in Sri Lanka: A Multi-Model Assessment at the Pradeshiya Sabha Level

I.L. Jayasekara[1], H. Rajakaruna[2], W.A.P.P. de Silva[1], A. Dangolla[3], N.D. Karunaweera[4], R. Dewasurendra[4], I.E. Gunaratna[5], P. Chulasiri[5], R.S. Rajakaruna[1]*

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Battelle Center for Mathematical Medicine, Abigail Wexner Research Institute, Nationwide Children's Hospital, Columbus, OH, USA*
[3]*Department of Veterinary Clinical Science, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Parasitology, Faculty of Medicine, University of Colombo, Colombo, 00300, Sri Lanka*
[5]*Anti Malaria Campaign, Ministry of Health, Colombo, 00100, Sri Lanka*
**rupika.rajakaruna@sci.pdn.ac.lk*

Cutaneous leishmaniasis (CL), an emerging public health concern caused by a dermotropic variant of *Leishmania donovani* unique to Sri Lanka, was historically low and sporadic prior to 2001, then escalated to over 4,000 cases by 2019, with previous models predicting approximately 19,000 cases by 2025 without intervention. Despite this trajectory, environmental predictors at the Pradeshiya Sabha level remain poorly understood. Existing modelling has relied on linear frameworks inadequate for capturing the complexity of climate-disease interactions. Using 2025 empirical data, this study quantified climatic predictors of CL presence and case count magnitude, while evaluating the effectiveness of non-linear modelling. Across 239 Pradeshiya Sabhas, 113 (47.3%) recorded at least one case, totaling 2,827 cases. Twenty-four standardised climatic predictors from NASA POWER were examined using three models: a Generalized Additive Model with Negative Binomial distribution (GAM-NB) for case count magnitude, a stepwise binary Logistic Regression (LR) with variance inflation factor filtering, and a GAM with binomial distribution (GAM-L) for disease presence/absence, evaluated using deviance, Area Under the Receiver Operating Characteristic Curve (AUC), and Akaike Information Criterion (AIC). The GAM-NB explained 52.6% of deviance, with mean temperature, diurnal temperature range, wind speed, maximum temperature, rainfall, root zone soil wetness, hot and very hot day frequency, and solar radiation identified as significant ($p < 0.05$). The LR identified relative humidity (OR = 3.64), very hot day frequency (OR = 3.13), maximum wind speed (OR = 2.09), and clear sky solar radiation (OR = 1.70) as the strongest predictors of disease presence, with rainfall protective (OR = 0.41). The GAM-L substantially outperformed the LR (AUC = 0.909, 95% Confidence Interval: 0.873–0.944 vs. AUC = 0.768, ΔAUC = 0.14), confirming that climate-disease relationships are inherently non-linear and insufficiently captured by conventional approaches. Thermal environment and wind speed were the most consistent drivers across all models. Critically, relative humidity was non-significant for case count magnitude, yet the strongest predictor of disease establishment, revealing a functional distinction between climatic drivers of CL presence and intensity. These findings provide the first empirical climatic evidence at the Pradeshiya Sabha level for CL in Sri Lanka, providing a base for risk stratification and development of early warning system design.

Keywords: cutaneous leishmaniasis, climatic predictors, non-linear modelling, Sri Lanka, spatial epidemiology

Comparative Dietary Ecology of Two Sympatric Shrub Frog Species, *Pseudophilautus Rus* and *Pseudophilautus Popularis* in Lower Hanthana, Sri Lanka

D.M.T.M.K. Disanayaka, W.M.K.B. Wijesooriya, D.R.G.W.B. Ellepola*

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Peradeniya, Sri Lanka
**gajaba.ellepola@sci.pdn.ac.lk*

Dietary ecology provides fundamental insights into species interactions, ecosystem functioning and informs species conservation, yet remains poorly understood for Sri Lankan endemic amphibians. In particular, ecological information on the diet of the genus *Pseudophilautus* (Rhacophoridae) is scarce, hindering the conservation of these species. This study investigates the dietary ecology by comparing diet compositions, dietary niche overlap and resource partitioning of two sympatric shrub frogs, *Pseudophilautus rus* and *Pseudophilautus popularis,* in the Lower Hanthana of Sri Lanka. total of 120 individuals were sampled across the study area from June to October 2025, and stomach contents were obtained using non-lethal stomach flushing method. The data were analyzed for prey composition, prey diversity, dietary niche breadth and dietary overlap by using the Shannon- weiner and Morisita horn indices respectively. Ecological information such as the gape width and perch height was also obtained to check for any correspondence to their dietary habits. Results revealed that both species functioned as generalist arthropod predators, consuming 14 prey orders dominated by Araneae. Significant interspecific dietary differences were observed. Isoptera formed a major component of *P. popularis´*s diet but were absent in *P. rus* diets, while land snails (Stylommatophora) were primarily consumed by *P. rus*. Shannon-Wiener diversity indices indicated high dietary diversity (popularis- H'p = 2.16, rus- H'p = 2.03) for both species, with Levins' standardized niche breadth values (popularis - H'R=0.468, rus- H'R=0.401) confirmed generalist feeding strategies. In contrast high taxonomic dietary overlap explained by Morisita-Horn similarity index (C_H = 0.805) indicating substantial similarity in prey taxonomic composition. But a significant vertical niche stratification was observed in their diets, with *Pseudophilautus popularis* occupied significantly lower perching heights (mean: 15 cm) compared to *P. rus* (mean: 45 cm). Morphological analysis revealed significant positive correlations between gape width and prey size in both species (*P. popularis*: $r^2 = 0.058$, $p = 0.018$; *P. rus*: $r^2 = 0.085$, $p = 0.040$), supporting gape-limitation hypotheses. Temporal dietary variation reflected seasonal shifts in prey availability, with both species demonstrating dietary plasticity. Findings indicate that vertical microhabitat partitioning is likely to contribute to the coexistence of sympatric *Pseudophilautus* species, although the role of dietary overlap warrants further investigation. Study provides valuable ecological information for conservation of these endemic amphibians in fragmented habitats.

Keywords: conservation, dietary ecology, endemic amphibians, niche partitioning, *Pseudophilautus*

Comparative First-Principle and Experimental Study of Properties of FAU Zeolite Synthesized Using Rice Husk Ash and Waste Beer Cans

B.M.M.D. Basnayake[1], C.N.R Ratnaweera[1]*, W.W.P. De Silva[2]

[1]*Department of Chemistry, University of Ruhuna, 81100, Sri Lanka*
[2]*Department of Physics, University of Sri Jayewardenepura, 10100, Sri Lanka*
**nadun@chem.ruh.ac.lk*

Zeolites are microporous aluminosilicate structures that are widely used for ion exchange, adsorption, and catalysis. Theoretical studies on the Na-Y (a subclass of FAU framework) zeolites remain scarce, and comparative studies between theoretical and experimental results for Na-Y zeolites are particularly limited. Both rice husk and empty beer cans are abundant waste materials, and in present study, the primary objective was to utilize those waste materials as sustainable raw precursors for zeolite synthesis in a low-cost method and to compare electronic and structural properties of the resultant zeolites with experimental data and periodic Density Functional Theory (DFT) calculations. Sodium silicate was synthesized from rice husk ash, while sodium aluminate was prepared by using waste beer cans. FAU(Na-Y) type zeolites were subsequently synthesized by using sodium silicate and sodium aluminate. All computational simulations were performed using the Quantum ESPRESSO package. A primitive rhombohedral unit cell containing 144 atoms was employed for the calculations. Structural properties, including optimized Si-O-Si bond length and angle, and vibration frequencies, were determined. Electronic properties were evaluated using the band structure and density of states. Synthesized zeolite frameworks were characterized by using SEM and EDX, XRD, Solid UV-Vis spectroscopy, FTIR, and TGA. The XRD, SEM, and TGA results confirmed the successful synthesis of FAU(Na-Y) zeolites and the calculated yield was ranged between 80% and 85%. The Si-O-Al symmetric vibrations appeared at 683 cm^{-1}, Si-O-Si asymmetric vibrations were located at 968 cm^{-1}, whereas their theoretical values were 665 cm^{-1} and 926 $cm^{-1,}$ respectively. Optimized Si-O bond lengths ranged from 1.60 Å to 1.62 Å, Si-O-Si bond angles spanned 149^0 to 151^0, and the band gap value was 3.86 eV. The derived band gap from the solid-state UV-Vis spectrum (3.90 eV) was in close agreement with its theoretical value. Furthermore, FTIR vibrational frequencies and theoretical values also fall within the same range. The lattice constants, including edge lengths and angles, also show strong agreement with their theoretical values. Overall, this integrated experimental and theoretical research demonstrates a powerful approach for aligning theoretical predictions with experimental findings and it turns waste into value while cleaning up the environment as well.

Keywords: FAU Zeolites, faujasite, Periodic Density Functional Theory (DFT), rice husk ash, beer cans

Comparative Performance Analysis of Parameter Estimation Methods for Some Discrete Models

K.S.D. Fernando*, H.T.K. Abeysundara

Department of Statistics and Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**surinfdo99@gmail.com*

Estimating parameters of probability distributions is a crucial aspect of inferential statistics, as it directly impacts inference accuracy, efficiency and robustness. This study mainly compares the performance of three parameter estimation methods – Minimum Hellinger Distance Estimation (MHDE), Minimum Density Power Divergence Estimation (MDPDE) and Maximum Likelihood Estimation (MLE) for the Bernoulli, Binomial, and Geometric distributions by considering both efficiency and robustness through systematically changing the parameters. Monte Carlo simulations were performed using varying sample sizes (n), success probabilities (p), and contamination levels (γ) where, contamination refers to the occurrence of outliers primarily arising from mislabeled observations. For the Bernoulli and Binomial models, contamination was introduced by replacing a fixed proportion of observations with the corresponding fixed trial value, while for the Geometric model, replaced by the 99th percentile value to create outliers. The evaluation of the estimators was done using key metrics such as Bias, Variance, Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE). According to this study, For the Bernoulli distribution, all three methods behaved almost similarly in clean data, but under contamination MLE and MHDE showed slightly higher RMSE while MDPDE maintained lower errors specially for large samples, indicating robustness. For the Binomial distribution, an increase in sample size steadily reduced the RMSE for all methods. For clean data, and higher success probability values, MLE had slightly better performance than the robust estimators with contamination, confirming its efficiency. However, MHDE and MDPDE have remained much more stable, especially at lower success probabilities. For the Geometric distribution, MHDE indicated best performance for large samples while MDPDE seemed to maintain a good trade-off between efficiency and robustness at moderate sample sizes. Regarding interval estimation, almost all coverage probabilities for the estimators exceeded 80%, demonstrating strong reliability under contamination. A real-data validation study based on Bernoulli supported these patterns and confirmed simulation results. In general, MHDE and MDPDE are reliable robust alternatives to MLE when there is discrete data with possible contamination or label noise.

Keywords: binomial density, geometric density, maximum likelihood, minimum density power divergence, minimum Hellinger distance

Competitive Adsorption of Ciprofloxacin, Tetracycline, and Sulfamethoxazole Antibiotics in Fe-rich Soils

U.S.T. Sachintha[1], N.H. Koralegedara[1]*, K.G.N. Nanayakkara[2]

[1]*Department of Geology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**nadeeshak@sci.pdn.ac.lk*

The continuous release of antibiotic residues into the environment has become a major environmental issue due to their contribution to antimicrobial resistance. Therefore, low-cost and environmentally sustainable remediation methods are necessary to mitigate this issue. This study investigates the removal potential of three commonly used antibiotics in veterinary and agricultural fields, ciprofloxacin (CIP), tetracycline (TC), and sulfamethoxazole (SMX), using two iron-rich soils, Red Earth (RE) and Laterite (LT), as competitive adsorption studies. Although the application of Fe-rich soil for the adsorption of individual antibiotics has been reported previously, the competitive adsorption behaviour in the multi-antibiotic systems has not yet been investigated. In this study, the competitive adsorption experiments were performed by adding all three antibiotics simultaneously across three concentration ranges, from 9 to 82 mg/L. Experiments were conducted as batch adsorption studies over specified contact times (5, 10, 30, 60, 120, 180 min) and analysed for antibiotic concentrations using a UV spectrophotometer (at λ_{max}= 273.1 nm for CIP, λ_{max}= 352.1 nm for TC, and λ_{max}= 266.1 nm for SMX). The effects of pH (3, 4, 7, 9,11), adsorbent dosage (10, 50, 100 g/L), and the soil organic matter (OM) were investigated. LT exhibited higher removal of antibiotics compared to RE. The optimum conditions were observed as pH 4, 10 g/L adsorbent dosage, 30 min contact time, and antibiotic concentrations between 23 and 37 mg/L. The higher removal by LT may be related to its higher Fe and Al oxide content and greater surface reactivity. For both RE and LT, the adsorption trend followed was TC > CIP > SMX. TC exhibited the highest removal due to strong interactions with Fe-rich mineral surfaces, whereas SMX exhibited the lowest adsorption due to its lower affinity for mineral surfaces. The presence of a higher number of active functional groups in the TC structure may facilitate these interactions. These findings indicate that Sri Lankan Fe-rich soils, particularly LT, have strong potential as low-cost adsorbents for removing multiple antibiotics from contaminated water systems.

Keywords: antibiotic, remediation, red-earth, laterite, adsorbent

Acknowledgement: *Financial support provided by the University of Peradeniya Research Council – (URC) multidisciplinary research grant (# 486) is highly acknowledged.*

Development of a Low-Cost Hardware and Software Framework for a Near-Infrared Spectrometer

M.S. Wanniarachchi*, P. Samarasekara

Department of Physics, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**muditha25sw@gmail.com*

Fourier Transform Infrared (FTIR) spectroscopy is a fundamental analytical technique widely used in scientific research to characterize materials. While high performance commercial spectrometers are standard in laboratories, their high cost and mechanical complexity make them difficult to use for portable field applications and education. This research addresses this limitation by designing and building a low cost near infrared FTIR spectrometer using standard, off the shelf components. The instrument is based on a custom 3D printed Michelson interferometer, powered by a G4 tungsten-halogen broadband light source. To precisely modulate the optical path, a linear actuator was built using a stepper motor and an A4988 microstepping driver. This setup includes a vibration damped, belt drive mechanism to minimize mechanical noise. The detection system uses a room temperature InGaAs photodiode (spectral range 0.9 μm to 1.7 μm), paired with a high sensitivity transimpedance amplifier built around a TL072 operational amplifier. Data collection and instrument control are handled by an Arduino Uno microcontroller for real time hardware synchronization, alongside a custom Python software suite for signal processing. The raw interferogram is mathematically converted into a usable spectrum using the Fast Fourier Transform algorithm. Experimental results demonstrate that the vibration isolation design effectively protected the optical bench from motor noise. However, initial tests did not produce a distinct centerburst in the interferogram. This indicates that the system's current limitation in gas sensing is tied to the strict optical alignment required for the moving mirror. Ultimately, this study establishes a functional hardware and software framework for low-cost spectroscopy, highlighting precision optical alignment as the critical remaining challenge for the future development of affordable gas sensing devices.

Keywords: FTIR Spectroscopy, gas sensing, low-cost spectrometer, Michelson interferometer, near infrared

Development of a Machine Learning-Based Early Warning System for the Survival of Micro-Enterprises in Sri Lanka

N. Athukorala*, R.K. Ravindradasan, S.G.J. Senarathne, R.D. Yapa

Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**nathalia@sci.pdn.ac.lk*

Micro-Enterprises (MEs) are central to employment generation, innovation, and inclusive economic growth in Sri Lanka, yet many remain vulnerable to closure due to financial obstacles, managerial limitations, and external shocks. Hence, reliable early warning systems are essential for identifying businesses at risk and providing them with proactive support. This study develops a machine learning-based early warning model to predict short-term non-survival among MEs using firm-level financial and operational indicators. The model was developed using primary survey data from approximately 700 micro-enterprises in the Kandy, Matale, and Nuwara Eliya districts in Sri Lanka, collected between 2020 and 2023. Business Status was defined as the target variable, where active enterprises were coded as 0 and closed enterprises as 1. The modelling framework was designed to be applicable across all sectors, without incorporating sector-specific industry categories as predictor variables. Before modelling, active and closed enterprise datasets were cleaned and harmonised, retaining only micro-enterprises, standardising variable names and coding structures, and removing duplicate records. Missing numerical values were handled using median imputation within the modelling pipeline. Feature engineering derived profitability measures, latest raw-variable values, summary statistics, temporal trends, variability measures, and loss-history indicators. Group-based partitioning and cross-validation were applied to reduce information leakage. Logistic Regression, Random Forest, XGBoost, and LightGBM were compared. Class imbalance was addressed using balanced class weights where applicable and a scale-positive-weight adjustment for XGBoost. Hyperparameter tuning used randomized search, followed by probability calibration and SHAP-based interpretability analysis. XGBoost achieved the best overall performance, with validation accuracy of 0.9474, balanced accuracy of 0.9033, macro-F1 of 0.9208, failed-class ROC-AUC of 0.9758, failed-class PR-AUC of 0.9478, and Brier score of 0.0420. On the test set, it achieved an accuracy of 0.9145, macro-F1 of 0.8728, and failed-class ROC-AUC of 0.9649. SHAP analysis identified staff level, expenditure, expenditure trend, profit variability, revenue variability, loss history, and revenue trend as influential predictors. The findings show that machine learning can support interpretable early warning of micro-enterprise closure; however, generalisation beyond the surveyed districts and operational deployment requires further sector-sensitive validation and user testing of the prototype decision-support dashboard.

Keywords: cross-validation, firm-level financial indicators, resilience, machine learning, SHAP analysis

Acknowledgement: *This study was supported by a Multidisciplinary Research Grant (Grant No. 393/2024) from the University of Peradeniya.*

Development of a Wireless Chemiluminescence Detector for Reducible Analytes Using Bipolar Electrochemistry

H.M.R.R. Wijeweera[1]*, M.B. Wijesinghe[1,2], H.P.G.N. Lakmini[2]

[1]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Environmental and Industrial Sciences, Faculty of Science, University of Peradeniya, Peradeniya,20400, Sri Lanka*
**rashmiw@sci.pdn.ac.lk*

Bipolar electrochemistry enables wireless, potentiostat-free detection by converting electrical signals into optical outputs. This transduction uses emissive molecules at a reporting pole coupled with a sensing pole. This study developed a background-free electrogenerated chemiluminescence (ECL) method to quantify 3-nitro-L-tyrosine (3-NT), a key biomarker for nitrosative stress. This approach offers a powerful tool for the improved detection of neurodegenerative diseases, such as Alzheimer's, particularly in challenging environments where traditional sensing is difficult. A 3D-printed bipolar electrode cell holder, featuring necessary tubing and a detection window, was fabricated. The luminol–H_2O_2 system was utilized to generate ECL, which was captured via a smartphone using the Blackmagic application. Recorded videos were then analyzed frame-by-frame using custom computer code. Initially, chemiluminescence was evaluated without applied voltage to determine the minimum H_2O_2 concentration required to trigger the reaction, a step essential for minimizing background noise during bipolar ECL. The 3D-printed detector was first tested using dissolved oxygen at the cathodic pole and the luminol–H_2O_2 system at the anodic pole, with KCl added to ensure conductivity. Before 3-nitro-L-tyrosine (3-NT) analysis, nitrogen was introduced into the cathodic compartment to eliminate dissolved oxygen. The operating potential was optimized by testing three 3-NT concentrations across a range of 1.50 V to 3.50 V (0.50 V increments). While intensity generally increased with voltage, 3.00 V was identified as the optimal potential for its superior stability. The resulting system demonstrated a strong positive linearity (R^2 = 0.9793), high sensitivity, and a low limit of detection 1.25×10^{-6} mol L^{-1} with excellent reproducibility. These results confirm that the developed analysis system is with the precision within 1.0% - 5.0% ,wireless, power-efficient, and highly portable.

Keywords: bipolar electrochemistry, blackmagic application, electrogenerated chemiluminescence, Luminol-H_2O_2 System, 3-Nitro-L Tyrosine

Development of Controlled Release Formulation from the Extracts of *Gymnema Sylvestre* to Mitigate Rapid Blood Glucose Reduction

J.M.S. Jayasinghe*, E.A.S.P. Ekanayake

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**susanthij@sci.pdn.ac.lk*

Diabetes mellitus is a multifactorial disease which is characterized by hyperglycemia. *Gymnema sylvestre R. Br. Ex Sm* also known as 'gurmar' or 'sugar destroyer' is a traditional medicinal herb which has many therapeutic applications in Ayurvedic medicine. It has proved antidiabetic potential. More importantly, leaves of *G. sylvestre* reduces the blood glucose level drastically creating hypoglycemia and as a result, its application in diabetes treatment is limited. Further no reports were identified regarding its development as a controlled release drug to mitigate its hypoglycemic effect. Hence, the main objective of this study is to develop a controlled release formulation from *Gymnema sylvestre* leaf extracts, so that it would not create hypoglycemic conditions. Three different extracts, cold-water, hot water and acetone-water extracts were made using the air dried leaves of *G. Sylvestre* and their antidiabetic effect and antioxidant effect were evaluated through alpha-amylase inhibitory assay and DPPH assay respectively. The extract having the highest activity was selected and encapsulated into carrageenan nanoparticles prepared via ionic gelation and release kinetics of 1:1, 1:3 and 1:5 carrageenan nanoparticle : GS extract formulations were studied via dialysis bag method. Cold-water extract showed the best activity having IC_{50} value of 17.89±0.29 mg dm^{-3} for alpha amylase assay and 398.45±4.13 mg dm^{-3} for DPPH assay. The synthesized carrageenan nanoparticles with a particle size 9.0 nm were used to encapsulate cold-water extract and the resulting encapsulated nanoparticle had a size of 164.9 nm according to dynamic light scattering-particle size analyzer data. Encapsulation was confirmed through FTIR-ATR data. Highest cumulative release of 70±0.05% was observed for 1:5 formulation among other formulations. It also exhibited encapsulation efficiency of 95% and drug loading of 90% and proved to be a slow release formulation. The synthesized pure carrageenan nanoparticles showed no activity to alpha amylase assay, but the encapsulated nanoparticles showed an IC_{50} value of 59.23±1.06 mg dm^{-3}. These empirical observations showed that the encapsulated nanoparticles could be used to mitigate rapid blood glucose reduction caused by *Gymnema sylvestre* and future studies are warranted for further optimization.

Keywords: carrageenan, formulation, hypoglycemia, nanoparticles, slow release

Development of Porous Fired Clay Bricks Incorporating Rice Husk Additives

H.F.V.I. Fonseka*, P.W.S.K. Bandaranayake

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**vidunif@pdn.ac.lk*

The growing need for sustainable construction materials has intensified interest in utilizing agricultural residues to reduce raw material consumption and energy demand in brick manufacturing. This study investigates incorporating rice husk as a pore-forming additive in fired clay bricks, focusing on its dual role in modifying microstructure and enhancing firing efficiency. The heat treatment of samples was done in a muffle furnace with controlled temperature up to peak temperature of 850 °C. The primary objective is to evaluate the influence of varying rice husk contents (5%, 10%, 15%, and 20% by weight) on physical, mechanical, thermal and processing characteristics while identifying a composition for balanced performance. Specifically, bulk density and water absorption was calculated from specimen masses and geometric dimensions, while apparent porosity was evaluated using the Archimedes principle. Compressive strength was measured via a universal testing machine and thermal conductivity was quantified using an experimental setup based on one-dimensional heat flow. Results indicate that Rice husk acts as an effective internal pore generator through in-situ combustion, yielding a well-distributed void network that reduces density from 1.59 kgm^{-3} to 1.08 $\times 10^{3}$ kgm^{-3}, increases porosity from 28.3% to 39.5%, and lowers thermal conductivity from 0.91 W m^{-1} K^{-1} to 0.35 W m^{-1} K^{-1} as incorporation increases from 5% to 20%. These improvements yield a lighter, highly insulating material. Notably, the exothermic combustion of rice husk creates a self-fueling effect that lowers external energy demand and shortens firing duration from 500 to 300 minutes at 20% incorporation. However, increasing the rice husk content from 5% to 20% induced higher porosity, which gradually reduced the compressive strength from 23.62 kN to 7.79 kN. XRD results revealed phase transformations occur during sintering process due to firing, while XRF analysis confirmed increased silica content due to rice husk ash contribution. An optimal incorporation range of 10% to 15% is identified, achieving improved thermal efficiency without critical loss of structural integrity. These findings demonstrate that rice husk-modified bricks offer a sustainable, energy-efficient alternative with improved performance for low-cost, resource-constrained construction. This study provides new insights into energy-assisted firing mechanisms in porous composites.

Keywords: fired clay bricks, pore-forming additive, rice husk, self-fueling combustion, thermal insulation

Development of Phosphorus Doped ZnO-Loaded Zeolite Materials for Enhanced Gas Sensing Performance

H.M.B.A. Lakmal[1], M.B. Wijesinghe[1]*, A. Bandara[1], L. Jayarathne[2], J.M.S.G.B Navarathne[2]

[1]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka*
**manjulaw@sci.pdn.ac.lk*

Reliable gas-sensing technologies are critical for environmental monitoring, industrial safety, and healthcare applications, particularly for detecting low-concentration-oxidizing gases. While commercial gas sensors are dominated by n-type metal oxide semiconductors, p-type materials offer distinct advantages, such as complementary response patterns and increased selectivity toward oxidizing gases. In this work, phosphorus doping was employed to tailor zinc oxide (ZnO) leveraging its chemical stability and tunable electrical properties. Furthermore, ZSM-5 zeolite was employed to enhance gas absorption and molecular diffusion since it has very specific pore size (~0.55 nm). Also, the kinetic diameter of N_2O is ~0.33 nm it can easily diffuse through the pores. Pure ZnO and phosphorus-doped ZnO (P-ZnO) were synthesized using a hydrothermal method and systematically characterized to elucidate the effects of dopant incorporation and zeolite loading on structural, morphological, and gas-sensing properties. Powder X-ray diffraction (PXRD) confirmed the hexagonal wurtzite structure of ZnO in all samples while additional secondary phases at higher dopant levels indicated the formation of phosphate-related complexes. Scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), elemental mapping, Fourier-transform infrared spectroscopy (FTIR), and Raman spectroscopy verified the formation of ZnO nanostructures, homogeneous dopant distribution, and dopant-induced lattice distortions. Sensors were fabricated by depositing the ZnO-zeolite composites onto thin glass slides and exposing them to nitrous oxide (N_2O) gas within a controlled chamber. Electrical resistance of the fabricated material was measured using a custom build setup, where resistance converted into voltage signals and recorded for subsequent analysis. Gas-sensing performance toward N_2O was evaluated for the P-ZnO and ZnO-zeolite composite sensors with ZnO:Zeolite mass ratios of 7:1, 1:1, and 1:7 over an operating temperature range of 100–180 °C. The P- ZnO sensors exhibited a decrease in output voltage with increasing N_2O concentration, consistent with p-type sensing behavior toward an oxidizing gas. The ZnO:Zeolite (1:1) composite demonstrated the highest sensitivity and the widest dynamic response range. This enhanced performance is attributed to zeolite-assisted gas transport and optimized sensing within the ZnO network, highlighting the potential of p-type ZnO-loaded zeolite composites for advanced gas sensing applications.

Keywords: gas sensing, Nitrous Oxide, semiconductor, Zinc Oxide, ZSM-5 Zeolite

Development of Polymer-Based Hydrogels for Controlled Curcumin Release

K.R.R.I. Sandanayake[1], V.U. Godakanda[1], K.M.N. De Siva[1], W.R.M. De Silva[1,2]*

[1]*Centre for Advanced materials and Devices (CAMD), Department of Chemistry, University of Colombo, Colombo 00300, Sri Lanka*
[2]*Department of Biomedical Science, NSBM Green University, Mahenwaththa, Pitipana, Homagama, 10206, Sri Lanka*
**rohini@chem.cmb.ac.lk*

Curcumin, a polyphenolic compound derived from *Curcuma longa*, possesses well-established anti-inflammatory and antioxidant properties. However, its clinical applications are limited due to poor aqueous solubility, chemical instability, and uncontrolled burst release in conventional drug delivery systems. This study focuses on developing a biocompatible chitosan/carboxymethyl cellulose (CS/CMC) hydrogel bead system as a controlled delivery platform for curcumin, using naturally derived polymers and avoiding toxic chemical crosslinkers. Hydrogel beads were fabricated through ionic gelation by utilizing the electrostatic interactions between the protonated amino groups of chitosan and the carboxylate groups of CMC. Citric acid (CA) and polyethylene glycol (PEG) were incorporated into the hydrogel to stabilize and plasticize the polymer network, respectively. Curcumin, solubilized using tween 20, was incorporated into the CMC-CA-PEG mixture prior to dropwise addition into the CS solution. The optimized CS:CMC:CA:PEG ratio of 1:1:1:2 was selected based on bead uniformity, mechanical stability (assessed qualitatively via visual inspection of bead integrity during handling and across swelling-drying cycles) and reproducibility. FTIR confirmed CS-CMC polyelectrolyte complex formation and curcumin incorporation into the matrix. XRD indicated an amorphous structure favourable for drug diffusion. SEM revealed a porous interconnected network. Swelling studies in phosphate buffer solution (PBS) at pH 7.4 showed a maximum ratio of 256%, and curcumin encapsulation efficiency was 63.32% in the system. Preliminary UV exposure studies indicated that encapsulated curcumin exhibited reduced photodegradation compared to free curcumin. In vitro drug release studies conducted in PBS at pH 7.4 and 37 °C revealed an initial burst release of 48.8% within the first two hours, followed by a sustained release reaching 79.0% cumulative release at 48 hours. Kinetic modeling showed that the Korsmeyer-Peppas model provided the best fit (R^2 = 0.96), with a release exponent n = 0.42, indicating that Fickian diffusion was the dominant release mechanism, governed by concentration gradient-driven passive diffusion through the hydrogel network. The hydrogel system showed a significant antioxidant activity (80.46%) in the DPPH radical scavenging assay and anti-inflammatory activity (50.25%) via inhibition of egg albumin denaturation using the hydrogel's aqueous release medium. These findings confirm that the developed CS/CMC hydrogel bead system is a promising biodegradable and biocompatible platform for sustained curcumin delivery while preserving its therapeutic functionality.

Keywords: curcumin, hydrogel beads, chitosan/carboxymethyl cellulose, controlled drug release

Does Handling Time of Solitary Buzzing Bees Indicate Pollen Amount in Solanaceae Flowers?

W.M.L.W. Bandara, W.A.I.P. Karunaratne*

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**inokap@sci.pdn.ac.lk*

Buzz pollination is the primary mechanism of pollen release in *Solanum* species, yet how solitary buzzing bees assess pollen availability remains incompletely understood. Studying this behavior is important not only for optimizing pollination strategies in economically important crops, but also for understanding the cognitive complexity and advanced decision-making capabilities of these non-social insects. This study investigated whether handling time, the duration of floral buzzing, reflects pollen amounts in *Solanum insanum* and *S. melongena*. Further, examined how floral traits and bee morphology influence this foraging behavior. Field observations were conducted at the Dodangolla Experimental Station of the Department of Crop Science, University of Peradeniya from March to November 2025. Handling times of solitary buzzing bees visiting flowers of the two crops were recorded using a digital stopwatch on newly opened ($n \approx 150$) and one-day-old ($n \approx 150$) flowers for each crop. Concurrently, pollen grains extracted from flowers ($n = 5$ per age category for each crop) were quantified across flower ages using a hemocytometer, and key quantitative floral traits were measured using a digital micro-image system. Bee body sizes (dry weight via analytical balance, and five linear dimensions via digital micro-imaging: head capsule width, head length, head width, intertegular distance, total length) were evaluated using Principal Component Analysis to assess the morphological impacts on handling duration. Results showed that mean pollen counts per anther declined sharply from newly bloomed to one-day-old flowers in both *S. insanum* (from 182,400 ± 32,628 to 14,000 ± 2,828) and *S. melongena* (from 473,200 ± 143,522 to 58,000 ± 27,720), establishing a clear reduction in reward availability. Correspondingly, all observed bee species; *Hoplonomia westwoodi*, *Amegilla comberi*, and *Xylocopa ruficornis*, exhibited significantly longer handling times on newly bloomed, pollen-rich flowers compared to older, pollen-depleted flowers ($p < 0.05$). Furthermore, body size directly influenced foraging efficiency; the smallest species, *H. westwoodi*, consistently showed the longest handling durations, whereas larger bees extracted pollen more rapidly. In conclusion, handling time of a particular bee species serves as a reliable behavioral indicator of pollen availability. These findings align with Optimal Foraging Theory, demonstrating that solitary bees use context-dependent, time-minimizing foraging strategies in resource-rich environments, highlighting both their behavioral adaptability and their essential ecological role in effectively pollinating *Solanum* crops.

Keywords: buzz pollination, handling time, pollen amount, *Solanum Insanum*, *Solanum Melongena*

Eco-Friendly Textile Dyeing Using Natural Dyes Extracted from Selected Sri Lankan Plants: Characterization and Performance Evaluation

A.H.G.S.N. Kumari*, V.N. Senevirathne, O.A. Ileperuma

Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**shashikalaniwanthi001214@gmail.com*

The increasing environmental and health concerns associated with synthetic textile dyes have created renewed interest in sustainable alternatives derived from natural resources. Synthetic dyes are a major source of industrial water pollution, contributing to toxicity, bioaccumulation, and ecological imbalance, whereas plant-based dyes offer biodegradable, renewable, and environmentally friendly solutions for textile colouration. This study aims to extract, characterize, and apply natural dyes from selected Sri Lankan plants *Caesalpinia sappan* (Pathangi) and *Indigofera tinctoria* for eco-friendly textile dyeing, while systematically evaluating their color performance and fastness properties on different natural fibers. Aqueous extraction methods were employed under controlled and environmentally benign conditions to obtain dye solutions from selected plant materials. The extracted dyes were applied to natural textile substrates, including raw cotton fabric, wool, and embroidery threads, using standardized dyeing procedures to ensure uniform color uptake and reproducibility. The effects of different inorganic mordants, including alum, ferric, stannous, copper, and magnesium salts, on shade variation, colour strength, and fastness properties were systematically investigated, while *Indigofera tinctoria* was applied without mordanting due to its inherent vat dyeing mechanism. Dye characterization was carried out using UV–Visible spectroscopy to evaluate absorption characteristics, Fourier Transform Infrared (FTIR) spectroscopy to identify functional groups, and color strength analysis based on the Kubelka–Munk (K/S) function to quantify dye uptake. The results demonstrated that both plant dyes produced stable shades with high colour strength. *Caesalpinia sappan* and *Indigofera tinctoria* exhibited K/S values of 14.20 and 14.64, respectively. Both dyes showed good to excellent wash, sunlight, and UV fastness, with *Indigofera tinctoria* exhibiting superior fastness performance. FTIR analysis confirmed the presence of key functional groups such as hydroxyl, carbonyl, and aromatic compounds, which facilitate strong dye–fiber interactions owing to chelation with mordant metal ions and improve color retention. Overall, the findings indicate that these natural dyes provide effective and durable textile coloration, highlighting their potential as sustainable alternatives to synthetic dyes and contributing to the advancement of environmentally responsible and eco-friendly textile dyeing practices.

Keywords: natural dyes, eco-friendly textile dyeing, *Caesalpinia sappan*, *Indigofera tinctoria*, color fastness

Effect of Activated Carbon Electrode Thickness on the Performance of Counter Electrodes in Dye-Sensitized Solar Cells

M.D.D.S. Senevirathna[1,2]*, J.M.K.W. Kumari[1], M.A.K.L. Dissanayake[1,2], G.K.R. Senadeera[1,3]

[1]*National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka*
[2]*Postgraduate Institute of Science, Peradeniya, 20400, Sri Lanka*
[3]*Department of Physics, The Open University of Sri Lanka, Nawala, Nugegoda, 10250, Sri Lanka*
**sasankadumindu@gmail.com*

Dye-sensitized solar cells (DSSCs) have attracted considerable attention as low-cost photovoltaic devices due to their simple structure and ease of fabrication. However, the widespread use of platinum (Pt) as the counter electrode remains a major cost-limiting factor for large-scale applications. In this study, activated carbon was investigated as a low-cost alternative counter electrode material, with particular emphasis on the effect of electrode thickness on device performance. To prepare activated carbon-based counter electrodes, activated carbon was dispersed with polyvinylpyrrolidone (PVP) in ethanol to form a homogeneous slurry. The slurry was spray-deposited onto pre-cleaned stainless-steel substrates, where thickness was systematically controlled by varying the number of deposited layers (1-5 coatings). The fabricated electrodes were incorporated into DSSCs, and their photovoltaic performance was evaluated using current density-voltage (J-V) measurements under simulated AM 1.5G solar illumination (100 mW cm-^{2}) with an active cell area of 0.16 cm^{2}. Device reproducibility was confirmed through three independent measurements. The optimized two-layer activated carbon counter electrode, with an approximate thickness of 1.4 μm, exhibited the best performance, achieving an open-circuit voltage (Voc) of 671.0 mV, short-circuit current density (Jsc) of 14.67 mA cm^{-2}, fill factor (FF) of 54.61%, and power conversion efficiency of 5.43%. Although the efficiency value is lower than that of the Pt-based reference device (7.80%), it demonstrates that optimizing the activated carbon counter electrode thickness can significantly enhance DSSC performance. However, all devices exhibited relatively high open-circuit voltages (around 650 mV), indicating efficient charge separation. Electrochemical Impedance Spectroscopy (EIS) of the optimal activated carbon counter electrode-based device revealed a low charge-transfer resistance of 10.98 Ω, indicating an efficient charge-transfer process at the electrode/electrolyte interface. The enhanced performance at intermediate thickness is attributed to an optimal balance between electrocatalytic activity and charge transfer process at the electrode-electrolyte interface. These results highlight the importance of thickness optimization in carbon- based counter electrodes and demonstrate the potential of activated carbon as a viable, low-cost substitute for Pt in DSSCs.

Keywords: dye-sensitized solar cells, counter electrode, activated carbon, stainless-steel substrate, electrode thickness variation

Effects of Human Disturbance on Biodiversity and Community Structure in Two Rocky Reef Habitats, Galle, Sri Lanka

P.P. Premasinghe[1]*, C.S. Munasinghe[1], D.R.G.W.B. Ellepola[1], Y.R. Epa[2]

[1] *University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2] *Independent Researcher, Kandy, 20000, Sri Lanka*
**premasinghepubudu@gmail.com*

Rocky shore ecosystems support high biodiversity and productivity through complex physical and biological interactions. While natural gradients like wave exposure, tidal height, and temperature fluctuations typically structure these communities, human disturbances such as trampling and overharvesting can override natural processes and alter species composition. In Sri Lanka, the ecological consequences of such press-type disturbances on reef communities remain largely unquantified. This study investigated how human disturbance alters the biodiversity and community structure of two tropical rocky reef assemblages (Talpe and Koggala, Sri Lanka). Comparative analyses between the disturbed site (Talpe, Median Human Disturbance Index (HDI) = 75) and the reference site (Koggala) was done using quantitative quadrat sampling (n = 280). Results showed that while total organism abundance increased under human disturbance, Shannon-Wiener diversity (H'=5.23, p = 0.002) and Pielou's Evenness (J'=1.39, $p < 0.001$) significantly declined in Talpe. The disturbance favored opportunistic species, such as the green alga *Ulva lactuca* and the sea urchin *Stomopneustes variolaris*. This led to a significant reduction in primary producer richness ($p < 0.001$) and a concurrent increase in motile herbivores ($p = 0.041$) in Talpe. A critical link between habitat complexity and disturbance was identified ($p = 0.026$); visitor activity concentrated in species-rich microhabitats like tide pools, creating an ecological trap, where the ecological value and attractiveness of these microhabitats to humans intensified their degradation, leading to the functional loss of sensitive groups such as filter feeders and perennial red algae. The results showed that unmanaged trampling acts as a non-selective physical filter, simplifying trophic webs toward grazing loops and reducing resilience. These findings highlight that safeguarding biodiversity requires regulating physical visitation to structurally complex microhabitats, which are particularly susceptible to human-induced degradation. Urgent interventions, such as establishing trampling-free zones, are essential to preserve the ecological function of these unique tropical intertidal systems.

Keywords: biodiversity, human disturbance index, rocky shores, Sri Lanka, trampling

Effect of Interlayer Environment of Mg-Al Ldh on Corrosion Inhibition

H.G.W.M. Bhaddrathilake, H.M.D.N. Priyantha*, S.C. Abeyweera, H. Dilshan

Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**namalpriyantha@sci.pdn.ac.lk*

Corrosion of stainless steel in aggressive acidic and chloride-rich environments remains a critical industrial challenge despite the presence of a passive chromium oxide layer. Other than applying physical coating, development of corrosion inhibiting materials is one of the key interests due to their broad applicability. In this study, Mg–Al layered double hydroxides (LDHs) intercalated with organic anions (aspartate) were investigated as corrosion-inhibiting coatings for stainless steel Grade 304 in 2.0 mol dm^{-3} HCl medium. The LDHs were synthesized via hydrothermal methods and applied onto metal substrates using a dip-coating technique with varying concentrations; 1 ppm, 2 ppm, 4 ppm, and number of coatings; one to four. Corrosion inhibition performance was evaluated using a multi-technique approach including mass loss measurements, electrochemical impedance spectroscopy (EIS), Tafel polarization, and open circuit potential (OCP) analysis. Results revealed that LDH coatings significantly reduced corrosion rates, with mass loss decreasing from 7.8% (uncoated) to 5.4% for coated specimens after 15 days. EIS results showed an increase in polarization resistance of up to 38.4%, indicating enhanced surface protection. Intercalated aspartate ions also exhibited its influence on inhibition efficiency compared to the LDH. The performance can be attributed to its ability to form stable chelating complexes and protective films on the metal surface. The findings demonstrate that LDHs act as multifunctional corrosion inhibitors through barrier protection, anion exchange, and self-healing mechanisms, offering a promising strategy for corrosion mitigation in harsh environments.

Keywords: layered double hydroxide, aspartic acid, corrosion inhibition, Mg-Al LDH, Tafel polarization

Effect of Interlayer Environment Toward Electrocatalytic Activity of Ni–Fe Layered Double Hydroxides

A.A.H.P. Dilshan*, S.C. Abeyweera

Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**harsha.dilshan@pdn.ac.lk*

Nickel–iron layered double hydroxides (Ni–Fe LDHs) represent a prominent class of cost-effective electrocatalysts for the oxygen evolution reaction (OER) in alkaline environments. The overall electrocatalytic behavior can be influenced by both the elemental composition of the catalyst and the nature of the ions intercalated between the layers. Systematic understanding of how various intercalated anions-particularly those prevalent in seawater-affect electrochemical water splitting performance enables utilization of such catalysts for real world applications. In this work, Ni–Fe LDHs was prepared with chloride, nitrate, sulfate, and carbonate as interlayer anions. The synthesis was carried out through a hydrothermal method and catalyst-coated glassy carbon electrode was prepared and used for electrochemical measurements in a three-electrode system. The oxygen evolution reaction (OER) performance of the catalysts was investigated using cyclic voltammetry (CV) and linear sweep voltammetry (LSV) in 0.1 M KOH, and natural seawater. Structural and compositional characterization confirms the successful formation of distinct LDH phases with well-maintained Ni:Fe ratios across all precursor systems, despite variations in interlayer composition. When tested in 0.1 M KOH, LDHs bearing divalent oxyanions (SO_4^{2-} and CO_3^{2-}) demonstrate enhanced OER performance, with lower onset potentials (1.26–1.30 V vs Ag/AgCl/sat.KCl) relative to their monovalent counterparts (Cl^- and NO_3^-). However, upon switching to natural seawater as the working electrolyte, all synthesized catalysts converge to nearly the same onset potential (∼1.61 V vs Ag/AgCl/sat.KCl), implying that the performance gains arising from anion engineering are effectively neutralized by the highly complex ionic composition of seawater. Collectively, these observations demonstrate that tailoring the interlayer anion identity is a viable strategy for enhancing Ni–Fe LDH performance in alkaline media, yet this advantage diminishes considerably under seawater conditions, emphasizing the importance of developing stable interlayer environment of the LDH for efficient electrocatalytic applications

Keywords: oxygen evolution reaction, Ni-Fe layered double hydroxides, seawater electrolysis, intercalated anions, hydrogen production

Effect of ZnO Nanoparticle on the Sensitivity of Cellulose Acetate/Polyethylene Oxide/Bromothymol Blue (CA/PEO/BTB)-Based Electrospun Colorimetric Sensor Mats toward Gaseous Ammonia

W.S.M. Witharama[1], S.P.P.M. Perera[1], K.M.N.D. Silva[1], W.R.M.D. Silva[1,2]*

[1]*Center of Advanced Materials and Devices (CAMD), Department of Chemistry, University of Colombo, 00300, Sri Lanka*
[2]*Faculty of Biomedical Sciences, NSBM Green University, Pitipana, Homagama, 10206, Sri Lanka*
**rohini@chem.cmb.ac.lk*

Electrospun nanofiber (NF) mats are advantageous for gas sensing due to their high surface area and porous structure. Gaseous NH_3 ($NH_3(g)$) monitoring is important in environmental, industrial, and healthcare fields, while colorimetric sensors provide simple, low-cost visual detection. In this study, cellulose acetate/polyethylene oxide/bromothymol blue (CA/PEO/BTB)-based electrospun sensor mats were fabricated to investigate the effect of zinc oxide nanoparticles (ZnO-NPs) on $NH_3(g)$ sensing. ZnO-NPs were incorporated for their high surface area, favorable $NH_3(g)$ adsorption characteristics, and ability to provide active sites that enhance gas interactions. They were synthesized according to the bottom-up method (145 ± 29 nm) and characterized using SEM, XRD, and FTIR. With the incorporation of NPs, four different electrospun mats were fabricated: CA/PEO, CA/PEO/BTB, CA/PEO/BTB/ZnO-NPs (4%, w/w), and CA/PEO/BTB/ZnO-NPs (8%, w/w), and characterized using SEM, EDX, XRD, and FTIR. SEM analysis revealed smooth, straight, and bead-free fibers with average diameters of 329 ± 151 nm for neat CA/PEO mats and 221 ± 157 nm for CA/PEO/BTB mats. The loading capacity (84.24%) and encapsulation efficiency (75.36%) of the CA/PEO/BTB mats confirmed the suitability of the CA/PEO matrix for BTB encapsulation. The sensing performance was evaluated by exposing the mats to $NH_3(g)$ under controlled conditions. Upon $NH_3(g)$ exposure, ZnO-NP-incorporated mats exhibited a color shift toward a more basic response compared with the CA/PEO/BTB mats, indicating enhanced alkalinity in the presence of ZnO-NPs. RGB analysis based on ΔB showed an increasing response with ZnO-NP loading in the order: CA/PEO/BTB < CA/PEO/BTB/ZnO-NPs (4%, w/w) < CA/PEO/BTB/ZnO-NPs (8%, w/w). The enhanced response was attributed to increased ZnO active sites promoting OH^- generation and local alkalinity around BTB. The ZnO-induced sensitivity enhancement was statistically significant ($t = 5.27$, $p < 0.05$ for 4% ZnO-NPs; $t = 22.36$, $p < 0.05$ for 8% ZnO-NPs). Furthermore, ΔB comparison between 4% and 8% ZnO-NP mats confirmed a significantly higher response at increased ZnO-NPs loading, indicating enhanced local basicity ($t=2.53$, $p<0.05$). The detection range of the CA/PEO/BTB/ZnO (8%, w/w) mats toward gaseous $NH_3(g)$ was 0.05-5% (v/v), with a rapid colorimetric response (3s) and excellent reusability, retaining 93.58-100% of the initial response after 5 reuse cycles. These findings demonstrate the potential of 8% ZnO-NP-incorporated electrospun mats as effective colorimetric sensors for detecting gaseous $NH_3(g)$.

Keywords: electrospinning, Zno-NP, colorimetric sensor, bromothymol blue, gaseous ammonia

Electrical, Mechanical and Piezoresistive Properties of Natural Rubber Composites Incorporating Sri Lankan Vein Graphite

A.K.S. De Zoysa*, P.W.S.K. Bandaranayake

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**kavishkaz@sci.pdn.ac.lk*

Natural rubber (NR) is a highly valued, sustainable biopolymer known for its exceptional elasticity; however, its inherent electrical insulating nature limits its application in flexible electronics and wearable sensors. Overcoming this limitation requires the integration of conductive fillers without compromising the material's eco-friendly profile or mechanical flexibility. This study aimed to develop and characterize electrically conductive NR composites using high-purity Sri Lankan vein graphite as the primary functional filler. This inherently novel approach capitalizes on the cost-effectiveness and structural advantages of this natural resource. The primary objective is to achieve a functional electrical percolation network while preserving the polymer's inherent elasticity through scalable, eco-friendly processing techniques. To achieve uniform dispersion of the hydrophobic graphite particles within the elastomer matrix, an aqueous latex microdispersion technique was employed, utilizing sodium alginate as a surfactant. Raw vein graphite was systematically ball-milled to obtain a submicron median particle size (0.4 μm) to optimize interfacial integration, and composites were fabricated with filler loadings ranging from 0% to 60% (w/w). The resulting materials were evaluated for their chemical, electrical, and mechanical properties. Fourier Transform Infrared (FTIR) spectroscopy confirmed the stable physical integration of the graphite without altering the NR backbone's chemical integrity. Testing revealed a distinct structure property relationship, with an electronic percolation threshold occurring between 40% and 50% (w/w). Maximum electronic conductivity reached 1.85×10^{-6} S cm^{-1} at 60% loading. Mechanically, Young's modulus increased by approximately 4.8 times to reach 3.563 MPa, while the elongation at break decreased from 2.5 to 2.1 (an absolute strain ratio), reflecting the characteristic trade-off between electrical network formation and matrix elasticity. Furthermore, the 50% (w/w) composite exhibited a measurable piezoresistive response with a gauge factor of 0.17. While the observed conductivity and gauge factor are moderate compared to synthetic nanofillers, they demonstrate sufficient baseline performance for low-cost, large-strain biomechanical sensing applications. These findings successfully validate the potential of Sri Lankan vein graphite in producing functional elastomer composites. This eco-friendly aqueous processing approach offers a scalable, sustainable pathway for producing advanced conductive rubbers, adding significant value to current understandings of material applications in next-generation flexible electronics and strain sensors.

Keywords: electrical percolation, electronic conductivity, latex microdispersion, natural rubber composites, vein graphite

Electrospun Cassava Starch/Poly(ethylene oxide) Nanofibers as a Corrosion Inhibitor for Mild Steel in HCl Environment

H.H.M.H.B. Hapukotuwa*, W.S.S. Gunathilake, N. Priyantha

Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**harshantha.hapukotuwa@sci.pdn.ac.lk*

Mild steel (MS) mainly consists of a high amount of iron with a low amount of carbon. It has low corrosion resistance due to the absence of alloying elements. Even though there were several nanofiber materials used as corrosion inhibitors, the corrosion inhibition ability of electrospun nanofibers prepared either from cassava starch (CS) or poly(ethylene oxide) (PEO) has not been reported. Therefore, it is hypothesized that, since CS and PEO contain heteroatoms, they can form protective barriers with MS to inhibit corrosion. This study investigates the potential of electrospun CS/PEO nanofibers as a corrosion inhibitor for MS using 0.50 mol dm^{-3} HCl as the corrosive medium. As CS contains a higher proportion of branched amylopectin, PEO is used to enhance the electrospinnability of polymeric solutions. Instrumental parameters, including voltage, needle to collector distance and flow rate were optimized to produce bead-free nanofibers using electrospinning. Samples were characterized by a scanning electron microscope (SEM). Initially, polymer solutions for electrospinning were prepared separately by dissolving CS and PEO in water. Thereafter, two polymer solutions were blended in different ratios and electrospun onto the MS separately to produce nanofibers. A control experiment was conducted using PEO nanofibers deposited MS samples. A multi-technique approach, including mass loss measurements, electrochemical impedance spectroscopy (EIS), Tafel polarization and open circuit potential (OCP) analysis were used to evaluate corrosion inhibition. According to the results of SEM, electrospun CS:PEO at the ratio of (1:3) (w/w) and PEO only resulted in nanofibers with an average diameter of 98 nm and 30 nm respectively. A higher diameter for the polymer blend might be due to the increased solution viscosity and increased polymer solid content upon introduction of CS into the polymeric solution. Mass loss measurements conducted after immersing the samples in 0.50 mol dm^{-3} HCl solutions for 7 days revealed that electrospun PEO and electrospun CS/PEO coatings achieved 35.33% and 51.50% of inhibition efficiencies respectively. The polarization resistance obtained from EIS measurements for electrospun CS/PEO coated MS specimens were higher than that of electrospun PEO coated MS. These results suggest that electrospun CS/PEO is an effective corrosion inhibitor for MS surfaces to reduce corrosion.

Keywords: cassava starch, electrospinning, eugenol, mild steel, nanofibers

Enhanced Photoelectrochemical Water Splitting Using $WO_3/CaWO_4$ Heterojunction Photoanode

S.M.P.M.K. Sanganayaka[1]*, E.G.O.D. Egodawaththa[1], H.N.M. Sarangika[1], C. Bhattacharya[2], H.S. Sahoo[2]

[1]*Department of Physical Sciences & Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya,70140, Sri Lanka*
[2]*Department of Chemistry, Indian Institute of Engineering Science and Technology, Shibpur, Howrah, 711103, West Bengal, India*
priyanthikamaduwanthi98@gmail.com

The increasing demand for clean and sustainable energy sources has driven research into alternative energy sources, such as the production of hydrogen fuel through photoelectrochemical (PEC) water splitting. The performance of the PEC mainly depends on the properties of the photoanode material. In this study, a novel hetero-structured photoanode was developed by coating a calcium tungstate ($CaWO_4$) layer onto an electrodeposited tungsten trioxide (WO_3) layer to enhance the photoelectrochemical performance. Initially, the thin film of WO_3 was deposited via the electrodeposition method on fluorine-doped tin oxide (FTO) substrates. Then, the hydrothermally synthesized $CaWO_4$ was coated on top of the WO_3 layer by using the doctor blade method. The PEC performance was evaluated through linear sweep voltammetry and electrochemical impedance spectroscopy under simulated solar illumination. The photoelectrochemical measurements show a 61-fold increase in the photocurrent density (542.9 μA/cm^2 at 1.1 V vs Ag/AgCl) for the $WO_3/CaWO_4$ heterostructured photoanode compared to the pure WO_3 (8.9 μA/cm^2 at 1.1 V vs Ag/AgCl) photoanode. UV-Vis spectroscopy results show that the reduction in bandgap value from 3.00 eV for WO_3 to 2.72 eV for $WO_3/CaWO_4$, leading to enhanced light absorption. Under simulated solar illumination, the electrochemical impedance spectroscopy (EIS) measurements showed that the reduction of charge transfer resistance (Rct) for the $WO_3/CaWO_4$ photoanode (8.30×10^3) compared to the WO_3 photoanode (1.60×10^5), indicating improved charge transfer properties. The enhancement of the PEC performance indicates the formation of an efficient hetero-junction between $CaWO_4$ and WO_3, which facilitates efficient charge separation, enhances light absorption, and reduces the recombination loss by passivating interfacial defects. This study presents a simple way for improving PEC water splitting performance through layered semiconductor engineering, highlighting the potential for the $WO_3/CaWO_4$ hetero-structures for solar-driven hydrogen production.

Keywords: Calcium Tungstate, heterojunction, photoanode, photoelectrochemical water splitting, Tungsten Trioxide

Enhanced UV Absorption through Molecular Interactions in a Natural Sunscreen Formulation Using Tea Leaf Extract and Carrot Seed Oil

P. Dinoosha*, N.L. Dasanayake

Department of Physics, University of Peradeniya, Peradeniya, 20400 Sri Lanka
**dinooshapalaniyandi@gmail.com*

The increasing demand for safe plant-based photoprotective agents has driven the exploration of natural alternatives to conventional synthetic sunscreens. In this study, a natural sunscreen formulation was developed using tea leaf (*Camellia sinensis*) extract and carrot seed oil (*Daucus carota*), with emphasis on enhancing ultraviolet (UV) absorption through molecular interactions. UV–Visible spectroscopic analysis identified Central Province tea extract and carrot seed oil as the most individual photoprotective materials, exhibiting Sun Protection Factor (SPF) values of 5.46 and 8.72, respectively. SPF is an indicator of a material's ability to protect the skin against UVB-induced erythema (sunburn). To optimize the formulation, different concentration combinations of Central Province tea extract and carrot seed oil were evaluated using UV–Visible spectroscopy. Their photoprotective performance was assessed based on SPF and critical wavelength, a parameter used to evaluate broad-spectrum UV-A protection. Among the tested formulations, the combination of 0.02 mg ml^{-1} Central Province tea extract and 0.08 mg ml^{-1} carrot seed oil exhibited the highest photoprotective performance, achieving an SPF of 18.22 and a critical wavelength of 386.96 nm, demonstrating effective broad-spectrum UV protection. Therefore, this composition was selected for the sunscreen formulation. The optimized formulation exhibited significantly enhanced absorbance across both UV-A (320–400 nm) and UV-B (290–320 nm) regions compared with the individual extracts, confirming a synergistic effect. FTIR analysis revealed characteristic shifts in the O–H and C=O stretching regions, indicating hydrogen-bonding interactions between tea polyphenols and carrot-derived compounds. Gaussian computational analysis of epigallocatechin-3-gallate and umbelliferone showed good agreement with the experimental FTIR spectra, further supporting the presence of intermolecular interactions and enhanced electronic delocalization. These findings demonstrate that molecular interactions enhance the photoprotective performance of the formulation and highlight the potential of combining tea leaf extract and carrot seed oil for the development of effective plant-based natural sunscreen formulations.

Keywords: natural sunscreen, UV absorption, molecular interactions, FTIR analysis, gaussian computational study

Essential Oil-Loaded Zeolite for Sustained Mosquito Repellency Against *Aedes albopictus*

A.V.B.H.K. Jayasekara[1], K.C. Madhusanka[2], T.C. Weeraratne[1], L. Jayarathna[3], S.K. Rodrigo[4]*

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Chemistry, Faculty of Natural Sciences, The Open University of Sri Lanka, Nugegoda, 10250, Sri Lanka*
[3]*National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka*
[4]*Department of Chemistry, Faculty of Science, University of Colombo, Colombo, 00300, Sri Lanka*
*srodr@ou.ac.lk

Dengue remains a major public health concern in Sri Lanka, where *Aedes albopictus* predominantly acts as an outdoor, daytime-biting vector, increasing human-mosquito contact and highlighting the need for effective personal protection. Although plant-based essential oils are safer alternatives to synthetic repellents, their high volatility limits protection duration. Mosquito repellent efficacy can be enhanced through delivery systems that facilitate controlled and sustained release of essential oil active compounds. Hence, this study aimed to develop a sustained-release mosquito repellent by loading cinnamon and citronella essential oils into activated zeolite and evaluating their repellency against *Ae. albopictus*. Commercial zeolite was first activated at 450 °C to remove bound water and enhance pore availability. Cinnamon and citronella essential oils (50, 100, 150 and 200 µL, selected based on preliminary studies) were separately incorporated into 0.5 g of activated zeolite using the mixing method. The formulations were characterized using FTIR spectroscopy and SEM. FTIR spectra showed the characteristic zeolite framework band (~1093 cm^{-1}) together with characteristic absorption bands corresponding to the essential oils, while SEM revealed morphological changes consistent with successful oil loading into the zeolite matrix. Repellency was evaluated using a three-chamber assay in which 35–40 adult female mosquitoes were released into a central chamber connected to treatment and untreated chambers, allowing free movement after acclimatization. Mosquito distribution was recorded at 30-minute intervals over 10 hours. Both encapsulated formulations maintained high, statistically stable repellency across 10 hours (cinnamon: $F=1.11$, $p=0.348$; citronella: $F=1.26$, $p=0.219$). Repellency increased significantly with increasing oil loading ($p<0.001$). At 200 µL, mean repellencies of 77.60% and 80.64% were recorded for cinnamon-encapsulated and citronella-encapsulated zeolite respectively, with citronella showing significantly higher efficacy ($F=10.69$, $p=0.001$). Repellency of 200 µL encapsulated formulations was further compared with corresponding neat oils at the same volume. Compared to 200 µL neat oils, encapsulated formulations exhibited significantly greater repellency over 10 hours (cinnamon: $F=421.11$, $p<0.001$; citronella: $F=257.03$, $p<0.001$), with mean improvements of 20.67% and 19.37%, respectively. Overall, zeolite encapsulation significantly enhances both efficacy and longevity of cinnamon and citronella oils against *Ae. albopictus* through sustained release, demonstrating their potential as safer, long-lasting alternatives for sustainable dengue vector control.

Keywords: *Aedes Albopictus*, cinnamon oil, citronella oil, mosquito repellent, zeolite encapsulation

Evaluation of Antibacterial Activity of *Atalantia ceylanica*

M.M. HewaMarambage[1], K.M.S.M.K. Senavirathne[2]*, A.P. Jayasooriya[2]

[1]*Cardiff School of Sport and Health Science, Cardiff Metropolitan University, Wales, United Kingdom*
[2]*Department of Basic Veterinary Sciences, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**shashi92114@gmail.com*

Antimicrobial resistance (AMR) is a worldwide health concern that limits the efficacy of traditional antibiotic treatments. Medicinal plants contain significant amounts of bioactive chemicals with antibacterial effects. *Atalantia ceylanica*, an indigenous Sri Lankan plant belonging to the *Rutaceae* family, has traditionally been used to treat infectious diseases due to its phytochemicals and antibacterial properties. This study aimed to evaluate and compare the antibacterial activity of *A.ceylanica* leaf extracts against selected respiratory pathogens using the agar well diffusion method, focusing on solvent type (ethanol and aqueous) and differences between fresh leaves and commercially available leaf powder. Fresh leaf powder was prepared in the laboratory, and commercially available powder was purchased. Six leaf powder samples were used, with three extracted using ethanol and three using distilled water. The extracts were stored and tested against *Staphylococcus aureus* (ATCC 25923) and *Escherichia coli* (ATCC 25922) bacterial cultures. The bacterial inoculum was standardized at 0.5 McFarland and the agar well diffusion method was used on Mueller-Hinton Agar. Two concentrations (100mg/mL and 200mg/mL) were examined, with chloramphenicol serving as the positive control and solvents acting as negative controls. The zones of inhibition were evaluated to determine the antibacterial activity. The results demonstrated that ethanolic extracts were solely effective against *S. aureus*. The mean inhibition zone of ethanol extracts against *S. aureus* was 10.00 ± 6.29 mm (n=6), whereas aqueous extracts exhibited a mean inhibition zone of 1.17 ± 2.86 mm (n=6). Fresh samples showed a mean inhibition zone of 9.50 ± 7.59 mm (n=4), while commercial samples exhibited a mean inhibition zone of 3.63 ± 5.45 (n= 4) mm. All ethanolic extracts exhibited zero level of inhibition against *E. coli* and all aqueous extracts demonstrated extremely low inhibition zones against *S. aureus*. All aqueous extracts showed zero level of inhibition against *E. coli*. In conclusion, *A. ceylanica* exhibits antibacterial activity with ethanol extracts showing greater effects than water extracts due to improved phytochemical solubility. Fresh and shade-dried leaves had greater antibacterial activity than commercially available powders. Antibacterial effects were primarily detected against Gram-positive *S. aureus*, while *E. coli* remained resistant, underlining the importance of solvent type and raw material quality on the antibacterial activity.

Keywords: antibacterial activity, *Escherichia Coli*, *Staphylococcus Aureus*, phytochemicals

Evaluation of Bioactivity and Mineralization of Zinc Oxide-Hydroxyapatite Composites Modified with Aloe Vera in Simulated Body Fluid

I.F. Zamhara[1], T.P. Gamagedara[2]*

[1]*Department of Medical Laboratory Sciences, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Science, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**piumnilg@ahs.pdn.ac.lk*

Hydroxyapatite (HA) is widely used for bone regeneration due to its chemical similarity to natural bone material; however, its relatively low bioactivity can limit rapid bone bonding and mineralization, reducing its effectiveness in certain bone tissue engineering applications. This study aimed to evaluate the in vitro bioactivity and mineralization potential of zinc oxide (ZnO)-incorporated HA composites modified with *Aloe vera* extract using simulated body fluid (SBF). HA was synthesized by wet-chemical precipitation, while green-synthesized ZnO nanoparticles were produced using *Aloe vera* extract and calcined at 500 ^{0}C. Composite pellets containing 0-10% *Aloe vera* and 0-15% ZnO were prepared and immersed in SBF for four weeks with weekly renewal. Mineralization was evaluated through absorption and pH measurements, supported through particle size analysis, ATR-FTIR, SEM, and microscopy. Statistical analysis included factorial ANOVA and non-parametric tests. ZnO significantly enhanced mineralization ($F = 5.09$, $p < 0.001$), while *Aloe vera* exerted a moderate but significant effect ($F = 4.35$, $p = 0.015$). Time-dependent mineralization ($F = 3.04$, $p = 0.031$) and significant interaction effects ($p < 0.001$) demonstrated synergistic enhancement of biomineralization. Non-parametric analysis further confirmed progressive mineral deposition over time. ZnO also helped stabilize pH during SBF immersion, creating favorable conditions for apatite formation and biomineralization. Overall, the ZnO-modified HA composite emerged as promising biomaterial for bone tissue engineering, scaffold fabrication, and implant coating applications.

Keywords: hydroxyapatite, Zinc Oxide nanoparticle, *aloe vera*, bioactivity, mineralization, simulated body fluid

Evaluation of Quality Parameters and Heavy Metal Contamination in Selected Skincare Products Available in the Sri Lankan Market

G.D.K. Weerasinghe[1], K.A.D.D. Sakunthala[1]*, W.P.R.T. Perera[2], J.A. Liyanage[1], W.A.P.J. Premaratne[1]

[1]*CKDu Information and Research Centre & Department of Chemistry, Faculty of Science, University of Kelaniya, 11600, Sri Lanka*
[2] *Department of Indigenous Medical Resources, Gampaha Wickramarachchi University of Indigenous Medicine, Yakkala, 11300, Sri Lanka*
**kadds251@kln.ac.lk*

This study aimed to evaluate quality parameters and heavy metal levels in skincare products commonly available in the Sri Lankan market to determine their compliance with established cosmetic safety standards and potential risks to consumer health. Thirty commercially available skincare cream products that represented six types, including whitening (C1), men's (C2), night (C3), herbal (C4), acne treatment (C5), and baby creams (C6), were collected. The quality parameters that include the pH, water content, non-volatile matter, and ash content were measured according to Sri Lanka Standard 743:2021. After microwave acid digestion, heavy metals and metalloids were quantified using Inductively Coupled Plasma Mass Spectrometry. One-way analysis of variance (ANOVA) alongside the Tukey test was used for the statistical analysis. All analyses were done in triplicate. Most products met recommended pH limits; however, C4 had the highest average pH (8.66±0.02), exceeding the upper limit. C5 had the highest water content, which is above the recommended limit of 85% (w/w), and had the lowest non-volatile matter content. C4 had the highest ash content. Copper concentrations exhibited statistically significant variation among product categories. Zinc concentrations varied among product categories, with the lowest level in C5 and the highest in C2. However, these differences were not statistically significant ($p > 0.05$). Chromium levels exceeded the European Union maximum limit of 1 mg/kg in all samples. Lead, cadmium, and arsenic were well within the limit, while nickel was not detected in the samples. Overall, most products met the established safety standards; however, deviations in quality parameters highlight potential safety and quality concerns. These findings underscore the importance of continuous monitoring and stricter regulatory enforcement to ensure consumer safety and maintain the quality of skincare products in the Sri Lankan market.

Keywords: skincare, quality parameters, heavy metals, Sri Lankan market

Extraction, Characterization, and Evaluation of Bioactive Potentials of Yellow Pigment Extracted from Soil Bacterial Isolate HGY2

M.H.F. Hafna[1]*, C.S.K. Rajapakse[2], A.P. Halmillawewa[1]

[1]*Department of Microbiology, Faculty of Science, University of Kelaniya, Dalugama 11600, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Kelaniya, Dalugama 11600, Sri Lanka*
**hafnahafeel20@gmail.com*

Microbial pigments have emerged as promising alternatives to synthetic colorants due to growing concerns over the toxicity and environmental impact of chemical dyes, as well as the renewable production and potential bioactive properties of these pigments. Soil ecosystems harbor diverse pigment-producing bacteria; however, many strains and their pigments remain underexplored for industrial or pharmaceutical applications. The present study aimed to isolate, identify, and characterize pigment-producing bacteria from soil, with a specific focus on selected yellow-pigmented strain for its putative carotenoid content, and to evaluate the antioxidant, antimicrobial, and photoprotective potential of its pigment for possible biotechnological applications. The bacterial isolate HGY2 was obtained from soil using standard microbiological isolation techniques. Preliminary identification of the isolate was carried out using morphological and biochemical characterization. The intracellular yellow pigment was extracted using methanol through a cell disruption and solvent extraction approach, and characterized through UV-visible spectroscopy, thin-layer chromatography (TLC), column chromatography, and high-performance liquid chromatography (HPLC). Antioxidant activity of the pigment extract was evaluated using the DPPH free radical scavenging assay. Antimicrobial activity of the pigment extract was assessed using the agar well diffusion method on Mueller–Hinton agar, while its photoprotective potential was evaluated by determining the Sun Protection Factor (SPF) using a UV spectrophotometric method based on the Mansur equation. The isolate was preliminarily identified as belonging to the genus *Micrococcus* based on morphological and biochemical characterization. UV-visible spectroscopy revealed characteristic carotenoid fine-structure absorption peaks between 390–480 nm alongside a strong absorption in the 200–300 nm region. TLC revealed the presence of one visible and two UV-active components, while HPLC confirmed β-carotene as the primary pigment. The pigment extract demonstrated antioxidant activity with an IC_{50} value of 343.80 ± 3.47 µg/mL. Antimicrobial screening of the extract at 1000 µg/mL showed negligible inhibition, suggesting that higher concentrations or purified fractions may be required for significant activity. Notably, the pigment exhibited an SPF value of 14.88 ± 0.18, indicating promising photoprotective capacity. These findings highlight the biotechnological potential of this yellow bacterial pigment extract, particularly for cosmetic and nutraceutical applications. Further characterization of the pigment and molecular identification of the isolate are warranted in future studies to fully elucidate the bacterial identity and harness the biotechnological potential of the pigment.

Keywords: B-Carotene, microbial pigment, antioxidant, photoprotection, soil bacteria

Fabrication of Dye-Sensitized Solar Cells Based on Natural Pigments Extracted from the American Black Nightshade *(Solanum americanum* Mill.) Fruit

H.M.G.K.B. Herath[1,2], R.M.G. Rajapakse[2,3], G.R.A. Kumara[1]*

[1]*National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Chemistry, University of Peradeniya, 20400, Sri Lanka*
**grakumara2000@yahoo.com*

Dye-sensitized solar cells (DSCs) have gained attention as cost-effective alternative to conventional silicon-based solar cells. DSCs operating on a principle similar to natural photosynthesis by using photosensitive dye to absorb light and transfer electrons to a semiconductor, resulting in current generation. TiO_2 is commonly employed as the semiconductor due to chemical stability and non-toxicity, while ruthenium-based dyes such as N719 and N3 are widely used as sensitizers. However, the high cost and environmental concerns of synthetic ruthenium-based dyes encouraged the search for natural sensitizers. In this study, *Solanum americanum* Mill. fruit extract was investigated as a novel sustainable, biodegradable photosensitizer for DSCs, identifying it as an underexplored locally abundant source of anthocyanin pigments. The dye was extracted from crushed fruits, using 70% ethanol acidified with acetic acid at room temperature in the absence of light, yielding a purple-colored solution. The photoanode was fabricated using a TiO_2 P25-based paste (0.65 g TiO_2, 5 ml titanium isopropoxide, 5.5 ml acetic acid, 20 ml isopropanol and 5 ml distilled water), which was deposited onto fluorine-doped tin oxide substrates (FTO) via drop-casting, followed by sintering at 500 ℃ for 30 minutes and immersion in the extracted dye for 24 hours. Devices were assembled with the dye-adsorbed photoanode, a platinum counter electrode and I^-/I_3^- electrolyte, with an active area of 0.20 cm^2, and were then evaluated under standard AM 1.5G illumination (100 mW cm^{-2}). Among the fabricated cells, the maximum power conversion efficiency (PCE) of 0.45% was achieved with an open-circuit voltage (V_{oc}) of 0.500 V, a short-circuit current density (J_{sc}) of 1.49 mA cm^{-2}, and a fill factor (FF) of 0.601. UV-Vis spectroscopy showed a solution absorption maximum (λ_{max}) at ~537 nm, characteristic of anthocyanin pigments, which broadened and red shifted upon TiO_2 adsorption, confirming chemisorption. A 36 hour stability assay showed a ~14% decrease in peak absorbance with no λ_{max} shift, indicating short-term dye stability. These findings demonstrate that *S. americanum* pigments can function as a cost-effective, biodegradable sensitizer for DSCs. Future research could focus on optimizing dye adsorption, co-sensitization, and electrolyte composition to improve device performance and stability.

Keywords: dye-sensitized solar cells, natural sensitizer, *Solanum Americanum* mill.

Fish Community Structure and the Emerging Threat of Exotic Ornamental Fishes in Bolgoda Lake, Sri Lanka

P.S.L. Madawala, K.B. Wijesooriya, L.N. Rathnayake, G. Ellepola*

Department of Zoology, Faculty of Science, University of Peradeniya, 20400, Sri Lanka
**gajaba.ellepola@sci.pdn.ac.lk*

Freshwater and estuarine ecosystems face increasing pressure from non-native species introductions, disrupting community structure and threatening ecosystem stability. In Sri Lanka, ornamental fish trade has become a key pathway for biological invasions, posing a potential threat to native freshwater biodiversity. The Bolgoda Lake system, a semi-closed brackish estuary of high ecological and socioeconomic importance, supports diverse native ichthyofauna but remains poorly studied with respect to the impacts of exotic ornamental fish species. This study aimed to assess fish community structure, distribution and establishment of exotic ornamental fishes, examine their potential ecological impacts, and evaluate the human-induced pressure from ornamental fish farming on Bolgoda Lake. The study employed a six-month, multi-method approach across ten sites, integrating netting surveys, gut content and gonad analyses, physicochemical water quality assessment, geospatial analysis of aquarium distributions, and stakeholder questionnaires. A total of 59 species across 40 families were recorded, including 13 introduced species, seven of which were identified as ornamental fish escapes: *Chitala ornata, Hypostomus plecostomus, Poecilia reticulata, Betta splendens, Xiphophorus maculatus, Mayaheros urophthalmus,* and *Piaractus mesopotamicus*. Simple linear regression showed a relationship between introduced species richness and distance to the nearest ornamental fish keeping facilities. The Exotic species showed spatial clustering in the northern lake regions characterized by intermediate pH, conductivity, and higher human activity, but with weak association to ornamental fish keeping facilities ($p = 0.694$, $r^2 = 0.02$). Redundancy analysis indicated pH as the main environmental driver, with dissolved oxygen, temperature, conductivity, and TDS. Gut content analyses revealed dietary overlap between introduced and sympatric native species at higher taxonomic levels, suggesting the potential for resource competition. Gonad inspections confirmed breeding populations of *Mayaheros urophthalmus*. Notably, the study documented the first occurrence of *Piaractus mesopotamicus* in Bolgoda Lake, highlighting the introduction of a potentially invasive aquarium species. Although 79% of respondents recognized releasing aquarium fish as an ecological risk, 9% admitted to having released aquarium fish into natural water bodies. The study highlights the occurrence and establishment of breeding populations of exotic ornamental fishes in Bolgoda Lake and underscores the importance of continued monitoring and integrated management strategies to safeguard native fish biodiversity.

Keywords: exotic ornamental fish, geospatial analysis, ornamental fish trade, physicochemical parameters, redundancy analysis

Floral Constancy of *Tetragonula iridipennis* and *Tetragonula praeterita* in a Tropical Agro-natural Landscape in Panadura, Sri Lanka

W.S.K.D. Soysa, W.A.I.P. Karunaratne*

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**inokap@sci.pdn.ac.lk*

Floral constancy, the repeated visitation of a single floral species within a foraging trip, is a key behavioral mechanism influencing pollination efficiency in social bees, yet remains poorly studied in Sri Lankan stingless bees. This study compared floral constancy patterns of *Tetragonula iridipennis* and *T. praeterita* in a heterogeneous agro–natural farm environment in Panadura and identified the ecological drivers underlying constancy. Corbicular pollen loads (one per returning forager) were collected at nest entrances from six nests (three per species), with ten foragers sampled per nest during each of the morning and afternoon sessions over ten days, yielding 600 pollen loads per species (1,200 in total). Pollen types in a subsample mounted on a microscope slide were identified using a reference slide collection prepared from crop and non-crop flora within the area. Each corbicular pollen load was homogenized in 70% ethanol, and stained with methylene blue. Pollen grains were identified and counted under light microscopy using a field-of-view (FOV) method, and floral constancy was defined using a ≥70% uni-dominance threshold. Temporal pollen availability of the crops *Momordica charantia* and *Cucumis sativus* was also assessed to evaluate its influence on foraging behavior. Results showed that both species were predominantly generalist foragers across all six nests, with pollen loads dominated by wild flora, particularly *Tridax* sp., while crop pollen contributions were minimal in most nests (<4%). However, two constancy events were recorded exclusively in *T. iridipennis*: one exhibited strong morning constancy on *M. charantia* (74.8%), while another showed afternoon constancy dominated by *Tridax* sp. (75.2%). No constancy was observed in *T. praeterita* nests. Mean pollen loads were higher in *T. praeterita* (12,259,420 ± SE) than in *T. iridipennis* (9,939,048 ± SE), although variability within species was high. Temporal analysis revealed significantly higher crop pollen availability in the morning ($p < 0.05$), corresponding with increased crop pollen collection during early foraging periods, while total pollen loads remained relatively stable between morning and afternoon, indicating that constancy was driven by resource composition rather than total pollen intake. These findings demonstrate that floral constancy in the studied stingless bees is not a fixed species trait but a context-dependent response that emerges when resource abundance, temporal availability, and colony-level recruitment dynamics align. This study provides the first quantitative baseline for floral constancy in Sri Lankan stingless bees, emphasizing the need for broader studies on the influence of landscape heterogeneity and floral phenology on pollination behavior.

Keywords: stingless bees, floral constancy, *Tetragonula Iridipennis, Tetragonula Praeterita,* pollination ecology

Gastrointestinal and Ectoparasites in Feral Horses (*Equus caballus*) of Delft Island, Sri Lanka

W.H.I.S. Wijayarathne[1*], P.K. Perera[1], N.U.K. Pathirana[1], A. Dangolla[2], P. Gajavathany[3], R.S. Rajakaruna[1]

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Veterinary Clinical Science, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Zoology, Faculty of Science, University of Jaffna, Jaffna, 40000, Sri Lanka*
[*]*isurusandaruwan81@gmail.com*

Feral horses inhabiting Delft Island represent a unique component of Sri Lanka's natural and cultural heritage. It is important to assess their health status comprehensively. This study examined the prevalence, intensity and seasonal variation of gastrointestinal (GI) and ecto-parasites in feral horses during the wet and dry seasons, across different horse management conditions. Faecal samples and ectoparasites were collected during the dry and wet seasons; parasite eggs were isolated by modified salt flotation method and intensities were determined by counting recovered eggs after concentration of 3 g of faecal material into 0.5 mL. Of the 64 faecal samples collected during the two seasons, eggs of eight GI parasites: Strongyles, *Cystoisospora*, *Cryptosporidium*, *Anoplocephala*, *Strongyloides*, *Entamoeba, Parascaris* and other ascarid-type eggs were identified. Strongyle type nematode eggs were the most prevalent (100% wet; 93.8% dry) with no significant seasonal difference (Chi-square test, $P>0.05$). Both Cystoi*sospora* (21.9% wet and 3.1% dry), and *Anoplocephala* (21.9% wet and 3.1% dry) had a significant seasonal difference (Chi-square test, $P<0.05$). There was no difference in the prevalence of infection among the 64 horses (56 free-grazing; 8 captive) sampled. However, the intensity of infection varied by group and management system, with free-grazing horses having higher strongyle-type egg intensity (EPG 50–500 wet; 0–300 dry) than captive horses (EPG 50–200 wet; 0–100 dry). Tick infestations occurred in all horses only in the dry season, with *Rhipicephalus microplus* dominating (84.8%) and *Rhipicephalus haemaphysaloides* (15.2%), indicating dry conditions favour tick infection. Tick blood meals were screened for potential *Rickettsia* infections; however, all samples tested negative. No horses received deworming or veterinary care, and as they share common pastures with cattle, shared grazing areas may increase opportunities for parasite transmission between horses and livestock. A comparison with a study conducted about a decade ago reveals that, although the strongyle-dominated infection profile has remained consistently high, the parasite community has diversified, showing shifts in species composition and providing insights into seasonal variations. The findings revealed persistent gastrointestinal parasitism throughout the year, while tick infestation appears to be seasonally influenced, in the feral horse population inhabiting Delft Island.

Keywords: gastrointestinal parasites, tick infestation, feral horses, seasonality, Delft Island

GeoAI-Based Flood Extraction Using Sentinel Satellite Imagery and DEM: A Case Study of Cyclone Dithwa in The Attanagalu Oya River Basin, Sri Lanka

P.D. Sellahewa[1]*, J.K. Gunatilake[2], P.M.P.C. Gunathilake[1]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400 Sri Lanka*
[2]*Department of Geology, Faculty of Science, University of Peradeniya, Peradeniya, 20400 Sri Lanka*
**deshansellahewa@gmail.com*

Flooding associated with tropical cyclones frequently impacts riverine environments in Sri Lanka, where rapid and accurate flood extent mapping is essential for disaster response, mitigation, and recovery planning. This study focused on the flood event caused by Cyclone Ditwah, which occurred from 28 November to 2 December 2025 and resulted in inundation across the Attanagalu Oya river basin. Although satellite-based flood mapping has been widely applied, limited studies have comparatively evaluated transformer-based and CNN-based GeoAI models for cyclone-induced flood delineation in Sri Lankan river basins. This study addresses that gap using the Cyclone Ditwah flood event in the Attanagalu Oya basin. The second objective was to compare on model performance and identify the performing model using evaluation metrics. Sentinel-2A multispectral imagery acquired on 30 November 2025 and ASTER GDEM-derived topographic variables were used as the primary datasets for this study. A total of 745 pixel-based training samples representing flooded areas were prepared for SpectralFormer, U-Net, DeepLabV3+, and SegNet models. The predicted flood outputs were converted into polygon layers. Based on the confusion matrix evaluation at epoch 100, the results demonstrated that all four GeoAI models achieved high F1-scores ranging from 88.73% to 94.08%, confirming strong flood detection performance, with U-Net achieved higher performance (94.08%) followed by SegNet (89.43%), SpectralFormer (89.16%), and DeepLabV3+ (88.73%). SpectralFormer demonstrated a more balanced performance between precision (80.97%) and recall (99.21%), contributing to its overall effectiveness. Despite similar accuracy levels, the models produced noticeably different flood extent estimate: U-Net mapped the smallest area (56,012,100 m²), while SegNet, SpectralFormer, and DeepLabV3+ progressively overestimated flood extent to 60,966,700 m², indicating clear spatial variability in pixel classification. Overall, the findings indicate that higher F1-scores did not necessarily correspond to larger flood areas, highlighting inconsistencies in boundary delineation and demonstrating that each The GeoAI models represented flood distribution differently despite being trained and evaluated under the same input conditions, using Sentinel-2A multispectral imagery and ASTER GDEM-derived topographic variables. These findings support the use of GeoAI models for improved flood delineation in complex environments.

Keywords: DEM, Ditwah, flood, GeoAI, flood extent mapping

\

Halloysite Clay-based Electrospun Fiber Meshes as Hemostatic Wound Dressings

M.H.H.H Bandara[1], V.U. Godakanda[1], K.M.N. De Silva[1], W.R.M de Silva[1,2]*

[1]*Centre for Advanced Materials and Devices (CAMD), Department of Chemistry, University of Colombo, Colombo, 00300, Sri Lanka*
[2]*Department of Biomedical Science, NSBM Green University, Mahenwaththa, Pitipana, Homagama, 10206, Sri Lanka*
**rohini@chem.cmb.ac.lk*

Uncontrolled hemorrhage remains a leading cause of mortality worldwide, with conventional hemostatic materials often failing to actively promote rapid clot formation. Halloysite nanotubes (HNTs), naturally occurring aluminosilicate nanomaterials, possess intrinsic procoagulant activity through contact activation of the intrinsic coagulation pathway, making them promising candidates for advanced hemostatic wound dressings. However, nanoparticle agglomeration at higher HNT loadings within electrospun polymer matrices limits their hemostatic efficacy and hemocompatibility. This study aimed to fabricate electrospun ethyl cellulose (EC) and poly(vinylpyrrolidone) (PVP) nanofibrous mats incorporating pristine and 3-aminopropyltriethoxysilane (APTES)-functionalized HNTs (HNT–NH_2), and to evaluate whether surface modification improves nanotube dispersion, hemostatic performance, and blood compatibility. HNTs were functionalized with APTES and characterized by FTIR, XRD, and TGA, confirming successful covalent grafting while preserving the crystalline halloysite structure. EC/PVP nanofibrous mats were fabricated by electrospinning with HNT and HNT–NH_2 loadings of 5, 10, 15, and 20 wt%. Mats were characterized by SEM, EDX, FTIR, and XRD. Hemostatic performance was assessed using activated partial thromboplastin time (aPTT) and whole-blood coagulation (WBC) assays. Hemocompatibility was evaluated through direct-contact and leachate hemolysis assays, and anti-inflammatory activity was assessed using the egg albumin protein denaturation method. SEM and EDX confirmed significantly improved HNT–NH_2 dispersion within the polymer matrix compared to unmodified HNTs, which exhibited visible aggregation. The 20 wt% HNT–NH_2 mat reduced aPTT by 86.1% versus 79.8% for the equivalent pristine HNT mat. In the WBC assay, the 20 wt% HNT mat achieved a clotting time of 56.2 ± 1.86 s compared to 67.4 ± 2.65 s for HNT–NH_2. Hemolysis exceeded the 5% threshold only at 20 wt% HNT–NH_2 loading, while leachate hemolysis remained below 2% across all formulations. The 20 wt% HNT mat demonstrated 94.31 ± 1.8% anti-inflammatory inhibition. The 15 wt% HNT–NH_2 formulation offered the optimal balance of procoagulant activity, hemocompatibility, and anti-inflammatory performance, demonstrating that APTES functionalization effectively enhances HNT dispersion and hemostatic efficiency in electrospun EC/PVP nanocomposites, advancing the development of multifunctional hemostatic wound dressings.

Keywords: APTES, electrospun nanofibrous mats, hemocompatibility, hemostasis, HNT

Hidden Burden of Asymptomatic Fungal Colonization: The Role of Footwear as a Potential Reservoir of Fungi

M.S. Sheriffdeen[1]*, W.A.M. Daundasekera[2], S.H. Boyagoda[1]

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**shameersheriffdeen@gmail.com*

Fungal infections of the foot and toenails are among the most common superficial mycoses worldwide, with footwear type and hygiene practices influencing foot microenvironment and potentially contributing to fungal colonization. This study investigated the diversity and prevalence of fungi associated with toenails among undergraduates at the University of Peradeniya, focusing on footwear use, hygiene practices, and shoe–toenail fungal overlap. A mixed-methods approach combined a questionnaire survey (N = 117) assessing footwear habits, hygiene practices, and self-reported foot fungal infections with laboratory analyses of subset of participants (n = 20; 10 open- and 10 closed-footwear users). Toenail swabs and clippings were collected from all participants, and shoe swabs from closed-footwear users. Samples were analyzed by direct microscopy (10% KOH mounts) on toenail clippings and by fungal culture of toenail and shoe swabs on Sabouraud Dextrose Agar. Fungal load (CFU/ml), Species richness, and Shannon diversity index were calculated and analyzed using non-parametric statistics. Self-reported fungal infections were significantly higher among open-footwear users (28.6%) than closed-footwear users (10.0%). However, no significant associations were observed between infection status and foot hygiene (p = 0.582) or footwear hygiene (p = 0.128). Although microscopy detected no fungal elements, cultures revealed 10 morphotypes, predominantly non-dermatophyte molds (*Aspergillus* sp., *Penicillium* sp., *Fusarium* sp., *Cladosporium* sp., and an unidentified environmental isolate). Fungal load, diversity, and species richness showed no significant variation across footwear groups or hygiene categories ($p > 0.05$). The discrepancy between questionnaire-based self-reported infections and laboratory findings likely reflects methodological differences, as self-reported infections represent perceived or previous disease, whereas microscopy and culture evaluated current fungal colonization. Notably, a strong positive correlation (Spearman's $\rho = 0.74$, $p = 0.014$) was observed between fungal load in shoes and corresponding toenail samples, with 90% of closed-footwear users sharing at least one identical morphotype. These findings demonstrate widespread asymptomatic fungal colonization and identify footwear as a potential reservoir facilitating fungal persistence. The absence of clinically detectable infection despite fungal carriage suggests that colonization does not necessarily result in disease. Given the pilot laboratory sample size, these findings should be interpreted cautiously and validated in larger studies incorporating molecular identification.

Keywords: asymptomatic colonization, footwear, non-dermatophyte molds, toenail fungi, university students

Impact of Age on Pyrethroid and Organochlorine Resistance and Glutathion- S - Transferase Activity in *Culex Quinquefasciatus*

P.W.A.D.K.Weerasinghe, T.C.Weeraratne*

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
*thiliniw@sci.pdn.ac.lk

Culex quinquefasciatus is the principal vector of *Wuchereria bancrofti* in Sri Lanka, and understanding how physiological ageing influences insecticide resistance is essential for sustaining post-elimination vector control and preventing disease re-emergence. This study aimed to investigate age-dependent variation in susceptibility of adult *Cx. quinquefasciatus* to Lambda-cyhalothrin and DDT, while assessing changes in Glutathione S-transferase (GST) enzyme activity across age groups. *Culex quinquefasciatus* eggs collected from the Peradeniya university premises were reared under controlled laboratory conditions, and standard bioassays and biochemical assays were conducted to adults of five chronological age groups (1–3, 8–10, 15–17, 22–24, and 29–31 days). Standard bioassays were conducted using the WHO insecticide-impregnated paper method at discriminating concentrations of Lambda-cyhalothrin (0.05%) and DDT (4%), with 100 individuals tested per age group (25 per replicate).GST activity was quantified biochemically in 30 individuals per group. Prior to performing statistical analyses, the normality of the data were tested. Mortality differences among age groups and between insecticides were analyzed using one-way ANOVA and two-sample t-tests, while correlation analysis assessed the relationship between GST activity and mortality. Results showed that mortality for both insecticides remained below 90% across all age groups, indicating resistance according to WHO guidelines. A decreasing trend in mortality to Lambda-cyhalothrin was observed with increasing age, whereas DDT susceptibility slightly increased with age. GST activity was elevated across all age groups and increased significantly with age ($p < 0.001$). Older mosquitoes (29-31 days) exhibited approximately three times higher GST activity (10.376 ± 3.773 μmol/mg/min) compared to younger mosquitoes (1-3 days) (3.455 ± 0.781 μmol/mg/min).However, no significant correlation was observed between GST activity and mortality for either Lambda-cyhalothrin ($p=0.233$) or DDT ($p=1.000$). These findings suggested that GST-mediated detoxification is unlikely to be the primary resistance mechanism, particularly for DDT. Instead, alternative mechanisms such as monooxygenase and esterase activity, along with possible target-site mutations (*kdr*), may play a more significant role. Overall, the study demonstrated that chronological ageing influences insecticide susceptibility in a compound-specific manner and highlights that resistance is governed by multiple interacting mechanisms.

Keywords: age-dependent susceptibility, *Culex Quinquefasciatus*, Glutathione S-Transferase (GST), insecticide resistance

Impact of Common Household Water Treatment Methods on Microplastics in Drinking Water

R.M.P. Abeywickrama, B.A.P.C. Prematilake, R.S. Rajakaruna*

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**rupika.rajakaruna@sci.pdn.ac.lk*

Microplastic (MP) contamination in drinking water has emerged as a significant environmental and public health concern due to continuous human exposure through daily consumption. While centralized water treatment systems have been widely investigated, the influence of common household-level practices on MP abundance and size distribution remains inadequately understood. This study evaluates the impact of two widely used domestic water treatment methods, reverse osmosis (RO) filtration and storage in clay water containers, on MP abundance in drinking water, while also examining the influence of tap line material on MP concentrations. Water samples were collected under multiple treatment conditions, including unfiltered tap water from both polyvinyl chloride (PVC) and copper tap lines. All subsequent treatments were conducted using water from the PVC tap line. For each treatment, five replicate samples (n = 5), each consisting of 5 L, were processed. MPs were extracted using a 65 µm brass mesh sieve, followed by vacuum filtration through 0.45 µm glass fiber membrane filters, and the extracted MPs were analyzed and enumerated under a dissecting microscope at 40× magnification. Particles were measured using ZEN 3.1 software (Blue edition). One-way ANOVA revealed significant differences in MP abundance among treatment groups ($F = 23.962$, $p < 0.001$, $R^2 = 0.83$). Tukey's post hoc test showed that RO-filtered PVC tap water stored in a clay container had significantly higher MP abundance (126.20 ± 37.50 particles per 5 L) than all other treatments ($p < 0.001$), indicating that the combined treatment and storage process may contribute to increased MP levels. The higher MP abundance observed in RO-filtered water stored in a clay container, relative to untreated PVC tap water, suggests that the treatment and storage processes may have contributed additional MPs. Possible sources include plastic components of the RO filtration unit and MPs associated with the clay container material. Untreated samples exhibited lower MP abundance. Although no statistically significant differences were observed among untreated PVC tap water (32.00 ± 4.74), untreated copper tap water (25.00 ± 10.89), RO-filtered PVC tap water (37.80 ± 7.66), and untreated PVC tap water stored in a clay container (54.40 ± 12.89), gradual increases across treatments suggest subtle treatment-related influences, while consistently lower levels in copper tap water indicate a potential effect of plumbing material. The higher MP abundance observed following RO filtration and subsequent storage in a clay container suggests that both the filtration and storage processes contributed additional MPs. Potential sources include plastic components within the RO filtration system, as well as MPs incorporated into clay materials during manufacture, as environmental clay deposits can accumulate plastic particles from surrounding soils and sediments. Overall, common household practices do not consistently reduce MP contamination and may increase MP levels. These findings underscore the importance of comprehending household water handling to mitigate human exposure to microplastics.

Keywords: household water treatment, water safety, drinking water quality, filtration efficiency, adsorption dynamics

Impact of Fermentation on Plant-Based Serum Bioactivity and Stability

H.M.D. Nayomi*, A.S.D. Boteju

Faculty of Science, Horizon Campus, Malabe, 10115, Sri Lanka
**danushika@horizoncampus.edu.lk*

The growing demand for sustainable and multifunctional cosmetics has increased interest in plant-based and fermentation-enhanced skincare products. This study aimed to develop a serum based on *Lactobacillus*-fermented quinoa, naturally fermented rice water, flaxseed gel, and aloe vera, enriched with selected plant extracts and active ingredients. The study evaluated physicochemical properties and bioactivity of fermented and non-fermented serums, and identified optimal storage and packaging conditions for stability. Both formulations were identical, differing only by fermentation. Standard methods were employed to assess antioxidant activity using the DPPH assay, antimicrobial activity using the Kirby–Bauer disk diffusion method (Gentamicin as positive control and sterile saline as negative control), in vitro Sun Protection Factor using the Mansur method, and pH stability. All calculations were performed using standard method equations, and all tests were conducted in triplicate to ensure reproducibility. Organoleptic properties were evaluated at ambient conditions (25 ± 2 °C), with color assessed by visual inspection against a white background and odor by the wafting method. A 28-day stability study was conducted using amber and clear glass bottles under room temperature (25 ± 2 °C), refrigeration (4 ± 1 °C), and sunlight exposure (34.5 ± 1.3 °C), with evaluation of pH, color, odor, and microbial quality. Microbial quality was assessed at 0, 7, and 28 days using total viable count and yeast and mold count. Stability results indicated that amber bottles and controlled storage conditions (room temperature and refrigeration) better maintained formulation stability than sunlight exposure. The pH remained stable (4.85 ± 0.55) at 25 ± 2 °C, and microbial quality remained within acceptable limits across all conditions. The fermented serum exhibited moderate antioxidant activity (IC_{50} = 48.33 µg/mL), enhanced SPF (19.7–20.1), and measurable antimicrobial activity against *Staphylococcus aureus* (12.4 ± 3.9 mm) and *Escherichia coli* (14.3 ± 4.0 mm). In comparison, the non-fermented serum showed lower SPF (18.18- 19.0), lower antioxidant activity (IC_{50} = 50.2 µg/mL), and reduced antimicrobial activity against *Staphylococcus aureus* (6.8 ± 5.6 mm) and *Escherichia coli* (7.4 ± 5.7 mm), indicating improved functional performance due to fermentation. Overall, fermentation significantly enhanced the bioactivity of the serum, while optimized packaging and storage conditions ensured its stability, supporting its potential as a safe, effective, and sustainable cosmetic formulation.

Keywords: fermented serum, *Lactobacillus* fermentation, antioxidant, antimicrobial, Sun Protection Factor (SPF)

No show Abstract

Impact of Tourism and Demographic Factors on Sri Lanka's GDP: A Statistical and Machine Learning Approach

S.Gajane[1]*, N.Varathan[2], R.Tharshan[2], M.A.M. Mohamed[1]

[1]*Department of Physical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka*
[2]*Department of Mathematics and Statistics, Faculty of Science, University of Jaffna, Jaffna 40000, Sri Lanka.*
**gajane.sribala@gmail.com*

Gross Domestic Product (GDP) is a widely used indicator of a country's economic performance, reflecting production capacity, income generation, and overall development. In Sri Lanka, tourism and demographic factors significantly contribute to economic activity; however, previous studies have mostly examined these variables separately and relied on single forecasting methods, limiting understanding of their combined effects. This study investigates the impact of tourism arrivals and demographic variables, including population, birth rate, and death rate, on Sri Lanka's GDP and evaluates suitable forecasting models. Annual data from 1970 to 2022 were obtained from official secondary sources. Descriptive analysis showed increasing trends in GDP, tourism arrivals, and population, while birth and death rates declined over time, reflecting demographic transition. Although birth and death rates evolve gradually over time, they were incorporated to represent long-term demographic changes that may indirectly affect GDP by influencing population composition and labour force dynamics. Data preprocessing included logarithmic transformation, outlier detection, and stationarity testing to improve reliability. Multiple Linear Regression was used to examine relationships between GDP and explanatory variables, while ARIMA, ARIMAX, Random Forest, and XGBoost models were applied for forecasting. Diagnostic tests revealed violations of regression assumptions, including autocorrelation, heteroskedasticity, multicollinearity, and possible misspecification, indicating that regression is suitable for explanation but not robust forecasting. The ARIMA(0,1,0) model indicated that GDP follows a random walk with drift, while the ARIMAX(1,1,1) model improved forecasting by incorporating tourism and demographic variables. Feature importance analysis from XGBoost identified tourism arrivals and population as the most influential predictors of GDP, while birth rate and death rate had lower short-term influence and mainly reflected long-term demographic conditions. Forecasting performance was evaluated using Mean Absolute Percentage Error (MAPE) for the 2010–2022 test period. XGBoost achieved the best accuracy with a MAPE of 1.02%, outperforming ARIMA (21.05%), ARIMAX (39.25%), Random Forest (63.16%), Hybrid ARIMA–Random Forest (63.16%), and Multiple Regression (90.03%). The results demonstrate that integrating tourism and demographic variables with machine learning significantly improves GDP forecasting accuracy and provides valuable insights for economic planning, tourism policy, and sustainable development in Sri Lanka.

Keywords: ARIMAX, demographic factors, GDP, tourism arrivals, XGBoost

Insecticide Susceptibility of *Trichoplusia ni* (Cabbage Looper) to Etofenprox: A Comparison Between Badulla and Nuwara Eliya District Populations, Sri Lanka

R.A.T.K. Rupasingha[1], W.A.P.P. de Silva[1], S.K. Rodrigo[2], T.C. Weeraratne[1]*

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Colombo, Colombo 03, 00300, Sri Lanka*
**thiliniw@pdn.ac.lk*

Insecticide resistance is a persistent and growing challenge in the control of insect pests. Heavy use of insecticides in cabbage farming in Sri Lanka has increased the chance of resistance development in *Trichoplusia ni* (cabbage looper), a member of the cabbage caterpillar complex. This study aimed to evaluate and compare the susceptibility levels of *T. ni* populations from the Badulla and Nuwara Eliya districts to etofenprox (a widely used non-ester pyrethroid, recommended by the Department of Agriculture, Sri Lanka). Adult populations of *T. ni* were collected from five field locations in each district, and separate laboratory colonies were established. Standardized bioassays were conducted on second-instar larvae obtained from these colonies using the leaf-dip method. Larvae were exposed to concentrations ranging from 150 mg/L (recommended dose) up to 1800 mg/L for the Badulla population (7 concentrations) and up to 2400 mg/L for the Nuwara Eliya population (9 concentrations). Ten larvae were used per replicate, with three replicates tested for each concentration. A control group of ten larvae per replicate was provided with untreated cabbage leaves. Mortality was recorded 72 hours post-exposure. Probit regression analysis showed a significant dose-response relationship in both populations (Badulla, $R^2 = 0.952$, $p < 0.001$, Nuwara Eliya; $R^2 = 0.962$, $p < 0.001$), indicating increasing mortality with concentration. LC_{50} for the Badulla population was 808.6 ppm (95% CI: 684.9-954.6 ppm), whereas the Nuwara- Eliya population showed a higher LC_{50} of 1772.6 ppm (95% CI: 1485-2116 ppm). Non-overlapping confidence intervals and Mann-Whitney U test ($W = 0$, $p < 0.001$) confirmed a statistically significant difference in LC_{50} values between the two populations. The relative potency ratio (0.456) indicates that the Badulla population is relatively more susceptible, while the Nuwara Eliya population is approximately 2.2 times more tolerant to etofenprox. The LC_{50} values for the Badulla and Nuwara Eliya populations were ~5 and ~12 times higher than the recommended field dose, respectively. The outcomes suggest that isolated populations have progressively developed higher levels of insecticide resistance under sustained insecticide pressure, demonstrating regional variation in susceptibility and emphasizing the importance of evaluating local populations for effective pest management strategies.

Keywords: insecticide resistance, etofenprox, *Trichoplusia ni*, probit analysis

Acknowledgement: *Financial assistance from the National Research Council, Sri Lanka* (*Grant No IDG 24-021*) *is acknowledged.*

In Silico Evaluation of *Justicia adhatoda* Phytochemicals as Potential Dual Inhibitors of TGF-β Receptors in Oral Submucous Fibrosis

G.W.S. Priyangani[1], B.T.K. Perera[1], R.U. Jayakody[1], A.I. Jayawardhana[2], S. Adsaya[1], T.M.C.B. Tennakoon[1], S.I. Karunarathna[1], L. Ranathunga[3*]

[1]Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Department of Microbiology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[3]Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya,20400, Sri Lanka
**lakmalr@agri.pdn.ac.lk*

Oral Submucous Fibrosis (OSF) is a chronic precancerous condition driven by dysregulated TGF-β signaling, particularly through TGF-β receptor 1 (TβR1) and TGF-β receptor 2 (TβR2), which play a major role in mediating collagen deposition and fibrotic progression. *Justicia adhatoda* is a medicinally significant plant with well-documented anti-inflammatory and therapeutic properties, representing a promising yet underexplored source of bioactive compounds. However, its phytochemicals remain insufficiently explored as dual inhibitors of TGF-β receptors (TβR1 and TβR2) in the context of OSF. In this study, 30 phytochemicals were initially identified through a comprehensive literature-based screening of natural compounds present in *Justicia adhatoda*, incorporating both GC-MS and LC-MS data, with a focus on experimentally detected constituents in plant extracts. From those phytochemicals, six were shortlisted as potentially safe drug candidates, using SwissADME to evaluate drug-likeness and pharmacokinetic properties against Lipinski's rule of five, gastrointestinal absorption, and bioavailability parameters. Toxicity profiles were further predicted using ProTox-3.0 to identify toxicity classes. The 3D crystal structures of both receptors, TβR1 (PDB ID: 3TZM) and TβR2 (PDB ID: 1M9Z), were retrieved from the Protein Data Bank (PDB) with higher accuracy. Molecular docking simulations were conducted through CB-Dock2 against TβR1 and TβR2 to assess binding affinities, ligand orientation, and ligand-receptor interaction profiles within the active sites. Against TβR1, andrographolide exhibited the highest binding affinity (-10 kcal/mol), followed by apigenin (-9.3 kcal/mol) and lupeol (-8.7 kcal/mol). Critical interactions with catalytic residues Lys232 and Glu245 suggested ATP-competitive inhibition, stabilized through multiple hydrogen bonds and hydrophobic contacts within the kinase active site. For TβR2, lupeol demonstrated the strongest affinity (-7.6 kcal/mol), engaging hydrophobic residues Phe111 and Phe126 alongside hydrogen bonding with Glu128. Remaining compounds showed moderate TβR2 affinity (approximately -7.0 kcal/mol) through hinge-region interactions and π–π stacking with Trp65 and Phe126. These findings establish that *Justicia adhatoda* phytochemicals possess promising dual inhibitory potential against TGF-β receptors implicated in OSF pathogenesis. This study provides a foundation warranting further *in vitro* and *in vivo* validation of these compounds as candidate anti-fibrotic therapeutics targeting TGF-β-mediated fibrosis.

Keywords: anti-fibrotic therapeutics*, Justicia Adhatoda* phytochemicals, molecular docking, Oral Submucous Fibrosis (OSF), TGF-B Receptors (Tβr1/Tβr2)

Interactive Effects of Time of the Day and Wind Speed on a Raptor Species Assemblage: A Study from a Windfarm in Mannar, Sri Lanka

S.N. Rathnasiri[1]*, S.M.D. Suriyabandara[1], W.M.C.S. Wijesundara[2]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Zoology, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**nirmalr.drck@gmail.com*

Raptors are considered highly vulnerable around windfarms, because their behavior of soaring while searching for ground prey increases the risk of collision with rotating wind turbine blades. We studied the raptor community within a recently established windfarm in Mannar, Sri Lanka, aiming to assess how key environmental variables shape their species assemblage, and provide informed management insights. We conducted 32 point counts alternately during morning and evening periods, from December 2025 to April 2026, surveying raptor species abundance. We recorded wind speed as a key factor influencing both turbine operation and raptor flight behavior (Mean ± SD = 2.19 ± 1.06 m s^{-1}). Seven raptor species were recorded, and sampling adequacy was verified via an asymptotic species accumulation curve. The raptor community was relatively even (Pielou's J' = 0.86), and showed no significant difference in Shannon diversity between morning and evening periods (Kruskal-Wallis χ^2 = 0.004, p = 0.950). However, PERMANOVA revealed a significant effect of time of the day and wind speed on the raptor assemblage (R^2 = 0.27, p = 0.018; dispersion homogeneity was confirmed via PERMDISP, $p > 0.05$), indicating shifts in species composition despite the stable community diversity. We used Predictive Univariate Modeling to assess the significance of each variable in shaping the species assemblage. Our Generalized Linear Model (GLM) fitted with a negative binomial distribution (to handle the overdispersion of count data) revealed a highly significant positive influence from wind speed in the evening (p = 0.001), which was absent in the morning (p = 0.781, interaction coefficient = -0.428), indicating that wind speed increased raptor activity only in the evening. Our findings might support the hypothesis that raptors shift the physical mechanism used for soaring during morning and evening; when solar energy causes thermals to rise vertically from the heated ground in the morning, raptors use these to stay aloft; and when these currents weaken in the evening, they tend to rely more on horizontal wind. Therefore, we highlight the importance of diurnal cycles and wind speed in predicting raptor community dynamics, to improve biodiversity-sensitive windfarm management and raptor conservation.

Keywords: diurnal cycles, flight behavior, raptor conservation, species composition, wind speed

Acknowledgement: *Financial assistance from Ceylex Renewables (Pvt.) Ltd. is acknowledged.*

In Vitro Assessment of Trypsin Inhibitors from *Phaseolus lunatus*

I.H.M. Ilesinghe*, R.G.S.C. Rajapakse

Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**madushaharithi19@gmail.com*

Proteases, particularly serine proteases like trypsin, play vital roles in maintaining physiological functions, while their dysregulation contributes to pathological conditions such as cancer, inflammation, and neurodegenerative diseases. Therefore, protease inhibitors are recognized as potential therapeutic agents for these diseases, as they can regulate protease activity. Plants, especially legumes, are rich natural sources of such inhibitors. Yet, wild legume species in Sri Lanka remain largely unexplored for their protease inhibitory potential, thereby limiting the discovery of novel therapeutic agents. Therefore, this study aimed to screen selected, underutilized wild legumes for trypsin inhibitory activity. 12 wild legume species were selected, and the crude extracts of the seeds, the primary storage tissue of plants, were subjected to a spectrophotometric protease inhibition assay at 280 nm using trypsin as a model protease. Then, the species exhibiting the highest inhibitory activity was selected for further investigation. Initially, dialysis was performed to assess the approximate molecular nature of the inhibitor/s, followed by purification of the inhibitor using ammonium sulfate precipitation and DEAE-cellulose anion exchange chromatography. Furthermore, the effect of various metal ions, reducing agents, and non-ionic detergents on inhibitory activity was evaluated. Finally, the temperature and pH stability of the isolated inhibitor were tested. Among the 12 screened species, *Phaseolus lunatus* exhibited the highest inhibitory activity (71.23%). Dialysis using 12 kDa molecular weight cut-offs indicated that the inhibitor/s are larger than 12kDa and could be protein in nature. Then, inhibitor/s was successfully partially purified to 30-60% ammonium sulfate saturation, and the second fraction collected from DEAE-cellulose anion exchange chromatography. However, none of the agents enhanced the inhibitory effect, and thermal and pH stability studies revealed that the inhibitor is sensitive to extreme temperature and pH conditions, suggesting its protein nature. These findings demonstrate that *Phaseolus lunatus* is a promising source of trypsin inhibitor/s and inhibitor/s could be a protein. This study provides a foundation for further purification, molecular and structural characterization, and evaluation of therapeutic potential of the purified inhibitor/s. Significantly, the findings highlight the unexplored capacity of Sri Lankan wild legume species for the identification of novel protease inhibitors with therapeutic applications.

Keywords: inhibitor purification, *Phaseolus Lunatus*, protease inhibitors, serine proteases, therapeutic agents

k-Shifted Antimagic Labeling of Regular Triangular Grid Graphs

H.A.P. Lakmuthu[1], W.M.C.K. Wijekoon[1], M.D.D.H. Mallikarachchi[1], M.A.D. Priyadarshani[2], K.D.E. Dhananjaya[1]*

[1]*Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Mathematical Sciences, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Kuliyapitiya, 60200, Sri Lanka*
**dhananjayae@sci.pdn.ac.lk*

A graph $G = \big(V(G), E(G)\big)$ consists of a vertex set $V(G)$ and an edge set $E(G)$. Graph labeling, the assignment of integers to the elements of a graph subject to prescribed conditions, is a fundamental topic in graph theory with broad applications in computer science. A *k-shifted antimagic labeling* of G, introduced by Chang, Chen, Li, and Pan, is a bijection $f: E(G) \to [k+1, k+|E(G)|]$ such that the vertex sums $\phi_f(v) \coloneqq \sum_{e\sim v} f(e)$ are pairwise distinct for all $v \in V(G)$, where $k \in \mathbb{Z}$; G is called *k-shifted antimagic* if such a labeling exists. When $k = 0$ this reduces to the ordinary antimagic labeling, whose existence for every connected graph other than K_2 was conjectured by Hartsfield and Ringel. This work investigates the k-shifted antimagic labeling of regular triangular grid graphs T_n, the graph formed by stacking n layers of unit triangles with $1, 2, \dots, n$ triangles in the i-th layer. Every vertex of T_n has degree 2, 4, or 6: outer-layer vertices have degree 2 or 4, while all interior vertices have degree 6. We construct explicit labelings of T_n by assigning the smallest available labels to edges incident with the outer layer and the largest available labels to edges of the inner layers; this separates the vertex sums of the lower-degree outer vertices from those of the higher-degree interior vertices. Within each degree class, the labels on incident edges are further arranged so that no two vertices of equal degree receive the same vertex sum, so that together these two conditions guarantee pairwise distinct vertex sums for all $v \in V(T_n)$. Our main result is that, for every $n \geq 1$, T_n is k-shifted antimagic for every $k \in \mathbb{Z}$ satisfying $k \geq 0$ or $k \leq -(3n^2 + 3n + 2)/2$. These findings establish that regular triangular grid graphs form a k-shifted antimagic family, enriching the theory of antimagic labelings and opening directions for further investigation of grid-based graph families.

Keywords: antimagic labeling, shifted antimagic labeling, triangular grid graph, graph labeling

Larvicidal Effect of White Bird's Eye Chilli (*Capsicum frutescens*) and Garlic (*Allium sativum*) Encapsulated Chitosan Nanoparticles Against *Aedes spp.* Mosquito Larvae

M.D.M.N. Reshani, J.M.S. Jayasinghe*, W.A.P.P. de Silva, I.K.A.P.K. Premarathne

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**nirmanirmani99@gmail.com*

Dengue fever remains a major global public health concern due to the complexity of disease control. Consequently, the most effective and widely recommended strategy for preventing dengue is the control of its mosquito vectors. Eco-friendly larvicides are increasingly recognized as environmentally safe alternatives to synthetic insecticides for controlling dengue mosquitoes. In this study, a natural larvicide was developed using cold water extracts of *Capsicum frutescens* (White Bird's Eye Chilli) and *Allium sativum* (Garlic), which together showed considerable toxicity against *Aedes aegypti* and *Aedes albopictus* larvae. To improve the stability and controlled release of the active compounds, the plant extract, including *Capsicum frutescens:Allium sativum* into 1:1 ratio was encapsulated into chitosan nanoparticles using the ionic gelation method. In this process, tripolyphosphate (TPP) was added slowly dropwise into a chitosan solution under continuous stirring. Several parameters were optimized, including chitosan:TPP mixing ratio of 1:1, a stirring speed of 1500 rpm, a chitosan solution pH of 4.8, a height difference of 31 inches between the magnetic stirrer and the burette, and a TPP addition rate of 5 drops per minute. The resulting nanoparticles showed no clearly visible porosity, which had an average diameter of 35.4 nm, confirming successful nanoparticle formation. The encapsulation efficiency was recorded as 91.18 ± 1.68 %, indicating that most of the combined plant extract was successfully incorporated into the chitosan nanoparticles. Mosquito colonies were established using ovitraps, and emerged 4th instar larvae were used for bioassays. For each mortality test, 20 larvae were placed in 100 ml of distilled water and three replicates were conducted. For practical application, the nanoparticles were packed into sachets weighing 7.000 ± 0.001 g each after testing for best larval mortality. These sachets achieved 100 % mortality of *Aedes spp.* larvae for 11 consecutive days. Release studies showed a slow and steady pattern, with approximately 90 % of the extract released into the medium over a period of 16 days. These findings highlight the potential of this nano-formulated larvicide as a safe, low-cost, and eco-friendly solution for dengue mosquito control.

Keywords: eco-friendly larvicide, ionic gelation, dengue, chitosan nanoparticles

Ligand-Stabilized Hydrothermal Synthesis of Tio$_2$ Nanoparticles: A Precision Approach to Morphological Control

K.M.M.K. Dissanayake, P.G. Mantilaka*

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**mantilaka@gmail.com*

Titanium dioxide (TiO_2) is a cornerstone material in nanotechnology, valued for its exceptional chemical stability, non-toxicity, and versatile electronic properties. Despite its potential, the performance of TiO_2 is highly dependent on its structural characteristics, as traditional synthesis often results in poor morphological control and rapid charge carrier recombination. The purpose of this study was to establish a high-precision synthesis protocol to produce TiO_2 nanoparticles with optimized crystallinity and uniform morphology. The research employed a modified sol–gel assisted hydrothermal method, utilizing a triethanolamine (TEOA)-stabilized titanium isopropoxide (TTIP) complex to regulate the reaction environment. To ensure discrete particle growth, diethylamine and the surfactant Triton X-100 were integrated into the precursor solution. A critical two-stage hydrothermal process was conducted nucleation at 100 ^{o}C for 4 hours followed by crystal growth at 200 ^{o}C for 8 hours with final calcination performed at 500 ^{o}C. Results demonstrated that this ligand-stabilized approach effectively moderated the hydrolysis-condensation kinetics, yielding high-purity, fine TiO_2 nanopowder. FT-IR spectra confirmed surface hydroxyl groups (Ti-OH) via a broad band at 3400 cm^{-1} and characteristic Ti-O-Ti lattice vibrations between 800 and 400 cm^{-1}. XRD analysis verified the exclusive formation of the tetragonal anatase phase, with sharp, well-defined peaks indexed to the (101) plane at 25.3°, indicating high crystallinity. SEM imaging and ImageJ analysis revealed relatively small, spherical to irregular-shaped particles with an average particle size of 21.679±9.364 nm. The study concludes that the synergy between ligand stabilization and dual-stage hydrothermal treatment offers superior architectural control over TiO_2 compared to conventional methods. By successfully moderating hydrolysis-condensation kinetics, this ligand-stabilized, dual-stage hydrothermal approach overcomes the poor morphological control of traditional methods to deliver a precise, scalable framework for synthesizing pure, highly crystalline, and uniformly sized anatase TiO_2 nanoparticles optimized for advanced technological use. This research adds a sophisticated, scalable framework to the field of material science, providing a pathway for engineering semiconductor nanostructures with tailored properties for advanced technological use.

No Show Abstract

Keywords: Titanium Dioxide, hydrothermal method, ligand, nanostructures

Acknowledgements: *Mr. P.G. Wimalakeerthi Ariyasena's help during the research is highly acknowledged.*

Matrix Interference of Arrack to the Ethyl Alcohol Strength and Obscuration: A Comparative Study of Alcolizer System and Manual Techniques

W.S.H.K. Jayawansha*, I.J. Ambepitiya, S. Kulali, T. Kirudchayini, Y.B. Wickramasingha, B.W.V. Vidya

Government Analyst's Department, Battaramulla, 10120, Sri Lanka
**sammanihj88@gmail.com*

Accurate measurement of alcoholic strength as alcohol by volume (ABV) of arrack is essential for quality control in alcoholic beverage industry, and it plays an important role in revenue collection and regulatory compliance. Conventional methods, pycnometer and hydrometric measurements are widely used while pycnometer method is accepted as reference technique. However, these methods are time consuming, and results subjected to human errors, environmental influences along with other uncertainty sources and analytical challenges raised for measurement accuracy due to matrices. The Alcolizer system, incorporated with near-infrared (NIR) spectroscopy and density base u-tube technique with advanced calibration algorithms to minimize matrix effects and improves the analytical performance. This study aims to compare the analytical performance of Alcolizer system with conventional methods as per SLS 919:2020 for determining actual and apparent alcohol strength, as well as obscuration of local arrack varieties. Apparent and Actual alcohol strength (v/v%) of thirty quality control arrack samples were measured using a validated Alcolizer system and compared with actual alcohol strength determined by pycnometer method by distillation while apparent alcohol strength determined by hydrometer method using direct sample. Furthermore, forty local arrack samples submitted to Government Analyst's Department were analyzed using Alcolizer system to determine obscuration. Total solids content as per SLS 919:2020 was used to determine proof obscuration due to matrices. Relative standard deviation for repeatability and reproducibility for both actual and apparent alcohol strength observed less than 2% for all methods, where the Alcolizer system constantly showed lower values than manual methods. Relative errors of actual and apparent strengths for Alcolizer were 0.20 % and 0.11% with respect to conventional methods. Uncertainty for pycnometer method, hydrometer method and Alcolizer were estimated as ±1.08% ABV, ±0.96% ABV and ±0.02% ABV respectively. Proof obscuration is directly proportional to the amount of total solids in g/100 L of absolute alcohol multiplying with the factor of 1/650 and also this relationship confirmed by multiplication of the total solids in g/100 ml by four. Application of this rapid, reliable and precise Alcolizer system technique can enhance the expert analytical evidence for routine quality control in the alcoholic beverage industry.

Keywords: arrack, actual strength, apparent strength, obscuration, Alcolizer

Acknowledgement: *We would like to express our sincere gratitude to the Government Analyst at Government Analyst's Department for providing a supportive research environment for successful completion of this study.*

Modeling Flight Data: A Statistical Analysis Across Major Airports, Airlines and Aircraft Types

K.S.D. Ravihari*, S.P. Abeysundara

Department of Statistics & Computer Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**sandunidilshika95@gmail.com*

This research applies an integrated analytical framework designed to: identify, fit, and evaluate the most appropriate statistical distribution models to accurately characterize the duration profiles of arrival and departure delays; apply unsupervised machine learning techniques, specifically clustering algorithms, to group flight routes with similar historical delay characteristics to identify common profiles and anomalies across the global network; build and evaluate a predictive model for arrival delays while identifying and analyzing the significant operational and contextual factors, such as aircraft type, airline, day of week, and route that most strongly influence delay predictions; and investigate the presence of significant seasonal variations and temporal trends over time. Data was collected through the web scraping of FlightAware.com, capturing a dataset of approximately 26,000 flights operated by major international carriers across eleven global hubs between January 2023 and April 2025. After preprocessing, distribution modeling revealed that multi-modal, right-skewed delay patterns are optimized by lognormal mixture models rather than traditional single probability distributions. For arrival delay prediction, the XGBoost classifier emerged as optimal architecture, achieving 85% accuracy, 77% precision, 80% recall, and an ROC AUC of 0.92, outperforming the Generalized Linear Mixed Model (GLMM), which achieved 80% accuracy. Feature importance and mixed-effects modeling identified systemic factors specifically departure delay, taxi-out time, and flight distance alongside fleet-specific variables, such as Airbus A330-300 and A320 airframes, as the primary drivers of delay propagation. Furthermore, unsupervised clustering using K-means and DBSCAN successfully isolated systematic structural variations across routes, distinguishing the Maldives-Colombo corridor as a highly volatile operational anomaly characterized by extreme delay variances despite maintaining standard taxi times. In conclusion, this study demonstrates the power of combining machine learning with advanced statistical techniques to dissect complex flight delay dynamics. Practical Implications: These findings offer immediate utility for industry stakeholders. Airlines can leverage the framework to optimize schedule buffer allocations for specific delay-prone aircraft fleets, while airport authorities can refine gate management strategies to mitigate taxi-out congestion during peak windows. Future research will focus on integrating real-time weather and air traffic control data to further enhance model accuracy and generalizability.

Keywords: flight delay prediction, machine learning, mixture models, cluster analysis, air traffic management

Molecular Detection and Genetic Characterization of *Rickettsia* in *Rhipicephalus Linnaei* (Brown Dog Tick) from the Central Province of Sri Lanka

H.B. Abayakoon[1], M.M. Eremeeva[2], P.K. Perera[1], S. Ariyaratne[1], R.S. Rajakaruna[1]*

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Jiann-Ping Hsu College of Public Health, Georgia Southern University, Hendricks Hall, Bldg.303, 501 Forest Drive, Statesboro, GA 30460-8015 USA*
**rupikar@pdn.ac.lk*

Spotted fever group rickettsiae (SFGR) are emerging zoonotic pathogens transmitted by ticks worldwide. The brown dog tick, *Rhipicephalus linnaei* (formerly the tropical lineage of *Rhipicephalus sanguineus*), is a widely distributed species closely associated with domestic dogs and serves as a potential vector for SFGR. This study investigates the occurrence, spatial distribution, and genetic diversity of *Rickettsia* in *R. linnaei* from the Central Province of Sri Lanka. One Tick per dog was collected from 180 dogs in the three districts of the Central Province: Kandy, Matale and Nuwara Eliya (60 dogs each). Following morphological identification, tick DNA was extracted and screened for rickettsial DNA using polymerase chain reaction (PCR) targeting the outer membrane protein A (OmpA) gene. The products were then visualized through agarose gel electrophoresis followed by Sanger sequencing to assess phylogenetic relationships. Of the 180 dog ticks collected, 166 were identified as *R. linnaei* and the remainder were identified to be *Rhipicephalus haemaphysaloides, Amblyomma integrum* and *Ctenocephalides canis.* Out of the *R. linnaei* ticks 53.0% tested PCR-positive for SFGR DNA. While the SFGR PCR-positivity rate did not differ significantly across the three districts (Kandy 60.0%, Matale 54.0%, Nuwara Eliya 44.6%), spatial analysis at the Divisional Secretariat level revealed highly significant localized clustering ($p = 0.0056$), with prevalence peaking in the Udunuwara (90.9%) and Doluwa (70.6%) divisions. Phylogenetic analysis of three OmpA gene sequences (PZ022027, PZ022028, PZ022029) derived from positive ticks revealed two distinct genotypes, one genotype clustered with *Candidatus Rickettsia barbarica,* a potential human pathogen of unconfirmed pathogenicity and another genotype clustered with *Rickettsia massiliae* which is a confirmed human pathogen with at least one documented fatal case. It also clustered with *Rickettsi*a isolates previously detected in *Rhipicephalus haemaphysaloides* in Sri Lanka. The findings demonstrate the widespread, active circulation of diverse SFGR genotypes within *R. linnaei* in the Central Province. The identified spatial hotspots correspond to areas previously reported to have high incidences of human spotted fever, emphasizing the vital public health and epidemiological relevance of *R. linnaei* as a reservoir and possible vector of SFGR in Sri Lanka.

Keywords: Rhipicephalus linnaei, Rickettsia, Sri Lanka, ticks

Acknowledgement: *Financial assistance from the National Science Foundation (NSF/2019/EB/01) grant is acknowledged.*

Molecular Screening for *Wolbachia* Endosymbionts in Phlebotomine Sand Flies within North Central Province, Sri Lanka

F.B.R.P. Kumara[1], D.K. Hettiarachchi[2], N.D.A.D. Wijegunawardana[1]*

[1]*Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka.*
[2]*Department of Biological Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale ,50300, Sri Lanka.*
**awijegun@tec.rjt.ac.lk*

Leishmaniasis is a prominent neglected tropical disease transmitted by Phlebotomine sand flies globally, with approximately 350 million people at risk in over 95 countries. It also remains a significant public health challenge in Sri Lanka, including the North Central Province (NCP), which has a notable disease history. *Wolbachia* is an endosymbiont of considerable interest due to its ability to manipulate arthropod reproduction and influence pathogen transmission. While *Wolbachia* has been detected in various insect vectors in Sri Lanka, mainly mosquitoes, its presence in sandflies remains unexplored. This study aimed to investigate the natural prevalence of *Wolbachia* in sand fly populations across the Medawachchiya, Mihintale, Habarana, and Bakamuna public health inspector (PHI) areas, with a considerable number of cases. During this study, monthly entomological surveys were conducted from October 2024 to March 2025 using light traps. Collected specimens were morphologically identified in genus level using taxonomic keys with the aid of a stereomicroscope. All collected female samples underwent individual DNA extraction using the Genaid Presto™ Bacterial DNA Kit, and DNA quality was verified using a Nanodrop spectrophotometer (41.8 to 785.1 ng/µL). Molecular detection of *Wolbachia* was carried out using polymerase chain reaction (PCR) using *wsp* primers, *Culex pipiens* ovaries were used as positive controls, and results were supplemented by *16S* metagenomic analysis of an additional 25 pooled sandfly samples for further confirmation. A total of 331 sand flies (90 females and 241 males) were collected. Despite successful amplification of positive controls, all female samples showed negative results for PCR amplification. *16S* metagenomic analysis also indicated an absence of *Wolbachia* sequences in the analyzed pool. These results indicated the absence of *Wolbachia* among the Phlebotomine sand fly populations in the selected study sites. Thus, indicates that *Wolbachia*-based control strategies would necessarily require artificial introduction. Nevertheless, these results were obtained from a small sampling of regions and seasons. Hence, further assessment using a higher sample size, wider area, and more sensitive methods to validate these findings and alternative symbiont-based leishmaniasis vector control strategies is recommended.

Keywords: *Wolbachia*, PCR, *Phlebotomus*, leishmaniasis, *wsp Primers*

Acknowledgement: *This work was carried out with the aid of a grant from UNESCO and the International Development Research Centre, Canada (OWSD Early Career Fellowship Award 2022 (Agreement No. 4500476472)).*

Morphological and Molecular Analysis of Ecto and Endoparasites of Captive Elephants in Sri Lanka

S.A. Hapuarachchi[1,2]*, A. Dangolla[3], S.K. Piyadasa[3], M.R.C.K. Mallawa[3], R.S. Rajakaruna[2]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Zoology, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Department of Veterinary Clinical Science, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**saumyahapu1993@gmail.com*

Parasitism is a persistent ecological factor affecting the health and management of captive Asian elephants. This study examined the prevalence, diversity, and infection dynamics of haemoparasites, ectoparasites, and gastrointestinal parasites in captive elephants (*Elephas maximus*) in Sri Lanka using combined morphological and molecular diagnostics. Sampling occurred at the Temple of the Tooth Relic, Kandy, during the Esala Perahera season, when elephants from multiple districts gather for ceremonial activities. Faecal samples were analysed using salt flotation and McMaster egg counts, while blood smears were examined with Giemsa and Leishman stains. Molecular detection targeted the *18S rRNA* gene *via* PCR. Between 2023 and 2025, 67 blood samples and 57 faecal samples were collected. Gastrointestinal parasitism was highly prevalent, with helminths detected in 84.9% and protozoans in 81.1% of elephants. Strongyle-type nematodes, particularly *Strongylus* spp. were dominant, followed by *Fasciola* spp., *Ascaris* spp., *Anoplocephala* spp., *Paramphistomum* spp., and *Trichostrongylus* spp. Protozoan infections were widespread, with *Entamoeba* spp. and coccidia most common. Egg and oocyst counts indicated mainly low to moderate infection. The intensity of helminth infections ranged from 0 to 8 eggs per gram (EPG) of faeces, while protozoan infections ranged from 0 to 6 oocysts/cysts per gram. Pearson's Chi-square tests showed no significant association between age or sex and helminth or protozoan occurrence ($p > 0.05$), suggesting environmental exposure and management practices primarily shape infection risk. Microscopic examination of blood smears revealed no haemoparasites, however, PCR detected *Babesia* spp. DNA in 4.5% of samples. No ectoparasites were observed. The low haemoparasite prevalence likely reflects the absence of arthropod vectors on elephants and the high standard of veterinary care provided during parade preparation. Overall, gastrointestinal parasitism in captive elephants in Sri Lanka is widespread and sustained by continual environmental contamination and repeated exposure to infective stages, regardless of geographic origin. In contrast, the scarcity of ectoparasites corresponds with low haemoparasitic infection rates. The low parasitemia observed aligns with previous findings and likely reflects effective management and health monitoring practices.

Keywords: captive elephants, hemoparasites, ectoparasites, endoparasites, Sri Lanka

Morphological and Molecular Characterization of *Marsilea minuta* L. Collected from Sri Lanka

K.A.I. Lakshani[1,3]*, N.S. Gama-Arachchige[1,2], A.D.S.N.P. Athukorala[1,2]

[1]Department of Botany, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[2]Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
[3]Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**lakshikodithuwakku501@gmail.com*

Accurate species identification in the genus *Marsilea* is challenging due to high morphological plasticity and limited interspecific variation influenced by environmental conditions. In Sri Lanka, only two species, *M. minuta* and *M. coromandelina*, have been reported, with no prior integrated morphological and molecular studies. We hypothesized that morphological variation among Sri Lankan *Marsil*ea populations indicates the presence of different species. This study aimed to identify *Marsilea* species from six locations in Sri Lanka using morphological traits and the plastid *rbcL* gene, and to determine phylogenetic relationships with global reference sequences. Morphological characterization used quantitative traits (leaf lamina size, petiole length, root length, and internodal length) measured in triplicate and compared with a herbarium specimen of *M. minuta*. Genomic DNA was extracted using a modified CTAB method, and the rbcL gene was PCR-amplified and sequenced bidirectionally. Species identity was assessed via BLAST, and phylogenetic relationships were analyzed by maximum likelihood in MEGA12 using GenBank reference sequences, with *Regnellidium* and *Pilularia* as outgroups to root the phylogenetic tree. ANOVA results showed that most samples resembled the herbarium *M. minuta* specimen, while the Piramanlakulam sample differed significantly across all traits ($P < 0.05$). Cluster analysis grouped most samples with the reference specimen, with Piramanlakulam sample forming a separate cluster; the dendrogram showed a large Euclidean distance (5.54) between cluster centroids, suggesting size-related, environmentally influenced divergence. BLAST results showed 99.12–100% identity and 100% query coverage with *M. minuta* (E-value 0.0) for all six samples, confirming genetic identity. Phylogenetic analysis placed all samples in a well-supported clade with *M. minuta* and *M. crenata* (87% bootstrap support); since *M. crenata* is a recognized synonym of *M. minuta*, this supports a single taxonomic identity. Minimal genetic divergence and outgroup placement confirmed genus monophyly. Despite observed morphological differences, molecular analysis confirmed all samples belong to *Marsilea minuta*, highlighting the limitations of morphology-based identification and the effectiveness of molecular techniques for species-level identification in *Marsilea*.

Keywords: *Marsilea Minuta,* rbcL gene, morphological plasticity, molecular identification, phylogenetic analysis

Acknowledgement: *The authors gratefully acknowledge the financial support provided by the University of Peradeniya Research Grant (URG/2022/61/S).*

Naturally Derived Carbon Quantum Dots from Yam Starch (*Dioscorea alata*) as a Nanoplatform for Metformin Conjugation

K.M.K.S. Dissanayake[1], P. Perera[1], V.U. Godakanda[1], K.M.N. de Silva[1], W. R. M. de Silva[1,2] *

[1]*Center for Advanced Materials and Devices (CAMD), Department of Chemistry, University of Colombo, Colombo, 00300, Sri Lanka*
[2]*Department of Biomedical Science, NSBM Green University, Mahenwaththa, Pitipana, Homagama, 10206, Sri Lanka*
**rohini@chem.cmb.ac.lk*

Despite growing interest in Carbon Quantum Dots (CQDs) for biomedical applications, the potential of naturally derived starch-based CQDs as drug nanocarriers remains underexplored. This study aimed to synthesize and characterize yam starch (*Dioscorea alata*) derived CQDs and to evaluate the feasibility of conjugating the antidiabetic drug Metformin HCl (MET) to their surface as a proof of concept for future drug delivery applications. Yam starch was extracted from *Dioscorea alata* (Ube) using a 10% (w/v) solution of ammonium oxalate and an oxalic acid solution (1:1) to overcome its characteristic high mucilage content. This approach yielded 23.40% starch, with FTIR confirming characteristic absorption in the fingerprint region (400–1700 cm^{-1}) and XRD indicating a B-type crystalline polymorph (2θ = 15°, 17°, 22°, 24°). Starch was subjected to controlled carbonization, then refluxed with CH_3COOH and H_2O_2. Purification involved centrifugation, 48 h dialysis against deionized water, and sequential syringe filtration. HR-TEM revealed quasi-spherical CQDs (4.304 ± 1.11 nm) with a crystalline core- amorphous shell architecture. FFT analysis revealed a d-spacing consistent with sp^2 carbon character (0.221 nm). FTIR confirmed the presence of surface C=O and aromatic C=C functionalities, while UV-Vis spectroscopy revealed characteristic π→π* and n→π* transitions. The optical band gap was determined to be 3.5 eV. The CQDs exhibited blue-green fluorescence with a peak at 460.4 nm. Metformin was conjugated to the CQD surface via EDC/NHS coupling in PBS, with a conjugation efficiency of 24.64%, likely due to the low CQD concentration and the suboptimal pH of PBS for efficient coupling. UV-Vis analysis of the MET-CQD conjugate revealed pronounced peak broadening and a bathochromic shift distinct from the simple spectral superposition observed in the physical mixture control, confirming covalent bond formation and its perturbation of the CQD π-system. Photoluminescence spectroscopy further indicated successful conjugation, showing a 79.7% reduction in emission intensity at 456 nm. Raman analysis revealed a 78% enhancement in scattering intensity in the MET-CQD spectrum. These findings demonstrate that *Dioscorea alata* starch-derived CQDs possess the surface chemistry necessary to enable covalent drug conjugation, establishing them as a promising, naturally derived nanoplatform that could be further investigated for drug delivery applications.

Keywords: CQDs, *Dioscorea alata*, EDC/NHS conjugation, metformin, yam starch

Natural Radioactivity Along the Coastal Areas in Jaffna: Measurement, Analysis and Implications

N. Vithushan*, T.P. Ranawaka

Department of Physics, University of Peradeniya, Peradeniya, 20400, *Sri Lanka.*
**nallanathanvithushan2000@gmail.com*

Natural background radiation is the ionizing radiation present in the environment from natural sources such as cosmic rays, terrestrial sources, and within the human body. Jaffna is a peninsula in the northern part of Sri Lanka. The presence of geological substratum such as Miocene limestone and alluvial deposit may cause elevated radiations in the beaches of Jaffna. Beaches of Jaffna are the places where locals and tourists gather. However, there is a lack of systematic data and analysis on the variation of natural background radiation levels along the coastal regions of Jaffna. This study is aimed to assess the natural radioactivity along the coastal areas in Jaffna by using GIS IDW interpolation which was performed using the in-situ measurements of gamma count taken across 50 coastal locations using Ludlum 3014 gamma ray survey meter at 1m from the ground level. The IDW interpolation in this study illustrates that the relatively elevated radiation zones than the other locations, are localized to a specific location not spreading continuously to the nearby location. Southern and south western coastal regions of Jaffna are identified as elevated radiation zones than the other coastal regions using IDW interpolation. These elevated radiation zones are located near mangrove ecosystems or engineered coastal structures, such bridges, jetty, forts and harbors. However, the entire eastern coastline is sandy beaches and it shows a constant continuous low radiation zone extending across the entire sealine. Therefore, the IDW interpolation confirms that natural background radiation along the Jaffna coastline is characterized by localized elevated radiation zones surrounded by extensive areas of relatively low and uniform radiation levels. This study implies that the natural background level of coastal lines of Jaffna ranges from 0.15 to 0.67 mSv/year. It is very less compared to the world average level 2.4 mSv/year. This shows that he annual natural background level of coastal lines of Jaffna are in the lower level. Therefore, this study confirms that the coastal areas of Jaffna is safe for public usage and do not pose any health risks to the people. This study marks the coastal areas of Jaffna as the low radiation zones and it establishes a strong baseline dataset as reference for future environmental monitoring programs, bridging the gap of unavailability of research data about the level of natural background radiation about Jaffna.

Keywords: natural background radiation, Jaffna peninsula, in-situ gamma survey, GIS mapping, environmental monitoring

Numerical Approximation of Caputo Fractional Derivative Using Hypercomplex-Step Method

A.K.H. Sifa*, W.A. Gunarathna

Department of Physical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale, 50300, Sri Lanka
**shamthoon@gmail.com*

Fractional calculus plays a significant role in modeling physical systems with memory and hereditary properties in science and engineering. Unlike many other fractional derivatives, the Caputo fractional derivative allows initial value problems to be modeled with classical derivative initial conditions, which can be physically interpreted, making it particularly well suited for practical applications. However, its numerical evaluation is difficult due to weakly singular integrals and derivative terms, causing instability and reduced accuracy in standard methods like finite differences. This study aims to use hyper complex numbers to approximate the Caputo fractional derivative with high accuracy. The hypercomplex- step differentiation is a recently developed computational technique which approximates classical integer order derivatives with a desired order of accuracy. The numerator of the integrand in the Caputo derivative formulation includes classical derivatives. To approximate these derivatives, the hypercomplex-step method is used. The resulting definite integral in the Caputo derivative is then approximated by the standard composite trapezoidal rule. The method is implemented and tested on selected functions at various evaluation points. Furthermore, the influence of fractional order (α) and subinterval size (N) on accuracy and stability is systematically analyzed. As a numerical illustration, the Caputo fractional derivative is evaluated for $f(x) = x^2$ with order $\alpha = 0.5$, using $N = 100$, evaluation point $x = 1$, and step size $h = e^{-8}$. The results are compared using the hypercomplex-step method and the complex-step method to assess accuracy and numerical stability. The Caputo derivative values are 1.33994737264935 and 1.33994736705680 respectively. The results demonstrate that the method produces more accurate approximations than the standard complex-step method, with consistently lower relative errors. It is observed that increasing the number of subintervals improves convergence, while moderate step sizes are sufficient to maintain high accuracy, enhancing computational efficiency. Overall, the proposed approach offers an accurate, stable, and computationally efficient framework for evaluating Caputo fractional derivatives and can be effectively applied in solving fractional differential equations in applied sciences and engineering.

Keywords: Caputo fractional derivatives, composite trapezoidal rule, hypercomplex-step differentiation

Occurrence and Parasitization of *Plutella xylostella* by *Cotesia vestalis* Across Major Cabbage-Growing Regions of Sri Lanka

B.G.M.P. Bogahawatta[1], W.A.P.P. de Silva[1], S.K. Rodrigo[2], T.C. Weeraratne[1]*

[1]*Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Chemistry, Faculty of Science, University of Colombo, Colombo 03, 00300, Sri Lanka*
**thiliniw@pdn.ac.lk*

The cultivation of *Brassica oleracea* (cabbage) is significantly affected by lepidopteran pests, dominated by the Diamondback moth, *Plutella xylostella* (Linnaeus, 1758) (Lepidoptera: Plutellidae). As control of *P. xylostella* has become increasingly challenging due to widespread insecticide resistance. Integration of parasitoids into pest management will provide a sustainable control strategy. This study aimed to identify naturally occurring parasitoids across different life stages of *P. xylostella* in *B. oleracea* crops, and to determine the common parasitoid species and evaluate their parasitization rates. Samples were collected from three *B. oleracea* sites each of four districts (Kandy, Badulla, Matale, Nuwara Eliya). Relative abundance of *P. xylostella* was calculated by the number of larvae and pupae collected from 120 randomly selected plants over a 2-hour sampling period. Collected samples were brought to the laboratory and observed individually in breathable containers until adult or parasitoid emergence. The larval parasitoid *Cotesia vestalis* (Halidae, 1834) (Hymenoptera: Braconidae) was the only parasitoid species identified across all study sites, associated with *P. xylostella*. Morphological identification of *P. xylostella* and *C. vestalis* were confirmed through partial COI sequencing. Mean abundance of *P. xylostella* (±SE) were 37.33 ± 11.87, 51.33 ± 7.88, 38.67 ± 7.51 and 45.33 ± 2.60 in Kandy, Badulla, Matale and Nuwara Eliya respectively, indicating no substantial variation in pest pressure among the considered sites in four districts. Parasitization rates of pest larvae by *C. vestalis* (total number of pest larvae infected by *C. vestalis*/total number larvae collected) were 33.33%, 43.37%, 33.03%, and 36.28% in Kandy, Matale, Badulla, and Nuwara- Eliya districts, respectively, which did not show any significant variation among districts (Chi-square test, $\chi^2 = 2.60$, df = 3, p = 0.458). Consistent parasitization rates across the considered sites, despite climatic variation, indicate a wide distribution of *C. vestalis* actively regulating *P. xylostella* populations, highlighting its potential as a biological control agent in integrated management programs for *P. xylostella*.

Keywords: *Plutella Xylostella*, *Cotesia Vestalis*, parasitoid, parasitization rate

Acknowledgement: *Financial assistance from the University Research Council, Multidisciplinary Research Grants (MRG 09-2025) is acknowledged.*

Optimization and Characterization of *Cinnamomum Verum* (Sri Lanka) Bark Extract Mediated Green Synthesized Silver Nanoparticles

K. Thanoshka*, M.P.N. Thilakarathna, W.M.M.D. Bandara, B.A.S.O. Perera

Department of Food Technology, Faculty of Technology, Rajarata University of Sri Lanka, 50300, Sri Lanka
**bst1920082@tec.rjt.ac.lk*

Silver nanoparticles (AgNPs) have attracted considerable interest due to their distinctive physicochemical properties and biological applications. This study aims at the green synthesis of AgNPs using aqueous *Cinnamomum verum* (Sri Lanka) bark extract (CVBE), prepared by boiling bark powder with DI water, as a natural reducing and stabilizing agent. The main objectives of the study were to optimize the synthesis parameters (temperature, time, and CVBE volume) using response surface methodology (Box–Behnken design) to evaluate their contributions and to obtain cinnamon-mediated silver nanoparticles (CV-AgNPs) with improved size control and stability, followed by characterization. Total phenolic content assay (TPC) and radical scavenging activity measured via DPPH and ABTS assays indirectly confirmed the reduction potential of aqueous CVBE, with TPC, DPPH and ABTS values of 11.53 ± 0.44 mg GAE mL^{-1}, 10.59 ± 0.67 mg TE mL^{-1} and 66.43 ± 5.29 mg TE mL^{-1} respectively. CV-AgNPs were synthesized according to the selected variable range as per experimental design (15 synthesis conditions) and the particle size analysis using DLS showed a size distribution 75 – 212 nm. The optimization predicted a particle size of 78.36 nm at 80 °C, 43.33 min, and an extract concentration of 18.78%. The lyophilized CV-AgNPs synthesized under the optimized conditions were characterized by FTIR, XRD, TEM, PSA and Zeta potential. FTIR analysis confirmed the presence of similar surface functional groups (hydroxyl, carbonyl, aromatic, and C–O groups) in both CV-AgNPs and CVBE. XRD confirmed the crystalline nature of CV-AgNPs (at the peak of 38.21° (111)). TEM analysis confirmed the formation of predominantly spherical nanoparticles with sizes in the nanometer range (10-20 nm). Following lyophilization and subsequent redispersion, the optimized CV-AgNPs exhibited a hydrodynamic diameter of 200.56 ± 145.16 nm, a zeta potential of −22.26 ± 5.93 mV, and a PDI of 0.33, indicating moderately polydisperse NPs with intermediate colloidal stability during post-synthesis processing. The substantial increase in particle size and moderate increase in PDI after redispersion indicate nanoparticle aggregation during lyophilization. These findings suggest that lyophilization without suitable cryoprotectants compromises colloidal stability and that the incorporation of cryoprotective agents should be considered to better preserve the original particle characteristics.

Keywords: green synthesis, silver nanoparticles, process optimization, nanoparticle characterization, lyophilization

Acknowledgement: *This research was supported by a university research grant awarded by the Research and publication committee, Rajarata University of Sri Lanka (Grant no: RJT/ R&PC/ 2024/ R/ FOT/ 07).*

Palladium Impregnated Boron-Modified ZSM-5 Zeolite for Selective Oxidation of Benzyl Alcohol

D.L.M. Bandara[1*], W.M.A.T. Bandara[1], L. Jayarathne[2]

[1]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*National Institute of Fundamental Studies (NIFS), Kandy, 20000, Sri Lanka*
**lahiru.bandara@sci.pdn.ac.lk*

The selective aerobic oxidation of benzyl alcohol to benzaldehyde is a strategically important reaction in green fine chemical synthesis, yet it remains challenged by acid catalysed side reactions such as disproportionation and hydrogenolysis to toluene. This study develops a palladium impregnated, boron-modified ZSM-5 (Pd/B-ZSM-5) catalytic system in which palladium serves as the redox active site for O_2 activation and β-hydride elimination during oxidative dehydrogenation, while isomorphous substitution of boron for aluminium in the framework weakens Brønsted acid site strength, suppressing the competing acid catalysed disproportionation pathway. Boron-modified ZSM-5 supports with varying B:Al molar ratios (3:1, 1:1, 1:3, and 0:1) were synthesised via hydrothermal crystallisation using boric acid and tetrapropylammonium bromide, followed by 1.0 wt% palladium loading via two step aqueous ion exchange with $Pd(NO_3)_2 \cdot 2H_2O$ at pH ≈4. Catalytic performance was evaluated by headspace GC-MS, chosen to selectively monitor the volatile side product toluene and avoid direct injection of the heterogeneous reaction slurry, with temperature (150–180°C), reaction time, base addition, and B:Al ratio systematically varied. Structural characterization by PXRD, FTIR, Raman, and SEM/EDX confirmed preserved MFI topology, successful B–O–Si framework incorporation, and high PdO dispersion across all compositions. Increasing temperature from 150°C to 180°C raised conversion substantially for all catalysts (maximum 94% at B:Al = 1:1) but promoted toluene formation, with conversion approaching a plateau for the more aluminous samples, suggesting diminishing returns beyond this range. Sodium carbonate addition further neutralised residual surface acidity during the reaction itself, complementing the permanent framework modification imparted by boron. The boron richest catalyst (B:Al = 3:1) gave the highest benzaldehyde selectivity (48%) at a correspondingly lower conversion of 65%, compared to 76% conversion but only 45% selectivity for the pure aluminosilicate analogue (B:Al = 0:1), a consistent trade-off across the full series. These results confirm that combined framework and reaction level acidity control, together with Pd redox activity, provides a robust mechanism for selectivity tuning. Future work should extend the temperature range, assess Pd sintering at higher temperatures, and explore hierarchical porosity to improve mass transfer, providing a rational design platform for acidity-tuned zeolite oxidation catalysts.

Keywords: Pd/B-ZSM-5, selective oxidation, benzyl alcohol, benzaldehyde, boron-modified zeolites, heterogeneous catalysis

Phytochemical and Physicochemical Evaluation of Natural Plant Extract-infused Soap from Lotus, Cinnamon and Mung Beans for Safe Skin Application

D. Rajithan, V.C. L. Hewage*, K.R.W.M.M.K Karunathilaka, W. Weerasinghe

Faculty of Life and Medical Sciences, BMS Campus, Colombo, 00600, Sri Lanka
**visal.c@bms.ac.lk*

Herbal formulations have gained popularity as safer substitutes for traditional synthetic based cosmetics due to growing demand for natural and ecofriendly personal care products. This research builds on the creation of responsive and predictive health ecosystems, by assessing an herbal soap infused with natural extracts derived from lotus petals (*Nelumbo nucifera*), mung beans (*Vigna radiata*), and cinnamon bark (*Cinnamomum verum*), emphasizing their phenolic and flavonoid contents, antioxidant capacity, and analysis of their physicochemical properties. Plants were collected from local markets and extracted using cold maceration method followed by phytochemical analysis. Total phenolic content (TPC) and total flavonoid content (TFC) were used to measure the phytochemical composition of plant extracts, whereas total antioxidant capacity (TAC) was used to determine their antioxidant capacity. The cinnamon extract showed high flavonoids (285.37 ± 7.91 mg QE/g) content, whereas the lotus extract had the highest TAC (69.08 ± 5.25 mg AAE/g) and TPC (113.53 ± 1.70 mg GAE/g) which were significantly higher ($p < 0.05$) than other plant extracts. Based on these results, optimized extract combinations were selected and analyzed for their phytochemical properties. The results indicated that the combination 3 exhibited the highest TPC (127.33 ± 2.95 mg GAE/g), while no significant difference ($p > 0.05$) observed among the combinations for TFC. Combination 1 showed the highest TAC (93.3 ± 2.62 mg AAE/g), ($p < 0.05$). The enhanced antioxidant capacity of the extract combinations suggests that antioxidant activity may be influenced not only by the phenolic content but also by synergistic interactions among different phytochemicals. Based on these results, the combination with the most favorable results was selected for soap formulation. The herbal soap was prepared using glycerin-based melt-and-pour method at low temperature to preserve phytochemicals. Physicochemical analysis indicated that the soap had pH 8.44-9.83, good foam height and retention, appropriate moisture content, total fatty matter of 70.98 %, and lower free alkali content than the control soaps (without plant combination infusion). These findings suggest that the formulated herbal soap possesses acceptable physicochemical characteristics for cosmeceutical applications. Overall, this research indicates the potential of combining natural plant extracts to develop herbal soap with desirable phytochemical and physiochemical properties.

Keywords: health ecosystem, natural plant extracts, physicochemical properties, phytochemical analysis, total phenolic content

Phytochemical Screening and *In-vitro* Antioxidant, Anti-obesity, and Anti-diabetic Properties of the Latex of *Garcinia zeylanica*

T.K.S.P Abeygunawardhana[1], T.M.T.D. Thennakoon[2], J.M.S. Jayasinghe[1]*

[1]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**susanthij@sci.pdn.ac.lk*

Garcinia zeylanica, an endemic Sri Lankan medical plant, has been traditionally used for various health benefits. Although previous studies have focused on fruits, leaves and bark, the biological potential of the latex remains largely unexplored. This study aimed to assess its phytochemical profile and *in-vitro* antioxidant, anti-obesity, and anti-diabetic activities. Latex samples were collected from mature trees and extracted using acetone. Preliminary phytochemical screening was conducted for major secondary metabolites. Antioxidant activity by DPPH radical scavenging assay, anti-obesity activity through pancreatic lipase inhibition, and anti-diabetic activity through α-amylase inhibition were assessed. Additionally, Total Phenolic Content (TPC), Total Flavonoid Content (TFC), and Total Alkaloid Content (TAC) were also determined using standard spectrophotometric methods. The result of phytochemical screening confirmed the presence of flavonoids and phenolic compounds, while saponins, steroids, terpenoids, and tannins were not clearly detected. The latex exhibited notable antioxidant activity with an IC_{50} of 16.46±0.79 mg/L (positive control ascorbic acid IC_{50} = 6.23±0.03 mg/L).Significant pancreatic lipase inhibition (IC_{50}= 42.73±2.25 mg/L; positive control orlistat IC_{50}=11.48±0.44 mg/L) and α-amylase inhibition (IC_{50} = 39.63±2.66 mg/L; (positive control acarbose IC_{50} = 8.87±0.62 mg/L) were also observed. Quantitative analysis revealed TPC of 22.63±2.51 GAE mg/g, TFC of 265.84±0.91 QE mg/g, and TAC of 43.12 ± 8.46 PE mg/g, indicating flavonoids as the dominant phytochemical group. These findings demonstrate that *Garcinia zeylanica* latex possesses promising *in-vitro* antioxidant, anti-obesity, and anti-diabetic properties, likely associated with its high flavonoid content. The study introduces latex as a valuable yet underexplored bioactive source and supports further isolation of active compounds for nutraceutical or pharmaceutical development.

Keywords: *Garcinia Zeylanica*, latex, phytochemical screening, antioxidant activity, anti-diabetic activity

Potential Biostimulatory Effect of *Mikania micrantha* Leaf Powder and Aqueous Extract on Chilli (*Capsicum annuum*) Variety MI-2 Seed Germination and Seedling Growth

W.M.A.H. Wanninayake[1]*, A.D.S.N.P. Athukorala[2], J.W. Damunupola[2]

[1]*Department of Environmental and Industrial Sciences, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**wanninayakeahinsa@gmail.com*

While agriculture relies heavily on agrochemicals, their environmental consequences emphasize the necessity for sustainable alternatives such as biostimulants. Invasive plants, despite ecological threats, may possess biostimulatory compounds which will make them potential natural biostimulants. Current study assessed the biostimulatory effect of *Mikania micrantha* leaf powder and aqueous extract on seed germination and seedling growth in MI-2 chilli (*Capsicum annuum*). Parameters evaluated included seed germination percentage, shoot and root lengths of germinated seeds, height and leaf number of seedlings treated for 2 months. Phytochemical screening of extract, elemental analysis of leaf powder using X-ray fluorescence (XRF) spectrophotometer and total phenolic content (TPC) in leaves were analyzed. For seed germination assay, powder (100-1000 mg) and extract (2.50%-20.00%) were used alongside gibberellic acid, 2-methyl-4-chlorophenoxyacetic acid (MCPA) and distilled water as controls. Seedling treatments included powder (1-10 g) and extracts (2.50%-20.00%), with Department of Agriculture-recommended fertilizer dosage and water as controls. Seed germination assay revealed significant ($p<0.05$) dose-dependent responses. Highest germination occurred in 100 mg (74.50±3.11%) and 2.50% (85.00±2.59%), which were slightly lower than in gibberellic acid (88.00±1.51%) and distilled water (89.00±1.65%). Higher doses (1000 mg, 20.00%) inhibited germination, similar to MCPA. Maximum shoot (4.24±0.19 cm) and root (4.18±0.17 cm) lengths were shown in 100 mg, which are significantly higher ($p<0.05$) than in distilled water (1.96±0.14 cm and 2.29±0.19 cm, respectively). For seedling treatments, the highest values were observed for 10 g (height: 22.00±1.00 cm, leaves: 17.00±2.00), compared to water (18.75±2.75 cm and 13.50±2.50, respectively), but they were not statistically significant ($p>0.05$). Phytochemical screening of 10.00% extract showed the presence of phenols, flavonoids, alkaloids and saponins. XRF analysis revealed a wide-range of elements in *M. micrantha* and treated chilli leaf powder, with Ca, K, Fe and Cu common to all. The highest TPC value was observed in 20.00% (246.57 µg/ml GAE), compared to water (71.04 µg/ml GAE). Conclusively, *M. micrantha* acted as a potential biostimulant at lower doses, but a phytotoxic threshold was reached in higher doses. These findings warrant further studies to reveal the biostimulatory potential of *M. micrantha* in enhancing early chilli seedling growth and the specific compounds responsible for biostimulatory effect.

Keywords: biostimulatory, *Capsicum Annuum*, *Mikania Micrantha*, seed germination, seedling growth

Predicting Monthly Coconut Price in Kurunegala District: A Hybrid SARIMAX-ARCH Modelling Approach

P.W.M.S.N. Bandara, N. Satkunanathan*, A. Laheetharan

Department of Mathematics and Statistics, University of Jaffna, Jaffna, 40000, Sri Lanka
**snalini@univ.jfn..ac.lk*

Coconut is a major plantation crop in Sri Lanka, providing a livelihood for several million people in rural areas. It supports a wide range of activities, including cultivation, processing, and marketing, making it a vital contributor to both the national economy and rural development. Kurunegala district is one of the heartlands of Sri Lanka's coconut triangle and is a major contributor to the country's total coconut production. However, coconut prices exhibit substantial instability, creating uncertainty for producers, traders, and policymakers. This study aims to develop a reliable forecasting model to predict monthly coconut prices (per kg) in Kurunegala with improved accuracy. The analysis employs two modeling approaches: a regression model with Seasonal Autoregressive Integrated Moving Average (SARIMAX) errors and a regression model incorporating Autoregressive Conditional Heteroscedasticity (ARCH) effects. Monthly data from 2016 to 2024 were collected from the Coconut Research Institute, Central Bank reports, and the Department of Meteorology, incorporating climatic and economic factors including rainfall, temperature, exchange rate, average daily wage, production, and rainy days. The data were divided into training (January 2016–May 2024) and testing (June 2024–December 2024) sets for forecasting evaluation. Multicollinearity between exchange rate and daily wage variables was identified using the Variance Inflation Factor (VIF), leading to the estimation of two alternative regression models excluding each variable in turn. Using adjusted R^2 as the selection criterion, best subset selection identified temperature and daily wage in the first model and temperature and exchange rate in the second model as significant predictors, explaining 58.18% and 52.07% of the variation in coconut prices, respectively. Residual diagnostics revealed autocorrelation and heteroscedasticity, prompting the application of SARIMA models to the residuals. The best-fitting models were identified as SARIMAX$(1,1,0)(3,0,0)_{12}$ and SARIMAX$(1,1,1)(1,0,1)_{12}$ for the first and second model respectively, based on minimum AIC and RMSE criteria. Additionally, evidence of conditional heteroscedasticity in the second model justified the use of a regression model with ARCH(1) errors to capture time-varying instability. Forecasting results indicate a gradual increase in coconut prices over the seven-month forecasting period**.** Comparative analysis based on RMSE indicates that the regression model with ARCH(1) errors (RMSE = 8.7612) outperforms the SARIMAX-based model (RMSE = 9.5247) in terms of predictive accuracy, as it achieves a lower forecasting error. This study highlights the role of addressing multicollinearity and integrating regression-based variable selection with SARIMAX and ARCH models to improve coconut price forecasting, while providing insights into the effects of climatic and economic factors on price dynamics.

Keywords: coconut price, multiple regression, SARIMAX, ARCH model, forecasting

Preliminary Functional Assessment of Leaf and Fruit Extracts of *Coccinia grandis* (Kowakka) on Glucose Metabolism

H.M.S. Lochana*, M.P.C.S. Dhanapala

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**s19099@sci.pdn.ac.lk*

Coccinia grandis (L.) Voigt, commonly known as Kowakka, is a rapidly growing herbaceous climbing plant native to tropical regions of Asia and Africa. Various parts of the plant, including leaves and fruits, are traditionally used in herbal medicine for diabetic and have gained scientific attention due to their rich phytochemical composition. Phytochemicals such as flavonoids and alkaloids are known to influence glucose metabolism through direct and indirect biochemical mechanisms. In the modern world, diabetes has become a major health concern, with a large proportion of the global population currently in the pre-diabetic stage. However, limited research has systematically compared the α-amylase inhibitory activity of leaf extracts with that of fruits at different maturity stages of *C. grandis*, and few studies have translated the findings into functional products. This study aimed to conduct a preliminary functional assessment of *C. grandis* leaf and fruit extracts on glucose metabolism using methanol, aqueous, and boiled water extracts. Antihyperglycemic activity was evaluated using enzyme inhibition assays and a colorimetric method to assess the inhibitory potential of the extracts. For the assay, 5U α-Amylase enzyme was used with 1% starch as the substrate, and 3,5-dinitrosalicylic acid (DNSA) was used to quantify reducing sugars. Plant materials were dried and phytochemicals were extracted using different solvents such as methanol and water. The samples were analyzed spectrophotometrically to determine IC_{50} values. Based on the findings, a lozenge formulation was prepared as a convenient, dose-controlled option for individuals with busy lifestyles. The results indicated that methanolic, aqueous, and boiled leaf extracts exhibited higher inhibitory activity compared to fruit extracts, with IC_{50} values of 244.42 ± 0.61 µg/mL, 306.01 ± 3.02 µg/mL, and 646.63± 3.75 µg/mL, respectively. Furthermore, immature green fruit extracts showed lower IC_{50} values than mature red fruit extracts, suggesting higher inhibitory activity at the immature stages. The Kowakka lozenge produced using leaf aqueous extract demonstrated an IC_{50} of 280.95± 3.64 µg/mL, indicating enzyme inhibition. These findings suggest that *C. grandis* leaf and fruit extracts possess significant potential to interfere with glucose metabolism and may serve as a basis for the development of functional products for blood glucose management.

Keywords: α-Amylase Inhibition, antihyperglycemic property, *C. grandis*, glucose metabolism, IC_{50} values

No Show Abstract

Preliminary Functional Assessment of the Antidiabetic Activity and Genotypic Diversity of Selected *Costus* Species

U.N. Kumarage, M.P.C.S Dhanapala*

Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**chandimasd@sci.pdn.ac.lk*

Diabetes mellitus is a chronic disease found worldwide, and maintaining blood glucose levels is crucial. Due to the adverse effects of conventional antidiabetic drugs, there is an increasing interest on plant-based therapies, as medicinal plants are rich sources of phytochemicals with potential antidiabetic properties. *Costus* species are traditionally used to treat diabetes, respiratory disorders, and several health conditions. However, studies investigating both the antidiabetic activity and genotypic diversity of different *Costus* species remain limited. This study aimed to evaluate the antidiabetic activity and genotypic variance of *Costus* species consumed in Sri Lanka, morphologically identified as *C. arabicus*, *C. speciosus, C. lucanusianus*, *C. afer*, and *C. pictus*. Methanol, water, and hot water leaf extracts were prepared to extract phytochemicals with different polarities, and thermal sensitivities. An alpha-amylase inhibition assay was performed for all the different types of extracts. Genotypic analysis was done using DNA barcoding markers, such as *ITS* and *rbcL*. All *Costus* extracts exhibited alpha-amylase inhibitory activity. Methanolic extract of *C. lucanusianus* showed the highest inhibitory activity (IC_{50} = 4.989 mg ml^{-1}) compared to all the extracts. *C. pictus* exhibited the highest inhibitory activity among water extracts (IC_{50} = 8.323 mg ml^{-1}), while *C. arabicus* showed the strongest inhibitory effect among boiled water extracts (IC_{50} = 8.847 mg ml^{-1}). Regardless of the extraction type, *C. arabicus* and *C. lucanusianus* showed the highest inhibitory activity, whereas *C. speciosus* showed the lowest ($P < 0.05$). The results indicate variations in alpha-amylase inhibitory activity within the same genus. Therefore, accurate species identification is essential, as earlier investigations showed taxonomic confusion among these species. Compared with *rbcL*, the *ITS* marker produced observable differences in PCR band sizes among the studied *Costus* species, suggesting its' potential for species identification. However, DNA sequencing is essential to detect accurate species-level identification. In conclusion, methanol extracts of five species showed highest inhibitory activity among three different extracts. Compared to the standard drug Acarbose (IC_{50} = 0.027 mg ml^{-1}), all the extracts had higher IC_{50} values, indicating the less potential of inhibitory activity than Acarbose ($P < 0.001$). However, the extracts have shown moderate inhibitory activity against alpha-amylase.

Keywords: alpha-amylase inhibition, *Costus* species, diabetes mellitus, genetic diversity, IC_{50}

Preliminary Study on Identification and Comparison of Potential Allergenic Protein Profiles in Four Banana Varieties (*Musa* spp.) Available in Sri Lanka

N. Kumaresan[1,2], C.K. Premachandre[3]*, L.J.P.A.P. Jayasooriya[3]

[1]*ICBT Campus, Department of Biomedical Science, Colombo, 00400 Sri Lanka*
[2]*Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University, UK*
[3]*Department of Basic Veterinary Sciences, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, 20400 Sri Lanka*
** chinthap@vet.pdn.ac.lk*

Banana (*Musa* spp.) is a widely consumed fruit in Sri Lanka, and an important component of the diet. However, its consumption has been associated with allergic reactions in sensitized individuals. Previously, Mus a 1 – 6 and S-adenosyl-L-homocysteine hydrolase have been identified as banana allergens in allergen identification studies and cross-reactivity studies with latex and other fruits. Despite the widespread consumption and diversity, scientific information regarding the allergenic protein profiles of commonly consumed Sri Lankan banana cultivars remains limited. Therefore, this study aimed to analyze the protein profiles of selected Sri Lankan banana cultivars to identify potential variations associated with allergenic proteins. Four commonly consumed varieties, 'Ambul', 'Anamalu', 'Seeni', and 'Ambun', were selected based on their widespread availability, and traditional beliefs suggesting that certain cultivars, particularly 'Ambul' and 'Anamalu', may aggravate asthma and wheezing, although scientific evidence supporting these claims is limited. Total proteins were extracted from ripen banana pulp using phosphate-buffered saline and separated using Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). Protein band patterns and sizes were compared to identify variations in the protein profiles. The protein profiles revealed multiple protein bands ranging from approximately 10 to 80 kDa, with prominent bands at ~9-10, ~15, ~20, ~33-40, and 60 kDa across most banana varieties. A distinct band at approximately 27-30 kDa was observed uniquely in the 'Seeni' variety, while a 50-55 kDa band appeared exclusively in the 'Anamalu' variety, suggesting cultivar-specific protein expression patterns. The presence of several bands within the 15-35 kDa range and the unique band present in 'Anamalu', which overlaps with the reported molecular weights of known banana allergens, suggests the presence of potential allergenic proteins. However, since this study relied solely on SDS-PAGE, the identities of these proteins and their allergenic properties need to be confirmed through immunological techniques. Future studies employing proteomic approaches such as LC-MS/MS and immunological methods including IgE-immunoblotting and ELISA recommended for accurate allergen identification and characterization. Overall, this study provides preliminary insights into cultivar-specific protein profiles among commonly consumed Sri Lankan bananas and establishes a foundation for future research aimed at improving the understanding and diagnosis of banana-associated food allergies.

Keywords: allergy, allergenic proteins, *Musa* spp., SDS-PAGE, Sri Lankan banana varieties

Relationship Between Physicochemical Parameters and Microbial Contamination in Major Tributaries Connected to the Mahaweli River in the Kandy District, Sri Lanka

F. Fareed[1], T.R.G.S.D. Thoradeniya[2]*, P.T.A. Thilakarathna[3], H.W.T.N. Rathnaweera[2], H.R.N. Jinadasa[4], S.H.P.P. Karunaratne[2]

[1]*China-Sri Lanka JRDC for Water Technology, Meewathura, Peradeniya,20400, Sri Lanka*
[2]*Department of Zoology, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[4]*Department of Veterinary Pathobiology, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**shalini.thoradeniya@sci.pdn.ac.lk*

Drinking water contamination is a major public health concern in tropical regions, particularly where human activities contribute to environmental pollution. There can be a relationship between the physicochemical characteristics of water and microbial contamination. Understanding this relationship is essential for identifying contamination sources and mitigating risks associated with waterborne microbes in vulnerable communities. This study aimed to assess the relationship between physicochemical parameters and microbial contamination in major tributaries connected to Mahaweli River in Kandy District, Sri Lanka. It further sought to identify high-risk locations with elevated fecal contamination across different seasonal sampling periods. Eighteen 500 mL water samples were collected from six surface water sources which are tributaries connected to the Mahaweli River, namely Nillambe Oya, Gelioya Ela, Nanu Oya, Meda Ela, Pinga Oya, and Thalathu Oya, during August, October, and December 2024. Physicochemical parameters, including pH, electrical conductivity (EC), turbidity, and color, were measured using standard methods. Microbial analysis included total plate count (TPC), total coliform (TC), and fecal coliform (FC) counts. Microbial data were log-transformed to reduce skewness, and Spearman rank correlation analysis was performed using SPSS statistical software. Mean FC and TC values were calculated to identify high-risk contamination sites. Significant spatial and temporal variations in water quality were observed across all sampling locations. Total coliform and fecal coliform counts ranged from 10300–19733CFU/100 mL and 3133–12533 CFU/100 mL, respectively, across the six tributaries, exceeding the reference limits specified in SLS 614:2013 and indicating widespread microbial contamination. Meda Ela was identified as the highest-risk site. Spearman correlation analysis revealed a strong positive relationship between EC, TC, and FC ($\rho > 0.6$), suggesting that increased dissolved ion concentration is associated with fecal contamination. In contrast, pH, turbidity, and color showed weak correlations with microbial loads. Seasonal peaks in contamination were observed during October, likely due to rainfall-associated runoff. Electrical conductivity showed the strongest relationship with microbial contamination in surface waters. High-risk was observed in Meda Ela likely influenced by hospital and urban wastewater runoff. Persistent fecal contamination highlights significant public health risks and demonstrates the importance of effective water quality monitoring and environmental management in vulnerable regions.

Keywords: Total Coliform, Fecal Coliform, Surface Water Quality, Electrical Conductivity, Sri Lanka

Resonance Classification of the Proton-Proton Collision at Large Hadron Collider Using Machine Learning and Deep Learning Models

K. Sajuran[1*], H.T.K. Abeysundara[2], R. Mendis[2]

[1]*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
[2]*Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
[*]*sajuran1994@gmail.com*

Analysis of high-energy collision data from Large Hadron Collider (LHC) experiments requires advanced techniques to distinguish resonant particle decays from substantial background processes. Machine learning enables resonance identification using multidimensional event features in complex datasets. This study aims to compare and evaluate the newly developed and optimized machine learning and deep learning models using two distinct datasets. The first contains charmonium (J/ψ), bottomonium (Y(1S,2S,3S)), and Z-boson events with 21,900 records and 17 features, while the second contains Higgs boson and W-boson signatures with 3,534,883 records and 21 features. To replicate the original experimental conditions, initial event selection employed physics-driven cuts derived from Breit–Wigner fits, yielding a pure training dataset. A comprehensive preprocessing workflow was carried out, involving the application of SMOTE or ADASYN in conjunction with Tomek Links to address class imbalance in the training dataset, along with the elimination of highly correlated attributes, label encoding, and data normalization. Four sophisticated models that have been widely employed in previous studies were considered in this research: Random Forest, Light Gradient Boosting Machine (LightGBM), Extreme Gradient Boosting (XGBoost), and a Residual Multi-Layer Perceptron (Res-MLP) deep learning architecture. The selection of optimal hyperparameters was done with the help of grid search cross-validation where each algorithm was provided with a certain combination of parameters for higher performance improvements. However, the Res-MLP model outperformed other models for J/ψ, achieving the highest balanced accuracy of 90%, overall accuracy of 95%, Training accuracy 97.91% and F1-score of 1.00. For rare Upsilon states, the classification became more complicated. however, all models perfectly identified the Z boson. Out of four selected algorithms, Res-MLP showed strong discriminative performance with F1-scores of 0.88, 0.78, and 0.81 for Y(1S), Y(2S), and Y(3S), respectively. On the second dataset, it achieved 98.33% training accuracy and 98.25% test balanced accuracy. For both datasets, the training and testing accuracies exhibit negligible differences, suggesting no evidence of overfitting. The optimized Res-MLP model, when integrated with suitable devices within the experimental setup, could enable automated identification of the target particles and be extended to records generated from LHC's proton–proton collisions.

Keywords: resonances, precision, balanced accuracy, model generalization, collider

Seasonal Shift of Transport Pathways and Potential Source Regions of $PM_{2.5}$ in Colombo, Sri Lanka (2023 - 2025)

B.R.N.P. Senarathna*, M.P. Rambukkange

University of Peradeniya, 20400, Sri Lanka
**a20gis074@arts.pdn.ac.lk*

Air pollution driven by fine particulate matter with a diameter of 2.5μm or less ($PM_{2.5}$) poses significant risks to both human and environmental well-being. In Sri Lanka, $PM_{2.5}$ levels usually reach moderate or unhealthy levels mainly because of regional transport of pollutants. Yet, the assessment of source regions of $PM_{2.5}$ in Sri Lanka remains underexplored. This study identifies and compares geographical source regions responsible for high- and low-PM2.5 periods in Colombo from 2023 to 2025 and determines their contribution magnitude using Concentrated Weighted Trajectory (CWT) analysis. Hourly $PM_{2.5}$ data were obtained from the PurpleAir low-cost sensor network, and monthly means were calculated to identify peak and minimum $PM_{2.5}$ months. Back-trajectory and CWT analyses spanning 120 hours were performed at 1500 m altitude using MeteoInfo software (TrajStat tool) with GDAS reanalysis data. Peak $PM_{2.5}$ months were identified as February (2025) and March (2023 and 2024), while August (2023 and 2025) and September (2024) recorded the lowest concentrations. Trajectory cluster analysis across all study months reveals that during peak PM months, trajectories originating from the eastern corridor, encompassing the Bay of Bengal, Myanmar, and Thailand, accounted for approximately 50% of all arriving air masses, while those arriving from North-eastern India and Bangladesh contributed around 40%. In contrast, during low-PM months, nearly 90% of trajectories originated from the Indian Ocean, Arabian Sea, and East African coast, with low CWT values, reflecting clean marine air transport dominant under the southwest monsoon. CWT analysis for high-PM months indicates the Bay of Bengal, Myanmar, Thailand, North-eastern India, and Bangladesh regions, which are well known for intense seasonal biomass burning and industrial emissions, as strongly weighted source regions. These findings confirm that $PM_{2.5}$ variability in Colombo is primarily governed by monsoon-driven atmospheric circulation. Specifically, the northeast monsoon transports pollutants from high-emission continental regions, whereas the southwest monsoon delivers cleaner oceanic air masses. This study contributes novel source apportionment evidence for Sri Lanka, emphasising the need for regional cooperative frameworks to address transboundary air pollution.

Keywords: $PM_{2.5}$, Concentrated Weighted Trajectory (CWT), transboundary air pollution, Sri Lanka

Silica-Rich Rice Husk Ash in Mortar: A Sustainable Approach for Mortar Production

N.A.A.N.D. Gunawardhane*, V.N. Seneviratne, O.A. Ileperuma

Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**nimeshag@sci.pdn.ac.lk*

Rice husks are abundant agricultural by-products in Sri Lanka with high silica content ranging around (15-25)% by weight. White ash obtained from combustion of rice husks can yield high contents of amorphous silica with high specific surface area and pozzolanic activity. Therefore it can be used as a promising resource for value-added applications. Due to energy intensive, expensive and environmentally harmful conditions utilized in the production of raw materials required for mortar production such as cement and sand, determination of suitable alternatives for these is important. In this study, rice husk ash was produced using different methods including traditional open air heap burning, calcination in laboratory muffle furnaces and a novel low-cost approach of powder-stove like technique developed as an intermediate alternative simply made using a barrel and metal meshes. The produced ash was characterised based on composition, surface morphology and crystallinity. The powder-stove technique produced porous ash with approximately 95.2% silica content and XRD confirmed that the silica remained predominantly amorphous, indicating favorable pozzolanic reactivity. This ash was incorporated separately, as a partial replacement for cement and sand in mortar. Here variable percentages of rice husk ash were added and the variations in compressive strength was studied to determine the feasibility of replacing cement and sand separately and the optimum replacement percentages were determined. Among the replacement strategies examined, sand replacement has proven to be the most successful where up to 30% of sand can be replaced while obtaining the same compressive strength as in the case without any rice husk ash. Replacement of cement was also successful up to a certain extent where 10% and 15% replacements retained approximately 96% and 94% of the control strength respectively. Although further analysis is required for large-scale implementation, rice husk ash obtained from the simpler and low-cost powder stove technique demonstrates the potential of utilising agricultural waste as a partial replacement for conventional mortar constituents paving the way for reduced dependence on natural sand and cement.

Keywords: rice husk ash, powder stove technique, mortar, compressive strength

Source-Specific Toxic Metal Bioaccumulation and Health Risk Assessment in Edible Aquatic Organisms from Freshwater and Estuarine Systems; A Study in Sri Lanka

W.P.R.T. Perera[1]*, M.A.U. Dias[2], W.A.S. Fernando[2], K.A.D.D. Sakunthala[2], P.A.D.H.J Gunathilaka[3], J.A. Liyanage[2]

[1]Department of Indigenous Medical Resources, Faculty of Indigenous Health Sciences and Technology, Gampaha Wickramarachchi University of Indigenous Medicine, 11870, Sri Lanka
[2]Department of Chemistry, Faculty of Science, University of Kelaniya, 11600, Sri Lanka
[3]Department of Rogavignana, Faculty of Indigenous Medicine, Gampaha Wickramarachchi University of Indigenous Medicine, 11870, Sri Lanka
**wprtp@gwu.ac.lk*

Toxic metal contamination in edible organisms in aquatic ecosystems is a growing concern due to bioaccumulation, persistence, and potential health risks. Freshwater and brackish environments are often subjected to distinct anthropogenic pressures, particularly industrial discharges, fishing activities, and agricultural runoff. However, integrated assessments combining statistical discrimination, bioaccumulation behavior, and human health risk evaluation remain limited. The primary objective of this study was to comparatively evaluate the distribution, tissue-specific bioaccumulation, and toxicological implications of selected heavy metals/metalloids (Cr, Mn, Cu, Zn, As, Cd, and Pb) in edible organisms (*Etroplus suratensis*, and *Scylla serrata*). Samples were collected from freshwater systems (Minipe lake, *Etroplus suratensis*, N=15) influenced predominantly by agricultural activities and brackish environments (Negombo estuary, *Etroplus suratensis* N=15, and *Scylla serrata*, N=15) impacted by industrial sources based on two areas in Sri Lanka. All samples were acid digested and subjected to ICP-MS for toxic metal analysis. Kruskal–Wallis tests revealed significant differences in metal accumulation all analyzed metals among edible and non-edible tissues including muscle, gills, gut of *Etroplus suratensis* ($p < 0.05$). Accordingly, a tissue-specific bioaccumulation pattern was observed with the order of liver > gills > muscle. The edible tissues of *Etroplus suratensis* collected from the freshwater sampling site exhibited elevated concentrations of Mn, Zn, and Cr across all samples, likely reflecting the influence of agricultural activities, including fertilizer application, pesticide runoff, and soil erosion., whereas edible samples collected from brackish water environments showed higher Cu, As, Cd, and Pb levels, indicative of industrial effluents and localized discharge hotspots. *Scylla serrata*, the hepatopancreas exhibited the highest metal accumulation, whereas body muscle showed extremely high Zn concentrations. Hierarchical agglomerative clustering distinctly separated agricultural freshwater sites from industrially influenced marine sites, validating source-specific contamination fingerprints. Toxicological risk assessment indicated that Hazard Index (HI) values for both inland fish and brackish crustaceans were below unity, suggesting no immediate non-carcinogenic risk. However, carcinogenic risk assessment identified arsenic as the dominant carcinogenic contributor in *Etroplus suratensis* and cadmium in *Scylla serrata*, with risk values approaching or slightly exceeding acceptable thresholds (10^{-4}). The presence of source-specific carcinogenic risks underscores the need for continuous monitoring and targeted mitigation strategies.

Keywords: aquatic ecosystems, bioaccumulation, *Etroplus Suratensis,* human health risk assessment, potential toxic elements

Stability and Reusability of Metatitanic Acid-Based Photocatalysts in Continuous Flow Water Treatment Systems

A.V.H.H. Amarathunga[1], A.H.J. Sampath[1], K.M.N. de Silva[1], W.R.M. de Silva[1,2]*

[1]*Center for Advanced Materials and Devices (CAMD), Department of Chemistry, University of Colombo, Colombo, 00300, Sri Lanka*
[2]*Department of Biomedical Science, NSBM Green University, Mahenwaththa, Pitipana, Homagama,10206, Sri Lanka*
**rohini@chem.cmb.ac.lk*

Industrial wastewater contamination with synthetic organic dyes is a major environmental concern because conventional treatment methods fail to mineralize these persistent, non-biodegradable pollutants. This study aims to develop a reusable Metatitanic acid (MTA)-based photocatalyst through polymer immobilization for efficient continuous flow wastewater treatment. Heterogeneous photocatalysis employs semiconductor photocatalysts to generate reactive oxygen species for pollutant degradation under UV irradiation. However, metal oxide nanomaterials are hindered by poor stability, limited reusability and difficult recovery from treated media. For that purpose, an ilmenite-derived titanium containing species, known as MTA, was synthesized, as a cost-effective photocatalyst, and its reusability was enhanced through polymer-based immobilization. Nano-MTA was synthesized by digesting ilmenite followed by the introduction of PEG 6000 into the aging solution as a capping agent. Three polymer-immobilized composite photocatalysts were fabricated as MTA-Chitosan (CS) beads through ionic crosslinking with NaOH (1%, 2%, 3% w/v MTA loadings), MTA-pectin beads crosslinked with 5% $CaCl_2$ and MTA-PVA-CS composite films prepared by solution casting. Characterizations were carried out using FTIR, XRD and SEM analysis. Photocatalytic performances of powdered photocatalysts and polymer composite photocatalysts were assessed by degradation of 20 ppm Rhodamine B monitored at 554 nm under UV irradiation over 10 minutes. Reusability was evaluated over successive degradation cycles, and the optimized 3% MTA-CS beads were tested in continuous-flow packed column reactor over 20 minutes. Nano-MTA achieved the highest dye removal (87.4%), outperforming bulk-MTA (81.2%), while demonstrating the benefit of nanoscale morphology. Among polymer composites, 3% MTA-CS beads revealed 84.3% removal efficiency, superior to 2% MTA-CS (81.9%), 1% MTA-CS (72.4%), MTA-pectin (62.4%) and MTA-PVA-CS (62.2%) systems. The 3% MTA-CS beads maintained consistent activity across three cycles (84.3%, 83.1%, 81.5%), with a significant drop observed in cycle 4 (72.9%). Under continuous flow conditions, 3% MTA-CS beads achieved dye removal efficiencies of 63.2%, 55.7% and 47.7% in cycles 1-3, demonstrating sustained photocatalytic activity under operational conditions. The slight activity loss during repeated cycles was attributed to partial photocatalyst leaching and blockage of active sites. In conclusion, chitosan immobilized nano-MTA offers a robust, reusable photocatalytic system with enhanced stability and recovery for continuous-flow wastewater treatment.

Keywords: heterogeneous photocatalysis, Metatitanic Acid, wastewater treatment, reusability

Statistical Analysis and Risk Classification of Chronic Kidney Disease of Unknown Etiology (CKDu) in Sri Lanka: Integration of Clinical and Environmental Factors

L.P.D. De Silva[1]*, Y.P.R.D. Yapa[1], N. Nanayakkara[2]

[1]*Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Nephrology and Kidney Transplant Unit, National Hospital, Kandy, 20000, Sri Lanka*
**pathumd@sci.pdn.ac.lk*

Chronic Kidney Disease of Unknown Etiology (CKDu) has emerged as a critical public health issue in Sri Lanka, particularly affecting agricultural communities, yet its underlying causes and early detection mechanisms remain insufficiently understood. This study aims to identify distinct CKDu risk groups, examine variation in clinical and environmental factors, and develop accurate predictive models for early risk classification. The analysis is based on a dataset of 402 clinically evaluated individuals obtained from the National Hospital, Kandy. The sample comprises individuals from both CKDu-endemic (high prevalence) and non-endemic areas to allow for comprehensive comparative analysis. The dataset comprises demographic information, kidney function indicators, tubular injury biomarkers, and serum and urinary trace elements. Non-parametric statistical tests were initially employed to assess differences across CKDu stages and exposure categories. Principal Component Analysis (PCA) was used for dimensionality reduction of the numeric variables, followed by K-means clustering applied strictly to the resulting orthogonal continuous principal component scores to identify underlying risk groups. The optimal number of clusters was validated using the Silhouette score in conjunction with expert clinical interpretability. Categorical clinical variables, including established CKD stages, were subsequently utilized post-clustering to ensure the groups corresponded to biologically meaningful disease states, with final risk labels assigned under the clinical guidance of a consultant nephrologist. Factor analysis further supported the interpretation by revealing latent clinical–biochemical dimensions. The clustering approach identified four meaningful groups: CKDu, High Risk, Low Risk, and Not At Risk, based on distinct clinical and biochemical profiles. To effectively handle highly correlated predictors and inherent multicollinearity, predictive modeling utilized cross-validated regularized multinomial LASSO regression, Random Forest, and XGBoost algorithms, which were implemented and evaluated on a held-out test set. Among these, multinomial LASSO achieved the highest balanced accuracy (96.99%) and macro F1-score (94.51%), outperforming Random Forest (94.21% balanced accuracy; 94.15% macro F1) and XGBoost (94.07% balanced accuracy; 91.66% macro F1). Key predictors included estimated glomerular filtration rate (eGFR), serum creatinine, adjusted RBP4 levels, and selected trace elements. The findings demonstrate that integrating multivariate statistical techniques with machine learning provides a robust framework for CKDu risk stratification. This study contributes to improved early detection strategies and offers valuable insights for public health interventions aimed at mitigating CKDu progression in vulnerable populations.

Keywords: CKDu, risk classification, biomarkers, multivariate analysis, machine learning

Sustainable Inkjet Ink from Waste Human Hair: Melanin-Based Waterborne Formulation

S.B. Alahakoon*, B.B.T. Madhubhasini

University of Peradeniya, Peradeniya, 20400, Sri Lanka
**sampath.alahakoon@sci.pdn.ac.lk*

Human hair is an abundant biowaste generated primarily from barbershops and salons. Despite being biodegradable, its degradation is slow (1–2 years) due to the highly stable keratin structure, leading to accumulation in landfills and drainage systems. In addition, open burning of hair waste releases unpleasant odors and potentially toxic gases. Therefore, valorization of waste human hair into functional materials represents a sustainable waste management strategy. In this study, a water-based inkjet printing ink was developed using melanin extracted from waste human hair as a natural pigment and UV-resistant functional material. The cleaned hair sample was treated with detergent and acetone, followed by dissolution in 1 M NaOH for 24 h. Melanin extraction was performed via sequential acid–base (HCl/NaOH) treatment, yielding a crude pigment. Purification was done by repetition of base hydrolysis and acid precipitation until a clear supernatant is obtained. The extracted material was characterized using FTIR and UV–Visible spectroscopy with respect to the reported spectra. Color variation of crude melanin was evaluated using the CIE 1931 chromaticity diagram. Ink formulations were prepared using crude melanin as the pigment, along with appropriate carrier fluids, humectants, wetting/dispersing agents, and binders. The physicochemical properties of the formulated inks were systematically evaluated to assess their suitability for inkjet printing applications. The optimized formulation exhibited a viscosity of 2.68 mPa·s, surface tension of 42.9 $mN \cdot m^{-1}$, zeta potential of −32.9 mV, and an average particle size of 400.8 nm. Printing performance was tested using an HP DeskJet printer with an HP 680 cartridge and benchmarked against commercial black ink. The developed ink showed comparable physicochemical properties and satisfactory printability, although the relatively larger particle size causes nozzle clogging after printing one to two pages. Ongoing work focuses on particle size reduction to further enhance print quality and stability. Additionally, optical density, storage stability, adhesion and morphology of printed paper, and long-term cartridge performance will also be evaluated. This study demonstrates a sustainable and scalable approach for converting waste human hair into value-added functional ink materials, contributing to circular economy and green manufacturing practices.

Keywords: human hair waste, inkjet printable ink, keratin, melanin, waste valorization

Synergistic Effect of Solar Irradiation and Phytochemical Corona on the Photocatalytic Degradation of Methylene Blue Using Green-Synthesized Copper Nanoparticles

H.K.S. Madusanka[1] *, J.A.M.S. Jayasuriya[1], A.G.B Aruggoda[1], J.A.S Chathurika[2], S.R Weerakoon[3]

[1]*Department of Agricultural and Plantation Engineering, The Open University of Sri Lanka, Nawala, Nugegoda,10107, Sri Lanka*
[2]*Department of Urban Bio-resources, University of Sri Jayawardanapura, Ganagodawila, Nugegoda, 10107, Sri Lanka*
[3]*Department of Botany, The Open University of Sri Lanka, Nawala, Nugegoda, 10107, Sri Lanka*
**hksma@ou.ac.lk*

Synthetic organic dyes like Methylene Blue (MB) in effluents pose severe environmental threats due to their persistence and toxicity. Green-synthesized copper nanoparticles (Cu NPs) using plant extracts offer an eco-friendly Advanced Oxidation Process (AOP) for wastewater remediation, but the mechanistic role of the plant-derived phytochemical corona remains under-explored. This study aims to evaluate the synergistic effects of solar irradiation and the phytochemical corona on MB degradation kinetics by comparing non-calcinated (corona-intact) and calcinated (corona-destroyed) Cu NPs biogenically synthesized using *Mimosa pigra* aqueous extract. Cu NPs were synthesized utilizing the *M. pigra* aqueous leaf extract and characterized via UV-Visible spectroscopy, FTIR, XRD, and SEM. A specific subset was calcined at 500 °C to yield purified CuO NPs. Photocatalytic degradation of MB (15.46 mg/L) was evaluated under natural solar and dark conditions using a 1000 mg/L dosage of nanoparticles. Residual MB concentrations were quantified spectrophotometrically utilizing a statistically validated linear regression model, and catalyst regeneration was assessed via chemical desorption with 0.1 M NaOH. The calibration model demonstrated robust linear regression ($R^2 = 0.9554$). Non-calcinated Cu NPs under natural solar irradiation achieved superior degradation, strictly following pseudo-first-order kinetics with a remarkably short half-life of 6.34 minutes, compared to 249.37 minutes for calcinated NPs and 1177.54 minutes in the dark. FTIR and SEM analyses confirmed that calcination successfully generated phase-pure monoclinic CuO but incinerated the organic corona and induced significant thermal agglomeration. The retained anionic corona actively facilitated potent electrostatic adsorption of cationic MB molecules. In conclusion, the plant-derived phytochemical corona acts as a crucial kinetic enhancer that traps dye molecules within the localized active zone. Utilizing non-calcinated green nanomaterials, coupled with alkaline regeneration, provides a highly potent and sustainable framework for large-scale wastewater remediation.

Keywords: copper nanoparticles, green synthesis, methylene blue, photocatalysis, phytochemical corona

Acknowledgement: *The authors gratefully acknowledge the financial support provided by the Open University of Sri Lanka through the Competitive Research Grant 2020 (Grant No. 202003).*

Synthesis and Characterization of Aluminium Vanadate ($ALVO_4$): Structural, Morphological, and Optical Properties

U.N. Nisansala[1,2]*, H.M.B.I. Gunathilaka[1], R.C.L. De Silva[5], K.A. Nimasha[5], H.N.M. Sarangika[3], P.K.D.D.P. Pitigala[4], W.W.P. De Silva[4]

[1]*Materials Technology Section, Industrial Technology Institute, No. 363, Bauddhaloka Mawatha, Colombo 07, 00700, Sri Lanka*
[2]*Department of Chemistry, University of Kelaniya, Dalugama, Kelaniya, 11900, Sri Lanka*
[3]*Department of Physical Sciences and Technology, Faculty of Applied Sciences, Sabaragamuwa University, Belihuloya, 70140, Sri Lanka*
[4]*Department of Physics, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, 10250, Sri Lanka*
[5]*Petroleum and lubricant testing laboratory, Industrial Technology Institute, No. 363, Bauddhaloka Mawatha, Colombo 07, 00700, Sri Lanka,*
**naduniuyanage99@gmail.com*

Aluminium vanadate ($AlVO_4$) is an emerging vanadate-family semiconductor with notable chemical stability in aqueous environments, making it a promising candidate for electrochemical applications. However, its structural and optical properties have not been sufficiently characterized, which represents a clear research gap that limits its development as an electrode material. This study aimed to synthesize $AlVO_4$ through a cost-effective, scalable, wet-chemical co-precipitation method followed by calcination, and to comprehensively characterize the resulting material using complementary analytical techniques. It was synthesized by reacting ammonium metavanadate and aluminium chloride hexahydrate in aqueous solution, by varying pH and temperature systematically, and the dried precursor was calcined at 480°C for 2 hours. The structural characterization was performed using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), energy dispersive X-ray analysis (EDAX), and scanning electron microscopy (SEM), while the optical properties were determined via UV-Visible spectroscopy using the Tauc plot method for both direct and indirect transitions. A maximum product yield of 70.54% was obtained at pH 5 at 70°C. The XRD analysis confirmed a near-amorphous precursor with an average crystallite size of approximately 25 Å, which transformed into a well-crystallized mixed triclinic-monoclinic $AlVO_4$ phase after calcination, with crystallite sizes ranging from 71 to 608 Å and minor residual V_2O_5. The FTIR studies confirmed the presence of characteristic V-O stretching and Al-O-V bridging vibrational modes. EDAX verified the Al-V atomic ratio as 1:1. A porous, hierarchical, coral-like advanced three-dimensional morphology was observed using SEM analysis, which is electrochemically beneficial in various applications. UV-Visible spectroscopy determined direct and indirect band gaps of 4.09 eV and 3.67 eV, respectively. This confirms primary absorption in the UV region. Thereby, this study establishes a practical, low-cost synthesis route for $AlVO_4$ and provides comprehensive characterization data, advancing the fundamental understanding of this material for future applications like photocatalytic applications.

Keywords: aluminium vanadate, co-precipitation, optical band gap, structural characterization

Acknowledgement: *The authors gratefully acknowledge the Industrial Technology Institute (ITI) for financial support provided through project grant number TG 24/247.*

Synthesis, Characterization, and In Vitro Bio-evaluation of a Schiff Base and Its Cu(II), Ni(II), and Mn(II) Complexes: Potentiating Antimicrobial and Antioxidant Efficacy via Metal Coordination

P.H.S.S. Karunarathna[1], B.S. Nanayakkara[2], M.Y.U. Ganehenege[3]*

[1] *Postgraduate Institute of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
[2]*Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
[3]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka.*
**myug@sci.pdn.ac.lk*

A novel tridentate Schiff base ligand, 2-((E)-((2-(((E)-benzylidene)amino)phenyl)imino)methyl)-naphthalene-1-ol, was synthesized via reflux condensation of o-phenylenediamine with 2-hydroxy-1-naphthaldehyde and benzaldehyde in absolute ethanol, and subsequently complexed with Cu(II), Ni(II) and Mn(II) ions. The ligand and its metal complexes were characterized by FT-IR (where C=N bond formation was evident from the new band appeared at 1612 Cm^{-1}), UV–Vis spectroscopy (λ_{max} for the ligand, Cu(II)-L, Ni(II)-L and Mn(II)-L complexes are respectively 228 nm, 423 nm, 485 nm and 452 nm), X-ray diffraction, TGA, SEM and elemental analysis (CHN). Spectroscopic data confirmed that the coordination of the ligand to the metal ion occurs through azomethine nitrogen and phenolic oxygen atoms in a tri dentate nature. The antimicrobial activity of the ligand and its complexes were evaluated against cultures of *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Enterococcus faecalis* and *Candida albicans* using the agar well-diffusion bioassay, while the Minimum Inhibitory Concentrations (MICs) were determined through the agar dilution method in Mueller Hinton Agar and Dimethyl sulfoxide(DMSO) was used as the solvent. Among the complexes, Cu(II) derivative showed the most potent and broad-spectrum activity (inhibition zone: 17 ± 0.5 mm; MIC: 128 ppm), prominently against *E. faecalis* while the Mn(II) complex exhibited the highest activity (inhibition zone: 22 ± 0.5 mm; MIC: 640 ppm) against *S. aureus*. The free ligand and corresponding metal salts showed minimal or no antimicrobial activity, highlighting the critical role of chelation in enhancing biological efficacy. The IC_{50} values calculated using DPPH (2,2-diphenyl-1-picrylhydrazyl) assay were 24.8 ppm, 41.34 ppm, 64.9 ppm and 139.5 ppm for the ligand, Cu(II)-L complex, Ni(II)-L complex and Mn(II)-L complex, respectively, indicating that the antioxidant capacity decreases in the order of Ligand > Cu(II)-L complex > Ni(II)-L complex > Mn(II)-L complex. Toxicity studies are currently underway to assess the safety profile of these compounds. In conclusion, the findings of the current study revealed that the antioxidant capacity of the ligand and its metal complexes cannot be directly correlated to their antimicrobial activity. However, showing the highest antimicrobial activity of Cu(II)-L complex may be due to the net increase in both the lipophilicity and the antioxidant capacity of the ligand with the Cu(II) coordination.

Keywords: anti-microbial resistance, broad-spectrum, metallodrug, anti-bacterial, anti-candidal

Acknowledgement: *The PGIS/2024/09 Grant funded by the PGIS, University of Peradeniya.*

Synthesis of Chitosan Nanoparticles Loaded with Methanolic Extract of *Chrysophyllum cainito* Bark and Drug Release Studies

P.D.R. Pathirana, V.N. Seneviratne*

Department of Chemistry, Faculty of Science, University of Peradeniya, 20400, Sri Lanka
**vns@pdn.ac.lk*

Chrysophyllum cainito bark, used traditionally for diabetes, contains bioactive compounds. However, their stability and bioavailability may be limited and hence it may benefit from a nanoformulation to enhance stability and controlled release. This study aimed to synthesize and characterize *C. cainito* bark extract-loaded chitosan nanoparticles (CC-CNPs) and evaluate their drug loading and *in vitro* release profile. Chitosan was extracted from shrimp shells through demineralization (4% HCl), deproteinization (5% NaOH), and deacetylation (70% NaOH). CC-CNPs were prepared using ionic gelation with 1% sodium tripolyphosphate (pH 5.0). Phytochemical screening for phenols, flavonoids, alkaloids, saponins, and phytosterols was performed for the methanolic extract of *Chrysophyllum cainito* bark using standard tests. Total phenolic content was determined using the Folin-Ciocalteu method with pyrogallol as standard. CC-CNPs were characterized by Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), and particle size analysis. Encapsulation efficiency was calculated by measuring UV-Visible absorbance before and after centrifugation. *In vitro* release studies were conducted at pH 7.4 (phosphate-buffered saline, 37°C) using the dynamic dialysis method. Release kinetics were modeled using zero-order, first-order, and Higuchi equations. Phytochemical screening confirmed the presence of phenols, saponins, and phytosterols, while alkaloids and flavonoids were absent. Total phenolic content was 81.85 ± 0.1 mg pyrogallol equivalents per gram of extract. FTIR spectra revealed characteristic peaks of both chitosan and extract components, indicating successful incorporation. SEM images showed rough and aggregated morphology of CC-CNPs compared to smooth unloaded nanoparticles, further confirming extract loading. Particle size analysis showed CC-CNPs at 47 ± 15 nm. Encapsulation efficiency was 66.84%. Release studies showed an initial burst release of 39.9% within the first hour (surface-bound compounds), followed by sustained release over 24 hours. Kinetic analysis fitted best to the zero-order model ($R^2 = 0.95$), compared to first-order (0.88) and Higuchi (0.93), indicating constant drug release independent of concentration. These findings highlight the significance of chitosan-based nanoparticles in improving the stability and bioavailability of plant-derived bioactive compounds with potential anti-diabetic applications.

Keywords: *Chrysophyllum Cainito*, chitosan nanoparticles, ionic gelation, zero-order kinetics, drug release

Synthesis of Eugenol Derivatives as Potential Antibacterial Agents Against *Streptococcus mutans*

L.B.W.W. Wickramasooriya[1]*, J.M.S. Jayasinghe[1], K.S.N.D. Gunawardhana[2]

[1]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Department of Basic Sciences, Faculty of Dental Sciences, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**warnaw@sci.pdn.ac.lk*

Eugenol is the major phenolic component of clove essential oil. It is widely used in medical and dental fields for its antimicrobial, analgesic, and anti-inflammatory properties. *Streptococcus mutans,* the primary etiological agent of dental caries is known to be inhibited by eugenol; only at high concentrations. This study aimed to overcome the mentioned limitation by synthesising eugenol derivatives with improved antibacterial activity against *S. mutans*. Five derivatives (Compounds 1-5) were synthesized following standard procedures, with structural modifications introduced exclusively at the terminal olefin of eugenol. Compound 1 was synthesized via hydroxylation of the terminal olefin, Compound 2 via alkoxylation, Compound 3 via hydrogenation, while Compounds 4 and 5 were synthesized via dihydroxylation and cyano-hydroxylation of the terminal olefin respectively. Structural characterization of the synthesized derivatives was performed using FTIR, ^{1}H-NMR, and ^{13}C- NMR. The antibacterial activity of the synthesized compounds against *S. mutans* was evaluated using the disc diffusion assay on Mueller-Hinton agar plates, which were incubated overnight at 37 °C. Among the compounds tested, Compound 3 showed the highest antibacterial activity (mean inhibition zone (1.77 ± 0.02) cm), whereas Compound 2 (mean inhibition zone (1.61 ± 0.02) cm) and Compound 1 (mean inhibition zone (0.84 ± 0.02) cm) showed moderate activity, and the remaining two compounds (Compounds 4 and 5) were inactive. Overall, findings from this study suggest that enhanced hydrophobicity is essential for the activity of eugenol derivatives against *S. mutans*. Further, these results support the potential development of eugenol derivatives as naturally derived antibacterial agents against *S. mutans* and consequently, as therapeutic agents for dental caries.

Keywords: antibacterial activity, disc diffusion assay, eugenol, hydrophobicity, *Streptococcus Mutans*

Temporal Variation of Groundwater Quality in Shallow Aquifers in the CKDU Hotspot of Wilgamuwa

P.M. Wijethunga*, C. Chandrarathna, R. Chandrajith

Department of Geology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**pasindimekala@gmail.com*

Chronic Kidney Disease of Unknown Etiology (CKDu) is a serious issue among agricultural communities in the rural dry zone of Sri Lanka, where residents rely on untreated groundwater for drinking. Due to its unique geographic distribution, groundwater, particularly hard groundwater containing silica and fluoride, is among the many factors believed to be associated with the etiology. Although previous studies have documented seasonal variation, only a few have examined monthly variations of groundwater quality in disease-prevalent regions. This study aimed to assess the monthly variation of groundwater quality and its possible correlation with CKDu. Thirteen (13) shallow wells in households with CKDu patients in the Wilgamuwa area were sampled each month from March to September 2025, spanning the post- and pre-monsoon periods. Physicochemical parameters, including depth to the groundwater table, pH, electrical conductivity (EC), total hardness, dissolved oxygen (DO), and alkalinity, were measured on-site. Major cations (Na^+, K^+, Ca^{2+}, Mg^{2+}, Si^{4+}(as H_4SiO_4), major anions (F^-, Cl^-, SO_4^{2-}, NO_3^-), trace elements (Ni, Cu, Zn, Sr, Cd, Ba), and stable water isotopes ($\delta^{18}O$ and δ^2H) were analyzed using standard laboratory procedures. The results showed that the dominant groundwater facies are Ca-Mg-HCO_3, while silicate weathering primarily governs groundwater quality in both seasons. Stable water isotopic compositions indicated that the primary source of groundwater recharge is local precipitation, and evaporation is more intense during the dry months (June to September) than during the wet months (March to May). Total alkalinity, pH, and EC exhibit minimal seasonal variation and are comparable across seasons. Nonetheless, high DO levels were observed during the wet months (mean 3.62 mg/L), which may be due to greater oxygen input during recharge than during the dry months (mean 2.76 mg/L). The Wilcoxon signed-rank test reveals that among the major constituents, Si^{4+}, Na^+, K^+, Mg^{2+}, and F^- showed significant seasonal variation ($p < 0.05$), with higher ion concentrations in the dry months than in the wet months. Mean concentrations of major ions increased markedly during the study period, with Na^+ rising from 29.8 to 40.5 mg/L, K^+ from 0.8 to 2.6 mg/L, Mg^{2+} from 8.8 to 16.9 mg/L, and Si^{4+} from 23.2 to 68.1 mg/L. Fluoride concentrations also exhibited a similar seasonal increase, rising from 0.5 to 0.7 mg/L. In the assessment of the CKDu risk based on dissolved silica and fluoride concentrations in groundwater, 34.2% of groundwater samples were classified as high risk during the wet months. This percentage increases significantly to 88.5% during the dry months. In addition, nephrotoxic heavy metals (Cd, As, Ni, Cu) remain well below the SLS maximum permissible limits for drinking water, indicating they are less likely to be the primary cause of CKDu. Overall, this study highlights that monthly variations strongly affect groundwater geochemistry and that seasonal increases in Si^{4+} and F^- concentrations above the SLS limit may be associated with increased CKDu risk, particularly during the dry months.

Keywords: dry zone, groundwater, monthly monitoring, temporal variation, Wilgamuwa

Toxicity and Repellency of *Olax zeylanica* Leaf Extract on the Stored Product Pest *Sitophilus zeamais* (Coleoptera: Curculionidae)

S.D.C.D. Munasinghe, T.C. Weeraratne*

Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka
**thiliniw@sci.pdn.ac.lk*

Sitophilus zeamais is a major destructive stored-product pest of maize grain, causing significant post-harvest losses worldwide. Concerns over the environmental and health impacts of synthetic insecticides emphasize the need for natural alternatives. Therefore, this study aimed to evaluate and compare the toxicity and repellency of aqueous and methanolic formulations prepared from the crude extract of *Olax zeylanica* leaf powder against laboratory-reared *S. zeamais* adults. Toxicity bioassay was conducted using the filter paper method for five concentrations [1%, 3%, 5%, 7%, and 9% (w/v)] prepared using distilled water and methanol as solvents, each with five replicates (20 per replicate), and mortality was recorded every 24 hours over 10 days. Repellency test was carried out for the same test concentrations prepared in distilled water, each with three replicates (40 per replicate), with distilled water alone serving as the negative control. Repellency was assessed after 24 h of exposure by calculating the repellency index (RI). The results revealed that the crude extract of *O. zeylanica* leaf powder exhibited significant dose-dependent ($p<0.001$) and time-dependent ($p<0.001$) toxicity and repellency ($p=0.001$) effects against *S. zeamais*. The toxicity assay showed that the aqueous formulation was slightly more effective than the methanol formulation, whereas both solvents reached 100% mortality by day 10. After 72 hours, the LC_{50} and LC_{90} for the aqueous formulations were 2.23% (w/v) and 69.81% (w/v), while for the methanol formulations were 2.83% (w/v) and 117.53% (w/v), respectively. Lethal time analysis indicated faster mortality with the aqueous formulation (LT_{50}=0.94 days, LT_{90}=3.65 days) than the formulation in methanol (LT_{50}=1.02 days, LT_{90}=4.90 days). All aqueous concentrations significantly repelled *S. zeamais*, with RI decreasing from 0.9 at 1% (w/v) to 0.3 at 9% (w/v), indicating increased repellency with concentration. Phytochemical analysis showed the presence of phenols, tannins, quinones, terpenoids, saponins, reducing sugars, steroids, and alkaloid compounds in *O. zeylanica* crude, known to contribute to toxicity and repellency effects against *S. zeamais*. The overall results of this study revealed that *O. zeylanica* leaf crude extract exhibits significant toxicity and repellency effects against *S. zeamais*, with the aqueous extract demonstrating slightly higher efficacy, indicating a promising, eco-friendly biopesticide with practical potential for managing *S. zeamais* in stored maize.

Keywords: crude extract, *Olax Zeylanica*, repellency effect, *Sitophilus Zeamais*, toxicity effect

Unveiling the Diversity of Haemoparasites in Chickens in Kandy District, Sri Lanka: Evidence for the First Record of *Plasmodium Homopolare*

M.S. Malshani[1]*, S.S. Iddamaldeniya[2], D. Abeykoon[2], P.K. Perera[1]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Veterinary Research Institute (VRI), Gannoruwa, 20400, Sri Lanka*
**sashinimalshani2@gmail.com*

Across the globe, poultry production contributes to both food security and the transmission dynamic of parasitic infections. In South and Southeast Asian regions, poultry sectors are rapidly expanding and chickens act as a critical host for several opportunistic pathogens. Similarly, in Sri Lanka, parasitic infections remain a major challenge in poultry health and productivity. Poultry production primarily categorized as commercial and backyard farming. Aim of this study is to compare haemoparasites between the commercial and backyard farming practices in Kandy District, using microscopic and molecular techniques. A total of 65 blood samples were collected between February 2025 and October 2025 from commercial (n=50) and backyard (n=15) farms; Gelioya, Kundasale, Pitawalawatta and Ampitiya. Haemoparasites were examined using thin blood smears and microscopic observation. Subsequently, PCR, sequencing and phylogenetic analysis were conducted. Microscopic examination revealed the presence of haemoparasites, including *Leucocytozoon* sp.(23.07%), *Plasmodium* sp.(49.23%), *Haemoproteus* sp.(21.53%), *Trypanosoma* sp.(12.30%) and microfilariae(4.61%), with a considerably higher parasitic prevalence in backyard chickens(100%) compared to commercial farms(52%); Chi-square test, χ^2 =11.667, $p<0.001$. In the backyard farming system, mixed infections were more prevalent(60.00%) than single infections(40.00%). However, the difference was not statistically significant; Chi-square test, χ^2= 0.60, p=0.44. Part of the mitochondrial cytochrome b (*cyt b*) gene was amplified and sequenced to detect the presence of *P. juxtanucleare*, *P. homopolare* and *Haemoproteus* sp. from chicken blood samples. Phylogenetic analysis showed that the *P. juxtanucleare* sequence previously reported from a *Culex* mosquito in Sri Lanka clustered with the chicken isolates obtained in this study, supporting local vector-associated transmission. *P. homopolare* sequence showing 97% similarity and phylogenetic clustering within the reference clade but forming a slight genetic divergence. This is the first record of *P. homopolare* in Sri Lanka. *Haemoproteus* sp. from this study clustered with *Haemoproteus* sp. previously reported in avian lineages from Sri Lanka. According to this study, backyard chickens had a significantly higher haemoparasite prevalence than commercial chickens (χ^2=11.667, $p<0.001$) indicating association between farming system and parasite prevalence. This study highlights the critical need for effective parasite control programmes in order to mitigate productivity losses and improve the health and sustainability of the poultry industry in Sri Lanka.

Keywords: Chickens, Molecular Epidemiology, Haemoparasites, Commercial, Backyard

Urban–Suburban Contrasts in Particulate Matter Dynamics in and North of Kandy: A Statistical Analysis of Topographical and Meteorological Influences

R.K. Ravindradasan[1*], S.G.J. Senarathne[1], L.M. Zubair[2]

[1]*Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Federation for Environment, Climate and Technology (FECT), Akurana, 20850, Sri Lanka*
[*]*rocheller@sci.pdn.ac.lk*

Ambient air pollution driven by particulate matter ($PM_{2.5}$ and PM_{10}) is a major public health concern, particularly in rapidly urbanizing South Asia. In Sri Lanka, PM dynamics remain poorly quantified in the complex terrain of the central hill country. This study examines the variability of $PM_{2.5}$ and PM_{10} concentrations and the influence of meteorological conditions at representative urban (Kandy) and suburban (Akurana) monitoring sites, while evaluating the $PM_{2.5}/PM_{10}$ ratio as a diagnostic indicator of aerosol composition and pollution source dynamics. Kandy is a highly urbanized plateau, whereas Akurana is a valley 10 km North, influenced by traffic emissions along the A9 corridor and localized emissions from high emitting auto rickshaws climbing up the hill slopes. A statistical framework was applied using hourly air quality and meteorological observations from 2019 to 2024 obtained through regulatory-grade monitoring stations operated by the Central Environmental Authority (CEA) and supplementary sensor networks provided by the Foundation for Environment, Climate, and Technology (FECT). Data were quality controlled and temporarily aggregated. Analyses included correlation, non-parametric tests and Theil–Sen trend estimation, while seasonal and meteorological influences were explored using bivariate polar plots. Results revealed pronounced seasonal variability. Higher particulate concentrations occurred during December–April, while stronger southwesterly winds reduced concentrations during May–September. Although Kandy recorded higher concentrations of $PM_{2.5}$ and PM_{10}, Akurana consistently exhibited higher $PM_{2.5}/PM_{10}$ ratios, averaging 0.88, indicating persistent dominance of fine particles. This pattern may reflect localized fine-particle accumulation influenced by stagnation conditions that are not apparent from absolute PM concentrations. In contrast, Kandy showed lower PM ratios, averaging approximately 0.34, reflecting coarse particle influence. Trend analysis further revealed a statistically significant increase in fine particle dominance at Akurana (Sen's slope = 0.009 year^{-1}, 95% CI: 0.0004–0.0189 year^{-1}, $p = 0.047$). The observed urban–suburban contrasts are consistent with previous studies, supporting the broader applicability of the findings across topographically diverse regions. Overall, the findings support site-specific mitigation strategies, including reducing combustion-related emissions in Akurana and controlling coarse particulate sources in Kandy, while strengthening air-quality monitoring and public health planning in Sri Lanka. Not only $PM_{2.5}$, PM_{10} data but their ratio is useful for interpreting pollution dynamics.

Keywords: air quality, meteorological, particulate matter, polar plots, Theil-Sen trend estimation

Water Quality Analysis of Groundwater Around the Seethawaka Export Processing Zone, Sri Lanka

A.S.Thalangama[1], K.A.D.D. Sakunthala[1]*, W.P.R.T. Perera[2], J.A. Liyanage[1], W.A.P.J. Premaratne[1]

[1]*CKDu Information and Research Centre & Department of Chemistry, Faculty of Science, University of Kelaniya, 11600, Sri Lanka*
[2] *Department of Indigenous Medical Resources, Gampaha Wickramarachchi University of Indigenous Medicine, Yakkala, 11300, Sri Lanka*
**kadds251@kln.ac.lk*

Groundwater is an important source of drinking and domestic water. Industrial activities may introduce heavy metals and inorganic pollutants into waterbodies, creating environmental and public health concerns. Despite this, groundwater quality around the Seethawaka Export Processing Zone (SEPZ) has not been comprehensively assessed. Therefore, this study aims to assess physicochemical parameters, anions, and heavy metal(loid) contents to determine potential impacts and water suitability for drinking and domestic use. Moreover, this study compares contaminant levels across industrial, urban, and rural locations and evaluates compliance with SLS 614:2013 and WHO (2022) guidelines. Twenty-five water samples were collected within a 5 km radius of the SEPZ, representing areas with potential industrial influence, using stratified purposive sampling approach during the dry season. The groundwater samples were collected from industrial(n=5), urban(n=5) and rural(n=5) locations. Additionally, treated surface tap water supplied through public water treatment facilities(n=10) were collected. Physicochemical parameters were determined using standard American Public Health Association methods, while anions (F^-,Cl^-,NO_3^-,SO_4^{2-},NO_2^- and Br^-) were analyzed using ion chromatography and heavy metal(loid)s (As,Cd,Pb,Mn,Ni, and Zn) were quantified using Inductively Coupled Plasma–Mass Spectrometry. Groundwater generally exhibited low mineralization, soft water characteristics, and adequate dissolved oxygen (6.58±0.11 – 8.86±0.01 mg/L), indicating favorable natural water quality. Slightly acidic pH (4.58±0.03 – 6.72±0.01) values were common in groundwater. Average fluoride, chloride, nitrate, and sulfate concentrations of groundwater samples (F-<0.006 mg/L, Cl-<0.676 mg/L, NO_3^-<0.813 mg/L, SO_4^{2-}<0.073 mg/L) were less than both WHO/SLS limits. Average Pb, Cd and As concentrations of groundwater samples (Pb<0.68 µg/L, Cd<0.07 µg/L, As<2.70 µg/L) were less than both WHO/SLS limits, while Ni was not detected in any sample. Nonetheless, tap water contained the lowest overall metal concentrations and complied with safety standards. Lower Mn levels in tap water likely reflect effective water treatment, whereas Mn concentrations exceeded the SLS guideline value (100 µg/L) in urban (335.76±4.10 µg/L) and rural (137.06±4.70 µg/L) groundwater samples, indicating that continued monitoring and treatment are required before the water is used for drinking. Overall, most groundwater quality parameters complied with WHO and SLS guideline values. The study provides baseline groundwater quality data to support future comparisons between groundwater within and beyond the SEPZ.

Keywords: groundwater quality, heavy metals, industrial contamination, Seethawaka Export Processing Zone

WO_3 Based Electrochromic Devices for Integrated Energy Storage Applications

B.L.P. Dineshi, S.M.P.M.K. Sanganayaka, E.G.O.D. Egodawaththa, H.N.M. Sarangika*

Department of Physical Sciences and Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka
**sarangikah@appsc.sab.ac.lk*

WO_3 based electrochromic devices (ECDs) have attracted significant attention due to their dual functionality of optical modulation and energy storage. ECDs are widely studied for smart windows, displays, and energy-saving optical devices due to their ability to control light reversibly with applied voltage. In this study, WO_3 thin films were electrodeposited on fluorine doped tin oxide (FTO) glass substrates using acidified sodium tungstate ($Na_2WO_4.2H_2O$) solution (pH 1.2). The WO_3 thin films were characterized using UV–Vis and Fourier-Transform Infrared spectroscopy. An electrochromic battery was assembled using WO_3 as the working electrode, platinum (Pt) as the counter electrode and 3.0 M KCl as the electrolyte. The WO_3 electrode shows in-situ blue coloration from an initially transparent state upon applying 2.5 V. The coloration was completely reversible, and the device returned to its transparent state once the applied voltage was removed. The fabricated device achieved a high optical modulation of 82.27% at 785 nm with an optical density of 0.93. The switching behavior revealed coloration and bleaching times of 4.8s and 2.0s, respectively, indicating fast and efficient electrochromic response. Electrochemical analysis showed reversible redox behavior, and it was confirmed by the stable charge–discharge behavior. During the discharging process, the device exhibits an areal discharge capacity of 249 mAh m^{-2}, indicating good energy storage performance. These results indicate that WO_3-based electrochromic devices, particularly with Pt counter electrode, have promising potential for integrated electrochromic energy storage applications.

Keywords: discharge capacity, electrochromic device, electrodeposition, energy storage, optical modulation

Special Session on Engineering Education

Acceptance of Generative Artificial Intelligence (Gen AI) Among Undergraduate Students: A Case Study

D. Herath[1]*, D. Dissanayake[2], R. Ragel[1]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Sri Lanka Institute of Information and Technology (SLIIT), New Kandy Road, Malabe 10115, Sri Lanka*
**damayanthiherath@eng.pdn.ac.lk*

The rapid growth of Generative Artificial Intelligence (Gen AI) tools has significantly influenced how students approach academic work, especially in project-based learning environments. Generative AI can support diverse learning preferences by enabling the personalization of learning materials and teaching strategies, reflecting the principles of the Felder–Silverman Learning Style Model (FSLSM). Although previous studies have investigated students' perceptions and acceptance of Generative AI, limited research has specifically examined undergraduate students' long-term intention to continue using these tools within the Sri Lankan higher education context. Therefore, this study focuses on students' intention to use AI-based tools, based on survey responses from a cohort of undergraduate students. This study's questions take place similarly to the Unified Theory of Acceptance and Use of Technology (UTAUT) and related frameworks. A total of 60 valid responses were gathered based on scale 1 (strong disagreement) to 5 (strong agreement). Responses were analyzed using descriptive statistics, including mean scores, to evaluate students' intention to use Generative AI. The analysis mainly focused on four key aspects of intentions: continued usage of AI tools, recommendation to others, future involvement with AI technologies, and avoidance behavior. Final results show a strong positive intention among students to use AI tools in their academic work. The statement "I will continue to use AI-based tools" recorded a high mean score of 4.65, indicating that most students choose to continue using AI. Similarly, students show a strong willingness to recommend AI tools for future projects (Mean = 4.52) and to become more involved with AI-based applications (Mean = 4.44). Moreover, "I would not use AI-based applications if I could avoid it" yielded an average score of 3.49, indicating that while most students are positive, some still show reluctance. Overall, the findings indicate a strong intention to continue using Generative AI among the surveyed undergraduate students. These results align with existing research highlighting the growing trust in AI technologies in education and their effects on student acceptance and learning outcomes. In conclusion, the study demonstrates that the surveyed undergraduate students are not only comfortable using Gen AI in their research but are also willing to continue and expand their use in future academic projects. These are particularly beneficial for enhancing research-based courses within Sri Lankan higher education.

Keywords: generative AI, higher education, gen AI, user acceptance

A Hybrid Quantum Framework for Managing High-Volume Missing Data in Engineering Education Analytics

B.V. Lakshman[1]*, J.V. Wijayakulasooriya[2], T.M.S.S.K. Yatigammana[3]

[1]*SIBA Sri Lanka International Buddhist Academy (SIBA Campus), Kundasale 20168, Sri Lanka*
[2]*Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[3]*Faculty of Arts, University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**venuralak104@gmail.com*

Understanding how engineering students learn, progress, and disengage is central to improving teaching quality and reducing dropout in engineering faculties. However, the institutional data that supports such analysis continuous assessment records and learning management system (LMS) activity logs is often severely incomplete, with 40–50% of values Missing Not at Random (MNAR): the missingness itself depends on the unobserved values, as when struggling students skip assessments. Classical imputation methods (MICE, KNN, GAN-based) assume weaker missingness mechanisms and therefore introduce systematic bias into student profiling and dropout-prediction pipelines. This study develops and validates the Hybrid Quantum Missing-Data Processing Framework (HQ-MDPF), a NISQ-compatible architecture for engineering education analytics under high-volume MNAR conditions. The framework employs a dual-mode variational quantum circuit (8–13 qubits, depth 21–42 gates) whose two switchable modes serve complementary analytical goals: an Imputation Mode (controlled-RY ansatz, parameter-shift optimisation) reconstructs values when downstream tasks require complete data, while an Uncertainty Mode (quantum flag qubits with ZZFeatureMap) bypasses imputation entirely, generating unbiased kernel matrices for spectral clustering of student profiles. The framework was validated on two engineering education datasets: undergraduate continuous-assessment records (N = 168; 49.4% MNAR) and Moodle LMS logs from a Faculty of Engineering (N = 412; 38–44% missingness). Imputation accuracy was evaluated via a masked-value protocol, in which known values were artificially masked under an MNAR mechanism and reconstructed, enabling mean absolute error (MAE) computation on real data. HQ-MDPF reduced MAE by 28.3% relative to baseline imputation, improved clustering Silhouette scores by 18.1% (0.391 vs. 0.332), and achieved an F1-macro of 0.861 for dropout-risk classification, outperforming classical ensemble baselines while remaining robust under IBM Falcon r5-level quantum noise ($p \leq 0.01$). Unlike prior quantum machine learning studies that assume complete data, HQ-MDPF integrates the missingness mechanism into the quantum feature map itself. Compliant with NIST AI RMF 1.0 and IEEE 7000-2021, it offers engineering faculties a governance-ready pathway to trustworthy learning analytics.

Keywords: quantum machine learning, missing data, engineering education, learning analytics, variational quantum circuits

Industry-Driven Telecommunication Curriculum Design Using the ADDIE Model

U. S. Premarathne

The Open University of Sri Lanka, Nawala, 11222, Nugegoda, Sri Lanka
uspre@ou.ac.lk

Telecommunication engineering degrees require dynamic curricula to match rapid technology evolution.Annual Industry advisory Board (IAB) discussions largely contributes to the curriculum revisions of telecommunication engineering courses. This research explores the use of ADDIE model to structure the modules in selected telecommunication courses. Outcomes of this study include new interactive learning, gaming activities, audio, video recorded content and supplementary learning material. Designs were focused to enhance learner engagement through modules fostering project based learning. Analyses of the module topics were selected based on the standard knowledge and the competencies expected by the telecommunications industry. Four (04) compulsory courses were selected. Based on the discussions, six (06) topics that can apply project based learning were identified. Placement of the topics were distributed across two courses each in Semester 5 and 6 courses while the remaining placed at Semester 8. At Semesters 5 & 6, development of learning resources included guided course material supplemented with 12 audio recordings and game based learning activities for 12 theoretical models. Semester 8 courses were designed to include problem based learning with three (03) short-term milestones. Each course consisted of a minimum of four(04) interactive learning sessions structured aligning with the milestones. In conclusion, student interaction increased by 42% for interactive learning activities and 40% for interactive sessions. Furthermore, active participation in group discussion activities grew by 52%, while access to learning materials increased by 30%. Results evidence by using the ADDIE model transformed the course modules with interactive, project-based learning that enhanced learner engagement.

Keywords: ADDIE model, curriculum revision, telecommunication engineering, industry, academia

Mapping Learning Styles to Assessment Effectiveness: Adaptive Assessment Framework

D. Premasiri[1]*, R. Ragel[2], I. Nawinne[2]

[1]*SLIIT Kandy UNI, Kengalla, 20186, Sri Lanka*
[2]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
**dinusha.p@kandyuni.lk*

Assessment practices in higher education are often designed using a one-size-fits-all approach that does not adequately account for differences in how students learn and demonstrate knowledge. This is crucial in engineering and computing education, where the complexity of technical courses and the necessity of theory and practice demand assessments that align with the way students learn. This study seeks to examine the relationship between students' learning styles and assessment methods. The following hypotheses are going to be tested in this study. H1: Learning styles have a significant influence on assessment effectiveness, H2: Assessment methods produce significantly different results among different learning styles. H3: Machine Learning models can predict suitable assessment methods with acceptable accuracy. The study is grounded in Felder-Silverman Learning Style Model (FSLSM). The study adapts a quantitative approach which involves undergraduate students in Engineering and Computing related domains in Sri Lankan Higher Education Institutes. A multi stage sampling approach with purposive sampling and stratified random sampling will be employed. A sample size of around 300 students will be selected. Learning styles information is collected through an Index of Learning Styles (ILS) survey. Learners' performance and engagement information is obtained from various kinds of assessment, including quizzes, written tests, practical exercises, and group activities done using learning management systems. Assessment efficacy in this research is analyzed using a range of learner performance, learner engagement, completion behavior, and learner perception of appropriateness of the assessment. An Explainable Artificial Intelligence (XAI) Artificial Neural Network (ANN) model is proposed to forecast the most appropriate assessment type for various learning style patterns. The XAI approach will be useful to increase transparency in the decision-making process of ANN. Local Interpretable Model-Agnostic Explanations (LIME) method will help to assess the impact of each feature on every prediction made by the algorithm. Model's efficiency is evaluated by repeating experiments, comparing results to self-assessment learning styles, and checking by domain experts. This study proposes a data-driven foundation for adaptive assessment strategies in higher education by linking learning styles to assessment effectiveness. The proposed framework is expected to provide a foundation for personalized and evidence-based assessment design and will be empirically validated in future studies.

Keywords: XAI, e-learning, learning styles, adaptive assessment, higher education

Towards a Pedagogically Aligned Blended Learning Framework for Foundation Computing Education: Evidence from Behavioural Learning Analytics of Engineering Undergraduates

I. P. Ratnapala

Computing Centre, Faculty of Engineering, University of Peradeniya, Peradeniya, 20400, Sri Lanka
iroshinir@eng.pdn.ac.lk

Undergraduate engineering students possess diverse skills, necessitating a well-structured foundation for a smooth transition to tech-enhanced learning. However, many blended teaching methods are ad hoc and misaligned with learner readiness, topic difficulty, or learning outcomes. This study proposes a Pedagogically Aligned Blended Course Design Framework for Foundation Computing in engineering programmes. Unlike existing blended learning models that primarily prescribe instructional methods or technology integration, this framework provides a systematic process for aligning learner readiness, topic complexity, cohort feedback, and ILOs with appropriate blended strategies. This alignment enables lecturers to make evidence-informed instructional decisions rather than adopting blended learning practices in an ad hoc manner. By integrating these pedagogical dimensions into a repeatable course design process, the framework provides a practical approach for developing adaptive, scaffolded, and learner-centred Foundation Computing courses in engineering education. The curriculum was organised into six instructional clusters: face-to-face instruction, external online courses, instructional videos, interactive videos, interactive lessons, and annotated learning materials. Formative assessments integrated game-based learning, peer review, and automated programming practices within the Moodle LMS. The framework was implemented in a six-week programme at the Faculty of Engineering, University of Peradeniya, in 2025. After preprocessing and removing missing data and outliers, data from 282 students were analysed using R. The evaluation encompassed pre- and post-assessment analysis, LMS behavioural analytics, and qualitative feedback analysis. Descriptive statistics indicated that pre-assessment scores had a mean of 46% (SD=9.38), whereas post-assessment scores had a mean of 83% (SD=15.29). A paired-samples t-test demonstrated a statistically significant improvement in post-assessment scores ($t(280) = 41.07$, $p < 0.001$), with a mean learning gain of 37.08 points and a very large effect size ($d = 2.45$). Furthermore, a Wilcoxon Signed-Rank test confirmed the significance of the improvement ($p<0.001$). Correlation analysis revealed weak relationships between basic LMS usage indicators (such as login frequency and time spent) and performance outcomes; however, LMS activity completion, configured across all course activities, exhibited a strong positive correlation with learning gain ($r=0.681$, $p<0.001$). Qualitative feedback further underscored students' positive perceptions of interactive activities, personalised guidance, clear navigation, and game-based learning. The findings suggest that effective blended learning environments in engineering education should be developed through pedagogically aligned instructional planning rather than technology-driven implementation. The proposed framework demonstrates how learner readiness, curriculum complexity, and ILOs can be systematically mapped to blended teaching strategies to establish adaptive, evidence-based, and engagement-oriented Foundation Computing courses.

Keywords: blended learning, engineering education, learning analytics, instructional design, Moodle

MAIN ORGANIZING COMMITTEE - iPURSE 2026

- Prof. Rupika Rajakaruna (General Chair)
- Prof. Sakunthala Ekanayake (Chair/Ceremonial Committee)
- Prof. Damayanthi Dassanayake (Co-Chair/Ceremonial Committee)
- Dr. Nuresh Eranda (Chair/ Logistics Committee)
- Prof. Janaka Ekanayake (Chair/Awards Committee)
- Dr. Ruwan Ranaweera (Chair/Technical Program Committee)
- Prof. V. Sivakumar (Co-Chair/Publications Committee)
- Dr. Jayampathi Herath (Co-Chair/Publications Committee)
- Dr. Chatura Withanage (Co-Chair/Exhibition Committee)
- Dr. Niluka Gunawardena (Co-Chair/Exhibition Committee)
- Prof. Lasantha Weerasinghe (Chair/Marketing & Communication Chair)

CONFERENCE SECRETARIAT – iPURSE 2026

- Ms. R.M. Kalsha Rathnayake (Secretarial work and Communication)
- Ms. U. Samadhi Dasanayake (Publicity and Secretarial work)
- Mr. Chaminda Ekanayake (Website Administration)

SUB COMMITTEES – iPURSE 2026

Technical Program Committee

- Dr. Ruwan Ranaweera (Chair)
- Prof. Susiji Wickramasinghe (Co-Chair)
- Dr. Yasitha Illangasekara (Co-Chair)
- Prof. Ruvini Kalupahana (Co-Chair)
- Dr. Pabodha Weththasinghe (Co-Chair)
- Prof. Roshan Godaliyadda (Co-Chair)
- Prof. Chaminda Bandara (Co-Chair)
- Dr. M.M. Alikhan (Co-Chair)
- Dr. W.G.C.T. Kamalarathne (Co-Chair)
- Dr. N. Agilan - Track 5 Co-Chair
- Dr. W.M.H.U. Wijetunga (Co-Chair)
- Prof. Shalika Kumburegama (Co-Chair)
- Dr. Susanti Jayasinghe (Co-Chair)
- Dr. Damayanthi Herath (Co-Chair)
- Prof. Bimali Weerakoon
- Ms. MMMJP Manchanayake
- Dr. Randilini Angammana
- Dr. Aruni Pradeepika
- Dr. Dinaka Vithanachchi
- Dr. Ashani Ratnayake
- Dr. Lakshika Pathirana
- Dr. N.M.T. Anupama
- Dr. D.P.H. Wijesekera
- Dr. Ishanka Hemachandra
- Dr. Saumali Daundasekara
- Dr. Sumali Dissanayake
- Dr. K.S.A. Kottawatta
- Prof. R.R.M.K.K. Wijesundera
- Dr. Isuru Nawinne
- Dr. Nalin Harischandra
- Prof. Parakrama Ekanayake
- Dr. Swarnalatha Radhakrishnan
- Prof. D. S. K. Karunasinghe
- Dr. Sewwandhi Chandrasekara
- Dr. Sachith Abeysundara
- Dr. Jagath Senarathne
- Dr. Susantha Rasnyakaka
- Dr. W.N.D.N. Wijesiri

- Dr. S. Baskaran
- Mr. T.S.S. Fernando
- Dr. M.G.P.D. Menike
- Dr. E.N. Jayaweera
- Dr. N. C. Sumudu Ruklani
- Dr. Nadeesha Koralegedara
- Dr. Sachinthani I. Karunarathne
- Dr. Niluka Rodrigo
- Dr. Lakshika Nawaratha
- Dr. Nuwandi Pathirana
- Ms. Amadini Premarathne
- Dr. Dushanthi Dissanayake

Publications Committee

- Prof. V. Sivakumar (Co-Chair)
- Dr. Jayampathi Herath (Co-Chair)
- Dr. Kumudu Kopiyawattage
- Dr. H.R.W.M.D.P.K. Niyangoda
- Dr. Chandima Weerasekera
- Ms. S. Yamuna
- Ms. E.M.W.A. Edirisooriya
- Dr. B. R. Pavithra M. Basnayake
- Dr. N.U.A. Jayasena
- Dr. A. Arulkathan

Ceremonial Committee

- Prof. Sakunthala Ekanayake (Co-Chair)
- Prof. Damayanthi Dassanayake (Co-Chair)
- Prof. J.K. Vidanarachchi
- Dr. M.A.S.B. Alawathukotuwa
- Prof. Maheshi Dissanayake
- Dr. Upuli Nakandala

Logistics Committee

- Dr. Nuresh Eranda (Chair)
- Dr. Malinda Hulugalla
- Dr. S Thilakarathne
- Prof. M.B. Ranathilake
- Dr. Gayani Nawarathna

- Dr. Samith Buddika
- Ms. P.L.W. Priyadarshani
- Dr. Thilanka Seneviratne
- Dr. K.D. Eranda Dhananjaya
- Prof. P.G.A. Pushpakumara

Awards Committee

- Prof. Janaka Ekanayake (Chair)
- Prof. Pradeepa Bandaranayake
- Ms. AYR Athukorala
- Prof. K.M.R. Dasanayaka
- Prof. M. P. Paranagama
- Dr. Pramila Gamage
- Ms. D.M.S.M. Dasanayake
- Dr. Ruwanthi Bandara
- Dr. Nuwandi Pathirana

Exhibition Committee

- Dr. Chatura Withanage (Co-Chair)
- Dr. Niluka Gunawardena (Co-Chair)
- Dr. Jayampathi Ekanayake
- Dr. Dulanjalee Neelawala
- Dr. Chandira Gunasena
- Dr. Chiranthi Rajapaksha
- Dr. G.L. Nalaka P. Sumanarathna
- Dr. H.E.L. De Seram

Marketing and Communications Committee

- Prof. Lasantha Weerasinghe (Chair)
- Dr. Dilini Hemachandra
- Prof. Dileep De Silva
- Dr. Damayanthi Herath
- Mr. D.M.D. Bandara
- Prof. I. B. Gawarammana
- Dr. Dilan M. Ratnayake
- Prof. L.J.P.A.P. Jayasooriya

LIST OF REVIEWERS

1. Dr. A.A. Sunethra, University of Colombo
2. Dr. A. Isthikar, University of Peradeniya
3. Dr. A. Samarasinghe, Ministry of Health
4. Dr. A. Pallegedara, University of Peradeniya
5. Prof. A. Attygalla, University of Peradeniya
6. Dr. A. Mohideen, University of Peradeniya
7. Prof. A. Perera, University of Peradeniya
8. Ms. A. Premarathne, University of Peradeniya
9. Mr. A. Bandara, University of Peradeniya
10. Prof. A. Silva, Rajarata University of Sri Lanka
11. Prof. A. Mohotti, University of Peradeniya
12. Dr. A. Hewaarachchi, University of Kelaniya
13. Dr. A. Bandara, University of Peradeniya
14. Dr. A. Karunarathna, University of Peradeniya
15. Dr. A. Kankanamge, University of Peradeniya
16. Ms. A.P. Anusha, University of Peradeniya
17. Dr. A. Rajapakse, University of Peradeniya
18. Dr. A.P.L. Arachchige, University of Peradeniya
19. Prof. A. Rathnaweera, University of Peradeniya
20. Dr. A. Bulathwatta, University of Peradeniya
21. Dr. A. Ratnayake, University of Peradeniya
22. Dr. A. Kulasinghe, Teaching Hospital Peradeniya
23. Dr. A.L.A.R.R. Thanuja, University of Moratuwa
24. Dr. B. Arularasi, University of Peradeniya
25. Prof. B. Samarasinghe, University of Peradeniya
26. Prof. B.C. Jayawardana, University of Peradeniya
27. Dr. B. Athurupana, University of Peradeniya
28. Prof. B. Weerakoon, University of Peradeniya
29. Mr. B. Weerasuriya, University of Peradeniya
30. Mr. C. Kavinda, University of Peradeniya
31. Dr. C. Wijekoon, University of Ruhuna
32. Dr. C. Bandaranayake, University of Peradeniya
33. Prof. C. Bandara, University of Peradeniya
34. Mr. C. Rathnayake, University of Peradeniya
35. Dr. C. Wijesundara, University of Peradeniya
36. Dr. C. Guruge, University of Peradeniya
37. Prof. C. Ratnatunga, University of Peradeniya
38. Mrs. C. Kumari, University of Peradeniya
39. Dr. C. Senanayake, University of Peradeniya
40. Dr. C. Ariyarathna, University of Peradeniya
41. Dr. C. Dhanapala, University of Peradeniya
42. Dr. C. Weerasekera, University of Peradeniya
43. Dr. C. Katupelella, Wayamba University of Sri Lanka
44. Dr. C. Mendis, University of Peradeniya
45. Mr. C. Kulathilake, University of Peradeniya

46. Dr. C. chandrasiri, University of Peradeniya
47. Dr. C. Karunarathne, University of Ruhuna
48. Dr. C. Senanayake, University of Sri Jayawardenepura
49. Dr. C. Kumari, University of Peradeniya
50. Ms. C. Munasinghe, University of Peradeniya
51. Dr. C. Dalukdeniya, Sabaragamuwa University of Sri Lanka
52. Prof. D.D.K.S. Karunanayake, University of Peradeniya
53. Prof. D. Jayawardana, University of Sri Jayewardenepura,
54. Prof. D. Wanniarachchi, University of Kelaniya
55. Prof. D. Gunawardane, University of Peradeniya
56. Prof. D. Nandadeva, University of Peradeniya
57. Prof. D. Karunanayake, University of Peradeniya
58. Dr. D. Niyangoda, University of Peradeniya
59. Prof. D. Dayawansa, University of Peradeniya
60. Prof. D. Herath, University of Peradeniya
61. Mr. D. Rathnayake, University of Sri Jayewardenepura
62. Dr. D. Ratnayake, University of Peradeniya
63. Prof. D.D. Silva, University of Peradeniya
64. Ms. D. Ariyawansa, University of Peradeniya
65. Dr. D. Hemachandra, University of Peradeniya
66. Dr. D. Vidusha, University of Peradeniya
67. Prof. D. Jayatilake, University of Peradeniya
68. Dr. D. Vithanachchi, University of Peradeniya
69. Ms. D. Senevirathne, University of Peradeniya
70. Ms. D.Y. Abeywardhana, University of Peradeniya
71. Mr. D.I. Samaranayake, University of Peradeniya
72. Dr. S. Wijesundara, University of Peradeniya
73. Dr. B. Nanayakkara, University of Peradeniya
74. Prof. C. Hettiarachchi, University of Peradeniya
75. Dr. C. Jayalath, University of Peradeniya
76. Dr. C. Jayasinghe, University of Sri Jayewardenepura
77. Prof. G. Jayasuriya, University of Peradeniya
78. Dr. I.P.L. Jayarathne, National Institute of Fundamental Studies
79. Prof. I. Karunaratne, University of Peradeniya
80. Dr. J.M.S.J. Menike, University of Peradeniya
81. Dr. K. Pethiyagoda, University of Peradeniya
82. Dr. K.S.A. Kottawatta, University of Peradeniya
83. Dr. L. Nawarathna, University of Peradeniya
84. Dr. L. Silva, University of Colombo School of Computing
85. Prof. M. Pathirage, University of Peradeniya
86. Dr. M. Balamayuran, University of Peradeniya
87. Dr. M. Dewasurendra, University of Peradeniya
88. Dr. N. Wijesundara, Uwa Wellassa University of Sri Lanka
89. Dr. P. Perera, University of Peradeniya
90. Prof. P. Vitharana, University of Peradeniya
91. Dr. R. Kumarihamy, University of Peradeniya
92. Dr. S. Karunarathna, University of Peradeniya

93. Dr. S. Gama-arachchige, University of Peradeniya
94. Dr. T. Cooray, Uva Wellassa University
95. Prof. U.J.M.A.L. Jayasinghe, University of Peradeniya
96. Dr. W.M.H.U. Wijethunga, University of Peradeniya
97. Dr. W. Wickramasinghe, University of Peradeniya
98. Dr. Y.A. Illangasekera, University of Peradeniya
99. Dr. D. Thilakarathne, University of Peradeniya
100. Dr. D. Abeykoon, University of Kelaniya
101. Prof. D. Yasaratne, University of Peradeniya
102. Dr. D. Dissanayake, University of Peradeniya
103. Dr. E. Ekanayake, University of Peradeniya
104. Ms. E. Jayawickrama, University of Peradeniya
105. Dr. E. Jayaweera, University of Peradeniya
106. Dr. E. Dayaratna, University of Peradeniya
107. Dr. E. Liyanage, University of Peradeniya
108. Dr. E. Jayaweera, National Hospital Kandy
109. Prof. F. Ibrahim, University of Peradeniya
110. Dr. G. Ellepola, University of Peradeniya
111. Dr. G.M. KUMARA, University of Sri Jayewardenepura
112. Dr. G. Parththuran, University of Jaffna
113. Dr. G. Amiyangoda, University of Peradeniya
114. Dr. G. Kodikara, University of Ruhuna
115. Dr. G. Somaratne, University of Peradeniya
116. Dr. G. Pamunuwa, Wayamba University of Sri Lanka
117. Mr. G. Dissanayake, University of Peradeniya
118. Dr. G. Edirisinghe, University of Peradeniya
119. Ms. G. Sherminie, University of Peradeniya
120. Dr. G.D. Silva, University of Peradeniya
121. Dr. H.G.S. Mayuranga, University of Ruhuna
122. Dr. H.C. Kumarihami, University of Peradeniya
123. Prof. H. Herath, University of Peradeniya
124. Dr. H.S.K. Ratnatilake, University of Peradeniya
125. Ms. H. Dissanayake, University of Peradeniya
126. Dr. H. Rathnayake, University of Peradeniya
127. Dr. H.E.D. Seram, University of Peradeniya
128. Dr. H. Abeysundara, University of Peradeniya
129. Prof. H. Yapa, University of Peradeniya
130. Mr. H. De Silva, Institute of Engineering Technology (IET), Katunayake
131. Dr. I. Tennakoon, University of Peradeniya
132. Ms. I.L. Ranaweera, University of Peradeniya
133. Ms. I. Kinkini, University of Colombo
134. Prof I. Thilakumara, University of Peradeniya
135. Mr. I.D. Zoysa, University of Peradeniya
136. Prof. I. Karunaratne, University of Peradeniya
137. Prof. I.C. Kandauda, University of Peradeniya
138. Dr. I. Subhasinghe, University of Saskatchewan
139. Dr. I. Ariyaratne, University of Kelaniya

140. Dr. I. Hemachandra, University of Peradeniya
141. Ms. I. Gunarathna, University of Peradeniya
142. Ms. I. Sevwandi, University of Peradeniya
143. Mr. I. Gunarathne, University of Peradeniya
144. Dr. J. Senarathne, University of Peradeniya
145. Ven. Dr. J. Dhammaloka, University of Peradeniya
146. Prof. J. Ekanayake, University of Peradeniya
147. Dr. J. Marasinghe, University of Peradeniya
148. Dr. J. Suntharesan, Sirimavo Bandaranayke Specialized Children's Hospital
149. Dr. J. Fernando, Rajarata University of Sri Lanka
150. Dr. J. Rathnayake, University of Peradeniya
151. Ms. J. Manchanayake, University of Peradeniya
152. Dr. K.A.D. Deshani, University of Colombo
153. Dr. K.G.N. Piyasena, National Institute of Fundamental Studies
154. Mr. K.M.C. Tharupath, University of Ruhuna
155. Prof. K.S.H.M.V.W.W. Senevirathne, University of Peradeniya
156. Dr. K. Senaratne, University of Peradeniya
157. Ms. K. Dheerasekara, University of Peradeniya
158. Ms. K. Sylva, University of Peradeniya
159. Dr. K. Hettigoda, University of Peradeniya
160. Mr. K. Premarathne, Rajarata University of Sri Lanka
161. Dr. K. Herath, University of Peradeniya
162. Dr. K. Wickramasinghe, University of Peradeniya
163. Dr. K. Tissera, University of Peradeniya
164. Dr. K. Dissanayake, Base Hospital Mawanella
165. Mr. K. Piyasena, University of Sri Jayewardenepura
166. Prof. K. Marambe, University of Peradeniya
167. Dr. K. Sinnarajah, University of Peradeniya
168. Prof. K.P. Vithana, University of Peradeniya
169. Mr. K. Wijesooriya, University of Peradeniya
170. Dr. K. Ariyawanse, University of Peradeniya
171. Dr. K. Kopiyawattage, University of Peradeniya
172. Prof. K. Perera, University of Peradeniya
173. Dr. L. Narangammana, University of Peradeniya
174. Dr. L. Ranathunga, University of Peradeniya
175. Ms. L. Chandrasiri, University of Peradeniya
176. Dr. L. Pathirana, University of Peradeniya
177. Dr. L. Rankoth, University of Peradeniya
178. Dr. L. W, University of Peradeniya
179. Prof. L. Weerasinghe, University of Peradeniya
180. Prof. L. Rathnayake, University of Peradeniya
181. Dr. L. Uyanege, Teaching Hospital Peradeniya
182. Dr. L. Somaratne, University of Peradeniya
183. Prof. L. Amarakeerthi, University of Peradeniya
184. Ms. M. Weeratunge, University of Peradeniya
185. Dr. M. Munasinghe, University of Peradeniya
186. Dr. M. Adikaram, South Eastern University of Sri Lanka

187. Dr. M. Rambukkange, University of Peradeniya
188. Dr. M. Hulugalla, University of Peradeniya
189. Dr. M. Samaranayke, Ministry of Health
190. Dr. M. Alawathukotuwa, University of Peradeniya
191. Dr. M. Kumari, University of Sri Jayewardenepura
192. Prof. M.P. Ekanayake, University of Peradeniya
193. Dr. M. Wettasinghe, Ministy of Health
194. Dr. M. Jayatilake, University of Peradeniya
195. Dr. M. Ariyaratne, University of Peradeniya
196. Ms. M. Atapattu, University of Peradeniya
197. Prof. M. Karunarathna, University of Peradeniya
198. Dr. Ven. M. Indarathana, University of Peradeniya
199. Dr. N. Jayawardana, University of Peradeniya
200. Dr. N. koralegedara, University of Peradeniya
201. Dr. N. Premathilaka, University of Peradeniya
202. Prof. N. Nanayakkara, University of Peradeniya
203. Prof. N. Zawahir, University of Peradeniya
204. Dr. N. Agilan, University of Peradeniya
205. Dr. N. Sumanarathna, University of Peradeniya
206. Dr. N. Gama-Arachchige, University of Peradeniya
207. Dr. N. Harischandra, University of Peradeniya
208. Dr. N. Karunaratne, University of Peradeniya
209. Dr. N. Kalugampitiya, University of Peradeniya
210. Dr. N. Withanage, University of Ruhuna
211. Prof. N. Alles, University of Peradeniya
212. Ms. N. Liyanage, University of Peradeniya
213. Dr. N. Chathuranga, University of Peradeniya
214. Mr. N. Jayanath, University of Peradeniya
215. Dr. N. Gunawardhana, University of Peradeniya
216. Dr. N. Rodrigo, University of Peradeniya
217. Dr. N.R. Amarasinghe, University of Peradeniya
218. Dr. N. Dasanayake, University of Peradeniya
219. Dr. N. Priyankarage, University of Peradeniya
220. Dr. N. Wijesiri, University of Peradeniya
221. Dr. N. Sirimalwatta, University of Peradeniya
222. Dr. N. Narasinghe, University of Peradeniya
223. Dr. N. Wedamulla, Uva Wellassa University
224. Ms. N. Jayaweera, University of Peradeniya
225. Dr. N. Eranda, University of Peradeniya
226. Dr. N.D. Silva, University of Peradeniya
227. Dr. N. Gunandahandi, Consultant Oral Pathologist at Ministry of Health
228. Dr. N. Herath, University of Peradeniya
229. Dr. N. Pathirana, University of Peradeniya
230. Dr. P.W.S.K. Bandaranayake, University of Peradeniya
231. Dr. P. Weththasinghe, University of Peradeniya
232. Dr. P. Fernando, Ministry of Agriculture, Livestock, Land and Irrigation
233. Dr. P. RATNAYAKE, Ministry of Health

234. Dr. P. Neluwala, University of Peradeniya
235. Ms. P. Suwathika, University of Peradeniya
236. Prof. P. Dissanayake, University of Peradeniya
237. Dr. P. Dissanayake, University of Peradeniya
238. Dr. P. Basnayake, University of Peradeniya
239. Dr. P.R. Liyanage, Consultant Oral Pathologist at Ministry of Health
240. Ms. P. Embuldeniya, University of Peradeniya
241. Dr. P. Seelagama, University of Peradeniya
242. Dr. P. Gunathilake, University of Peradeniya
243. Dr. P. Perera, University of Peradeniya
244. Dr. P. Peiris, University of Peradeniya
245. Dr. P. Dharmapriya, University of Peradeniya
246. Dr. P. Liyanage, University of Peradeniya
247. Mr. P. Abeysundera, University of Peradeniya
248. Prof. P. Jayasooriya, University of Peradeniya
249. Prof. P. Wijesinghe, University of Peradeniya
250. Dr. P. Hewage, University of Peradeniya
251. Dr. P. Menike, University of Peradeniya
252. Prof. A. Navaratne, University of Peradeniya
253. Prof. D. Dasanayake, University of Peradeniya
254. Prof. H.M.T.G.A. Pitawala, University of Peradeniya
255. Prof. I. Munaweera, University of Sri Jayewardenepura
256. Prof. K. Bandara, University of Peradeniya
257. Prof. N. Priyantha, University of Peradeniya
258. Prof. N. Punyasiri, University of Colombo
259. Prof. P. Wijekoon, University of Peradeniya
260. Prof. P.H.P. Prasanna, University of Peradeniya
261. Prof. R. Liyanage, National Institute of Fundamental Studies
262. Prof. R.M.G. Rajapakse, University of Peradeniya
263. Prof. R. Rajakaruna, University of Peradeniya
264. Prof. S. Kodituwakku, University of Peradeniya
265. Prof. S. Rubasinghe, University of Peradeniya
266. Prof. W. Daundasekara, University of Peradeniya
267. Dr. P. Rathnayake, University of Peradeniya
268. Prof. P. Vitharana, University of Peradeniya
269. Prof. R.M.C. Deshapriya, University of Peradeniya
270. Dr. R. Mendis, University of Peradeniya
271. Prof. R. Abeysekera, University of Peradeniya
272. Ms. R. Munasinghe, University of Peradeniya
273. Dr. R. Usoof, University of Peradeniya
274. Dr. R. Angammana, University of Peradeniya
275. Dr. R. Rajapaksha, University of Peradeniya
276. Dr. R. Samarakoon, University of Peradeniya
277. Ms. R. Tennakoon, University of Peradeniya
278. Dr. R. Ekanayaka, University of Sri Jayawardhanapura
279. Prof. R. Kuruppuge, University of Peradeniya
280. Prof. R. Nianthi, University of Peradeniya

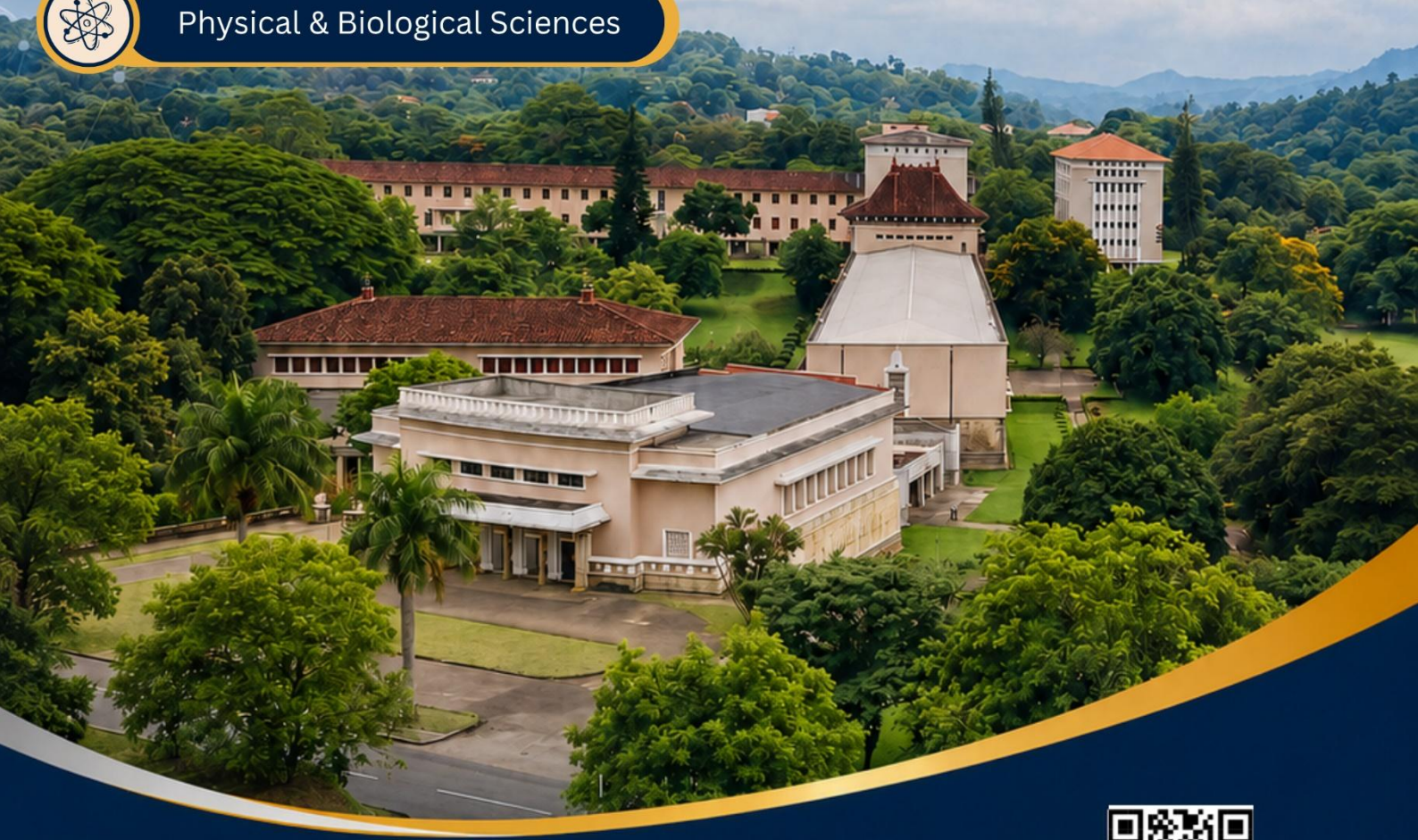
281. Dr. R. Gnanapragasam, The Open University of Sri Lanka
282. Prof. R. Wickramaratne, University of Peradeniya
283. Ms. R. Bartholomeusz, University of Peradeniya
284. Prof. R. Chandrajith, University of Peradeniya
285. Prof. R. Godaliyadda, University of Peradeniya
286. Prof. R. Ragel, University of Peradeniya
287. Dr. R. Rambukwella, University of Southampton
288. Dr. R. Perera, University of Peradeniya
289. Prof. R. Waduge, University of Peradeniya
290. Dr. R. Nawarathna, University of Peradeniya
291. Dr. R. Prematilake, University of Peradeniya
292. Dr. R. Ranaweera, University of Peradeniya
293. Prof. R. Kalupahana, University of Peradeniya
294. Dr. R. Bandara, University of Peradeniya
295. Dr. R. Siyambalapitiya, University of Peradeniya
296. Dr. S. Maheswaran, University of Peradeniya
297. Prof. S.A.C.N. Perera, University of Peradeniya
298. Prof. S.H.P.P. Karunaratne, University of Peradeniya
299. Mr. S.L.P. Fonseka, University of Peradeniya
300. Dr. S. Seneviratne, National Hospital Kandy
301. Dr. S. Karunarathne, University of Peradeniya
302. Dr. S. Abeysundara, University of Peradeniya
303. Dr. S. Thoradeniya, University of Peradeniya
304. Dr. S. Daundasekara, University of Peradeniya
305. Prof. S. Ekanayake, University of Peradeniya
306. Prof. S. Dharmarathna, University of Peradeniya
307. Dr. S. Pushpakumara, University of Peradeniya
308. Dr. S. Dissanayaka, University of Peradeniya
309. Dr. S. Jagoda, University of Peradeniya
310. Mr. S. Feranando, University of Peradeniya
311. Prof. S. Navaratna, University of Peradeniya
312. Prof. S. Tennakoon, University of Peradeniya
313. Dr. S. Alahakoon, University of Peradeniya
314. Dr. S. Gnanarathne, University of Peradeniya
315. Prof. S. Amaratunga, University of Peradeniya
316. Prof. S. Abeyrathne, Uwa Wellassa University of Sri Lanka
317. Prof. S. Adikari, University of Peradeniya
318. Dr. S. Rodrigo, University of Colombo
319. Dr. S. Gamage, consultant OMF surgeon, Ministry of Health
320. Dr. S. Diyabalanage, Unversity of Sri Jayewardenepura
321. Dr. S. Athukorala, University of Peradeniya
322. Dr. S. Athukorala, University of Peradeniya
323. Dr. S. Baskaran, University of Peradeniya
324. Dr. S. Abeyweera, University of Peradeniya
325. Dr. S. Weerasooriya, University of Peradeniya
326. Dr. S. Samarasinghe, University of Peradeniya
327. Dr. S. Chandrasekara, University of Peradeniya

328. Prof. S. Kumburegama, University of Peradeniya
329. Dr. S. Adikari, National Hospital Kandy
330. Dr. S. Ekanayake, Teaching Hospital Peradeniya
331. Dr. S. Navarathnam, University of Peradeniya
332. Prof. S. Velautham, University of Peradeniya
333. Ms. S. Yamuna, University of Peradeniya
334. Dr. S. Sooriyagoda, University of Peradeniya
335. Mrs. S. Dasanayake, University of Peradeniya
336. Dr. S. Gunathilake, University of Peradeniya
337. Ms. S. weerakotuwa, University of Peradeniya
338. Dr. S. Dharmapriya, University of Peradeniya
339. Prof. S. Mantillake, University of Peradeniya
340. Dr. S. Fernando, Uva Wellassa University
341. Dr. S.D. Maithreepala, University of Peradeniya
342. Prof. S. Kodithuwakku, University of Peradeniya
343. Dr. S. Dissanayake, University of Peradeniya
344. Dr. S. Medawela, University of Peradeniya
345. Dr. S. Rasnayaka, University of Peradeniya
346. Prof. S. Rubasinghe, University of Peradeniya
347. Dr. S. Ruklani, University of Peradeniya
348. Ms. S. Kulatunga, University of Peradeniya
349. Dr. S. Jayasinghe, University of Peradeniya
350. Prof. S. Kodithuwakku, University of Peradeniya
351. Dr. S. Wadugodapitiya, University of Peradeniya
352. Dr. S. Rasnayake, University of Peradeniya
353. Prof. S. Wickramasinghe, University of Peradeniya
354. Prof. S. Boyagoda, University of Peradeniya
355. Dr. T.P. Gamagedara, University of Peradeniya
356. Ms. T. Kumudumali, University of Peradeniya
357. Dr. T. Kithsiri, University of Peradeniya
358. Dr. T. Weerakoon, University of Peradeniya
359. Ms. T. Kuruppu, University of Peradeniya
360. Mr. T. Loganathan, University of Peradeniya
361. Dr. T. Subramaniam, University of Jaffna
362. Mr. T. Athukorala, University of Peradeniya
363. Dr. T. Thevakumar, RMIT University, Australia
364. Dr. T. Seneviratne, University of Peradeniya
365. Dr. T. Samarasinghe, University of Peradeniya
366. Prof. T. Weeraratne, University of Peradeniya
367. Dr. T. Ariyasena, University of Peradeniya
368. Ms. T. Abirami, Wayamba University of Sri Lanka
369. Dr. T. Perera, Wayamba University of Sri Lanka
370. Dr. T. Kamalrathne, University of Peradeniya
371. Dr. T. Sampath, University of Ruhuna
372. Dr. T. Gunawardana, University of Peradeniya
373. Mr. U.S. Sathyaras, RMIT University, Australia
374. Dr. U. Ranatunga, University of Peradeniya

375. Ms. U. Rathnayaka, University of Peradeniya
376. Dr. U. Wijesooriya, University of Peradeniya
377. Dr. U. Jayasinghe, University of Peradeniya
378. Dr. U. Nakandala, University of Peradeniya
379. Prof. U. Jayawardena, Open University of Sri Lanka
380. Prof. V. Herath, University of Peradeniya
381. Prof. V. Liyanapathirana, University of Peradeniya
382. Prof. V. Herath, University of Peradeniya
383. Dr. V. Perera, Sabaragamuwa University of Sri Lanka
384. Dr. V. Senadheera, University of Peradeniya
385. Prof. W.A.D. Silva, University of Peradeniya
386. Dr. W.E.M.L. Ekanayake, University of Peradeniya
387. Dr. W.M.K.B.N. Wijayaratne, University of Peradeniya
388. Prof. W. Senevirathne, University of Peradeniya
389. Ms. W. Edirisooriya, University of Peradeiya
390. Dr. W. Kudagammana, University of Peradeniya
391. Ms. W. Niwarthana, University of Peradeniya
392. Ms. W. Priyadarshani, University of Peradeniya
393. Dr. W.S. Manjula, University of Peradeniya
394. Dr. W. Jayasinghe, University of Peradeniya
395. Ms. Y. Senavirathne, University of Peradeniya
396. Ms. Y. Basnayake, University of Saskatchewan

Themes

- Medical & Health Sciences
- Agriculture & Veterinary Sciences
- Engineering & Technology
- Social Sciences & Humanaties
- Management
- Physical & Biological Sciences



iPURSE 2026

Peradeniya University

International Research Symposiom and Exposition

"Transformative Synergies: Integrating Knowledge Across Borders for Tomorrow"

ISBN 978-624-1234-56-7

9 786241 234567