PURSE 2025

PERADENIYA UNIVERSITY
INTERNATIONAL RESEARCH SYMPOSIUM
AND EXPOSITION

Navigating the Future:
A Multidisciplinary Perspective

PROCEEDINGS

Volume 26

28th and 29th August 2025

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UNIVERSITY OF PERADENIYA

SRI LANKA

"Navigating the Future: A Multidisciplinary Perspective"

PROCEEDINGS

PERADENIYA UNIVERSITY INTERNATIONAL RESEARCH SYMPOSIUM AND EXPOSITION (iPURSE) 2025

iPURSE 2025

Volume 26

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MESSAGE FROM THE VICE-CHANCELLOR

It is with great pleasure and pride that I extend my warmest congratulations to all participants of the Peradeniya University International Research Symposium & Exposition (iPURSE 2025) and the award recipients. As the premier research symposium of the University of Peradeniya, iPURSE continues to serve as a vital platform for addressing the most pressing challenges of our time—including climate change, environmental sustainability, economic resilience, and social justice—under the timely and unifying theme, ***"Navigating the Future: A Multidisciplinary Perspective"***. This theme underscores the imperative of multidisciplinary and collaborative approaches in crafting innovative and sustainable solutions for the future.

The strong response to this year's call for abstracts—with over 600 submissions and nearly 400 accepted presentations—reflects both the relevance of the theme and the vibrancy of the research culture at the University of Peradeniya. iPURSE brings together academics, researchers, practitioners, students, and policymakers to share their ideas, inspire transformative change, and celebrate the depth and diversity of research excellence within the university.

Despite significant financial constraints the country faced during the past few years, the university remains firmly committed to advancing research. In the past year alone, we allocated over Rs. 100 million in research grants. The newly introduced initiative to award cash prizes for publications in Q1 journals is a clear demonstration of this commitment. As the founding Director of the University Research Council (URC), I take personal satisfaction in seeing the continuation—and strengthening—of initiatives such as researcher recognition programs and the provision of Article Processing Charges (APC) for authors. These efforts are now making an even greater impact in fostering a dynamic and supportive research environment.

I offer my sincere appreciation to our esteemed keynote speakers for accepting our invitation and contributing to iPURSE 2025 despite their tight schedules. I also wish to thank the Organizing Committee, led by URC Director Prof. Janaka Ekanayake and Conference Chair Dr. Ruwan Ranaweera, the faculty coordinators and the staff of the URC for their tireless efforts in making this event a resounding success. My gratitude also extends to the academic and non-academic staff whose dedication and hard work have brought this symposium to fruition.

I once again extend my heartfelt congratulations to all paper presenters, co-authors, the recipients of this year's prestigious awards, including the Prof. Lakshman Samaranayake Awards, Research Excellence Awards, URC Research Awards, Recognition Awards for grant recipients, and Q1 Paper Awards. Your outstanding achievements not only uphold the highest standards of scholarship and innovation but also exemplify the University of Peradeniya's unwavering mission to drive impactful

research for the betterment of society.

Prof. Terrence Madhujith

Vice-Chancellor | University of Peradeniya

MESSAGE FROM THE CHIEF GUEST

Dear Friends and Esteemed Colleagues,

It is a privilege and an honor to pen this message for the 26th edition of iPURSE an event that has grown to become a premier platform for knowledge sharing, cross disciplinary collaboration, and academic excellence in Sri Lanka and the South Asian region.

At the outset, I wish to express my sincere appreciation to the Organizing Committee of iPURSE 2025, led by Professor Janaka Ekanayake, for inviting me to be part of this distinguished gathering of scholars, researchers, and visionaries. The theme of this year's conference, **"Navigating the Future: A Multidisciplinary Perspective,"** is both timely and essential, as we collectively face the uncertainties and opportunities of a rapidly evolving world.

India and Sri Lanka share an enduring partnership rooted in history, culture, education, and people to people ties. In recent years, this partnership has expanded significantly in the areas of science, technology, health, and sustainable development. Forums such as iPURSE play a vital role in strengthening this bond by bringing together minds from both nations to collaborate, co-create, and contribute to regional and global progress.

The sub-themes of this year's conference ranging from healthcare innovations and sustainable agriculture to digital transformation and re-imagining education reflect the urgent need for integrated approaches to global challenges. It is heartening to see researchers across disciplines coming together to find novel solutions, push boundaries, and imagine futures that are inclusive, resilient, and sustainable.

The University of Peradeniya, with its long-standing legacy of academic excellence, continues to be a beacon of intellectual leadership in Sri Lanka. Its ability to convene such impact forums speaks volumes of its commitment to nurturing the next generation of thought leaders. I am confident that iPURSE 2025 will further enhance the spirit of regional academic collaboration, especially between Indian and Sri Lankan institutions.

As we navigate the challenges of the 21st century from climate change to digital disruption, from food insecurity to health inequities the role of multidisciplinary research has never been more crucial. iPURSE, by fostering dialogue across domains, offers a space where innovative ideas can take root and thrive.

I extend my best wishes to all the participants, presenters, and organizers for a meaningful, insightful, and successful conference. May this year's iPURSE spark new partnerships, generate transformative knowledge, and inspire each of you to continue your journey of inquiry and innovation.

Dr. Satyanjal Pandey

Deputy High Commissioner of India to Sri Lanka

MESSAGE FROM THE GUEST OF HONOUR

It is a great honor and privilege to contribute this message to the programme book of iPURSE 2025. The chosen theme, **"Navigating the Future – A Multidisciplinary Perspective,"** is both timely and vital, reflecting the complexity of the global challenges we face today in health, science, technology, and society.

As a clinician, scientist and academic, I have witnessed firsthand the transformative power of multidisciplinary collaboration—particularly in the fields of medicine and biomedical science, where progress depends on the seamless integration of expertise from multiple domains. Events like iPURSE create invaluable opportunities for researchers and practitioners across disciplines to engage in dialogue, exchange innovative ideas, and foster collaborations that can translate into meaningful real-world impact.

The University of Peradeniya, with its proud history and remarkable breadth of scholarship, is uniquely placed to lead such conversations at both national and international levels. iPURSE 2025 stands as a beacon of this vision, providing a vibrant platform for advancing knowledge, building partnerships, and inspiring the next generation of researchers.

I extend my warmest congratulations to the organizing committee for bringing together this important symposium and wish all participants a rewarding and stimulating experience at iPURSE 2025.

Prof. Adam Greenstein

University of Manchester, UK

MESSAGE FROM THE GENERAL CHAIR

It is with great pleasure and pride that I welcome you to iPURSE2025, the annual multidisciplinary research symposium of the University of Peradeniya. Over the years, iPURSE has grown into a premier academic forum, bringing together a diverse and vibrant community of scholars, researchers, professionals, and students who are united by a shared commitment to advancing knowledge and innovation.

This year's theme, ***"Navigating the Future: A Multidisciplinary Perspective,"*** emphasizes the urgent need to approach global challenges through collaborative and cross-disciplinary efforts. As the world continues to grapple with rapid technological advancement, environmental pressures, shifting economic paradigms, and evolving societal needs, the importance of research that spans traditional academic boundaries has never been greater.

The symposium features a broad range of contributions spanning health and well-being, agriculture and veterinary sciences, engineering and technology, fundamental sciences, business and management, education, social sciences, and public policy. We are particularly honored to host four keynote speeches by world-renowned scientists, who will share insights from the forefront of global research. In addition, a plenary panel discussion on "The Future of Work and University Curricula" will explore how higher education must adapt to remain relevant and impactful in a rapidly changing world.

I would like to extend my sincere thanks to Professor Terrence Madhujith, Vice Chancellor of the University of Peradeniya, for his visionary leadership and unwavering support of this symposium. I am also deeply grateful to Professor Janaka Ekanayake, Director of the University Research Council, whose strategic guidance has been instrumental in realizing the objectives of iPURSE2025.

My heartfelt appreciation goes to all authors, reviewers, session chairs, keynote speakers, and panelists for their invaluable contributions. I also commend the organizing committee for their exceptional dedication, and thank our sponsors and partners for their continued support.

As we convene for iPURSE2025, I hope the symposium inspires new thinking, meaningful dialogue, and lasting collaborations. May this gathering help us all navigate the future—together.

Thank you for joining us at iPURSE2025.

Warm regards,

Dr. Ruwan Ranaweera | General Chair – iPURSE2025

EDITORIAL NOTE

As Publications Chair of iPURSE 2025, it is with great pride that I present this volume of proceedings, encapsulating the vibrant breadth and depth of research conducted across disciplines at the University of Peradeniya. This year's symposium continues the momentum of our flagship research forum—iPURSE—reflecting our institutional commitment to cross-disciplinary collaboration, knowledge creation, and addressing pressing global challenges.

The response to this year's call for abstracts was nothing short of remarkable. We received 631 submissions spanning fields from healthcare and sustainable agriculture to engineering innovations, basic and applied sciences, social sciences, and governance—all focusing on the central theme of **"Navigating the Future: A Multidisciplinary Perspective."**. After a rigorous peer-review and selection process, 416 abstracts were chosen for inclusion. This underscores both the high interest in contributing to iPURSE and our dedication to maintaining the scholarly excellence that defines the symposium. The abstracts in the proceedings are organized according to the seven sub themes: Innovations in Healthcare and Well-being (170), Sustainable Agriculture and Veterinary Medicine for Food Security (47), Engineering and Technological Innovations for a Smart and Sustainable Future (62), Expanding Frontiers in Basic and Applied Sciences and Mathematics (49), Transforming Business and Management for Sustainable Economic Growth (24), Humanities and Social Sciences in a Rapidly Changing World (46) and Reimagining Education, Policy and Governance for the 21st Century (18).

This volume of the proceedings is more than an academic record; it is a celebration of research endeavor at the University of Peradeniya. It stands testament to the hard work of authors, reviewers, track chairs, and all those who supported the editorial journey behind these pages.

In closing, I extend heartfelt gratitude to the general chair of the conference, Dr. Ruwan Ranaweera and all members of iPURSE 2025 organizing committee. Their invaluable contributions were essential in making proceedings of iPURSE 2025 a reality. I wish to extend my special thanks to my colleagues in the publications committee who have done a tremendous job in compiling and editing the proceedings on time. Also, my sincere gratitude goes to Dr. Nalin Harischandra of Faculty of Engineering for his inspiring cover page design.

It is my sincere hope that these proceedings will inform, inspire, and catalyze future research. At last, but not least, I extend my well wishes to all presenters of iPURSE 2025.

Prof. Disala Uduwawala | Publications Chair – iPURSE2025

KEYNOTE SPEECH I

Title: Leading the Intelligent Revolution

Synopsis: This keynote will explore the transformative potential of AI. It will highlight AI's rapid adoption, economic contributions, and applications in research, education, and industry, emphasizing faster data analysis and personalized learning. The talk will also address ethical concerns, skills mismatches, and the need for AI literacy in curricula.

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Keynote Speaker:

Dr. Romesh Ranawana is the Group Chief Analytics and AI Officer at Dialog Axiata. He earned his DPhil in Artificial Intelligence from the University of Oxford. Dr. Ranawana has experience as an academic, entrepreneur, and business leader. At Dialog Axiata, he was instrumental in setting up an AI and analytics division, enhancing the company's operational efficiency and customer service.

He founded Enterprise Machine Learning (Pvt) Ltd, providing AI implementation support to various organizations. Dr. Ranawana also founded SimCentric Technologies, a simulation software company, and successfully exited the business after establishing it as a leader in its field. His efforts span multiple sectors, including simulations, gaming, drug design, telecommunications and UAV technology.

In addition to his business achievements, Dr. Ranawana is the Chairman of the AI Advisory committee to the ICTA, the former chairman of the National Committee to formulate an AI Strategy for Sri Lanka and the former Chairman of SLASSCOM AI Center of Excellence. He has authored 14 peer-reviewed international publications.

KEYNOTE SPEECH II

Title: Beyond Reductionism: Unravelling Randomized Clinical Trials Through Complex Self-Adapting Systems

Synopsis: This keynote explores the limitations of reductionism in understanding Randomized Clinical Trials (RCTs), a cornerstone of drug discovery, through the lens of complex self-adapting systems. It challenges attendees to apply theories of complex self-organizing systems to better predict changes in bio-physical environments.

Keynote Speaker:

Professor Maheshan Nirmalan hails from the village of Karainagar in Jaffna, Sri Lanka. He received his early education in Jaffna and Bandarawela before entering the Faculty of Medicine, University of Colombo, where he graduated in 1990 with Second Class Honours (Upper Division) and distinctions in Physiology, Obstetrics, and Gynaecology. He pursued postgraduate studies at the Postgraduate Institute of Medicine (PGIM), University of Colombo, earning his MD (Anaesthesiology) in 1994 and receiving the prestigious Laddie Fernando Memorial Gold Medal.

In 1996, Prof. Nirmalan obtained his Fellowship of the Royal College of Anaesthetists (FRCA) in London. He then pursued a PhD in Physiology at the University of Manchester, conducting research as a Research Associate at the Medical Research Council's Trauma Group, and was awarded his doctorate in 2001.

Since 2002, he has served as a Consultant in Intensive Care Medicine at the Manchester Royal Infirmary and has been a Professor of Medical Education and Training at the University of Manchester since 2015. From 2016 to 2024, he also held the position of Vice Dean for Social Responsibility and Public Engagement at the University. In 2025, he was appointed as the Associate Vice President of the University of Manchester. Prof. Nirmalan holds honorary professorships at the University of Cairo (Critical Care Medicine) and the University of Gulu, Uganda (Post-Conflict Studies). He serves as a member of the International Scientific Advisory Board of UK Research and Innovation (UKRI).

In addition to his academic and clinical contributions, Prof. Nirmalan is a past president of the Sri Lanka Medical and Dental Association (UK) and a trustee of the Meththa Foundation UK, a charity supporting post-conflict rehabilitation in Sri Lanka.

His current research interests focus on Global Health and the application of complex systems theory to biological systems.

KEYNOTE SPEECH III

Title: Multidisciplinary Impact of AI: Large Language Models, Graph Neural Networks, and Physics-Informed Neural Networks

Synopsis: This keynote talk showcases how AI, through Large Language Models, Graph Neural Networks and Physics-Informed Neural Networks, is transforming disciplines. The speaker will present three ongoing research projects from their AI group with the potential to revolutionize multiple fields.

Keynote Speaker:

Prof Saman Halgamuge, Fellow of IEEE, IET, AAIA and NASSL received the B.Sc. Engineering degree in Electronics and Telecommunication from the University of Moratuwa, Sri Lanka, and the Dipl.-Ing and Ph.D. degrees in data engineering from the Technical University of Darmstadt, Germany. He is currently a Professor of the Department of Mechanical Engineering of the School of Electrical Mechanical and Infrastructure Engineering, The University of Melbourne. He is listed as a top 2% most cited researcher for AI and Image Processing in the Stanford database. He is a distinguished Visitor of IEEE Computer Society (2024-26) and was a Distinguished Lecturer of IEEE Computational Intelligence Society (2018-21). He supervised 50 PhD students and 16 postdocs on AI and applications in Australia to completion. He is appointed as visiting professor of SLIIT and was appointed as visiting professor of University of Peradeniya, NIFS and University of Colombo.

KEYNOTE SPEECH IV

Title: Hypertension and the Brain: Mechanisms of Small Vessel Disease leading to memory loss and dementia

Synopsis: The keynote speech outlines hypertension as the primary risk factor for memory loss and dementia. It discusses University of Manchester research on cellular and biophysical mechanisms linking elevated blood pressure to brain small vessel disease, published in top journals. The 2024 British Heart Foundation award-winning work has generated intellectual property, now in talks with major pharma for early memory loss drug development.

Keynote Speaker:

Professor Adam Greenstein is a Professor of Medicine at the University of Manchester and a Consultant Physician specializing in general medicine, geriatrics, and hypertension. He studied pharmacology and medicine at Manchester, trained in Leeds, and earned a PhD exploring how fat tissue influences small arteries and blood pressure. His research focuses on perivascular adipose tissue (PVAT) and its role in vascular health, showing how obesity-related inflammation disrupts vessel dilation but can be reversed with weight loss. Supported by the British Heart Foundation, his work also investigates how high blood pressure alters brain blood vessel signaling, contributing to dementia. This breakthrough earned him the BHF "Research Story of the Year." During the COVID-19 pandemic, he led frontline care at Manchester Royal Infirmary while continuing his research. Widely featured in the media, he is recognized for advancing understanding of hypertension, vascular aging, and dementia, with the aim of developing new therapies.

PROF. LAKSHMAN SAMARANAYAKE RESEARCH EXCELLENCE AWARD

"Professor Lakshman Samaranayake Research Excellence Award of the University of Peradeniya" is a prestigious award in order to recognize exceptional achievements in research and discovery as endowed by Prof. L. Samaranayake, an Alumnus of the University of Peradeniya. To ensure equity and fairness in the distribution of awards across all faculties of the university, the awards are annually granted to a single faculty within each of three faculty clusters on a rotational basis (i.e., one award per cluster and a total of three awards per year). The faculty clusters are as follows:

Cluster I: Medicine, Dental Sciences and Allied Health Science
Cluster II: Agriculture, Veterinary Medicine & Animal Science and Engineering
Cluster III: Arts, Science and Management

This year, Faculties of Agriculture, Arts and Medicine are eligible for the award; accordingly, the following are selected from each faculty on a merit basis.

Profiles of Prof. L. Samaranayake Awardees 2025

Professor Pradeepa Bandaranayake – Faculty of Agriculture

Pradeepa C.G. Bandaranayake (PhD (UC Davis), MPhil (UoP), MSc.(UC Davis), MSc. (UoP), LLM (Cardiff, UK), BSc. Agic. Sp (UoP)) is a Professor in Molecular Biology & Biotechnology and the Director of the Agricultural Biotechnology Centre, Faculty of Agriculture, University of Peradeniya. A Fulbright, OWSD, Borlaug, Cochran, Endeavour Fellow, she has 100+ peer reviewed publications, 40+ international and national awards, and 25+ research grants. She has supervised seven PhDs and five MPhil degrees and is currently supervising three PhD and five MPhil studies. Cinnamon research work that she led provided molecular evidence for a 200-year nomenclature issue, impacting the global cinnamon industry.

Professor Sakunthala Yatigammana Ekanayake – Faculty of Arts

Prof. T.M.S.S.S.K. Yatigammana Ekanayake (PhD (Bristol), MSc (UoP), PGDip (Bristol & UoP)) is a Professor in Education and the Head of the Department of Information Technology, Faculty of Arts, University of Peradeniya, Sri Lanka. A recipient of the UGC Tier 4* Research Excellence Award and a Commonwealth Professional Fellowship, she has authored over 25 peer-reviewed journal articles, 8 book chapters, and 4 books. Her expertise spans science education,

educational technology, AI in education, and STEM integration. She has led and contributed to numerous Erasmus+ and IDRC-funded projects and is recognised for impactful capacity-building programmes for teachers, principals, and academics.

Professor Indika Gawarammana – Faculty of Medicine

Professor Indika Gawarammana, MBBS, MD, PhD, FRCPE, is a Senior Professor of Medicine at the University of Peradeniya and Consultant Physician at Teaching Hospital Peradeniya. Leading the South Asian Clinical Toxicology Research Collaboration (SACTRC), his work on pesticide poisoning has saved 140,000 lives through regulatory changes. With over 110 peer-reviewed publications, 2316 citations since 2018, and an h-index of 37, he has presented at over 90 international conferences. Gawarammana developed a species-specific antivenom for Sri Lankan snakebites and secured grants, including AUD 750,000 from NHMRC and GBP 6 million from NIHR for poisoning prevention.

TIER 4* AWARDEES, URC RESEARCH AWARDEES AND RECOGNITION AWARDEES

Tier 4* Research Awardees

1	Prof. R.S. Dharmakeerthi	Faculty of Agriculture
2	Dr. P. Weththasinghe	Faculty of Agriculture
3	Prof. D.M. De Costa	Faculty of Agriculture
4	Prof. H.M.V.R. Herath	Faculty of Engineering
5	Prof. M.B. Dissanayake	Faculty of Engineering
6	Prof. S.G. Abeyrathne	Faculty of Engineering
7	Prof. R.R.M.K.K. Wijesundera	Faculty of Veterinary Medicine & Animal Science
8	Prof. R.S. Kalupahana	Faculty of Veterinary Medicine & Animal Science
9	Prof. A.S. Abeygunawardena	Faculty of Medicine
10	Prof. D.M.P.U.K. Ralapanawa	Faculty of Medicine
11	Prof. L.P.M.M.K. Pathirage	Faculty of Medicine
12	Prof. R.G.S.C. Rajapakse	Faculty of Science
13	Prof. H.M.S.P. Madawala	Faculty of Science
14	Prof. W.A.I.P. Karunaratne	Faculty of Science
15	Prof. S.R. Kodithuwakku	Faculty of Science

URC Research Awardees – 2024

1	Prof. R.D. Jayasinghe	Faculty of Dental Sciences
2	Dr. A.J. Dammika Abeykoon	Faculty of Engineering
3	Dr. N.M.S.H. Bandara	Faculty of Engineering
4	Dr. J. A. S. C. Jayasinghe	Faculty of Engineering
5	Dr. N.G.P.B. Neluwala	Faculty of Engineering
6	Prof. G.M.R.I. Godaliyadda	Faculty of Engineering
7	Prof. K.K. Wijesundara	Faculty of Engineering
8	Prof. A.M.A.C.S. Bandara	Faculty of Engineering
9	Dr. H.A.D. Samith Buddika	Faculty of Engineering
10	Dr. E.M.K.B. Ekanayake	Faculty of Medicine
11	Dr. D.A. Gunawardane	Faculty of Medicine
12	Dr. L.S. Nawarathna	Faculty of Science
13	Dr. P. L. Dharmapriya	Faculty of Science
14	Prof. R.S. Rajakaruna	Faculty of Science
15	Prof. T.M.W.J. Bandara	Faculty of Science
16	Dr. N.M.T. Anupama	Faculty of Veterinary Medicine & Animal Science

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2	Prof. A.M.A.C.S. Bandara	Faculty of Engineering
3	Prof. P.C.G. Bandaranayake	Faculty of Agriculture

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Theme 1

Innovations in Healthcare and Well-being

A Case of Anti-*Tuberculosis* Drug-Induced *Liver* Injury Complicated by Multisystem Organ Failure Including Acute Kidney Injury – A Case Report

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The liver is highly susceptible to damage from oxidative stress induced by various drugs. Anti-tuberculosis drugs are a well-known cause of hepatotoxicity, which, although rare, can lead to significant morbidity and even mortality. The incidence of Anti-Tuberculosis Drug-Induced Hepatotoxicity (ADIH) ranges from 2% to 28%, depending on the definition of ADIH and the exclusion of other causes. Drug-induced liver injury (DILI) is characterized by a peak alanine aminotransferase (ALT) level that exceeds five times the upper limit of normal (5 × ULN), or a combination of ALT levels that are three times the upper limit (3 × ULN) and total bilirubin greater than two times the normal limit (2 × ULN). The majority of ADIH cases occur within the first month of initiating the intensive phase of tuberculosis treatment. This report presents a case of ADIH complicated by multisystem organ failure, including acute kidney injury. A 57-year-old male, a former smoker, was diagnosed with pulmonary tuberculosis and had been undergoing anti-tuberculosis therapy for one month. He presented with progressively worsening symptoms, including shortness of breath, right upper abdominal pain, distension, nausea, and vomiting over the past week. Investigations revealed left-sided hilar opacification on chest X-ray, partially compensated respiratory acidosis on arterial blood gas (ABG), and significantly elevated liver transaminases, bilirubin levels, and low albumin. The clinical diagnosis was Anti-Tuberculosis Drug-Induced Hepatitis (ATDIH), complicated by type 2 respiratory failure and acute kidney injury (AKI). The anti-tuberculosis therapy was withheld, and treatment with intravenous N-acetylcysteine (NAC) was initiated for liver failure. The patient also required continuous renal replacement therapy (CRRT), invasive ventilation, and other intensive care management strategies. Despite these interventions, the patient succumbed to multiorgan failure. This case underscores the critical importance of closely monitoring patients undergoing anti-tuberculosis therapy for adverse drug effects. Early detection and management of hepatotoxicity, along with appropriate supportive care, are crucial for preventing further complications and ensuring optimal outcomes in tuberculosis treatment.

Keywords: Drug-induced liver injury, anti-tuberculosis therapy, hepatotoxicity, tuberculosis, multisystem organ failure

A Case Report of Hyperostosis Frontalis Interna

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Hyperostosis frontalis interna (HFI) is an uncommon condition characterized by excess bone growth with multiple nodules mostly on the inner table of the frontal bone but occasionally extending into other cranial bones. Estimated prevalence of HFI is 5-12% of the general population, and the magnitude of manifestation and frequency of HFI are much higher in the female population. HFI is mostly considered as a benign condition. With the increase in the severity of bone overgrowth it can cause symptoms by compressing the brain matter. Reduced blood supply to the localized areas of the brain can cause in localized neurological signs and neuropsychiatric symptoms such as mood disorders, Schizophrenia, atypical non progressive Parkinsonism and impairment of memory and cognition. We report a case of HFI in 85-year-old female identified during a routine dissection in the Faculty of Dental Sciences. A transverse cut of the calvaria was made according to the dissection guidelines. The inner table of the calvarium of the frontal bone was covered with large, irregular nodular bony thickening, but it was not present on any part of other skull bones. The overall extension of bony overgrowth was more on left side compared to the right side. The antero-posterior osseous thickness spanned approximately 1.5 cm in right side and 2 cm in left side into the cranial cavity. Some areas of parietal bone were noted to be markedly thin, while temporal ridges of both side of skull were more prominent. There was no noted internal damage to the brain was found including the arterial examination. All the suture lines were fused, and the suture lines were hardly noticeable. Although there's a significant prevalence of HFI among general population, there are very limited research studies carried out in Sri Lankan population. The CT findings can misinterpret HFI as bone metastases, or hemorrhages. Therefore, the adequate awareness about HFI, gold-standard diagnostic methods, and radiological findings in HFI among medical professionals will reduce such false positive diagnoses.

Keywords: Hyperostosis frontalis interna, postmenopausal women, calvarial growth

A Cohort Study and Spatial Analysis for Predicting Future eGFR Using Machine Learning in Chronic Kidney Disease of Unknown Etiology (CKDu)

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Chronic Kidney Disease of Unknown Etiology (CKDu) is a progressive, non-traditional form of chronic kidney disease predominantly affecting rural agricultural communities in Sri Lanka. Early prediction of kidney function decline is crucial for effective intervention. This study analyses longitudinal clinical data to forecast future trends in estimated glomerular filtration rate (eGFR) using machine learning. A dataset of 300 CKDu patients from Wilgamuwa, Matale district (2016–2024), approved by the Kandy Kidney Unit, was used. Each record includes eGFR, serum creatinine, blood pressure, and demographic data. After data cleaning and normalization, machine learning models were applied for both forward prediction (forecasting future eGFR values) and backward analysis (identifying early risk indicators). The models tested include Long Short-Term Memory (LSTM) networks for non-linear sequence prediction, ARIMA for statistical forecasting under stationarity assumptions, and Random Forest and Linear Regression for non-temporal modelling. The performance of each model was evaluated using metrics such as RMSE, MAE, and R^2. Results revealed a rapid decline in eGFR with a slope of 3.11, indicating severe disease progression. Boxplot analysis exposed significant outliers, while gender-based analysis showed that female patients had higher median eGFR than males. Among the models, ARIMA achieved the best performance, with 78.02% accuracy, MAE of 8.98, and RMSE of 8.99. The findings confirm ARIMA as a robust and interpretable model for CKDu-related eGFR forecasting. Accurate prediction supports early clinical decision-making, targeted care, and improved patient outcomes. Additionally, observed gender differences underline the need for personalised healthcare strategies in CKDu management.

Keywords: CKDu, eGFR prediction, cohort study, spatial analysis, chronic kidney disease

A Comprehensive Study on the Food Supplement Industry and Consumer Perceptions in Sri Lanka

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Sri Lanka's food supplement industry is experiencing rapid growth, driven by increasing health consciousness, demand for natural remedies, and evolving wellness trends. However, consumer behavior, market structure, and regulatory compliance in this sector remain under-researched. This study aimed to explore the market size, pricing strategies, regulatory frameworks, and consumer attitudes toward food supplements in Sri Lanka through a mixed-methods approach that integrates industry-level and consumer-level perspectives. The industry survey (n = 577) included manufacturers, distributors, retailers, and health professionals, selected using simple random sampling across the island. It focused on supplement types, pricing strategies, regulatory impacts, and marketing innovations. Separately, the consumer survey (n = 385) used stratified sampling across Colombo, Gampaha and Kandy districts, targeting supplement users and non-users to analyze demographic trends, consumption patterns, awareness levels, and price sensitivity. Supplementary qualitative data were collected via in-depth interviews (n = 15) with key industry stakeholders, including CEOs, regulatory advisors, and senior marketers, to capture experiential insights on regulatory barriers and market adaptation. Quantitative data were analyzed using descriptive statistics and chi-square tests to assess associations between demographic and behavioral variables. Results showed Ayurvedic (17.1%) and herbal (14.1%) products dominated the market, with pharmacies being the main purchasing channel (51.5%). Most consumers (77.9%) used supplements daily and showed moderate health awareness (72.6%) and high price sensitivity (77.6%). Industry respondents cited regulatory inconsistency, compliance costs, and consumer trust as critical challenges. Qualitative findings highlighted a preference for locally made, natural products and gaps in enforcement of quality standards. The study concludes that Sri Lanka's food supplement market is shaped by consumer education levels, income disparities, regulatory uncertainty, and the cultural preference for Ayurvedic solutions. Addressing regulatory fragmentation, improving labeling transparency, and fostering innovation in digital health and product personalization are key to sustainable growth.

Keywords: Food supplements, consumer behavior, market analysis, regulatory challenges, Sri Lanka

Addressing Sri Lanka's Noncommunicable Disease Burden Through a Novel *Hibiscus sabdariffa* L. Functional Beverage: Development, Evidence-Based Formulation and Consumer Acceptability

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Sri Lanka faces a high prevalence of noncommunicable diseases, necessitating effective dietary interventions. *Hibiscus sabdariffa* L. (Roselle) has clinically proven effects on blood pressure, lipid profiles, and blood glucose levels, yet remains underutilized in Sri Lankan markets despite growing well under local conditions. This study aimed to develop a commercially viable, functional Ready to Serve (RTS) Roselle beverage that harnesses its health benefits while promoting local production and consumption, using amounts previously validated to produce beneficial physiological effects in humans. Dried Roselle calyces were extracted in water at 90°C for 10 minutes followed by heat treatment at 85°C for 30 minutes. The RTS beverage was formulated comparing varying amounts of dried Roselle calyces with two different sweetener levels (5% W/V and 8% W/V of sucralose) and evaluated against two locally available food flavors (Strawberry and Guava). Sensory evaluation was conducted using a consumer panel of 40 members in controlled sensory laboratory facilities to prevent bias, with formulation acceptability assessed via paired preference and ranking tests using identical servings. Physicochemical analyses measured total soluble solids, pH, and titratable acidity. Statistical analysis was performed using Minitab statistical software. A shelf-life study was conducted under ambient temperature conditions for 28 days without the addition of artificial preservatives. The most acceptable formulation consisted of 150 g/10 l of dried Roselle calyx, 8% W/V of sucralose, and strawberry flavor. Further, it had significantly higher ($p < 0.05$) consumer preference for sensory attributes. Physicochemical analyses reported values of 1.2°B for total soluble solids, 2.391 ± 0.01 for pH, and 2.27% for titratable acidity. The beverage remained shelf-stable for 28 days under ambient temperature conditions without preservatives, demonstrating both stability and palatability throughout the shelf-life period while maintaining the bioactive compounds associated with Roselle's health benefits. This research represents the first development of a scientifically validated, value-added Roselle product in Sri Lanka.

Keywords: RTS beverage, dried roselle calyx, physicochemical properties, functional beverage, noncommunicable diseases

AI-Driven Image Processing for Early Detection of Oral Cancer: Current Advances and Future Directions

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Oral cancer, particularly oral squamous cell carcinoma (OSCC), presents a global health challenge, marked by low survival rates due to delayed diagnosis. Early detection, however, greatly improves prognosis. Recent advancements in AI-based image processing have revolutionised oncology, enabling rapid and accurate detection of oral cancer, transforming dental diagnostics through sophisticated image analysis. This study aims to evaluate the effectiveness of AI-based image analysis techniques for detecting early-stage oral cancer, with a focus on OSCC. It assesses the accuracy of various imaging tools and explores recent advancements, clinical applications, and future directions to enhance diagnostic precision and improve oral health outcomes through early detection. A narrative review was conducted, synthesising studies from PubMed, Google Scholar, ScienceDirect, and other online databases. The review examines AI-driven image segmentation, focusing on advanced deep learning methods such as Convolutional Neural Networks (CNNs), and explores their transformative potential in oral carcinoma detection. The findings were thematically integrated to highlight the current state of AI in dental and oncology settings, with an emphasis on qualitative insights, without a quantitative meta-analysis. AI-based image segmentation, particularly through CNNs, has proven effective in detecting early oral carcinoma across various imaging modalities, including radiographs, histopathology, and endoscopic images. However, challenges such as image variability, resolution limitations, and model interpretability persist, particularly in low-resource settings. Despite these challenges, these AI-driven advancements significantly enhance the early detection and diagnostic accuracy of oral cancer, showing promise for improved patient outcomes. AI-driven approaches, combined with imaging technologies, are demonstrating considerable potential in oral cancer diagnosis. The integration of AI in clinical evaluation could play a pivotal role in early-stage cancer detection. However, further research and thoughtful implementation are required to maximise its potential and contribute to more effective oral cancer management.

Keywords: Artificial intelligence, convolutional neural networks, early detection, narrative review, oral squamous cell carcinoma

Analysis of Antioxidant Activity of Traditional Sri Lankan Herbal Formula Composed of *Phyllanthus Emblica* and *Tinospora Cordifolia*

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Sri Lanka harbours a diverse range of herbal plants that have long been valued in traditional medicine for their potent bioactive compounds. *Phyllanthus emblica* and *Tinospora cordifolia* are two widely used medicinal plants known for their antimicrobial, antioxidant, anti-inflammatory, and immunomodulatory properties. Although these two plants have traditionally been used together in Sri Lankan healing practices, their combined therapeutic effects remain underexplored in scientific literature. Hence, this study aimed to evaluate the antioxidant activity and total phenolic content of water and ethanol extracts of the *P. emblica* and *T. cordifolia* combination, using the DPPH radical scavenging assay and Folin-Ciocalteu method. Equal amounts of dried fruits of *P. emblica* and the dried stems of *T. cordifolia* were used to prepare traditional 8:1 kashaya preparations. To prepare ethanol extract, the mixture of powdered plant samples was extracted at a solid: solvent ratio of 1:10 in ethanol using a Soxhlet apparatus. Water extract and ethanol extract of the herbal formula composed of *P. emblica* and *T. cordifolia* showed excellent antioxidant activity measured by 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging assay. The water extract of this combination showed an IC_{50} value of 0.139 ± 0.001 µl/ml, while the ethanol extract showed a value of 5.47 ± 0.002 µg/ml. Ascorbic acid, used as the reference standard, demonstrated an IC_{50} of 4.31 µg/ml. The total phenolic contents of the water extract and ethanol extracts were 12.66 ± 0.132 mg Gallic Acid Equivalent (GAE)/ml extract and 233.2 ± 0.12 mg GAE/g extract, respectively, indicating this is a rich source of polyphenols. The results of this study provide evidence that water and ethanol extracts of folkloric herbal formulations composed of *P. emblica* and *T. cordifolia* are a potential source of natural antioxidants, which will be valuable in the pharmaceutical and nutraceutical industries. Further detailed studies on varying proportions of this combination and identification of the bioactive compounds responsible for the beneficial effects of this combination are warranted.

Keywords: *Phyllanthus emblica*, *Tinospora cordifolia*, antioxidant, DPPH assay, phenolic content

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Analysis of Factors Influencing Weight Loss in Patients Undergoing Head and Neck Radiotherapy

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Weight loss is a prevalent and critical issue in patients undergoing head and neck radiotherapy, often leading to treatment interruptions, reduced efficacy, and poor clinical outcomes. Addressing this challenge is vital in improving patient care and treatment efficacy. This study aimed to analyze factors associated with weight loss during head and neck radiotherapy, to assess the extent of weight loss with clinical and treatment-related influences and to compare the effects of treatment modalities (Intensity Modulated Radiotherapy and 3-D Conformal Radiotherapy). A prospective analysis was conducted at the Department of Radiotherapy and Oncology, National Cancer Institute Maharagama, between October and November in 2024. A total of 61 patients who received head and neck radiotherapy were included. Data on weight changes, treatment modalities, tumor characteristics, and chemotherapy regimens were collected and analyzed using descriptive statistics, group comparisons, correlation analysis, and regression modeling to identify significant predictors of weight loss. In this study, 91.8% of patients experienced weight loss, with a mean reduction of 4.03 kg (± 2.14). Males lost more weight than females, and those receiving concurrent chemoradiotherapy showed the greatest weight loss. Tumor location significantly impacted outcomes; patients with soft palate tumors lost the most due to impaired speech and swallowing. IMRT was linked to greater weight loss than 3D-CRT, likely from increased toxicities in nutritional areas. Higher radiation doses (≥ 60 Gy) were also associated with greater loss. Regression analysis identified concurrent chemoradiotherapy, sex, and tumor location as significant predictors, while age, tumor stage, and dose were having weaker associations. The study demonstrates that radiotherapy-related weight loss is dose- and modality-dependent, reinforcing the importance of early, individualized nutritional interventions. Effective nutritional management is crucial for improving outcomes in head and neck cancer. Future studies should include larger, multi-center cohorts and assess baseline nutrition, psychosocial factors, and long-term weight patterns.

Keywords: Head and neck cancer, radiotherapy, weight loss, nutritional management

Analysis of Lung Dose Variation in Post-Mastectomy Radiotherapy and Whole Breast Radiotherapy

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Breast cancer is the most common cancer in women worldwide; Radiotherapy reduces the recurrence following surgery and chemotherapy. Post Mastectomy Radiation Therapy (PMRT) and Whole Breast Radiation Therapy (WBRT) pose a risk of lung injuries due to proximity, necessitating an analysis of lung dose variation between these two techniques. This study focused on comparing lung radiation dose variation between PMRT and WBRT, evaluating the influence of lung dose distribution with anatomy and radiotherapy treatment strategies and identifying optimization methods to reduce lung toxicities due to radiation. A retrospective study involved extracting lung dose metrics (V20, V5, mean lung dose) from Dose Volume Histogram (DVH) along with anatomical parameters such as Central Lung Distance (CLD), Midplane Lung Width (MLW), Maximum Heart Distance (MHD) as well as treatment strategies details including wedge type and Field arrangement in breast cancer patients treated with PMRT and WBRT at the National Cancer Institute Maharagama, Sri Lanka, using the Varian Eclipse treatment planning system. The impact of differences in radiation therapy techniques on lung dose variation was analysed using SPSS 25.0. PMRT resulted in higher lung doses compared with WBRT, with mean lung dose values of 6.68 ± 2.19 Gy and 6.34 ± 2.16 Gy ($p < 0.05$), respectively. The percentage of V20 was 14.67 ± 6.32% for PMRT and 12.77 ± 6.88% for WBRT. CLD in PMRT is higher as compared to WBRT: 2.84 ± 1.24 cm versus 2.33 ± 0.91 cm ($p < 0.05$). Field in Field technique and 30° wedges significantly reduced mean lung doses, WBRT achieved 5.46 ± 1.78 Gy with 30° wedges compared to 6.60 ± 1.57 Gy with 15° wedges ($p < 0.05$). This study highlights that WBRT reduces low-dose lung radiation than PMRT, with lower V5 values. CLD is a major parameter for lung dose difference, especially for PMRT. The 30° wedge optimise lung dose sparing in WBRT. However, the combination of FIF and wedges effectively reduces lung doses in both treatment approaches.

Keywords: Post mastectomy radiation therapy, whole breast radiation therapy, lung dose, central lung distance, field in field technique

Analysis of Nutritional and Health Status of Sri – Lankan High Performance Athletes

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Health and nutritional status are crucial for the optimal performances of athletes, though less attention is being paid by Sri Lanka. This research aims to analyze and assess the current overall nutritional and health status of Sri Lankan high – performance pool athletes for further enhancements and optimizations in the aim of optimal performance. This is a quantitative cross-sectional study with 125 athletes from 12 sports in Sri Lankan high-performance pool selected by convenient sampling. Dietary and hydration data were collected from validated 24-hour dietary recalls and 3 – day diet diaries. Height, weight and BMI were taken as anthropometric data. Body composition data were collected from Bio-electrical impedance analyzer (BIA). But due to special physical impairments, 7 sites skinfold method was used for para-athletes' body composition assessment. Bio-chemical data were taken from pathology reports. Sleep quality was assessed using validated PSQI questionnaire. Dietary data were analyzed using the software "FoodBase2000". The Body Mass Index, (21.2 ± 5.2) was not optimal for around 50% of the athletes. The mean body fat percentage for males [10.93 ± 5.4 (n = 74)] and females [22 ± 6.6 (n = 50)] fell within normal ranges. The mean daily energy intake was 2556 ± 937.2 Kcal/day (n = 122), with an optimal macronutrient distribution as carbohydrate 59 ± 9.6% per day (n = 122), protein 14 ± 3.3% per day (n = 122), and fat 26 ± 8.8% per day (n=116). Iron intake (18.21 ± 17.26mg/day) was insufficient in 70% participants. Biochemical results indicated Low serum Vitamin D in 58% of participants (mean serum level of 40.89 ± 38.92 ng/mL), Liver enzyme elevation in 18.4%, and higher TAG/HDL index in 4% of the population, which led to insulin resistance. Other biochemical parameters have shown optimal results. Sleep quality (mean score 4.5 ± 3.2) was inappropriate for 55% of athletes. The anthropometry and body composition status of most athletes are optimal but Dietary intakes were sub optimal including macro and micronutrients. Except for few, biochemical results were optimal and controversially, insulin resistance was observed even they are high – performance athletes which can be due to inappropriate dietary behaviors. Poor sleep quality also can be observed. These results finally conclude that the current health and nutritional and health status of Sri Lankan high – performance athletes do not at its optimal level and need further optimizations.

Keywords: Body composition, high – performance, nutrition, sleep quality

Analysis of Pattern of Mandibular Third Molar Impaction and the Presence of Caries of Adjacent Second Molar Tooth – A Retrospective Cone Beam Computed Tomography Study

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Mandibular third molar is the commonest tooth to get impacted due to various local and systemic factors. Impacted mandibular third molar (ILTM) may lead to complications in adjacent mandibular second molar, such as caries development, root resorption and periodontal disease. This study aims to evaluate the pattern of ILTMs and its relationship with the occurrence and progression of caries in adjacent second molars. This retrospective descriptive study was conducted at the Division of Radiology, Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka. Out of the 478 Cone Beam Computed Tomography (CBCT) images of the patients who underwent CBCT examinations from January 2021 to December 2023, 400 CBCT images were selected with a convenient sampling method and analysed. Impaction was assessed by two classifications in relation to occlusal plane, mandibular ramus and long axis of second molar. The collected data were statistically analysed using IBM SPSS version 25.0. The chi-square tests were performed for the statistical analysis. Pell and Gregory Position-A Class-I impaction was the commonest type (41.50%), while mesioangular impaction was the predominant orientation (39.25%) under Winter's classification. Individuals aged 21-30 years old showed higher impaction rates, greatly affecting second molars. The prevalence of mandibular second molar caries was found to be 47.25%. Females were more prone to mesioangular impaction (20.50%) and had higher occurrence of Position-A or Position-B with Class-I impactions, frequently associated with second molar caries than males. A significant correlation for caries on mandibular second molar with position ($p = 0.011$, $p < 0.05$), class ($p = 0.007$, $p < 0.05$) and angulation ($p = 0.000$, $p < 0.05$) of ILTM was detected using both classifications accordingly. This study emphasizes the significant association between mesioangular ILTM and adjacent second molar caries with sex and age, influencing impaction pattern and caries risk. Age-specific strategies, further studies with larger sample sizes, and longitudinal studies are suggested to understand prolonged effects of mandibular third molar impaction.

Keywords: Impaction, mandibular third molar, second molar caries, mesioangular

Analysis of the Presence of Pathogenic Bacteria on the Hand Touch Surfaces in Public Buses at the Colombo Central Bus Station, Sri Lanka

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Public buses play a major role in public transportation in urban areas like Colombo as it is one of the busiest and most crowded cities in Sri Lanka. Hand-touched surfaces such as door handles and handrails can be contaminated with several pathogenic microorganisms due to high passenger capacity, a lack of cleaning procedures, and inconsistent hygiene practices. This study aimed to detect the presence of *Escherichia coli* and *Staphylococcus aureus,* and to quantify the total bacterial count (TBC) to assess the level of bacterial contamination in swab samples collected from the surfaces of selected public buses at Colombo Central Bus Station, Sri Lanka. A total of 40 samples were collected from door handles and handrails of 20 selected public buses. All samples were analyzed using standard microbiological procedures, including culturing on selective media, Gram staining and biochemical tests, to identify the pathogenic bacteria. Total Bacterial Count (TBC) was determined by using the serial dilution and plate count methods. And colony-forming units (CFU) were calculated to quantify the level of bacterial contamination on the surfaces of public buses. The results indicated significant bacterial growth on all 40 samples, with some pathogenic bacterial species, including *Escherichia coli* (06 isolates), *Staphylococcus aureus* (23 isolates), *Klebsiella* spp. (09 isolates), Coagulase-negative *Staphylococcus* spp. (12 isolates), *Enterobacter* spp. (03 isolates) and *Corynebacterium* spp. (02 isolates). The average CFU value was 5.14×10^6 CFU/cm², and the standard deviation was 2.23×10^6 from 40 collected samples. The average bacterial load on door handles and handrails were $5.70 \pm 1.84 \times 10^6$ CFU/cm² and $4.59 \pm 2.48 \times 10^6$ CFU/cm², respectively. Statistical analysis revealed no significant difference between the contamination levels of door handles and handrails ($p > 0.05$). The results of this study highlight the poor hygienic conditions in public buses in Colombo. Also, presence of these organisms indicates more community-acquired infections can be transmitted. These findings suggest that requirement for better hygiene practices, public awareness campaigns, and frequent disinfection procedures to mitigate microbial risks. Although our study had a limited sample size and represents small part of transportation system in the city, these findings draw attention to public health issues that national authorities should consider seriously.

Keywords: Bacterial contamination, public buses, pathogenic bacteria, public health risk, hand touch surfaces

Anemia Among Non-Dialysis CKDu Patients in Giradurukotte, an Endemic Area in Sri Lanka

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Chronic Kidney Disease of Uncertain Etiology (CKDu) is an emerging public health concern that primarily affects young, productive-age farmers in the dry zone of Sri Lanka. CKDu is linked to numerous complications that contribute to a poor prognosis, with anemia being the most common. Despite its clinical significance, the prevalence and impact of anemia remain underexplored. This study evaluates the prevalence of anemia among stage II to stage V non-dialysis CKDu patients living in Giradurukotte, a CKDu endemic area in Sri Lanka. This was a cross-sectional study conducted among all 134 biopsy-proven CKDu patients registered at the Renal clinic, Giradurukotte, located in Uva Province, Sri Lanka. Blood samples were collected for Full Blood Count and Serum Creatinine tests. Demographic data were gathered from each participant, and the prevalence of anemia was studied according to age, gender, and CKDu stage. Written informed consent was obtained from all participants prior to data collection, and ethical approval was obtained from the ethical review committee at the Faculty of Medicine, University of Peradeniya. All statistical analyses were conducted using IBM SPSS Statistics version 23. A total of 134 patients, including 101 males and 33 females, were recruited. The overall prevalence of anemia was 61.94% (N = 83), with a higher prevalence in females (69.7%) compared to males (60.4%). The mean hemoglobin values were 11.34 g/dL ± 1.26 and 12.82 g/dL ± 2.21 for males and females, respectively. Anemia during the late stages of CKDu was higher than the early stages (Stage 2 - 36.0%, Stage 3 - 55.2%, Stage 4 - 79.4%, Stage 5 - 92.0%) (P = 0.000). Anemic patients had higher serum creatinine (3.36 ± 2.0 mg/dL) and were older (60.85 ± 9.4) than non-anemic patients (P = 0.02). Anemia remains highly prevalent among patients with CKDu and seems to increase with disease severity. Early identification and effective management strategies are essential to mitigate complications related to anemia. Continued research studies are crucial to understand and uncover the underlying causes and improve therapeutic interventions.

Keywords: Non-dialysis CKDu, anemia, endemic

Antibacterial Activity of Eugenol Derivatives Against *Streptococcus Mutans*

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Eugenol is the major constituent of clove essential oil and act as an antibacterial agent commonly used in dentistry in the form of Zinc Oxide-Eugenol (ZOE) to inhibit oral bacteria, specifically *Streptococcus mutans* which is the main contributor to dental caries. However, due to the high virulence of *S. mutans*, higher concentrations of eugenol are required for effective bacterial inhibition, reducing its efficacy as an antibacterial agent against this bacterium. To address this challenge, this study aimed to enhance the antibacterial activity of eugenol through functional group modifications. Additionally, this study focuses on investigating the structure - activity relationship of eugenol on antibacterial activity against this bacterium. Eugenol was extracted via steam distillation of clove buds followed by solvent extraction. Six derivatives were synthesized through acylation and esterification reactions at the hydroxyl group, as well as by epoxidation of the double bond. All compounds were characterized by FTIR spectroscopy, while the epoxy derivative was further characterized by NMR spectroscopy. The antibacterial activity of eugenol, clove oil, and the synthesized derivatives were evaluated using the disc diffusion method. To date, these derivatives have not been evaluated against *S. mutans*. According to the results, only eugenol, clove oil, and the epoxy derivative exhibited inhibitory activity against *S. mutans*. Notably, the epoxy derivative synthesized via an addition reaction demonstrated mild inhibitory activity. In contrast, the derivatives obtained through alkylation and esterification reactions were inactive. These findings suggest that only compounds possessing a free hydroxyl group were effective against *S. mutans*, indicating that the presence of a free hydroxyl group is essential for antibacterial activity against *S. mutans*. Future studies can focus on designing eugenol derivatives with enhanced antibacterial properties while preserving at least one free hydroxyl group to retain activity.

Keywords: Antibacterial activity, clove, eugenol, eugenol derivatives, *S. mutans*

Antibacterial Activity of Liquid Soap Enriched with *Sargassum Crassifolium* and *Caulerpa Racemosa*

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Seaweeds are marine macro algae which contain a variety of bioactive compounds with antimicrobial and antioxidant properties. Therefore, seaweeds are in high demand for the development of skincare products. The present study was designed to evaluate the antibacterial effect of liquid soap formulated using *Sargassum crassifolium* and *Caulerpa racemosa* against the *Escherichia coli* and *Staphylococcus aureus*. Ethanolic extracts of both seaweed species were obtained using maceration technique and analyzed for phytochemical screening for assessing the bioactive compounds. The hot process method was used to prepare the soap base, which was included with different levels of crude extracts to prepare treatments with three concentrations as 250 ppm (SC/CR250), 500 ppm (SC/CR500) and 750 ppm (SC/CR750) for each seaweed. Antibacterial activity of formulated liquid soaps was measured using disc diffusion method. A soap base without seaweed extract was used as the negative control (NC), while a commercial antibacterial handwash served as the positive control (PC). Results revealed that the crude extract of *S. crassifolium* composed of alkaloids, diterpenes, saponins, flavonoids, phenols and tannins and *C. racemosa* composed of saponins, diterpenes, phenols and tannins. Inhibition zone diameters were measured in triplicates (in mm), and the mean values of all eight treatments were compared using one-way ANOVA. Mean inhibition zone diameter (IZD) in liquid soaps formulated with *S. crassifolium* and *C. racemosa* against *E. coli* range from 7.42 ± 0.08 (NC) to 17.29 ± 0.08 (SC750) and 7.42 ± 0.15 (NC) to 9.28 ± 0.12 (CR750) respectively. Mean IZD in liquid soaps formulated with *S. crassifolium* and *C. racemosa* against *S. aureus* range from 5.30 ± 0.24 (NC) to 7.29 ± 0.20 (SC750) and 5.29 ± 0.02 (NC) to 6.65 ± 0.29 (CR750) respectively. Furthermore, SC750 was the most effective liquid soap with significantly higher ($p < 0.05$) inhibition against both bacteria species. However, the antibacterial effect of SC750 against the *E. coli* and *S. aureus* was significantly lower ($p < 0.05$) than that of positive control. These findings indicate that among the tested seaweed-based liquid soaps, SC750 exhibited the strongest antibacterial activity against *E. coli* and *S. aureus*. By increasing the concentration than 750 ppm or by using combination of both seaweeds can be achieve an antibacterial effect comparable to or exceeding that of commercially available liquid soaps.

Keywords: Disc diffusion method, *E. coli, S. aureus*, phytochemical

Antibacterial Effects of Natural Cinnamon Leaf Oil and Clove Oil Compared to Eugenol Against *Streptococcus Mutans*

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Dental caries is the most prevalent infectious disease affecting the oral cavity, and *Streptococcus mutans* is recognised as the principal pathogen for the development of dental caries. Eugenol, a natural compound derived from clove and cinnamon, has gained attention in dentistry for its antibacterial, anti-inflammatory, and analgesic properties. Eugenol is a main constituent in Zinc oxide-Eugenol, a dental material used to stabilise dental caries. Even though the antibacterial activity of cinnamon oil, clove oil and eugenol has been examined in several studies, comparative analysis of these three components is scarce in scientific literature. Furthermore, with economic uncertainties, there is a growing need to investigate sustainable healthcare alternatives. Locally sourced cinnamon and clove oils could serve as viable substitutes for imported eugenol, potentially enhancing the sustainability and affordability of dental care while promoting local entrepreneurship. Hence, this study aimed to comparatively analyse the anti-bacterial activity of commercial eugenol, natural oils extracted from clove buds (*Syzygium aromaticum*) and Ceylon cinnamon leaves (*Cinnamomum verum*) against *S. mutans*. Natural oils, extracted by steam distillation from clove buds (cultivated and commercial), cinnamon leaves, and commercial Eugenol, which is commonly used in dental clinics, were used. Antibacterial activity against standard *S. mutans* (ATCC 700610) was analysed using a disc diffusion assay. One-way ANOVA was employed to compare their antibacterial efficacy. The mean zone of inhibition of commercial eugenol, clove oils (commercial and cultivated) and cinnamon leaf oil were 20.33 ± 0.94 mm, 20.5 ± 1.48 mm, 20.31 ± 1.56 mm and 20.61 ± 1.11 mm, respectively. There was no significant difference in the antibacterial activity of the tested compounds ($P \leq 0.05$). *S. mutans* inhibitory effects of natural oils from Ceylon cinnamon leaves and clove buds were comparable to those of commercial eugenol. Further research is necessary to explore their broader therapeutic potential and the possibility of using these oils as alternatives to commercial eugenol in dental care.

Keywords: Eugenol, Ceylon cinnamon, clove, *streptococcus mutans*

Antibiotic Resistance in *Escherichia Coli* from Selected Mahaweli River Intake Points in Central Highlands of Sri Lanka

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The global increase in antibiotic resistance and the prevalence of waterborne diseases present significant public health challenges, especially in low and middle-income countries. *E. coli* is a faecal indicator bacterium commonly used in environmental antimicrobial resistance (AMR) monitoring. This preliminary study aimed to evaluate and compare the antibiotic resistance profiles of *E. coli* isolated from untreated water collected at 7 intake points that receive water from the Mahaweli River. Water samples of 100 ml were plated on MacConkey agar. Suspected colonies were sub-cultured and confirmed as *E. coli* based on typical colony morphology and biochemical tests including negative oxidase and positive indole results. From each intake point, two confirmed *E. coli* isolates were subjected to antimicrobial susceptibility testing using the disk diffusion method on Mueller-Hinton agar, following EUCAST guidelines. Antimicrobials tested included amoxicillin (10 µg), cefuroxime (30 µg), tetracycline (30 µg), streptomycin (10 µg), ciprofloxacin (5 µg), and co-trimoxazole (25 µg). All the tested isolates were resistant to amoxicillin and cefuroxime, while 43% were resistant to tetracycline, 36% to co-trimoxazole, 21% to streptomycin and 7% to ciprofloxacin. Multidrug resistance, which is defined as resistance to three or more antibiotic classes, was found in 57% of isolates, primarily from Heightenford, Elpitiya, Pahalkondadeniya, Oya Pahala and South Water Treatment plants. Out of the 14 isolates tested, 5 exhibited extensive drug resistance (XDR). These XDR. isolates were predominantly found in samples from Weligalla, Meewathura, Katugastota and Matale indicating potential resistance hotspots in these locations. These findings suggest that aquatic systems may act as reservoirs and transmission pathways for antimicrobial-resistant bacteria. While a direct assessment of contamination sources was not conducted, supporting evidence from previous studies indicates that untreated wastewater in Katugastota's Meda Ela canal, landfill runoff in Matale and inadequate sanitation infrastructure may contribute to the observed distribution of resistant isolates. These findings highlight the urgent need for improved waste management, regular water quality monitoring and strengthened antimicrobial stewardship to mitigate the spread of resistant bacteria. This study provides helpful insights into the environmental distribution of AMR, emphasising the importance of continuous monitoring of natural water sources to reduce public health risk.

Keywords: Antimicrobial-resistant bacteria, *E. coli*, multidrug resistance, Mahaweli river

Antifungal Activity of *Eichhornia crassipes* and *Salvinia molesta* Collected from Lake Gregory, Sri Lanka, Against Human Oral Pathogenic Fungi

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Invasive aquatic plants *Eichhornia crassipes* (Water hyacinth) and *Salvinia molesta* (Giant Salvinia) pose ecological threats but offer innovative healthcare potential. Rich in bioactive compounds, they exhibit antifungal effects against Candida species, presenting sustainable, natural alternatives for treating oral candidiasis while promoting eco-friendly disease control and biomass reuse. The study aims to determine the antifungal activity of *S. molesta* and *E. crassipes* against human oral pathogenic fungi specifically aiming to identify the most effective solvent and the minimum inhibitory concentration (MIC) against Candida species by the assessment of antifungal activity. *E. crassipes* and *S. molesta* were collected from Lake Gregory, Nuwara Eliya, Sri Lanka. Water and methanol extracts were prepared using ultrasonication. Phytochemical screening and FTIR analysis identified bioactive compounds. Methanol extracts were tested for antifungal activity against *Candida albicans*, *C. krusei*, *C. tropicalis*, *C. parapsilosis*, and *C. glabrata* obtained from the Faculty of Dental Sciences, University of Peradeniya. Disk diffusion method using Mueller Hinton Agar (CM0337) was conducted with different concentrations of extract, including 200, 400, and 800 mg/mL. Fluconazole served as the positive control. Inhibition zones were measured after 24-hour incubation at 48°C to determine MICs. Methanolic extraction yielded the highest extracts from both plants. Saponin, diterpene, tannin, and phenol were detected in both, but glycosides were limited to *S. molesta*, while flavonoids were exclusive to *E. crassipes*, as confirmed by phytochemical screening and FTIR analysis. Different concentrations were tested against five Candida species. *E. crassipes* had higher MIC than *S. molesta*, with lowest against *C. tropicalis* and highest against *C. albicans*. *S. molesta* showed the lowest MIC against *C. glabrata* and the highest against *C. krusei*. The most potent inhibitory zones appeared at 800 mg/mL. Overall, *S. molesta* demonstrated greater antifungal activity than *E. crassipes*. This study highlights the antifungal activity of *Eichhornia crassipes* and *Salvinia molesta* against Candida, with *S. molesta* being more effective. Their extracts offer a natural alternative to synthetic antifungals like fluconazole, suggesting potential use in antifungal therapies, including mouthwash, to suppress oral candidiasis effectively and affordably.

Keywords: Aquatic plant extracts, antifungal activity, candida colony, human oral pathogenic fungi, ultrasonication

Antioxidant Potential of Root Extracts of *Psidium guajava* and Molecular Docking Analysis

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Natural antioxidants which are primarily derived from plants, play a crucial role in stabilising free radicals and reducing oxidative stress. *Psidium guajava*, commonly used as both a food crop and a medicinal plant, has gained attention for its health benefits. While much research has focused on its leaves and fruit, the antioxidant potential of its roots has not been extensively studied. This study aimed to evaluate the *in vitro* and *in silico* antioxidant activities of n-Hexane, Chloroform and Methanol extracts of *Psidium guajava* roots. Sequential cold maceration extraction was conducted using three solvents: n-Hexane, Chloroform, and Methanol. The total phenolic content (TPC), total flavonoid content (TFC) and total antioxidant capacity (TAC) were evaluated. While the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging was used to assess *in vitro* antioxidant activities. Each assay was performed in triplicates, and the results were analysed using one-way ANOVA followed by Tukey's post-hoc test using SPSS software to determine statistical significance ($p < 0.05$). The phytochemicals present in the extracts were identified through Gas Chromatography-Mass Spectrometry (GC-MS) analysis. The identified compounds were docked with Superoxide Dismutase (SOD) using GOLD software. Methanol extract displayed the highest TPC and TAC values (49.99 ± 0.661 mg GAE/g and 18.85 ± 1.381 mg AAE/g) respectively, while Chloroform extract showed the highest TFC value (10.84 ± 0.385 mg QE/g). Methanol and the combined (n-Hexane: Chloroform: Methanol, 1:1:1) extracts showed significantly lower IC_{50} values (1.629 ± 0.12 µg/mL, 1.663 ± 0.10 µg/mL respectively) compared to the standard in the antioxidant assay. The docking results showed, palmitic acid and oleic acid to exhibit the highest binding affinities towards the SOD enzyme with a PLP fitness score of 59.1739 and 56.9547 respectively. These values are higher compared to standard ligand (Ascorbic acid) which has a score of 44.496. The roots extracts of *Psidium guajava* demonstrated significant antioxidant potential, as shown by the findings of TPC, TFC, TAC, DPPH free radical scavenging activity and binding affinity towards SOD enzyme. The results suggest that these roots may prove useful in developing new antioxidant-based treatments.

Keywords: Antioxidants, DPPH, *Psidium guajava*, *In silico*, superoxide dismutase, *In vitro*

Assessing Knowledge, Attitudes and Practices Towards Artificial Intelligence Among Undergraduates in Health-Related Degree Programs at Sri-Lankan [state] Universities

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By assessing the readiness of future healthcare professionals to embrace AI in healthcare, this research may inform the development of educational curricula tailored to meet the evolving demands of the healthcare sector. The study aimed to assess the knowledge, attitude, and practices (KAP) related to AI among undergraduates enrolled in health related programs. This descriptive cross-sectional survey was conducted among a non-probability sample of 1,100 undergraduates, proportionally selected based on the population distribution across all batches from the Faculties of Medicine (40%), Dental Sciences (25%), Allied Health Sciences (20%), and Veterinary Medicine (15%) in five selected state universities in Sri Lanka. Based on a calculated minimum sample size of 385 and an expected 35% online survey response rate, 1,100 students were invited via Google Forms. A pretested questionnaire was used to assess general opinions rather than subject-specific knowledge related to AI. A total of 424 (38.55%) students responded. Most participants (**98.6%**) had heard of AI, but **45.4% rated their understanding as "neutral"**, and **30% were unaware of AI's role in healthcare**. Students' perspectives were measured by their views on AI's contribution in healthcare improvement and its ability to replace human professionals. Nearly half (48.7%) expressed positive attitudes towards benefits of AI, while 45% disagreed that AI would replace healthcare professionals. **88.1% reported using AI tools for academic purposes** (Chat GPT, Grammarly, and Quill Bot). This contrast in familiarity was measured on a 5-point scale and suggests that students are more confident using AI for study-related tasks than in clinical contexts. While participants are generally aware of AI, their understanding of its specific applications in healthcare is limited. In conclusion, all the students in health care faculties do not have a very good knowledge of use of AI in health care. Only 50% of the population had positive attitudes towards AI. However, 88% use AI for their academic purposes. These findings support the implementation of targeted AI workshops and integration of AI content into existing curricula within the studied universities. Further, conducting large-scale studies with representative samples from all health faculties across Sri Lanka is essential to guide broader educational improvements.

Keywords: Artificial intelligence, KAP survey, AI in healthcare, medical education, health education, undergraduate students, Sri Lanka

Assessing the Impact of Cooking Fuels on Indoor Particle Matter 2.5 ($PM_{2.5}$) Levels in Sri Lankan Households

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Household air pollution resulting from biomass and fossil fuel combustion is a major contributor to indoor $PM_{2.5}$ concentrations, which is linked to respiratory health issues like chronic bronchitis and asthma. Different types of fuel produce varying amounts of $PM_{2.5}$, thereby affecting indoor air quality and potential health risks. This study aims to evaluate the relationship between fuel type, $PM_{2.5}$ levels, and respiratory health outcomes. $PM_{2.5}$ data were collected continuously over three days from 48 selected households in Kandy, Sri Lanka, using portable samplers. The data were analyzed to compare $PM_{2.5}$ concentrations across different household fuel types. In addition, the frequency of probable and confirmed cases of chronic bronchitis and asthma was assessed in relation to $PM_{2.5}$ exposure levels. $PM_{2.5}$ concentrations were categorized based on standard air quality classifications: Good ($\leq$ 12 $\mu g/m^3$), Moderate (12.1–35.4 $\mu g/m^3$), Unhealthy for Sensitive Groups (35.5–55.4 $\mu g/m^3$), Unhealthy (55.5–150.4 $\mu g/m^3$), Very Unhealthy (150.5–250.4 $\mu g/m^3$), and Hazardous (> 250.4 $\mu g/m^3$). Among the households surveyed, LPG (31) was the most commonly used cooking fuel, followed by firewood (12), while kerosene and electricity were each used by one household. Analysis of $PM_{2.5}$ concentrations by fuel type showed that kerosene had the highest mean $PM_{2.5}$ concentrations (57.0 $\mu g/m^3$.), followed by firewood (n = 12, 34.4 $\pm$ 11.7 $\mu g/m^3$), LPG (n = 31, 31.0 $\pm$ 28.4 $\mu g/m^3$), and electric stoves (n = 1, 21.6 $\mu g/m^3$). Firewood showed different $PM_{2.5}$ concentrations depending on the stove type, improved Anagi stoves (n = 1, 46.8 $\mu g/m^3$), traditional clay stoves (n = 4, 42.1 $\pm$ 3.51 $\mu g/m^3$), traditional stoves (n = 7, 29.9 $\pm$ 12.6 $\mu g/m^3$) Based on standard air quality classifications, 5.4% of observations fell into the 'Good' category, 69.6% were 'Moderate', 14.3% were 'Unhealthy for Sensitive Groups', and 10.7% were classified as 'Unhealthy'. The findings indicate fuel type influences indoor $PM_{2.5}$ concentrations, with kerosene and biomass linked to the highest exposure. However, this study does not consider household ventilation, which may affect $PM_{2.5}$ dispersion and exposure. Transitioning to cleaner fuels like LPG and electricity may reduce indoor air pollution and improve respiratory health.

Keywords: Indoor air quality, $PM_{2.5}$, cooking fuels, biomass combustion

Assessment of Anthropometric Measurements and Dietary Patterns in Relation to Post-Menopausal Stages Among Post-Menopausal Women Visiting Peradeniya Teaching Hospital: A Preliminary Cross-Sectional Study

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Menopause marks the end of menstruation and reproductive function, after which women enter early, mid, or late postmenopausal stages. In Sri Lanka, with an average lifespan of 78 years, women spend about a third of life postmenopausal, raising concerns about obesity, NCD risk, and diet. This cross-sectional study, conducted in February 2025 at Peradeniya Teaching Hospital, assessed anthropometric measures and dietary patterns in relation to postmenopausal stages. Eighty postmenopausal women (45–65 years) were recruited by convenience sampling with 28.75% early, 22.5% mid, and 48.75% late stage. Data were collected on anthropometric measurements (including BMI, waist and hip circumference, waist-to-hip ratio, body fat, and visceral fat), dietary intake (via 24-hour recall and the Food Frequency Questionnaire [FFQ]), and socioeconomic background. The data were analyzed using IBM SPSS Statistics version 22. The findings of the present study revealed that the mean age at menopause was 47 years. Participants had an average height of 153.59 cm (± 6.09), a mean weight of 62.76 kg (± 12.32), and a mean BMI of 26.47 kg/m² (± 4.23), classifying them as obese based on Asia-Pacific BMI cut-off values. The average total body fat was 36.40% (SD = 4.71), and the average visceral fat level was 10.11% (SD = 4.42), indicating elevated adiposity. Central obesity was common, with a mean waist circumference of 90.06 cm, hip circumference of 103.16 cm, and a waist-to-hip ratio (WHR) of 0.872. Dietary pattern analysis based on FFQ data indicated a predominant intake of carbohydrate-rich foods (42%), with low consumption of oily foods, sugary foods, and fruits (each 4%). Significant differences in fruit ($p = 0.038$) and sugary foods ($p = 0.043$) intake were found across postmenopausal stages, with lower consumption in the late stage. A high prevalence of overweight (78%) and obesity (58%) was observed within the study population, alongside a significant burden of NCDs. Late postmenopausal women showed higher obesity indicators, highlighting the need for stage-specific diet and lifestyle interventions to reduce metabolic syndrome risk. Expansion of this research into a larger, multi-district study incorporating a control group is recommended to enhance generalizability and guide postmenopausal public health strategies in Sri Lanka.

Keywords: Post-menopause, dietary patterns, anthropometric measurements, NCDs, obesity and diabetes

Assessment of Antioxidant Activity by Hydrogen Peroxide Assay for Combined Herbal Formulations of *Cinnamomum verum, Curcuma longa, and Ocimum tenuiflorum* Within the Non-Toxic Range as Assessed by Brine Shrimp Lethality Assay

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Medicinal plants have been utilized globally for centuries to treat infectious and non-infectious diseases, and their therapeutic potential has been validated by scientific research. *Cinnamomum verum* bark, *Curcuma longa* rhizome, and *Ocimum tenuiflorum* leaves are well documented for their individual antioxidant activity, particularly their ability to scavenge reactive oxygen species such as hydrogen peroxide (H_2O_2), an immediate inducer of oxidative stress and cellular damage. The study is novel in evaluating the synergistic antioxidant capacity of a combined aqueous and ethanolic extract of these three herbs using the hydrogen peroxide scavenging assay, in a non-toxic concentration range established by the brine shrimp lethality test. The study was conducted under a controlled in vitro laboratory setting using conveniently sampled plant materials known for their individual antioxidant properties. Authenticated plant materials were air-dried, powdered, and macerated separately in ethanol and distilled water (1:5 w/v). Aqueous and ethanolic extracts were mixed and evaporated to obtain a crude extract. Herb powders were mixed in a 1:1:1 ratio to provide a combined extract, and one gram of it was dissolved in 10 mL of distilled water. Fifteen two-fold serial dilutions (5×10^4 to 3.013 µg/mL) were prepared and tested for toxicity using the brine shrimp lethality test. The non-toxic concentrations were used for antioxidant assays. Reaction mixtures containing phosphate buffer, H_2O_2, and the combined extract or ascorbic acid (standard) were incubated at room temperature for 10 minutes, and absorbance was measured at 300 nm. GraphPad Prism 10.4.1 analysis indicated dose-dependent hydrogen peroxide scavenging. The extract exhibited maximum scavenging activity of 10% at 3125 µg/mL, compared to 14% for the standard. Mean values were 4.004% (extract) and 4.606% (standard) with standard deviations of 3.715% and 4.033%, respectively. The LC_{50} value of the brine shrimp assay was 3354 µg/mL, which indicates moderate toxicity. Despite expectations of synergy, the combined extract showed reduced efficacy compared to individual herbs, possibly due to antagonistic interactions, suboptimal ratios, or interference with bioavailability, highlighting that synergy in herbal mixtures is not guaranteed. Careful assessment of herb–herb interactions is crucial in formulating effective polyherbal antioxidants.

Keywords: Brine shrimp lethality assay, toxicity, *Cinnamomum verum*, *Curcuma longa*, *Ocimum tenuiflorum*, hydrogen peroxide scavenging assay

Assessment of Cardiac Autonomic Function in Young Adults with a Positive Family History of Hypertension

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Having a positive family history of hypertension (+FHH) is a major risk factor for developing hypertension. However, the mechanisms contributing to this increased risk are not fully elucidated. The autonomic nervous system plays an integral role in the regulation of cardiovascular function, and autonomic dysregulation is known to contribute to the development of hypertension. Whether autonomic dysregulation is a precursor of hypertension in individuals with a family history of hypertension has not been clearly established. Therefore, we aimed to test the hypothesis that young, normotensive adults with a +FHH would exhibit impaired cardiac autonomic functions compared to normotensive, age-matched adults with a negative FHH (-FHH). Nineteen normotensive adults with +FHH (median age = 27 [interquartile range, IQR:26-28] years) and nineteen adults with -FHH (age = 27 [27-29] years) underwent the following standard cardiac autonomic tests: head-up tilt test (HUT), deep breathing test (DBT), Valsalva manoeuvre (VM), and 30% isometric handgrip test (HGT). Heart rate (ECG) intermittent blood pressure, and respiration (pneumobelt) were continuously recorded during all tests while grip force was also measured during the HGT. Standard autonomic function metrics for the above tests were calculated. The two groups were compared using an independent sample t-test (mean ± SD) or Mann-Whitney-U test (median [IQR]). Resting heart rate, systolic blood pressure and diastolic blood pressure (DBP) were not different between the two groups ($p > 0.05$ for all). HUT-postural index ($p = 0.789$) was not different between the two groups. DBT-delta heart rate ($p = 0.337$) and Expiratory: Inspiratory ratio ($p = 0.618$) was also not different between groups. Similarly, the VM-Valsalva ratio ($p = 0.186$) and the HGT-maximum DBP difference ($p = 0.209$) were not different between +FHH and -FHH group. These findings indicate that cardiac autonomic functions do not appear to be affected in young, normotensive adults with +FHH. Whether cardiac autonomic functions would be altered in older individuals with a +FHH prior to development of hypertension needs to be investigated.

Keywords: Cardiac autonomic tests, parental hypertension, blood pressure regulation

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Assessment of Dietary and Lifestyle Risk Factors Associated with Urolithiasis: A Cased-Based Cross-Sectional Study in Matara District, Sri Lanka

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Urolithiasis, commonly known as urinary stone disease, is a multifactorial disorder influenced by a range of determinants including physiological, dietary, environmental, and genetic factors. The prevalence of urolithiasis is rising in tropical countries like Sri Lanka. This study aimed to investigate the dietary and lifestyle risk factors contributing to the formation and recurrence of urinary stones among patients attending the District General Hospital Matara in the Southern Province of Sri Lanka. A pre-validated structured questionnaire, which was designed based on previous research and expert input, was used to collect data on demographic and clinical characteristics, hydration status, urinary symptoms, dietary habits (including salt, protein, oxalate, and caffeine consumption), lifestyle, comorbidities, and family history of urolithiasis. After obtaining ethical clearance, the questionnaire was pilot-tested for readability, reliability, and relevance prior to deployment. Among 100 diagnosed urolithiasis patients, the majority were male (72%) and aged between 35 and 60 years. Key risk factors identified included low daily water intake (≤ 1.5 L) in 90% of patients, a high-salt diet (61%), and regular intake of oxalate-containing foods (74%). Additionally, many patients reported symptoms of dehydration and comorbid conditions such as hypertension and diabetes. Statistical analysis using chi-square tests revealed significant associations between dietary behaviors and stone formation, with 49% of patients experiencing recurrent stones. These findings emphasize the significant role of modifiable dietary and hydration factors in urolithiasis development and recurrence. The use of structured, validated assessment tools offers valuable insight into the risk profiles of urolithiasis patients, and provides a foundation for the development of evidence-based interventions to prevent and manage stone recurrence, particularly in endemic regions.

Keywords: Urolithiasis, urinary stones, dietary risk factors, hydration, recurrence

Association between Abdominal Aortic Calcifications and Renal Calculi

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Cardiovascular diseases (CVD) remain a leading cause of death worldwide. Early diagnosis of the disease significantly reduces both morbidity and mortality. Abdominal aortic calcifications (AAC) is one of the valuable indicators in assessing coronary artery disease, a form of CVD. Research indicates a potential association between AAC and renal calculi formation, as individuals with renal stones show a higher incidence of AAC. Non-contrast computed tomography (NCCT) of the kidney-ureter-bladder (KUB) region and abdomen, commonly used for diagnosing renal calculi, has emerged as a practical tool for evaluating AAC as well. This retrospective case-control study aimed to assess the relationship between AAC and renal calculi by analyzing 852 NCCT images of KUB and abdomen performed between 1st of July 2023, and 1st November 2024, in two major hospitals in the Northern Province. The study population consisted of 426 cases with AAC and 426 controls without AAC, involving both male and female individuals aged 35 to 84 years. Each group was further categorized based on the presence or absence of renal calculi. Statistical analysis using the chi-square test and binary logistic regression was employed to explore the relationship between AAC and renal calculi. Interestingly, renal calculi were more prevalent among individuals without AAC (35.2%) compared to those with AAC (28.9%), and this difference was statistically significant ($p = 0.047$). Logistic regression revealed that in individuals younger than 65 years, the presence of renal calculi was significantly associated with higher odds of AAC (OR = 1.428, $p = 0.046$), suggesting a meaningful relationship in this age group. However, no significant association was found in individuals older than 65 years (OR = 1.073, $p = 0.885$). Additionally, gender-based differences in AAC occurrence were not statistically significant (OR = 1.415, $p = 0.063$). In conclusion, this study indicates that renal calculi are significantly associated with AAC among individuals under 65 years of age, while no such relationship is evident in older individuals. The results underscore the importance of further investigations using comprehensive and longitudinal study designs to better understand the clinical implications of this association and to enhance early detection strategies for cardiovascular conditions.

Keywords: Abdominal aortic calcifications, renal calculi, cardiovascular disease

Association between Nutritional Knowledge, Attitudes, and Practices of Food Labels and Cardiovascular Disease Risk, Based on Anthropometric and Physiologic Measurements (Body Mass Index, Waist Circumference, Systolic and Diastolic Blood Pressure) Among Undergraduates of University of Peradeniya

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Cardiovascular diseases (CVD) are the main cause of death globally. Poor eating habits significantly increase the risk of CVD both in young adulthood and later in life. University students often develop poor dietary habits. One of the interventions to reduce CVD risk is adopting a healthy diet pattern from an early age. Information provided on food labels leads to healthier food choices among consumers. Hence, the study aims to assess the association between nutritional knowledge, attitudes, and practices of food labels and cardiovascular disease risk, based on anthropometric and physiologic risk factor measurements (BMI, Waist Circumference, Systolic and Diastolic Blood Pressure) among undergraduates of the University of Peradeniya. This study was a descriptive, cross-sectional, quantitative study conducted among 427 undergraduates from nine faculties of the University of Peradeniya in 2024. Data on socio-demographic profiles, nutritional knowledge, attitudes, and practices on food labels were collected using a pre-tested Google Form. Anthropometric data of participants were measured by standardised methodology, and blood pressure was measured using a digital sphygmomanometer. The collected data were analyzed using descriptive statistics and chi-square test using SPSS version 25. A p-value less than 0.05 was considered statistically significant. The mean age (± SD) of the study participants was 24 (24.22 ± 1.748) years. The majority of participants (n = 254, 59.5%) were within the normal BMI range. Based on Waist Circumference (WC), female participants (n =105, 24.6%) were at a higher risk of developing CVD than male participants (n = 6, 1.4%). The majority of participants had normal Systolic (SBP) and Diastolic Blood Pressure (DBP). There was a significant association between certain CVD risk factors, such as WC in females and SBP, with nutritional knowledge, attitudes, and practices of food labels ($p < 0.05$). No significant association was found between BMI, and WC in males with nutritional knowledge, attitudes, and practices of food labels ($p > 0.05$). Knowledge and attitudes of food labels showed a significant association with DBP ($p < 0.05$), whereas practices of food label usage showed no significant association with DBP ($p > 0.05$). These findings emphasise the gender-specific health education and suggest that improving nutritional knowledge and encouraging the proper use of food labels could help reduce CVD risk among young adults.

Keywords: Nutritional knowledge, attitudes, practices, food labels, cardiovascular diseases

Association Between Nutritional Status and Quality of Life Among Cancer Patients in the Ratnapura Area

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Cancer is a complex global health challenge and the second leading cause of death worldwide. Malnutrition is prevalent among cancer patients and reduces quality of life (QoL). However, in Sri Lanka, limited studies have been conducted to assess nutritional status and QoL to improve patient care strategies in oncology settings. This study aims to determine the relationship between nutritional status and QoL among cancer patients at the Teaching Hospital (TH) Ratnapura. This descriptive cross-sectional study was conducted in the TH Ratnapura. A total of 200 cancer patients were randomly selected from those admitted to the Oncology Wards and those attending the Oncology Clinic, based on inclusion and exclusion criteria. Nutritional status was assessed using the validated PG-SGA SF, while QoL was measured using the validated EORTC QLQ-C30. Socio-demographic data were collected through a pre-tested general questionnaire, and dietary intake was assessed using a 24-hour dietary recall. All questionnaires were administered by trained interviewers. Data were analyzed using the standard scoring manual, descriptive statistics and ANOVA. The relationship between QoL domains and nutritional status was determined using the Chi-square test. Of the 200 participants, 67% were female and the mean age was 58.91 (± 12.36). Among the 11 types of cancers, the most prevalent was breast cancer (30.0%), followed by gastrointestinal cancers (23.0%) and head and neck tumors (21.0%). Based on PG-SGA SF, 47% were severely malnourished (SM), 27% moderately malnourished, and 26% well-nourished. Gastrointestinal (13.5%), head and neck (11.0%), and breast cancers (10.0%) were the most common cancer types among SM patients. The dietary data showed that intake across all food groups was below the recommended servings among SM patients. The mean global QoL score was 55.1 ± 19.2, below the reference value (> 61.3), indicating impaired QOL. All the dimensions of the functioning scale and the symptoms scale had low and high mean scores, respectively indicating poor QOL. The association between the overall QOL and different nutritional stages ($p < 0.001$) and all the dimensions of the functional scale and symptoms scale except diarrhea ($p < 0.05$) were statistically significant. ANOVA results indicated significant differences across nutritional status groups for all QoL scores ($p < 0.05$). The study reveals a high prevalence of malnutrition among cancer patients and its strong significant association with poor QOL. The findings emphasize the need for routine nutritional assessment and targeted interventions in oncology care to enhance patient well-being, QOL, and clinical outcomes. They also highlight the important role of policymakers in strengthening nutrition services to improve patient outcomes in Sri Lanka.

Keywords: Cancer, nutritional status, QOL, PG-SGA SF, EORTC QLQ-C30

Association of Clinical and Behavioural Factors with Oral Levothyroxine (LT-4) Dose of Primary Hypothyroid Patients in Sri Lanka: A Matched Case Control Study

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Hypothyroidism is a prevalent endocrine disorder that requires treatment with levothyroxine (LT-4). Levothyroxine dose is typically ranging from 1.5-1.7 µg/kg/day to achieve a serum thyroid stimulating hormone (TSH) level of 0.4-4.0 mIU/L (reference range). Once the LT-4 dose is adjusted to obtain the target TSH level, it remains stable in most patients. However, around 10% of the patients require unusually high doses of LT-4 and frequent dose adjustments. This study aimed to determine the association of clinical and behavioural factors with the oral levothyroxine dose requirement of primary hypothyroid patients in Sri Lanka. The study was conducted as a matched case-control study, recruiting primary hypothyroid patients (18-65 years) who visit the diabetes and endocrinology clinic at the National Hospital, Kandy, Sri Lanka. The cases were defined as the patients receiving an LT-4 dose > 1.7 µg/kg/day and controls as the patients receiving an LT-4 dose ≤ 1.7 µg/kg/day with normal TSH, for the preceding three months. A total of 95 cases and 95 controls who are matched in terms of age, sex and Body Mass Index (BMI) were recruited. An interviewer-administered questionnaire was used to collect data from the participants (n = 190). Data was analysed using the SPSS software. The age group 42-52 years consisted of the majority of hypothyroid patients (31.6%), and the female individuals were more prone to primary hypothyroidism than males (92.6%). There was no statistically significant association of family history, patient compliance (assessed using Medication Adherence Report Scale (MARS-5), ©Professor Rob Horne), and medication storage conditions with LT-4 dose requirement ($p > 0.05$). Notably, there was a significant association of the intake of iron supplements (OR = 0.081 (95% confidence intervals (95% CI), 0.10 - 0.64), frequent intake of gastrointestinal medicines (OR= 3.8 (95% CI, 1.55-9.50) and iodine rich food (OR = 2.9 (95% CI, 1.21-6.97) with LT-4 dose requirement ($p < 0.05$).This study concludes that dietary habits, gastrointestinal medicines such as proton pump inhibitors and iron supplement intake should be considered when optimizing the levothyroxine dose and patient awareness should also be improved. Furthermore, additional research and genetic studies are recommended in this field in Sri Lanka, as genetic variations may significantly influence thyroid homeostasis.

Keywords: Hypothyroidism, levothyroxine, dose requirement, factors

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Awareness and Compliance with the Needle Stick Injury Management Protocol at the Dental Teaching Hospital, Peradeniya

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Needle stick injuries (NSIs) remain a significant occupational hazard globally particularly due to the risk of transmission of blood-borne pathogens. Therefore, strict adherence to universal precautions is essential for healthcare workers to minimize such risks. This cross-sectional descriptive study aimed to evaluate the incidence of NSIs, awareness and compliance of at-risk healthcare staff and trainee healthcare staff to the established protocol for managing NSIs at the Dental Teaching Hospital, Peradeniya. A cross-sectional descriptive study was carried out using a self-administered questionnaire which was distributed among dental surgeons, auxiliaries and undergraduate dental students who are at a possible risk of NSIs to assess awareness and compliance with the NSI protocol. Additionally, records of reported NSI incidents from 2020 to 2024 were reviewed and analyzed. Out of 274 respondents, 10% reported experiencing at least one NSI in the past 12 months, with the majority (61%) being dental undergraduate students. Half of the affected individuals followed the established protocol for the management of NSI, while the others failed to report. Notably, 20% of respondents were unaware of the existence of the NSI protocol at the hospital. Only 12 nurses out of 23 were aware of the above protocol. Although 80% of the participants were fully vaccinated against hepatitis B, only 21% had verified their antibody titers. Out of 16 dental surgery assistants 11 were not vaccinated against hepatitis B. Awareness of immediate actions following a NSI and proper sharps disposal was reported by 58%, whereas only 35% recognized the importance of reporting injuries from unused sharp instruments. However, only 39 NSI incidents were recorded between 2020 and 2024, in which eight incidents occurred within the last year. NSIs continue to be a prevalent yet under-reported among at-risk group working at the Dental Teaching Hospital. Awareness regarding prevention and management of NSI was also not adequate. Therefore, there is a clear need for improved awareness and adherence to established management protocols. Regular training and awareness programs need to be arranged to enhance knowledge and compliance related to NSI prevention and management.

Keywords: Needle stick injuries, dental, prevention, awareness

Awareness of Tuberculosis and the Standard Treatment Methods Among Nursing Undergraduates at the University of Peradeniya

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Tuberculosis is a communicable, notifiable disease that is treatable with proper care. Strict adherence is vital due to the lengthy treatment. Nurses play a crucial role in managing TB, making it important for nursing students to have a comprehensive understanding. This study aimed to assess the knowledge and awareness of tuberculosis and its standard treatments method among undergraduate nursing students enrolled at the University of Peradeniya. This study was a quantitative, cross-sectional study conducted among 178 undergraduate nursing students in all academic years of the Faculty of Allied Health Sciences, University of Peradeniya. Data collection was carried out for 3 months using a pre-tested, self-administered online questionnaire. The data analysis was conducted using SPSS version 26. The overall response rate was 100%, and to assess TB knowledge, participants' answers were marked correct or incorrect based on a standard manual. A cut-off was set using the overall mean percentage of correct answers. Students scoring above the mean were classified as "knowledgeable," while those below were labelled as having "low knowledge. The research found that 57.9% of nursing students exhibited adequate general awareness of TB. Additionally, 55.6% demonstrated adequate knowledge of treatment and management, while 44.4% exhibited notable knowledge deficiency. The Chi-Square test results revealed a significant correlation between academic year and tuberculosis knowledge levels among students. The study emphasizes significant knowledge deficiencies in TB awareness and management among nursing students, highlighting the need for improved education. It revealed significant gaps in knowledge among early academic years. While emphasizing the need for early training and addressing misconceptions in preparing students for effective TB care and management.

Keywords: Tuberculosis, DOT method, awareness, nursing student

Awareness on Nipah Virus Infection: A Cross-sectional Survey in Sri Lanka

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Nipah virus (NiV) outbreaks are reported predominantly in South and Southeast Asia. Despite its high mortality rate and potential for widespread transmission, public awareness regarding NiV infection remains understudied. This study assessed the awareness of NiV infection among the Sri Lankan population, focusing on prevalence, transmission, clinical features and prevention. An online self-reported questionnaire in English, Sinhala and Tamil was distributed via social media. It covered five sections; demographics, prevalence, transmission, symptoms and prevention with 27 questions. Responses were scored using a 5-point Likert scale from "Not at all aware" (1) to "Extremely Aware" (5). The questionnaire was partially validated through expert review (content validity index = 0.82, 10 experts) and pilot-tested among 30 individuals. Descriptive statistics was used to summarize the data. Awareness scores were calculated and compared between demographic characteristics using one-way ANOVA with Games–Howell post hoc test. Data were dichotomised into 'good' and 'poor' knowledge based on the cut-off awareness score. Binary logistic regression analysis was performed to assess the predictors of awareness. All analyses were done using MS Excel and MiniTab 21, considering $p < 0.05$ statistically significant. Among 425 participants, most were females (57%), employed (44%), aged 18–29 (67%), degree holders (45%) and residents of Central Province of Sri Lanka (42%). The overall awareness on NiV infection was significantly higher among females, participants aged 50 and above and those with postgraduate education ($p = 0.012$, < 0.001 and < 0.001, respectively). Prevention was the most understood topic, followed by transmission, prevalence and symptoms ($p < 0.001$). Participants aged 50 and above ($p = 0.132$) and with postgraduate education ($p = 0.236$) demonstrated moderate or better awareness across all categories tested. Higher education, older age and female gender had high likelihood for greater awareness on NiV infection. This study identified gaps in NiV awareness in Sri Lanka, with significant disparities across demographic groups. Higher education levels, older age and female gender were associated with better awareness. The findings emphasized the need for tailored educational initiatives, such as school-based health education, social media campaigns and collaboration with public health authorities, to improve understanding about NiV, particularly among younger and less-educated populations.

Keywords: Nipah, awareness, Sri Lankan, virus, spillover

Awareness on Nutrition and Sources of Dietary Information Among Female Breast Cancer Patients at a Tertiary Care Hospital in Sri Lanka

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Breast cancer patients often face dietary challenges following the disease and its treatments such as chemotherapy, radiotherapy, surgeries, or hormonal therapy. Dietary habits influence cancer prognosis and treatment outcomes highlighting the importance of adhering to a healthy lifestyle. However, dietary awareness among breast cancer patients in Sri Lanka remains limited. This study aims to assess the extent of the awareness on nutrition and the sources of dietary information among female breast cancer patients at National Hospital Kandy. This study was a quantitative, cross-sectional study conducted among 385 women diagnosed with breast cancer who were currently undergoing treatment. The convenience sampling technique was used to select the participants and the study was conducted at the oncology clinic of National Hospital Kandy. Data was collected using a pre-tested, self-administered questionnaire which was designed based on extensive literature review and opinions of experts in breast cancer management. SPSS version 26 was used to analyse the data. Out of 385 participants, a majority (60%) agreed (fairly or highly) that proper nutrition can improve cancer prognosis. Most participants (n = 213, 55.3%) had not sought information on nutrition from anyone. Those who gathered nutrition-related information (n = 172, 44.7%) mainly relied on family/friends (85.5%), peers (83.2%), and healthcare professionals (Oncologists - 62.4%, General practitioners - 52%, Nurses - 32.9%). Most respondents agreed with consuming citrus fruits (93.5%), carrot (95.6%), manioc (99.5%) and pomegranate (99.7%) and 97.4% disagreed with consuming alcohol following the diagnosis. Participants emphasized the importance of prescribing specific diets (85.2%) and enhancing knowledge on weight management and dietary well-being (77.7%). The patients with breast cancer have an average awareness of dietary benefits. There is a need for conducting awareness programs during their follow-ups and more involvement of healthcare professionals towards providing education and guidance.

Keywords: Breast cancer, nutritional awareness, information sources, diet

Awareness Related to Sexual Health Among New Entrants of the Faculty of Science, University of Peradeniya

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Sexually transmitted infections (STIs) and Human Immunodeficiency Virus /Acquired Immune Deficiency Syndrome (HIV/AIDS) continue to pose major global public health challenges. The WHO reports over one million daily STI cases, primarily among adults aged 15–49, with 39 million people living with HIV in 2022. Hence, adequate sexual health awareness is essential to control STIs but research among young Sri Lankan adults is limited. Therefore, this pre- post intervention study aimed to assess and compare the baseline and post-intervention sexual health knowledge among the University of Peradeniya entrants. Data collection involved an initial survey to assess baseline knowledge, using an experts validated structured questionnaire among new entrants in a single faculty at the University of Peradeniya. This was followed by an awareness program, which included interactive lectures and demonstrations led by experts in medicine. A post-intervention survey, using the same questionnaire, assessed immediate knowledge changes. Informed consent was obtained from all participants prior to data collection. Among participants, awareness of communication, check-ups, and protective measures for sexual well-being, increased from 78.3% to 80.6% post-program. Awareness that STIs can be transmitted in absence symptoms increased from 72.6% to 97.2%. Improper condom disposal was noted, with 67% discarding them in trash bins, risking STI transmission. Awareness of hormonal contraceptives increased from 32.1% to 80.6% and 86.8% knew emergency contraception is effective within 72 hours. Even before awareness program, most participants (97.2%) recognized the need for immediate testing and treatment after potential STI and HIV/AIDS exposure. Further, following a condom use demonstration, 98% successfully applied it to a penile model on their first attempt. Pre-test responses were from 106 participants, but post-test responses were limited to 36 due to time constraints after the program extension. Hence, further statistical analyses were not conducted due to insufficient post-intervention responses. The findings suggest that, although most participants possess fundamental knowledge of sexual health, STIs and HIV/AIDS and prevention, gaps remained in safe sex practices, condom disposal and contraceptive use. Therefore, targeted educational interventions are necessary to enhance awareness and promote safer sexual health practices within the young adults.

Keywords: Contraceptive awareness, public health education, sexual health, sexually transmitted infections

Beta-Thalassemia Traits Presenting as Disproportionate Anaemia in Chronic Kidney Disease of Unknown Aetiology (Ckdu): Single Centre Experience in Girandurukotte

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Sri Lanka reports carrier prevalence of 9.9% for α^{+}-thalassemia and 2.5% for β-thalassemia. Although β-thalassemia carriers are typically asymptomatic, they may develop severe anaemia when coexisting conditions such as chronic kidney disease. This comorbidity can result in resistance to conventional therapies, including hematinics and erythropoietin. This study presents the findings from a cross-sectional analysis of patients with coexisting β-thalassemia trait and CKDu, who presented with disproportionate anaemia. The study aims to determine the prevalence of β-thalassemia trait among the CKDu patient cohort in Girandurukotte who remain anaemic despite standard erythropoietin and hematinic therapy, to characterize their haematological indices alongside the renal function, and to highlight the importance of implementing tailored screening and management strategies for this subgroup. All confirmed CKDu patients attending the Girandurukotte renal clinic whose haemoglobin (Hb) remained below anaemia thresholds (men < 13 g/dL, women < 12 g/dL) and whose MCV was < 80 fL after ≥ 3 months of combined erythropoietin and haematinic therapy were screened. Blood samples from 44 patients were screened for β-thalassemia by HPLC (HbA_2 > 3.5%). Complete blood counts provided mean corpuscular volume (MCV); renal function was calculated using the CKD-EPI equation. Ethical approval was granted by the Faculty of Medicine, University of Peradeniya Ethics Review Committee (Ref. 2022/EC/02). Total 39 out of 44 patients (88.6%; 21 males, 18 females) reported HbA_2 levels above 3.5%, confirming the diagnosis of β-thalassemia trait. Laboratory parameters had mean Hb 9.2 g/dL (SD 1.3; range 6.0–11.7), mean MCV 65.5 fL (SD 3.2; range 60.0–73.6), and estimated glomerular filtration rate values ranging 12.3–63.2 mL/min/1.73 m² representing stages of CKDu (2-5). This study underscores the coexistence of β-thalassemia trait and CKDu as a contributor to hypochromic, microcytic anaemia that is unresponsive to conventional treatment. The findings emphasize the need for routine screening for hemoglobinopathies in patients with CKDu. Early identification enables tailored management by avoiding unnecessary escalation of erythropoietin or iron dosing, facilitating genetic counselling, and development of targeted treatment protocols for unique patient subgroups.

Keywords: β-thalassemia, CKDu, anemia, iron overload, hemoglobinopathy

Bladder Filling Volume Variation in Computed Tomography (CT) Simulation for Prostate Cancer Intensity Modulated Radiation Therapy (IMRT) and Its Correlation with Estimated Glomerular Filtration Rate (eGFR)

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Precise bladder volume management throughout the Computed Tomography Simulation (CT-Sim) is an important requirement for prostate cancer patients who are undergoing Intensity Modulated Radiation Therapy (IMRT). The estimated Glomerular Filtration Rate (eGFR), an indicator of renal function, may influence bladder filling dynamics. This study focused on investigating relationship between bladder filling volume variation during CT-Sim for prostate cancer IMRT and its correlation with eGFR, quantifying bladder filling volume variation among prostate cancer patients and evaluating association between bladder filling volume variation and changes in e GFR levels. This prospective cohort study was conducted at the National Cancer Institute, Maharagama, Sri Lanka, with 92 prostate cancer patients. The patient was asked to micturate and was administered 350 ml of water orally 30 minutes prior to the CT-Sim. Bladder volume was contoured and measured using 3D slicer software. The eGFR was calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. Data on patient age, body mass index (BMI) and Gleason score were collected. Statistical analyses were performed using correlation analysis, Shapiro-Wilk tests and Kruskal-Wallis tests using SPSS 25.0. The mean bladder filling rate was 1.59 ± 1.34ml/min, with significant variability and the mean of eGFR was 77.13 ± 14.992 ml/min/1.73 m^2. A weak positive correlation (spearman's rho = 0.277, p = 0.008) between bladder filling rate and eGFR was observed. The variability of bladder filling rate was not constant across different eGFR levels. Several outliers were observed. Bladder filling rate has shown weak negative correlation with BMI (-0.047), weak positive correlation with Gleason score (0.11) and weak negative correlation with age (-0.203). There were statistically significant differences in bladder filling rate across different eGFR groups (p = 0.005). The usage of a simple, universally applicable bladder protocol solely is insufficient to maintain reproducible and precise bladder volume. Hence, onboard imaging (bladder scanning/ Cone Beam CT) is recommended with a tailored bladder protocol that considers broader physiological and behavioural variables, such as patient hydration habits, environmental conditions and compliance with instructions.

Keywords: Bladder filling volume, computed tomography simulation, intensity modulated radiation therapy, estimated glomerular filtration rate

Bone Mineral Density Values in Sri Lankan Adults: Establishing Reference Standards for the Hip and Lumbar Spine

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Normative bone mineral density (BMD) data are lacking for Sri Lankan population. Current clinical assessments often rely on Caucasian reference standards, which may not reflect ethnic and anthropometric differences. This study aimed to establish age- and sex-specific BMD reference values for lumbar spine and hip in Sri Lankan adults. We retrospectively analyzed BMD data from 11,925 adults (4,549 men; 7,376 women), aged 20–80 years. Data were collected during preventive health screenings between January 2015 and December 2024 at five private hospitals in Western Province. Subjects with medications and conditions affecting bone metabolism were excluded. BMD was measured using Hologic dual-energy X-ray absorptiometry (DXA) systems with phantom-based calibrations and regular quality controls to ensure accuracy. These criteria were applied to ensure the reliability of normative BMD data. Demographic and clinical information gathered via standardized questionnaires. Statistical analysis performed using Python. Participants were stratified by the decade to examine age-related trends. BMD values were consistently higher in men than in women across all age groups. Peak lumbar spine BMD occurred at 31–40 years in both sexes. In women, lumbar BMD declined significantly after age 40, reaching the lowest levels at 71–80 years. In men, lumbar BMD declined after 40 but showed a secondary increase after age 60. Hip BMD declined progressively in both sexes after age 50. Spinal BMD showed moderate positive correlation with weight ($r = 0.47$) and height ($r = 0.39$) ($p < 0.001$). Among postmenopausal women, years since menopause correlated negatively with BMD at spine ($r = –0.46$), left hip ($r = –0.39$), and right hip ($r = –0.44$) ($p < 0.001$). Among women, strongest correlation between weight and hip BMD occurred in 41–50 age group. Cubic polynomial regression models captured the nonlinear trends of BMD variation in all three scanned regions across age groups. These findings demonstrate significant deviations from Caucasian BMD references. Establishing population-specific BMD norms will enhance diagnostic accuracy and guide clinical management of osteoporosis and osteopenia by accounting for ethnic and environmental differences that are not reflected in manufacturer-provided reference data, which is particularly important for postmenopausal women and elderly individuals.

Keywords: Bone mineral density, DXA, normative data, Sri Lanka, population reference standards

Bridging the Healthcare Gap by Enhancing Rural Well-Being in Sri Lanka Through Digital Innovation and User-Centric Solutions: 'SahanaSuwa'

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In Sri Lanka, nearly 30% of the rural population experiences significant barriers to accessing quality healthcare, disproportionately affecting the elderly, persons with disabilities, and low-income families. Ensuring equitable healthcare access and promoting well-being is essential for sustainable development. This study aims to address this gap by exploring how digital innovation and user-centered design can support inclusive healthcare delivery in underserved regions such as the North Central and Sabaragamuwa provinces. The study followed a qualitative exploratory design. Semi-structured interviews were conducted with a total of 100 participants, including rural residents, healthcare professionals, and community volunteers. The participants were selected using purposive sampling to ensure representation from various stakeholder groups. The data collected were analyzed using thematic analysis to extract key insights related to challenges in healthcare access, user experience needs, and potential digital interventions. Findings revealed that the major barriers to healthcare access include the uneven distribution of primary healthcare services, low digital literacy, and limited understanding of healthcare systems among rural populations. Based on these insights, a digital solution named 'SahanaSuwa' was conceptualized. 'SahanaSuwa' is a web-based and mobile-accessible platform that facilitates low-cost and accessible healthcare delivery through features such as virtual clinics, online chat consultations with certified professionals, and scheduling tools for community health programs. The platform also supports community engagement by enabling volunteer participation and donations while offering skill development opportunities for health volunteers. 'SahanaSuwa' uses a user-centric design approach to personalize services according to geographic and demographic needs, improving both communication and trust between patients and healthcare providers. This study concludes that integrating modern digital solutions with grassroots healthcare efforts can significantly improve healthcare access, education, and engagement in rural Sri Lanka. The proposed solution offers a scalable, sustainable model for other underserved regions facing similar challenges.

Keywords: Rural healthcare, digital innovation, user experience (UX) engineering, accessible healthcare, SahanaSuwa

Ceylon Cinnamon Bark Oil Inhibits *In Vitro* Growth of *Prototheca zopfii* Isolated from Four Dogs Diagnosed with Disseminated Protothecosis

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Prototheca zopfii is a ubiquitous, achlorophyllous, pathogenic microalga that causes disseminated protothecosis in dogs, a fatal disease with limited treatments due to its resistance to conventional antibiotics and most antifungals. Following a recent cluster of fatal canine cases in Sri Lanka, this study aimed to determine the efficacy of selected essential oils available in Sri Lanka, including Ceylon Cinnamon bark and leaf oil (*Cinnamomum zeylanicum*), Clove (*Syzygium aromaticum*), Citronella (*Cymbopogon nardus*), Nutmeg (*Myristica fragrans*), and Black pepper (*Piper nigrum*) against *Prototheca* isolates. Fecal samples from infected dogs reported to the Veterinary Teaching Hospital, Peradeniya, Sri Lanka, were cultured on Potato Dextrose agar (PDA) supplemented with chloramphenicol for 24-48 hours and characterized by PCR using genus-specific and species-specific primers. The minimum inhibitory concentrations (MICs) of essential oils were determined using microdilution in 96-well microtiter plates with two-fold dilution series. The cytological changes of *Prototheca* cells in each concentration of essential oils were also observed by light microscopy under 40× magnification using wet mount slides and Gram-stained smears on albumin-coated slides. All experiments were triplicated. Four *Prototheca* isolates were recovered, and all were confirmed as *P. zopfii* by PCR. Among the tested essential oils, only cinnamon bark and leaf oil exhibited an anti-algal effect with corresponding MICs of 1.25 µL/ mL and 5 µL/ mL, respectively. Thus, the highest anti-algal efficacy of cinnamon bark oil was likely due to its high content of trans-cinnamaldehyde. Cytological alterations observed in *Prototheca* exposed to Cinnamon oils suggest that sequential loss of viability along the concentration gradient is most likely to result from lysis of the outer capsule of the organisms. These findings indicate that Ceylon cinnamon oil can be used as a promising alternative therapeutic for canine protothecosis.

Keywords: *Prototheca zopfii*, canine protothecosis, Ceylon cinnamon oil, essential oils

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Characterization of Nutritional Composition, Functional Attributes and Glycemic Index in Three Commercially Available Breads: White, Finger Millet and Multigrain

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Bread is a staple in many human diets and currently, new formulations are gaining popularity due to the health-conscious nature of the consumers. This study investigated the nutritional composition, glycemic index (GI) and functional properties of three commercially available bread types: white, finger millet and multigrain bread. Standard AOAC methods were employed to analyze the nutritional composition of breads. Total phenolic content (TPC) and antioxidant activity were assessed using the Folin–Ciocalteu reagent method and 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. Eighteen non-diabetic healthy individuals with a BMI of 21.2 ± 1.7 kg/m^2 participated in GI studies after a 10-12 hour fasting period. The studies were conducted utilizing the ISO 26642:2010 method, measuring the blood sugar response over two hours from the point of consumption of bread samples containing 50g of available carbohydrates. As per the results, three breads differed significantly ($P < 0.05$) in terms of certain nutritional properties. White bread showed the lowest moisture (29.10 ± 0.14%), fat (2.40 ± 0.14%) and ash content (1.30 ± 0.14%) along with the highest protein content (8.10 ± 0.14%). Conversely, finger millet bread and multigrain bread contained 7.20 ± 0.14% and 5.40 ± 0.00% protein and 3.20 ± 0.14% and 4.80 ± 0.14% fat, respectively. Dietary fiber content was not significantly different ($P > 0.05$) between multigrain bread (3.40 ± 0.14%) and finger millet bread (3.10 ± 0.14%); however, both were significantly higher ($P < 0.05$) than that of white bread (2.10 ± 0.14%). The antioxidant activities were 0.13 ± 0.04%, 10.09 ± 0.10% and 7.76 ± 0.46% for white, finger millet and multigrain bread in that order. The TPC was 3.05 ± 0.39mg GAE/g for white bread, 3.53 ± 0.05mg GAE/g for finger millet bread and 4.41 ± 0.00mg GAE/g for multigrain bread, indicating that it was significantly higher ($P < 0.05$) in multigrain bread. The GI for white, finger millet and multigrain bread were 63.93 ± 8.14, 53.50 ± 4.81 and 45.78 ± 4.14, respectively. In conclusion, finger millet and multigrain bread were classified as low-GI bread compared to medium-GI white bread, demonstrating their suitability for better blood sugar control among consumers.

Keywords: Glycemic index, antioxidant activity, total phenolic content, bread, blood sugar response

Acknowledgement: *The financial support and provision of bread for the study by AB Mauri Lanka (PVT) LTD are gratefully acknowledged.*

Cinnamon Bark Oil (*Cinnamomum zeylanicum*) Inhibits the Growth of *Prototheca zopfii* at Canine Gastric pH

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Protothecosis is a potentially severe and often fatal disease in dogs, caused by the parasitic algal genus *Prototheca*. The condition typically presents as a disseminated infection, primarily occurring via ingestion of contaminated food or water. Among these species, *Prototheca zopfii* is one of the most frequently reported causes of disseminated protothecosis in dogs. Antifungal agents and/or antibiotics have shown limited efficacy as treatment options for disseminated protothecosis in dogs. According to previous studies, *P. zopfii* can survive and proliferate in environments with pH levels ranging from 5 to 12. The gastric pH in dogs is typically acidic, ranging from approximately 2.0 to 3.5, and the average gastric transit time is between 2-5 hours. It is currently unknown whether *P. zopfii* can survive canine gastric pH for the duration of gastric transit. This study aimed to assess the viability of four *P. zopfii* isolates from dogs diagnosed with disseminated protothecosis after exposure to cinnamon bark oil *(Cinnamomum zeylanicum)* for 5 hours and canine gastric pH (pH 2.0). A known concentration (OD 600 of 0.5 in 3 mL tryptic soy broth) of pre-characterized *P. zopfii* isolates was incubated for 5 hours, both with and without Cinnamon bark oil (1 µL/mL), at pH 2.0. Aliquots were collected from both test and control groups at one-hour intervals, streaked onto Potato Dextrose Agar plates, and incubated for 24 hours. In all control samples, dense growth of *Prototheca* colonies was observed, whereas test samples treated with Cinnamon bark oil showed no colony formation by the end of the incubation period. The experiments were triplicated. These results indicate that the combination of gastric pH (pH 2.0) and cinnamon bark oil exerts a synergistic inhibitory effect on the growth of *P. zopfii*.

Keywords: *Prototheca zopfii*, canine gastric pH, cinnamon bark oil

Acknowledgment: *University of Peradeniya Multi-Disciplinary Grant #505 for funding, and Samagi Organics (Pvt) Ltd for donating organic cinnamon bark oil are acknowledged.*

Clinicopathological Predictive Score for DNA Mismatch Repair Deficient Colorectal Carcinoma in Sri Lanka

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DNA mismatch repair deficient (dMMR) colorectal carcinoma (CRC) occurs in Lynch syndrome and around 15% of sporadic CRCs. Detection of these patients' aids prognostication, management and familial screening. While universal testing is now mandatory in many developed countries, resource limitations hinder it in Sri Lanka. This study investigated the prevalence of dMMR CRC in Sri Lanka and introduced a predictive score for CRC patients in our population. A cross-sectional analytical study was conducted on CRC patients from four tertiary care centres for two and half years. Haematoxylin and eosin-stained slides of colectomy specimens were assessed for histopathological features. Immunohistochemistry was performed for the four DNA mismatch repair proteins MLH1, MSH2, PMS2, and MSH6. Multivariate binomial logistic regression determined predictive variables. Of 185 patients, 104 (56.2%) were women. Mean age was 62.5 years (SD:11.8; range: 19-84). The prevalence of dMMR was 11.89% (n = 22). Multivariate analysis showed significant association with age < 60 years ($p = 0.001$), right sided tumour ($p=0.001$), family history of CRC (at least one 1st/2nd degree relative) ($p=0.029$), mucin percentage ≥ 20% ($p = 0.045$), solid region percentage ≥ 15% ($p = 0.021$), highest iTILs ≥ 3/HPF ($p = 0.001$), and Crohn-like peritumoral inflammation ($p = 0.005$). The cutoff value for the prediction of dMMR status was taken as ≥ 6 from a maximum value of 20 (sensitivity: 0.955, specificity: 0.682). This study suggests screening all CRC patients with the proposed predictive score to cost-effectively guide dMMR testing.

Keywords: Microsatellite instability, colorectal cancer, predictive score

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Coliform Contamination and Associated Risk Factors in Domestic Well Water Sources Within Gampaha District; A Preliminary Study

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Waterborne illnesses remain a serious public health concern in developing countries like Sri Lanka, where limited access to clean drinking water, inadequate sanitation infrastructure, and poor waste management practices contribute significantly to the transmission of diseases such as cholera, typhoid, dysentery, and various forms of diarrhoea. This study aimed to assess the level of coliform contamination in domestic well water sources in the Gampaha District, Sri Lanka and the potential risk indicators of coliform contamination of well water. In this cross-sectional study, water samples were randomly collected from 35 domestic wells. To assess potential risk factors, a structured checklist was simultaneously administered to one individual from each household. The water samples were analysed using the Most Probable Number (MPN) technique to detect coliforms. This was followed by two biochemical tests: culturing on MacConkey agar to assess lactose fermentation and on Eosin Methylene Blue (EMB) agar for the identification of Escherichia coli. Bacterial identification was based on colony morphology and growth characteristics. Data on potential risk factors of coliform contamination were analysed using the chi-square test. The findings revealed that a significantly high proportion of wells (94.7%, n=34; p=0.0078) were contaminated with coliform bacteria. Among these, 35.3% (n=12) of household well water sources were deemed unsafe for human consumption, exhibiting MPN values exceeding 150 per 100 ml. Based on morphological characteristics the isolated bacterial contaminants were identified as *Klebsiella* spp. (45.83%), *Enterobacter* spp. (27.08%), *Pseudomonas* spp. (14.58%), *Escherichia coli* (6.25%), and *Salmonella* spp. (6.25%). Key risk factors contributing to contamination included inadequate sanitation practices, improper waste disposal, close proximity of wells to septic tanks and toilet pits, lack of regular well maintenance, and environmental pollution from agricultural and industrial activities. This study highlights the urgent need to improve groundwater quality in Gampaha District by addressing key risk indicators such as poor well sanitation and environmental contamination, offering insights to promote safer water practices in rural Sri Lanka.

Keywords: Coliforms, contamination, groundwater, most probable number (MPN), waterborne illnesses

Combating Antimicrobial Resistance Through Education: A Pre-Post Intervention Study Among First-Year Allied Health Sciences Students

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Antimicrobial resistance (AMR) is a growing global health threat that undermines decades of progress in infectious disease management. Inappropriate antibiotic use drives AMR, highlighting the need for targeted educational interventions to promote responsible use. This study aimed to evaluate the impact of an educational intervention on improving knowledge and perceptions regarding AMR among first-year Allied Health Sciences (AHS) students, representing the disciplines of Nursing, Medical Laboratory Sciences, Pharmacy, Physiotherapy, and Radiography, with comparisons across these academic programs. A pre-post intervention study was conducted among all first-year AHS students of the University of Peradeniya using census sampling method. A structured questionnaire, developed from previous studies, was pre-tested and adapted to suit the Sri Lankan context. Participants completed the same questionnaire at three time points: pre-intervention, immediately after, and two weeks post-intervention. The intervention comprised a 10-minute video documentary and a printed leaflet. Phase 1 (pre- and immediate post-assessments) was conducted in person, while Phase 2 (two-week follow-up) was administered via Google Forms. Data were analyzed using chi-square tests, paired t-tests, and repeated measures ANOVA. Of 198 eligible students, 144 (73%) participated in Phase 1, and 65 (45% of Phase 1 participants) completed Phase 2. The 55% attrition was due to the voluntary nature of participation. The majority of participants were female (75%), and 88.2% reported no prior exposure to antibiotic awareness programs. Notably, 66% had used antibiotics within the past six months, often for non-bacterial illnesses such as fever (34%) and the common cold (25%). The mean knowledge score increased significantly from 19.81 ± 4.94 (pre-intervention) to 27.11 ± 5.36 (immediate post-intervention), with a slight decline to 24.58 ± 6.07 at follow-up. Differences between the time points were statistically significant ($p < 0.001$). Among disciplines, pharmacy students had the highest post-intervention scores (30.16 ± 4.83), while physiotherapy had the lowest (25.59 ± 4.54). The educational intervention significantly improved AHS students' knowledge and perceptions on AMR, with inter-disciplinary differences indicating the need for curriculum-tailored, periodically reinforced strategies for sustained impact.

Keywords: Educational intervention, antimicrobial resistance, healthcare students, antibiotics, awareness program

Comparative Analysis and Profiling of Risk Factors for CKDu Progression in Sri Lanka

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Chronic Kidney Disease of Unknown Etiology (CKDu) is a major public health crisis in Sri Lanka, disproportionately affecting rural agricultural communities. Despite extensive research, its precise causes remain unclear. This study explores the epidemiological, environmental, and biological risk factors contributing to CKDu progression using advanced statistical and machine learning techniques. The objectives are to determine key factors influencing CKDu progression by analyzing demographic, environmental, and clinical data; to identify predictors of disease severity; to evaluate potential interactions; and to generate data-driven insights for targeted interventions. The dataset includes demographic, clinical, and environmental information from CKDu patients in Sri Lanka. Random Forest and Kruskal–Wallis tests identify significant predictors. UMAP dimensionality reduction and clustering group patients based on progression. Logistic Regression and other machine learning models assess risk factors. Statistical analyses, including correlation matrices and hypothesis testing, examine the impact of hemoglobin, uric acid, potassium levels, water source history, and agrochemical exposure. A predictive model evaluates the effectiveness of interventions. Results reveal that low hemoglobin, high uric acid, potassium imbalances, and chronic exposure to contaminated well water and agrochemicals are strong predictors of progression. Random Forest ranked hemoglobin and uric acid as top risk factors. UMAP clustering identified distinct patient groups, primarily middle-aged male farmers from endemic regions, with progressive disease patterns. A simulation model showed reducing agrochemical exposure and improving water quality could lower CKDu risk by 15–20%. These findings emphasize the importance of targeted public health actions. This study highlights the complex interplay of biological and environmental factors in CKDu and provides actionable insights for policymakers to implement targeted interventions such as water filtration and reduced agrochemical use to mitigate disease progression and improve outcomes in high-risk regions.

Keywords: CKDu risk factors, epidemiological profiling, machine learning, predictive modelling, disease progression

Comparative Clinicopathological Analysis of 39 Cases of Oral Focal Mucinosis with Published Cases in the Literature

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Oral focal mucinosis (OFM) is a soft tissue swelling characterised by a localised myxoid area of stromal connective tissue. Due to its rare occurrence and nonspecific clinical presentation, OFM is frequently misdiagnosed and underreported. Objective of the study was to describe the clinical and histopathological features of 39 cases of OFM and to compare the clinical findings with those reported in existing literature to enhance diagnostic accuracy. This retrospective case series analysed 39 histologically diagnosed cases of OFM at the Department of Oral Pathology, Faculty of Dental Sciences, University of Peradeniya over 25 years. Data on patient demographics, lesion site, size, clinical diagnosis, and histopathological features were evaluated. A literature review was conducted revealing 113 previously reported cases in literature. Statistical analysis was performed with Chi-squared test and the t test considering $p < 0.05$ as significant. Our case series comprised of 20 females (51.28%) and 19 males (48.71%), with a mean age of 43.86 ± 15.80 and a 1.05:1 female-to-male ratio. The lesion size averaged at 2.15 ± 1.36cm. The most common anatomical location was the gingiva (56.41%), followed by the alveolar ridge mucosa (20.51%) and palate (17.95%). The average duration of lesions prior to diagnosis was 21.25 ± 27.75 months. Clinically, most lesions were diagnosed as reactive lesions (74.19%). Histologically, all cases showed myxoid stroma. Literature demonstrated a statistically significant female predominance, with 70.80% of cases reported in females and a female-to-male ratio of 2.42:1 compared to only 56.41% of females in our series ($p = 0.027$). Comparison with literature revealed no significant differences in other clinicopathological characteristics. A single case of recurrence was observed, aligning with previously reported findings in the literature. In conclusion, OFM predominantly affects adults in their fourth decade of life, with a slight female predilection. Notably, 9.68% of cases in the present series were clinically suspected to be malignant, highlighting the importance of histopathological confirmation for accurate diagnosis and appropriate treatment.

Keywords: Oral focal mucinosis, myxoid stroma, recurrence, clinical diagnosis

Comparative Efficacy of Dry Needling Combined with Passive Stretching Versus Dry Needling Combined with Muscle Energy Technique on Upper Trapezius Myofascial Trigger Points Associated with Neck Pain: A Randomised Clinical Trial

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Myofascial trigger points (MTrPs) in the upper trapezius contribute to neck pain, affecting daily activities. While dry needling (DN), passive stretching, and muscle energy techniques (MET) are effective individually, combined therapies may offer superior outcomes; however, no study has compared these two combinations. This study aimed to compare the efficacy of DN combined with passive stretching and DN combined with MET in treating upper trapezius MTrPs, focusing on pain intensity, neck disability, and active neck range of motion (ROM). In this single-blind randomised clinical trial, 46 participants with chronic neck pain due to upper trapezius MTrPs were randomly assigned to receive DN combined with passive stretching (n = 23) or DN combined with MET (n = 23). Treatments were administered twice per week for two weeks. Pain intensity (0-100 mm Visual Analogue Scale) was the primary outcome, while secondary outcomes included the Neck Disability Index (NDI) and active neck ROM. Assessments were conducted at baseline and after the final intervention. The groups were comparable at baseline ($P > 0.05$). Both groups showed significant improvement in neck pain intensity, neck disability and active neck ROM from baseline. However, there were no significant differences in pain intensity and NDI improvements between groups ($P > 0.05$). For ROM, significant differences were observed in neck flexion and rotation to the unaffected side ($P < 0.05$). DN combined with passive stretching was superior for neck flexion, while DN combined with MET was more effective for rotation to the unaffected side. In conclusion both treatment combinations effectively reduced pain and disability, though their effects on ROM varied. Further research extending treatment over three to four weeks could help distinguish between these treatments more effectively.

Keywords: Myofascial trigger points, passive stretching, MET, dry needling

Comparison of Image Features of Glioblastoma and Meningioma Using Magnetic Resonance Images

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Glioblastoma is the most common malignant brain tumor type, while meningioma is benign. Non-invasive, computer-based differentiation is beneficial in identifying these tumor types. Extraction and analysis of quantitative image features from MRI images can support distinguishing between them. Since conventional methods have limitations in differentiation, there is a need for non-invasive, reliable, and automated methods to aid in identification. The main objective of this study was to compare image features between glioblastoma and meningioma to accurately classify Meningioma and Glioblastoma tumors and thereby to reduce human error in the diagnosis. This quantitative study was conducted using 70 glioblastoma and 70 meningioma brain MRI images (both contrast-enhanced and non-contrast T1-weighted), obtained from The Cancer Imaging Archive (TCIA) website. ImageJ DICOM reader was used to view and select slices, and MATLAB software was used for segmentation and feature extraction. Segmentation was performed using two approaches: manual segmentation was applied when the tumor involved multiple tissue regions, while automated segmentation was used otherwise, based on a fixed intensity threshold value of 70.A total of 20 features were extracted: 7 texture properties, 6 Gray Level Co-occurrence Matrix (GLCM) properties, and 7 Hu's moment invariants. Data analysis was performed using Excel. Features were tested for normality, and only normally distributed features were selected for comparison. Comparisons were conducted separately for contrast-enhanced and non-contrast images based on the means of the selected features. Statistical significance of difference of means was determined using an independent samples t-test at a threshold of $P < 0.05$. For contrast-enhanced images, 9 features showed significant differences: 2 texture properties (average grey level, standard deviation), 3 GLCM features (correlation, homogeneity, entropy), and 4 Hu's moment invariants (moments 1, 2, 3, and 4). For non-contrast images, 3 features showed significant differences: 1 texture property (entropy) and 2 GLCM features (contrast, homogeneity). Since these features show significant differences between glioblastoma and meningioma, they can be considered useful for the non-invasive differentiation of these tumor types.

Keywords: Glioblastoma, meningioma, texture properties, invariant moment, GLCM

Consumer Health Informatics Challenges in Peradeniya Teaching Hospital in Central Province Sri Lanka

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Patients' understanding of Consumer Health Informatics (CHI) plays a crucial role in enabling them to make informed decisions about their health using digital tools and information technology. A cross-sectional survey was conducted to evaluate the knowledge, attitudes, and practices (KAP) of outpatients regarding CHI and to explore medical professionals' perceptions of patient engagement with CHI and progress in CHI adoption and to identify its challenges in Sri Lanka. Ethical clearance and necessary institutional permissions were obtained prior to initiating the study procedures. Data collection involved a pre-tested, structured, self-administered questionnaire capturing socio-demographics, computer literacy, and KAP concerning CHI. Knowledge was assessed across three dimensions: definition, application, and utilization. Attitudes and practices were measured using 5-point Likert-type scales and yes/no questions. The survey was conducted from October 2023 over a five-week period. Data collected from 371 outpatients were analyzed quantitatively, with mean scores for knowledge of CHI dimensions: 'definition', 'applications', and 'methods of use' being 43.9% ± 25.2, 45.8% ± 25.4, and 47.9% ± 25.8, respectively. The overall mean knowledge score was 45.5% ± 19.8, with most participants displaying low to intermediate knowledge levels (43.4% low, 53.6% intermediate, 3.0% high). About half of the participants (48.8%) exhibited limited understanding of CHI definitions, while intermediate knowledge dominated for 'applications' and 'methods of use'. Participants demonstrated comparatively positive attitudes toward CHI, with a mean score of 60.5% ± 13.8. Most (71.2%) showed intermediate attitudes, 19.7% low, and 9.2% high. Practice levels, with a mean score of 50.4% ± 26.5, showed 47.4% at intermediate levels, while 37.5% displayed low engagement and 15.1% high engagement. Qualitative interviews with three medical professionals provided insight into CHI challenges across several domains, including the impact of health apps and wearable devices, outcomes and obstacles, adoption factors, health literacy, patient decision-making, provider collaboration, and perceived behavioral changes among patients. In conclusion, the KAP of outpatients regarding CHI varied significantly. While attitudes toward CHI were positive, there is a need for enhanced knowledge and practice to address existing challenges and promote better adoption of e-health tools.

Keywords: Consumer health informatics, E-health, patient acceptance, intention to use, healthcare

Consumption of Oral Rehydration Solutions and Sports Drink Solutions Among the Sports Community and Formulation of a Sports Drink Powder for Rehydration

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Commercial sports drinks are often low in sodium and contain artificial ingredients, which goes against the growing consumer demand for natural products. Recent studies show increasing interest in sports drinks made with natural ingredients, highlighting the need for healthier options. This study aims to formulate a sports drink powder for athletes that contains no artificial ingredients and offers enhanced electrolyte replenishment. It began with a market survey to identify currently available sports drink products and their nutritional profiles, which identified three available sports drink solutions (SDS). Among these, SL Sport had the highest carbohydrate content (7.30 ± 0.14 g/100 mL), while 100 Plus contained the highest sodium concentration (44.33 ± 1.16 mg/100 mL). A questionnaire-based survey was then conducted among 85 national-level athletes, selected through random sampling, which revealed that 96.5% consumed oral rehydration solutions (ORS), while only 22.4% consumed SDS. The average daily consumption was 1180.72 ± 368.98 mL for ORS and 565.79 ± 163.34 mL for SDS. Based on these findings, this research focused on the formulation of a drink using king coconut water, beetroot juice, and pineapple juice. Through sensory analysis, a blend of 55 mL of king coconut water, 25 mL of pineapple juice, and 20 mL of beetroot juice was selected for spray drying. The resulting powder was evaluated for its physicochemical properties, mineral content, functional properties, and microbiological safety. The powder exhibited 98.77 ± 0.40% solubility and a water activity of 0.119 ± 0.001. Proximate analysis showed total ash (5.56 ± 0.18%), moisture (5.01 ± 0.09%), protein (1.16 ± 0.07%), fat (0.78 ± 0.04%), and total carbohydrate content (83.22 ± 2.26%). Sodium (24.29 ± 0.37 mg/g) and potassium (24.86 ± 0.38 mg/g) were significantly higher than other minerals. The powder was analysed for its antioxidant potential, including total phenolic content (6.73 ± 0.06 mg GAE/g), total flavonoid content (1.16 ± 0.06 mg RE/g), total antioxidant capacity (149.06 ± 3.50 mg AAE/g), and DPPH radical inhibition activity (50.18 ± 3.00%). In conclusion, this sports drink powder may be a promising natural alternative for athletes, offering effective hydration along with additional health benefits.

Keywords: Athletes, carbohydrate, sodium, spray drying

Convolutional Neural Network-Based Temporal Prediction of Subdural Haemorrhage on Computed Tomography

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Subdural haemorrhage (SDH) is a life-threatening condition requiring timely assessment to monitor its progression. While computed tomography (CT) imaging remains a primary tool for diagnosing SDH. But accurate prediction of its temporal changes remains challenging, especially in identifying sub-acute SDH. This study aims to develop a convolutional neural network (CNN) model for predicting the temporal progression of SDH by leveraging Hounsfield Units (HU) to estimate the age of SDH, aiming to improve diagnostic accuracy and support clinical decision-making for better patient outcomes. CT slices were sourced from the RSNA Intracranial Haemorrhage Detection dataset. Slices with clearly represented haemorrhages were selected and categorised into acute (HU > 55), sub-acute (HU 25–50), and chronic (HU 10–20) SDH by investigators under radiologist supervision. A CNN was developed using 825 pre-processed CT slices, divided into a 70:30 train-test ratio, along with a separate 150-slice validation set, ensuring balanced representation across all SDH stages. The model was implemented in Python on the Google-Colab platform. Model performance was evaluated using standard metrics, including accuracy, sensitivity, specificity, precision, F1-score, Dice Similarity Coefficient (DSC), Intersection-over-Union (IoU), and Area-Under-the-Receiver-Operating-Characteristic-Curve (AUC-ROC).The model achieved 83.11% training accuracy and 85.33% overall accuracy. Sensitivity for acute, sub-acute, and chronic SDH was 86.67%, 84%, and 85.33%, with specificity values of 94%, 88%, and 96%. Precision scores were 87.84%, 77.78%, and 91.43%, while F1 scores were 87.25%, 80.77%, and 88.28%. Excellent segmentation performance was demonstrated, with DSC values of 87.25%, 80.77%, and 88.28%, and IoU values of 77.38%, 67.74%, and 79.01% across the respective stages. AUC-ROC values ranged from 0.9394 to 0.9731 across five-folds, reflecting robust classification performance. In conclusion, the model effectively predicts the temporal progression of SDH with high accuracy, sensitivity, and specificity. These findings significant implications for improving diagnostic accuracy and treatment planning in SDH management. The research contributes to current understanding by leveraging artificial intelligence to automate and enhance CT scan analysis, providing a more reliable tool for clinicians.

Keywords: Subdural haemorrhage, computed tomography, convolutional neural network, python

Cost Comparison of Ward-Based and Centralized Co-amoxiclav Injection Preparation at Sirimavo Bandaranaike Specialized Children's Hospital (June - December 2023)

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Parenteral medicine preparations are formulations administered via injection. Ward based preparation of parenteral medicines often leads to drug wastage, increasing costs and environmental burden. Centralized preparation units enhance safety and efficiency while minimizing waste and associated efficiency. This study aimed to analyze the medicine wastage of and associated costs of ward-based vs centralized reconstitution of co-amoxiclav powder for injection. Data were collected from the records maintained at the wards of Sirimavo Bandaranaike Specialized Children's Hospital, Sri Lanka between June and December 2023. Data included dose, frequency and the number of vials used per bed head ticket (BHT). Ward-based wastage was calculated by comparing required and actual use. Centralized preparation wastage and cost were estimated theoretically based on dose requirements. Vial cost was obtained from the Medical Supplies Division price list. Over the six months period, total co-amoxiclav wastage due to ward-based reconstitution was 2654174 mg. The associated cost was LKR.1,925,751.20, whereas the theoretically estimated cost for centralized medicine reconstitution was LKR.774,097.50. Centralized preparation could have saved LKR.1,151,653.70 during this period. Centralized medicine preparation significantly reduces medicine wastage and associated costs. This study highlights the operational and economic advantages of implementing centralized medicine reconstitution units in hospital settings.

Keywords: Co-Amoxiclav, cost comparison, parenteral preparation, centralized, Sirimavo Bandaranayake specialized children's hospital

Demographic Insights into Disease Patterns: An Interactive Visualization Approach

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Population pyramids provide a comprehensive, multidimensional perspective of demographic structures by capturing age and sex distributions, revealing complex patterns critical for identifying public health vulnerabilities. These insights are especially valuable for understanding age-related diseases and disparities in healthcare access among diverse populations. We present an interactive interface that utilizes population pyramid structures to analyze disease-specific mortality patterns. This tool enables researchers and policymakers to explore how demographic variations impact disease burdens and to compare these insights with traditional demographic and economic indicators, supporting more informed public health analysis and decision-making. The system integrates two novel metrics from recent literature: PopDivergence, measuring the Kullback-Leibler (KL) divergence between population pyramids, and PoPStat, representing the Pearson correlation between PopDivergence and cause-specific mortality. These metrics quantify demographic divergence and its relationship with mortality. We apply these metrics to an extensive dataset spanning 180 countries and 371 disease types from 2015 to 2021. The interface also incorporates comparative visualizations of seven key demographic and socioeconomic indicators: Human Development Index (HDI), GDP per capita, life expectancy, Gini coefficient, median age, population density, and the Universal Health Coverage Index (UHCI). The user interface provides an interactive platform to visualize disease-specific correlations and compare them with traditional health indicators. It shows how various population pyramid types such as expansive, regressive, or stationary, relate to specific diseases using statistical measures. The analysis reveals that NCDs like cardiovascular diseases are more prevalent in regressive populations, while infectious diseases dominate in expansive ones. It also shows that injuries tend to be demography-independent. The interface identifies high-risk demographic groups and highlights how shifts in population structure influence disease burden. It transforms complex population data into accessible visualizations, supporting data-driven decisions, targeted interventions, and improved epidemiological insight. It enhances public health strategies by enabling professionals to explore demographic-disease relationships and visualize which population types are most associated with specific diseases, promoting more effective and equitable policymaking.

Keywords: Population pyramids, public health, demographics, PoPStat, PoPDivergence

Demographic, Clinical and Mammogram Features of Breast Cancer Patients

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Breast cancer is the most commonly diagnosed cancer affecting women worldwide, including Sri Lanka. Over the past few years, the incidence of breast cancer has risen steadily as the second leading cause of cancer death among women. Mammography remains the most commonly used imaging modality, with a high sensitivity and specificity in detecting breast cancers, including invasive ductal and invasive lobular carcionomas. This study aimed to investigate demographic characteristics, clinical presentations, and mammographic features in a cohort of Sri Lankan women with breast cancer. A retrospective study was carried out using a database maintained at the mammography unit, Cooperative Hospital, Kurunegala, Sri Lanka, between 2021 and 2024. A total of 451 breast cancer cases in the database were reviewed and analyzed. The age of the included subjects ranged from 26 to 92 years, with a mean age of 49.25 ± 11.69 years. The majority of them were aged 51–60 years (38.14%). Out of the total study population, most breast cancer women had fatty breast composition (61.20%), and their commonest clinical presentation was a breast lump (41.91%). From the mammogram image findings, 81.15% of cases presented with a mass with spiculated margins. While lymph node enlargement (100%) was seen among all breast cancer cases, architectural distortions (24.17%) and micro-calcifications (22.39%) were other frequently identified features in mammography. The upper outer quadrant was the most frequent breast tumor location (33.92%), and 57.43% of lesions were larger than 2 cm. Most cases were classified as BIRADS 5 (57.43%), indicating a high suspicion of malignancy. In conclusion, breast cancer was most common in women over 50 years, with fatty breast compositions and breast lumps being the most common clinical presentation. Spiculated masses, lymph node enlargement, and upper outer quadrant involvement were frequently observed, highlighting the importance of mammographic screening for early detection among women who are more vulnerable to breast cancer depending on age and clinical symptoms.

Keywords: Breast cancer, mammograms, fatty breasts, breast lumps, BIRADS 5

Denture Stomatitis in Sri Lankan Type 2 Diabetic Patients: A Comparative Proportional and Clinicopathological Analysis with Existing Literature

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Patients with Diabetes Mellitus (DM) are more susceptible to develop Denture stomatitis (DS) which is classified as a *Candida* associated lesion. The aim of the study was to present the proportion and clinicopathological characteristics of DS in a group of Sri Lankan Type 2 DM patients and compare the results with cases published in the existing literature. A descriptive cross-sectional study was conducted on 352 DM patients, including 94 denture wearers aged over 18 years, who had been receiving treatment for at least one year at the Teaching Hospital Peradeniya, to detect DS using clinical photographs and Periodic Acid-Schiff (PAS)-stained cytological specimens. These results were compared with proportion of DS patients identified among 923 DM patients published in the literature. In our study, proportion of DM patients presenting with DS was 4% (14/352) compared to 16.6% (153/923) DS prevalence identified in the literature. In addition, in our study sample, the prevalence of DS among Diabetic denture wearers were 14.9% (14/94), in contrast to 28.6% (45/157) in the published literature. The Majority (78.6%) (11/14) of DS patients were females in our study with a similar trend observed in the literature showing a female predominance of 66.7%. Literature revealed that denture wearers with elevated glycemic levels (> 148 mg/dl) had a higher chance of presenting with DS, which could not be supported in our study. Regarding the clinical presentation of DS, our study revealed 21.4 % and 78.6% of Newton Type 1 and Type 2 lesions respectively. Similar to literature majority of DS lesions identified in our study were Type 2 lesions. However, in contrast to literature where majority of Type 2 lesions were associated with symptoms all our DS patients were asymptomatic and the lesions were diagnosed as incidental findings. Similar to literature findings all DS patients had poor denture hygiene. In contrast to literature where DS was also associated with Angular cheilitis, none of our denture wearers and DS patients presented with this condition. In conclusion, the low prevalence of DS identified in Type 2 diabetic patients in our study compared to literature is most probably due to good Diabetic management. It is also noteworthy that all DS patients in our population were asymptomatic, although Newton Type 2 lesions are generally associated with symptoms according to the literature.

Keywords: Diabetes mellitus, *Candida,* denture stomatitis, glycemic level, Newton classification

Descriptive Comparative Study of Grip Strength in a Group of People with Frozen Shoulder - A Hospital-Based Study in Sri Lanka

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Frozen shoulder, or adhesive capsulitis, is a debilitating condition characterized by pain, stiffness, and restricted shoulder movement, which can impair hand function and grip strength. Grip strength is an essential measure of upper limb functionality, yet its relationship with frozen shoulder remains underexplored. This study aimed to evaluate the impact of frozen shoulder on grip strength through a descriptive comparative design. This study examines the relationship between frozen shoulder and grip strength using a descriptive comparative design. A total of 128 participants were recruited, divided equally into a study group (individuals diagnosed with frozen shoulder) and a control group (healthy individuals without shoulder impairments). Grip strength was assessed using a hand grip dynamometer. Demographic characteristics, including age, sex, and ethnicity, were recorded to ensure comparability between groups. Statistical analyses included Mann-Whitney U tests and Spearman's correlation to examine differences and associations. All statistical significance levels were set to $p < 0.05$. The study revealed significantly lower grip strength in individuals with frozen shoulders compared to controls ($p < 0.001$). A strong negative correlation ($r = -0.805$, $p < 0.01$) was observed between frozen shoulder presence and grip strength, highlighting the adverse impact of the condition on hand function. Additionally, grip strength varied across the stages of frozen shoulder progression, with improvements noted in the later stages (Stage 3) compared to the early stages (Stage 1). Frozen shoulder significantly impairs grip strength, underscoring the importance of early intervention to mitigate functional limitations and improve rehabilitation outcomes. Grip strength may serve as a valuable indicator for assessing recovery in individuals with frozen shoulders.

Keywords: Frozen shoulder, grip strength, adhesive capsulitis, hand function, rehabilitation

Detection of Bacterial and Fungal Pathogens Associated with Skin and Soft Tissue Infections in Patients with Diabetes Mellitus Reporting to a Tertiary Care Hospital in Sri Lanka: A Single-Center Study

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Skin and Soft Tissue Infections (SSTIs) in Diabetes Mellitus (DM) patients are a major health concern, often leading to serious complications. This study aimed to identify the bacterial and fungal pathogens associated with SSTIs among DM patients and assess their antimicrobial susceptibility to guide effective treatment. A cross-sectional study was conducted at Teaching Hospital Peradeniya, Sri Lanka, from 21st October to 25th November 2024. Wound swabs from DM patients admitted to surgical and medical wards were collected and processed using conventional culture techniques. Antibiotic Sensitivity Testing (ABST) followed Clinical and Laboratory Standards Institute (CLSI) guidelines. A total of 23 patients were enrolled, with a mean age of 58.8 years; 56.5% were male. Culture positivity was observed in 21 samples (91.3%), from which 39 isolates were identified. Over half (56.5%) of these cases were polymicrobial. Among the isolates, 35 (89.7%) were bacterial and 4 (10.3%) were fungal. Gram-negative bacteria predominated (80%), with *Proteus mirabilis* (20.5%) and *Pseudomonas aeruginosa* (12.8%) being the most common. *Staphylococcus aureus* accounted for 57.1% (n=2) of gram-positive isolates. All fungal isolates were *Candida* species, including *C. auris* (n=2), *C. albicans* (n=1), and *C. parapsilosis* (n=1). *P. mirabilis* exhibited high resistance to ampicillin, co-trimoxazole, cefuroxime, and ciprofloxacin (75.0%, 50.0%, 62.5%, and 50.0%, respectively) but remained sensitive to meropenem. *Staphylococcus aureus* showed low resistance to tetracycline (n=1) and clindamycin (n=1), though 2 isolates were Methicillin-resistant *Staphylococcus aureus* (MRSA). Extended-spectrum beta-lactamase (ESBL) producers were found in 19.0% of patients, MRSA in 9.5%, and Multidrug-Resistant (MDR) strains in 33.3%. One patient had both ESBL-producing and Vancomycin-Resistant Enterococci (VRE). Gram-negative bacteria were more frequently associated with SSTIs in DM patients. Meropenem and amikacin were the most effective treatments for gram-negative infections, while first-line agents like ampicillin and ciprofloxacin showed limited efficacy. Routine culture and ABST are recommended to decide targeted therapy for optimal infection management.

Keywords: Skin and soft tissue infections, diabetes mellitus, antimicrobial resistance, pathogens

Detection of *Toxocara* spp. in Selected Schools and Playgrounds in Peradeniya: A Pilot Study

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Toxocara spp. are common intestinal roundworms that parasitize dogs and cats. Humans can be accidental hosts by ingestion of parasitic ova through the contaminated food and water. Due to the presence of free roaming stray dogs and cats in our environment, open fields, yards, and playgrounds are likely to be highly prone to soil contamination with parasitic worm ova. Environmental exposure to *Toxocara* spp. eggs pose a potential health risk, particularly in areas that are commonly visited or regularly used by children. *Toxocara* infection in children can cause complications such as ocular toxocariasis, visceral toxocariasis, neuro-toxocariasis, and allergic reactions. This pilot study aims to detect the presence of *Toxocara* spp. in soil samples collected from selected schools and public playgrounds. A total of 16 soil samples were obtained from four different locations in Peradeniya, with two samples collected from shaded areas and two from areas exposed to the direct sunlight, at each site. The modified salt centrifugal flotation technique was employed for parasite ova detection with each sample processed in triplicate to ensure accuracy and reproducibility. Additionally, soil DNA extraction was carried out using the HiPurA® Stool DNA Purification Kit, in accordance with the manufacturer's protocol. Microscopic examination revealed two positive samples from two different locations (12.5%, 2/16), indicating the presence of *Toxocara* spp. eggs and these results are considerably higher compared to previous studies conducted in the Kandy area. Further molecular analysis is needed on the extracted DNA to confirm the *Toxocara* species in the samples. This preliminary investigation underscores the importance of conducting more comprehensive studies to evaluate the potential health risks posed by soil-transmitted parasites, particularly in recreational environments in Sri Lanka, where a large population of free-roaming stray dogs exists.

Keywords: *Toxocara* spp., soil contamination, public health risk

Detection of Virulent Genotypes *FimA* II and *FimA* IV of *Porphyromonas gingivalis* in Periodontitis Patients Attending the Dental Teaching Hospital, Peradeniya

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Porphyromonas gingivalis is the major bacterium involved in the pathogenesis of periodontitis. This disease is prevalent in more than 90% of Sri Lankan adults. Severe periodontitis can lead to loss of teeth and is also implicated in a myriad of health complications, including cardiovascular diseases, stroke, arthritis and oral cancer. Fimbriae is a key virulent factor of *P. gingivalis*. Based on the diversity of the *FimA* gene, which encodes a subunit of its fimbriae, *P. gingivalis* is classified into several genotypes. According to the studies conducted in other countries, *FimA* II and *FimA* IV genotypes have been strongly associated with periodontitis. However, *FimA* genotypic diversity of *P. gingivalis* in the Sri Lankan population has not been studied. Therefore, this study aimed to identify the *FimA* II and *FimA* IV genotypes of *P. gingivalis* from the saliva of periodontitis patients visiting the Peradeniya University Dental Hospital. DNA was extracted from their saliva samples and analyzed for the presence of *P. gingivalis* using species-specific primers. Thirty-four samples positive for *P. gingivalis* were subsequently analyzed by PCR using *FimA* II and *FimA* IV genes-specific primers. PCR amplicons were subjected to agarose gel electrophoresis and visualized by a gel imaging system. Among the *P. gingivalis* positive saliva samples, 73.5% (25/34) harbored the *FimA* II genotype, while 20.6% (7/34) harbored the *FimA* IV genotype. Notably, both genotypes were observed in 8.8% (3/34) of samples. However, 14.7% (5/34) of samples were negative for both genotypes. In conclusion, *FimA* II is the predominant genotype of *P. gingivalis* associated with periodontitis in our study population. This is the first insight into the virulent genotypes of *P. gingivalis* in the Sri Lankan population. This finding may be utilized in population screening for risk assessment of periodontitis and developing targeted therapeutics against *FimA* II expression enabling effective management of periodontitis in Sri Lankans.

Keywords: Fimbriae, *FimA* genotypes, periodontitis, *Porphyromonas gingivalis*, virulence genes

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Development of a Stable Powdered Herbal Formulation Suitable for Capsule Filling

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Herbal bioactive compounds hold significant therapeutic potential but often face formulation challenges due to hygroscopicity, stickiness, and poor flowability. This study aimed to develop a stable, free-flowing powdered formulation from a highly hygroscopic polyherbal extract for oral capsule delivery while ensuring safety, flowability, and stability. The polyherbal extract was prepared using hot water extraction of an equal weight of four different plant parts. Initial crude extracts exhibited a gummy consistency and extreme hygroscopicity, which remained even after conventional drying techniques (rotary evaporation, vacuum/oven drying, flash drying). Freeze-drying at −80°C produced a fine powder, but it still absorbed moisture easily, requiring the application of a suitable excipient mixture to stabilize. The flowability of the formulations prepared with different excipients was assessed using the angle of repose (angle determined by the fixed funnel method/ θ) and Carr's compressibility Index (calculated from the difference between bulk and tapped densities divided by tapped density, expressed as a percentage). Initial trials with corn starch alone as an excipient failed to improve flow, whereas pharmaceutical-grade Nano silica (Aerosil®) at 20% exhibited reduced hygroscopicity, passable flowability (θ = 41° 65′) and fair compressibility (17.7%), but led to excessive puffiness which cause to difficulties in the capsule filling process. Then the excipient mixtures containing Aerosil® (5–15%), talc (0.5%), and magnesium stearate (0.25–0.5%) were applied, which have reduced hygroscopicity and puffiness, but it still exhibited poor flowability (θ = 47°–55°). However, incorporating anhydrous lactose instead of talc, notably improved flow properties and the optimized formulation (9% Aerosil®, 20% lactose, 1% magnesium stearate), has achieved fair flowability (θ = 40°35′) and good compressibility (15.9%), producing a stable, non-hygroscopic, puffiness reduced powder, suitable for capsule filling. This study shows that excipient selection plays an important role in overcoming herbal extract formulation challenges. The optimized excipient mixture effectively mitigated hygroscopicity and improved flow properties, enabling scalable capsule production. These results revealed that adding suitable excipients could enhance the flow characteristics and reduce the hygroscopicity of highly hygroscopic herbal products to overcome the challenges associated with hygroscopicity and gummy nature.

Keywords: Herbal formulation, capsule filling, hygroscopicity, excipients, aerosil

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Development of Flavored Air-frying Oil Sprays Infused with Spice Oleoresins: Formulation, Physicochemical Characterization and Sensory Evaluation

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This study aimed to develop flavored air-frying oil sprays infused with spice oleoresins for potato chips and fish fillets, introducing a novel concept of flavoring air-fried food. The initial selection of base oil for the formulation was carried out among virgin coconut oil, sunflower oil and olive oil by evaluating their smoke point, oxidative stability, volatility, viscosity and spray ability. According to the physicochemical characterization, sunflower oil exhibited the highest smoke point (223.44 ± 3.36ºC) and olive oil and virgin coconut oil possessed relatively lower smoke points (185 ± 3.77ºC and 187.11 ± 3.86ºC respectively). Virgin coconut oil had the highest oxidative stability with the lowest peroxidase value (0.8156 ± 0.2354) based on iodometric titration compared to sunflower oil (9.228 ± 0.301) and olive oil (9.720 ± 0.568). Organoleptically accepted different formulations of oleoresins extracted from garlic, onion, and red chili were infused into virgin coconut oil, which was chosen as the optimal base oil. Infused oils were separately sprayed (0.65g of oil/100g of potato chips) onto potato chips and air-fried for 13 min at 180ºC. The development of flavored air frying oil sprays for fish fillets was done by infusing virgin coconut oil with different combinations of oleoresins of garlic, rosemary, red chili and black pepper. Fresh fish fillets of Sphyraena barracuda were separately sprayed with oil formulations and air-fried for 10 min at 160ºC. Based on sensory-evaluation studies conducted with 30 untrained consumer panelists, formulations of oleoresin-infused air-frying oils for potato chips 1.5%(v/v), at the ratio of 3:3:4 and (onion: garlic: red chili) and fish fillets 4.0%(v/v) at the ratio 4:2:2:1 (garlic: rosemary: chili: black pepper) respectively received the highest acceptance for their flavor, color, texture, and overall mouthfeel, highlighting their potential as marketable products. This innovative flavoring technique for air-fried food products is likely to capture the interest of food processors, caterers and household consumers, due to its convenience, consistent flavoring, and cost-effectiveness.

Keywords: Air-frying, oleoresins, flavored oil, sensory evaluation

Development of Gelatin-Free and No-Added-Sugar Stirred Yogurt for Toddlers Using Transglutaminase as a Natural Stabilizer

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With the growing awareness of the impact of early nutrition on lifelong health, the demand for toddler-friendly food products free from additives like gelatin and added sugars is increasing. Despite this, Sri Lanka currently lacks dairy products specifically formulated for toddlers. This study focused on developing a stirred yogurt tailored to toddlers, emphasizing natural formulation by excluding gelatin and added sugars. Transglutaminase (TGase), a food-grade enzyme known for its protein cross-linking ability, was employed as a clean-label stabilizing alternative. The yogurt was packaged in user-friendly squeezable pouches for ease of consumption by young children. Four different TGase concentrations (0.005%, 0.01%, 0.02% and 0.03%) were assessed against a gelatin-containing control over a 14-day refrigerated storage period. Assessments included physicochemical parameters, microbiological safety, probiotic viability, compositional content (protein, ash, moisture), caloric value, and consumer acceptability based on parental sensory feedback. All samples retained probiotic viability above 10^7CFU/g throughout the testing period. Sensory evaluations were done using 5 point Hedonic scale with 30 panelists. Yogurt formulation added with 0.01% TGase achieved the highest score in terms of texture, appearance & overall acceptability. The findings suggest that TGase is a viable alternative to gelatin in toddler-specific dairy applications, offering a pathway to clean-label, age-appropriate yogurt products. However, further improvement is needed to enhance water holding capacity and extend shelf life naturally.

Keywords: Toddler nutrition, transglutaminase, yogurt pouches, no added sugar, gelatin substitute

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Diagnostic Performance of PCR and ELISA in the Detection of Hepatitis B Virus: A Sri Lankan Perspective

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Hepatitis B virus (HBV) remains a major public health concern globally. In Sri Lanka, access to reliable diagnostic tools is essential for effective disease management and control. This study aimed to compare the sensitivity, specificity, and diagnostic accuracy of two commonly used HBV detection methods; Polymerase Chain Reaction (PCR) and Enzyme-Linked Immunosorbent Assay (ELISA), within the Sri Lankan healthcare context. A retrospective analysis was conducted using HBV test records from a local healthcare facility. Data from both PCR and ELISA results were analysed. Sensitivity, specificity, and diagnostic accuracy were statistically compared using SPSS version 26.0. Additionally, operational parameters including turnaround time, cost, and technical requirements were assessed to evaluate the practical viability of each method in routine clinical practice. PCR demonstrated a higher sensitivity and specificity (99% each) compared to ELISA (85% sensitivity, 90% specificity). ELISA, however, was found to be more cost-effective and suitable for large-scale screening due to its lower cost (LKR 1,500 per test) and faster turnaround time (2-3 hours), compared to PCR (LKR 6,500 per test, 6-8 hours respectively). Both methods showed strengths and limitations in terms of technical expertise required and adaptability to resource-limited settings. PCR is superior in terms of diagnostic accuracy, making it ideal for confirmatory testing and early detection. ELISA remains a valuable tool for initial screening, particularly in high-throughput or resource-constrained environments. Integrating both methods strategically can enhance HBV diagnosis and management across diverse clinical settings in Sri Lanka.

Keywords: Diagnostic accuracy, enzyme-linked immunosorbent assay, polymerase chain reaction, Sri Lankan healthcare

Dietary Influences on Gastrointestinal Tract Cancers: A Comparative Study in the Adult Population of Colombo District, Sri Lanka

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Gastrointestinal (GI) tract cancers are an increasing public health burden in Sri Lanka. While dietary habits are recognized as modifiable risk factors, region-specific evidence is limited. Understanding the dietary influences on GI tract cancers is essential for developing targeted public health interventions. This study aimed to examine the association between dietary patterns and the development of GI tract cancers, comparing food consumption habits between GI cancer patients and non-cancerous individuals. It also explored how these habits interact with lifestyle and demographic risk factors. A case-control study using a mixed-methods approach was conducted with 100 adults in Colombo district (50 GI cancer patients and 50 non-cancerous controls), selected through purposive sampling. Sample size was determined using G-Power software to ensure adequate statistical power. Data collection employed a validated Food Frequency Questionnaire (FFQ) available in Sinhala, Tamil and English. Quantitative data were analyzed using SPSS (Version 29), with Chi-square tests and Independent Sample T-tests used to assess group differences. Thematic analysis was applied to qualitative responses to explore cultural and behavioral influences on dietary practices. Cancer patients showed significantly higher consumption of red meat ($p < 0.001$), deep- fried foods ($p < 0.05$), sugary biscuits ($p < 0.01$), and white bread ($p < 0.05$), along with lower intake of vegetables ($p < 0.05$). In contrast, non-cancerous participants consumed more brown bread ($p = 0.004$) and fruits ($p = 0.001$). Alcohol use and smoking were also significantly associated with GI cancer prevalence ($p = 0.000$). Qualitative findings revealed limited dietary awareness and strong cultural influences on food choices among cancer patients. This study demonstrates a clear correlation between unhealthy dietary patterns and GI tract cancer risk in Colombo district. The findings underscore the urgent need for dietary awareness programs and preventive strategies in cancer control efforts. This localized evidence contributes to national and regional public health planning and nutrition-based cancer prevention.

Keywords: Gastrointestinal cancers, dietary habits, case-control study, mixed-methods, Sri Lanka

Discrepancies Between Diagnostic Testing and Continuity of Care in CKDu Surveillance: Insights from a Community-Based Study in Wilgamuwa, Sri Lanka

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Chronic kidney disease of unknown etiology (CKDu) remains a significant public health concern in the dry zone of Sri Lanka, where its causes are still unclear. Although serum creatinine testing (SCT) is common, there is limited research on how these communities manage and retain medical records, which are crucial for continuity of care. This study aimed to investigate local awareness, health behaviors, and testing practices related to CKDu by focusing on SCT and report retention in the Wilgamuwa divisional secretariat of the Matale district. A cross-sectional, community-based screening was conducted across five grama niladhari divisions: Naminigama, Perakanaththa, Sonuththa, Wanarawa, and Dewagiriya. Trained fieldworkers administered structured questionnaires during household visits, gathering demographic data and medical histories, including physician-referred SCT and whether participants retained their test reports. Responses were self-reported and verified, when possible, through direct observation. Among the total screened population (n=4,988), 15.2% (n=757) had undergone SCT; however, only 22.8% (n=173) of those participants retained their test reports. Dewagiriya had the highest number of tests conducted (n=278), yet the retention rate of test reports was only 22.7%. In contrast, Naminigama exhibited the highest retention rate at 91.1%, while Sonuththa had the lowest retention rate at 7.4%. Notably, Wanarawa demonstrated a 100% retention rate, although fewer tests were conducted in this division. These findings highlight critical gaps in health record retention and follow-up care. While physician-referred testing indicates healthcare engagement, poor documentation and limited clinic follow-up hinder disease monitoring and management. Although health literacy was not formally measured, field observations suggested inconsistent understanding of CKDu and its monitoring needs. The study emphasizes the urgent need for improved community awareness and strengthened health record systems which are essential for ensuring early detection, timely interventions, and long-term management of the disease.

Keywords: Chronic kidney disease of unknown etiology (CKDu), serum creatinine testing, medical documentation, diagnostic practices, community-based screening

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Distribution of Involvement of Physical Functions Among Patients with Different Grades of Knee Osteoarthritis in the Eastern Province of Sri Lanka

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Osteoarthritis (OA) is a progressive non inflammatory disease and is a major form of arthritis causing pain and disability. Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) is a most popular and widely used questionnaire to assess pain, stiffness, and physical functions in individuals with knee osteoarthritis (KOA). It consists of 24 items over 3 subscales; 5 items for pain, 2 items for stiffness and 17 items for physical function. This study was conducted to identify the distribution of involvement of physical functions among patients with different grades of KOA. This cross sectional descriptive study consisted of 324 participants with bilateral KOA including 251 females and 73 males from seven selected hospitals in the Eastern Province, Sri Lanka. Severity of KOA was assessed according to Kellgren & Lawrence (K – L) grading system (grades 0 – 4) using anterior posterior view radiographs. Self-administered WOMAC index was used to assess the knee functions. It was observed that the mean of WOMAC scores increased with the increasing of KOA grades in both the left and right knees. The WOMAC score peaked at KOA grade 3 (Moderate) for both the right and left knees with a mean of 71.34 ± 12.41 and 70.61 ± 14.06, respectively. It indicated that pain, stiffness and activity limitation increased with the severity of KOA. Also, it was observed that the WOMAC score dropped at KOA grade 4 for both the knees. However, this particular finding cannot be generalized due to the small number of participants with KOA grade 4 (N = 8) in the present study. WOMAC score exhibits a linear relationship with the KOA severity. Further, variability observed within the KOA grades indicates that, individuals with KOA experience a wide range of pain, stiffness and difficulties in their daily life. This study confirms that the WOMAC index is an effective tool for determining an individual burden from KOA and for designing patient based physiotherapy interventions.

Keyword: Knee osteoarthritis, WOMAC index, Kellgren & Lawrence grading system

Diversity of Gastrointestinal Parasites in Free-Living Birds Nesting in Public Areas of Kandy, Sri Lanka

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Free-living birds are essential for ecological stability. They serve as scavengers, pollinators, seed dispersers, and regulators of food chains, but also as roaming reservoirs of parasites, impacting birds and human health. The increase in free-ranging birds, domestic waste and climate change, raises the risk of parasite spillover. Despite this ecological relevance, parasitological studies on free- living birds, particularly in urban public areas in Sri Lanka are limited. This study aims to investigate the diversity of gastrointestinal parasites in free-living birds in Kandy and assess the associated public health risks. A total of 12 pooled fresh faecal samples were collected from 7 urban locations including market (n=2), bus stops (n=3), water bodies (n=4), and open public seating areas (n=3) using sterile polyethylene sheets positioned beneath bird nests. The sampling sites were selected based on high bird activity and potential public exposure. The samples were subjected to faecal salt-flotation and McMaster techniques to identify and quantify parasitological structures of nematodes, cestodes, and protozoa. The coverslip wash method with modified Ziehl- Neelsen staining was used to detect *Cryptosporidium* and *Giardia*, while sedimentation was performed to visualise trematode eggs. Faecal samples represented birds such as crows, pigeons, house sparrows and mynas. Diverse species of parasitic eggs were detected including, nematodes; *Trichuris* (6/12) and *Capillaria* (7/12) being the most frequent, alongside with *Ascaridia* (2/12) and *Strongyles* (2/12). *Hymenolepis* eggs (3/12) were the only cestode detected, with no trematode eggs. Eggs per gram in each sample ranged from 0 to 125 (mean ± SD: 95.0 ± 24.49). Protozoan oocysts, primarily *Eimeria* spp., were identified in 11 samples where oocysts per gram in a sample varied between 0 to 22,000 (mean ± SD: 4,560.42 ± 3,526.47). No samples tested positive for *Cryptosporidium* or *Giardia*. The highest parasite diversity was observed at Central Market. Parasitism is a key part of wildlife ecosystems. This study addresses a knowledge gap in Sri Lanka. Lack of bird species-specific parasite data is a limitation. Although no zoonotic parasites were detected, continuous surveillance is recommended, as urbanisation, pollution, and unnatural feeding habits may enable parasites to thrive on new hosts, including humans.

Keywords: Birds, free-living, parasites, urban, zoonoses

Effect of Immune Response in the Pathophysiology of Snake Envenoming and Antivenom Treatment: A Scoping Review of Clinical Evidence

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Snake envenoming poses a significant public health challenge, especially in tropical regions. The toxin and non-toxin components of snake venoms trigger both innate and adaptive immune responses in victims possibly playing a role in severe envenoming outcomes. This scoping review aimed to consolidate existing literature on immune responses in snakebite envenoming and antivenom treatment, summarizing significant clinical evidence. JBI scoping review methodology group and five-step framework previously described by Arksey and O'Malley were followed. A three-step literature search for English-language articles that reported original data from 2000 to 2024 was conducted. The preliminary search identified relevant keywords. An advanced search was performed across PubMed, EMBASE, Scopus, Web of Science and Cochrane Library, using a predefined search strategy, followed by a citation search to identify relevant grey literature. Of 19,551 records retrieved, 8,679 were manually screened after removing duplicates. After excluding irrelevant records, 17 abstracts were selected for full-text review, and 13 met the eligibility criteria. One additional article was retrieved from grey literature, totaling 14 studies on immune response in snake envenoming (local envenoming-3; systemic envenoming-4; local and systemic-5; adverse effect to antivenom-2) involving 981 patients. Only eight verified case authentication and snake authentication (*Daboia russelii*, *Bothrops atrox*, *Echis carinatus sochureki*, *Agkistrodon contortrix*, *Protobothrops mucrosquamatus*, *Viridovipera stejnegeri*, and *Naja atra*). Some study designs (n=4) could not distinguish whether immune response changes were due to antivenom or natural history. Most studies assessed the responses of TNF-α, IFN-γ, IL-1β, IL-2, IL-4, IL-6, IL-10, IL-17A, CCL-2/MCP-1, CCL-5/RANTES, CXCL-8/IL-8, CXCL-9/MIG, and CXCL-10/IP-10 in relation to local tissue complications, coagulopathy, kidney injury, and antivenom reactions. Overall, most studies showed a rise in the inflammatory mediators IL-1β, IL-6, and IL-10 following snake envenoming, compared to the control group. However, reduction in IL-10 was reported in two studies that examined severe envenoming. Higher concentrations of CXCL-8/IL-8 were associated with local effects, acute kidney injury, secondary infections, and antivenom reactions. Existing clinical studies indicate that snake envenoming causes an elevation of pro-inflammatory cytokines; IL-1β, IL-6 and anti-inflammatory cytokine IL-10. However, as envenoming severity increases, IL-10 levels appear to decrease. CXCL-8/IL-8 may also contribute to the development of severe envenoming outcomes.

Keywords: Immune response, snakebite, snake envenoming, snake venom, antivenom

Effectiveness of *Cinnamomum verum* on the Growth Inhibition of Oral Fungus, *Candida albicans*

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Natural plant products are increasingly being used to manage oral candidiasis due to their safety and effectiveness. *Cinnamomum verum*, commonly known as true cinnamon, contains bioactive compounds with significant antifungal potential. This study investigates its effectiveness against *Candida albicans*, a major cause of oral candidiasis. The study aimed to evaluate the effectiveness of methanolic and water extracts of the bark of the Gemunu and Wijaya varieties of *C. verum* against *C. albicans*. Healthy, undamaged plant materials were obtained from the National Cinnamon Research and Training Centre in Sri Lanka and authenticated at the National Herbarium, Peradeniya. Methanolic extracts were prepared using an ultrasound sonicator, while water extracts were prepared using the freeze-drying method. The agar well diffusion method was used to determine antifungal activity. The tests were conducted in triplicate, with results presented as mean ± standard deviation. Extracts from both varieties in methanol and water were tested at various concentrations. Data were analysed using two-way analysis of variance. Methanolic extracts exhibited concentration-dependent inhibition. The maximum inhibition zone for the Gemunu variety was 11.84 ± 0.29 mm at 25.0 mg/ml. The Wijaya variety showed a maximum inhibition zone of 4.67 ± 0.58 mm at the same concentration. In contrast, water extracts exhibited relatively lower antifungal activity, with Gemunu showing an inhibition zone of 7.34 ± 0.58 mm and Wijaya showing 5.67 ± 0.58 mm at 40.0 mg/ml. A significant difference was observed between the inhibition zones of the Gemunu and Wijaya varieties of *C. verum* ($p < 0.001$) in both methanol and water extracts. Results suggest that methanolic extracts possess more potent antifungal compounds, especially from the Gemunu variety. Considering the remarkable efficacy of *C. verum* methanolic extracts, they hold great potential as a natural remedy against *C. albicans* infections. Further studies are recommended to identify specific bioactive compounds and evaluate their effectiveness *in vivo* to explore their potential for clinical applications.

Keywords: Antifungal activity, Gemunu variety, inhibition zone, methanolic extract, well diffusion method

Effectiveness of Using Curcumin and Bee Honey for the Treatment of Allergic Diseases: A Systematic Review of RCT's

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Allergic diseases pose significant challenges to global health and quality of life. Due to the side effects of conventional treatments, there is growing interest in natural alternatives like curcumin (turmeric) and bee honey, known for their anti-inflammatory and immunomodulatory properties. These compounds reduce cytokines and allergic responses, showing promise as complementary options for managing allergies. This systematic review evaluates the effectiveness of using turmeric and bee honey in treating allergic diseases including allergic rhinitis, asthma, allergic urticaria and eczema (atopic dermatitis) through analysing randomized controlled trials (RCTs) published between 2015 till 11th march 2025. Following PRISMA 2020 guidelines, a literature search was conducted in PubMed, PubMed Central, Cochrane Library, and Google Scholar using MeSH terms (Turmeric, Bee Honey, Asthma, Allergic rhinitis, Atopic dermatitis, Urticaria) and Boolean operators (AND/OR), to identify relevant studies. Two independent reviewers screened the articles. Inclusion criteria: RCTs evaluating the efficacy of turmeric and bee honey in treating allergic conditions. Non – English articles, animal trials and incomplete studies were excluded. Outcomes assessed: symptom score improvement and/or FEV1 improvement in asthma, and reductions in inflammatory markers and improvement in symptoms in allergic rhinitis. Data was extracted by spreadsheets and quantitative synthesis. Study quality was evaluated using the Cochrane Risk of Bias 2 tool. 426 records were screened. Five RCTs met inclusion criteria: three involved adults and two involved children. Curcumin significantly improved asthma control in children by reducing nighttime symptoms ($p < 0.05$) without improving FEV1, while in adults, it significantly increased FEV1 ($p < 0.05$) without improving symptom control. In allergic rhinitis, curcumin significantly reduced IL-4 and TNF-α levels, reduced nasal airflow resistance, and alleviated nasal symptoms score ($p < 0.05$). Compound honey syrup significantly improved asthma control in both groups, enhancing ACT scores in adults and ACQ scores in children ($p < 0.05$). Both interventions were well-tolerated with minimal side effects across age groups. The evidence indicates that curcumin and bee honey are effective, safe complementary treatments for asthma and allergic rhinitis. However, their effectiveness in other allergic conditions like atopic dermatitis and allergic urticaria, or their combined use, remains unexplored. Further large-scale, high-quality RCTs are needed to confirm long-term benefits and establish standardized dosing protocols.

Keywords: Turmeric, bee honey, asthma, allergic rhinitis, atopic dermatitis, urticaria.

Efficacy of Combined Conservative Treatments Compared to Isometric Exercises Alone in patients with Cervical Radiculopathy: A Randomized Controlled Trial

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Cervical radiculopathy (CR) is characterised by nerve root compression, resulting in pain, sensory deficits, and functional limitations. Although CR can be managed surgically, conservative treatment remains the first-line approach. Given that CR affects multiple structures, a treatment approach that comprehensively targets each component is essential. There is limited evidence directly comparing the effectiveness of mechanical cervical traction, neural mobilisation, and isometric exercises with isometric exercises alone. Therefore, this study aimed to evaluate the efficacy of adding neural mobilisation and mechanical cervical traction to isometric exercises in managing CR, compared to isometric exercises alone. A single-blind randomised controlled trial involving 46 participants experiencing unilateral radiating neck pain lasting more than four weeks assigned them equally to either an experimental group (receiving neural mobilisation, cervical traction, and isometric exercises) or a control group (receiving isometric exercises only). Interventions were administered twice weekly for six weeks. Pain intensity, neck disability and cervical Range of Motion (ROM) were measured using the Visual Analogue Scale (VAS), Neck Disability Index (NDI), and universal goniometer, respectively. Statistical analysis was performed using SPSS V27.0 following intention-to-treat analysis principles. Missing data were addressed through multiple imputation. Baseline characteristics were comparable between groups ($p > 0.05$). Both groups demonstrated significant post-treatment improvements ($p < 0.05$). However, the experimental group showed greater reductions in VAS scores (median reduction: 2.8 vs. 1.4) and NDI scores (median reduction: 14 vs. 8), as well as significantly greater improvements in cervical ROM ($p < 0.05$), except for cervical rotation, which showed no significant difference ($p > 0.05$). These findings suggest that integrating mechanical cervical traction and neural mobilization with isometric exercises significantly improves pain, disability, and cervical mobility in patients with CR. Further research is needed to enhance outcomes related to cervical rotation.

Keywords: Cervical radiculopathy, neural mobilization, mechanical cervical traction, isometric exercises.

Ethnic Variations in the Clinicopathological Presentations of Oral Squamous Cell Carcinoma and Oral Submucous Fibrosis: A Retrospective Study from a Single Tertiary Care Centre in Sri Lanka

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To the best of our knowledge, there are no published data on ethnic distribution of Oral squamous cell carcinoma (OSCC) and oral submucous fibrosis (OSMF) in Sri Lankan patients. This study aimed to evaluate the ethnic variations in the clinicopathological presentations of OSCC and OSMF based on patients diagnosed over a 10-year period at a single tertiary care institution in Sri Lanka. This retrospective analysis involved 1466 OSCC and 1000 OSMF cases diagnosed at the Department of Oral Pathology, University of Peradeniya. Age, sex, lesion site, and histopathological diagnoses of both OSCC and OSMF cases were compared with the ethnicity using chi-square test to assess statistical significance ($p<0.05$). The Sinhala population had the highest OSCC (76%) and OSMF (74.5%) cases, followed by Tamils; OSCC (18.9%) and OSMF (22.7%), reflecting their order of majority in the population. The Muslim population had consistently lower OSCC (4.8%) and OSMF (3.3%) cases than expected based on their population size. Statistically significant ethnic variations were observed in OSCCs with respect to gender ($p=0.001$) and site distribution ($p=0.001$). Ethnic variations observed in OSMF patients were significant with respect to the age of diagnosis ($p=0.008$) and gender ($p=0.001$). The study found that there were striking changes in the gender distribution, with females more often affected by both OSMF and OSCC in the Muslim population. OSCC is more often on the tongue and floor of the mouth in Sinhala population compared to buccal mucosa being the more common location for both Tamils and Muslims. In the Muslim population, OSMF was diagnosed in equal numbers across all age groups, including elderly. In conclusion, Muslim population was consistently less affected by both diseases, which suggests the need for further research into possible protective factors in the Muslim community, including gene-culture interactions. Ethnically tailored prevention strategies may help reducing oral cancer burdens through culturally informed public health approaches.

Keywords: Oral squamous cell carcinoma, oral submucous fibrosis, ethnicity, Sinhala, Tamil, Muslim

Evaluating the Enzymatic Activity of Papain under Different Forms of Papaya at Optimal pH

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Papaya (*Carica papaya*) contains papain, a natural digestive enzyme. This study examined papain activity in five forms unripe, ripe, fermented, dried, and cooked under conditions mimicking the pH and the temperature of small intestine (pH 6.5, 37°C), where protein digestion occurs. Casein hydrolysis measured enzyme activity to identify which form retains the most activity, offering insights into health promotion and dietary use of papaya. Each form (1g) was homogenized in phosphate buffer (1:10), centrifuged, and the extracted enzyme was tested using a casein hydrolysis assay. The reaction mixture, containing 1.1 ml casein solution and 0.1 ml enzyme extract, was incubated for 10 minutes, terminated the reaction by using trichloroacetic acid, and centrifuged. The absorbance of the resulting supernatant was measured at 280 nm to quantify tyrosine release, indicating enzyme activity. The results were expressed as Casein Digestion Units per gram (CDU/g). The in vitro study produced major differences in papain activity for the five forms of papaya. The highest activity was observed in unripe preparation (26.08 CDU/g), followed by ripe (15.56 CDU/g), fermented (7.96 CDU/g), and dried (1.32 CDU/g) preparations. It was also noted that there was no quantifiable enzyme activity detected in cooked papaya. The one-way ANOVA confirmed that the differences in mean papain activity across the five forms of papaya were statistically significant ($p < 0.001$). The results showed the loss of papain activity through both heat and drying, with both unripe and ripe forms providing the majority enzyme activity potential in digestive conditions. This study contributes to understanding the level of papain activity in each form of papaya to understand which one provides the most enzyme benefits when consumed and supports the dietary benefits.

Keywords: Papain, papaya, pH, enzyme activity

Evaluating the Importance of Early Osteoporosis Screening in Women Aged 40-50 Years

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Osteoporosis, a progressive bone disease characterized by decreased bone density and increased fracture risk, often develops silently following osteopenia and remains undiagnosed until advanced stages, posing a major public health concern. Early screening in women aged 40–50 years is crucial, as hormonal changes during this period accelerate bone loss, allowing for the initiation of preventive strategies and reducing long-term health complications and healthcare costs. The aim of this study is to determine the importance of early screening and risk factors for osteoporosis and osteopenia among women aged 40-50 years. This is a retrospective, descriptive cross-sectional study conducted using data from 125 patients referred for Dual-energy X-ray Absorptiometry (DXA) scans to the Nuclear Medicine Unit, University of Peradeniya from January 2024 to March 2025. Data on potential risk factors including surgical menopause, breast cancer, inflammatory arthritis, endocrine disorders, and long-term steroid treatment were collected through medical records and standardized routine questionnaires used for assessing bone mineral density (BMD) studies. DXA scans were utilized to assess BMD, the gold standard method of diagnosing osteoporosis. BMD classification followed the International Society for Clinical Densitometry criteria. The BMD values for forearm, left hip, and lumbar spine were analyzed. Osteoporosis and osteopenia were considered as having low BMD. In the age group of 40–50-year women, 74% had either osteopenia or osteoporosis at the time of study. Among those, the percentages of commonly identified risk factors were 21.92% for surgical menopause, 43.84% for breast cancer, 12.33% for inflammatory arthritis, 27.40% for Diabetes, 28.77% for hypothyroidism, and 35.62% for long-term steroid therapy while less than 5% had conditions like hyperparathyroidism and hyperthyroidism. A comparison of low BMD and normal BMD patients with identified risk factors showed low BMD is associated with identified risk factors which is statistically significant ($p=0.007$). This study demonstrates a high prevalence of osteopenia and osteoporosis among women aged 40–50 years, with substantial links to multiple risk factors. The findings highlight the need for screening to diagnose osteoporosis before the age of 50 to prevent the later consequences associated with osteoporosis, which impair quality of life

Keywords: Osteoporosis, osteopenia, risk factors

Evaluating Video-Based Patient Education as a Tool for Improving Oral Health Knowledge

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Patient education is a critical component of effective dental care. Traditionally, it has relied on didactic methods such as verbal instructions and demonstrations. With the growing integration of digital health, video-based education is emerging as a promising tool. However, its effectiveness compared to conventional approaches remains underexplored. This study aimed to evaluate the effectiveness of video-based patient education in improving knowledge and practices related to oral health care, compared to traditional didactic methods. A quasi-experimental study was conducted at the Dental Hospital Peradeniya, Sri Lanka, involving 60 patients, with 30 patients in the test and control groups, selected through systematic random sampling. The test group received video-based education on dental plaque formation and plaque control, while the control group received the same content via a traditional didactic method. Pre- and post-intervention knowledge was assessed using a structured questionnaire, and brushing technique was evaluated using a standardized marking grid and a tooth brushing model. Data were analyzed using SPSS version 27. Among the participants, 32 had previously visited a dentist but had not received formal oral health education. Paired t-tests (95% CI) showed significant improvements in knowledge and brushing skills in both groups ($p < 0.001$). However, independent t-tests revealed no statistically significant differences between the groups before ($p = 0.460$) or after ($p = 0.790$) the intervention, indicating comparable effectiveness. Video-based education demonstrated similar effectiveness to traditional methods in enhancing oral health knowledge and practices. Its ease of implementation and scalability make it a valuable alternative in clinical settings. Further research is recommended to assess its long-term impact on patient outcomes and adherence.

Keywords: Patient Education, video-based education, didactic method, oral health knowledge, oral health Care

Evaluation of Balance Performance and Injury Prevalence among Racket Sport Players in University of Peradeniya

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Static and dynamic balance are crucial for fine motor skills in racket sports players. Balance training was found to enhance performance and reduce injuries among racket sports players. However, evidence comparing balance performance and injury prevalence among Sri Lankan racket sports players is scarce, indicating a need for further investigations. Firstly, this study aimed to evaluate the static and dynamic balance, injury prevalence and patterns of injuries among male and female badminton, table tennis and tennis players in University of Peradeniya. Secondly, the association between balance performance and injury prevalence was evaluated. This research was conducted as a cross-sectional descriptive study. 71 registered racket sports players in University of Peradeniya were included in the sample and 8 players were excluded due to acute injuries, recent surgeries, or chronic diseases. Single leg stance test and star excursion balance test were used to assess the static and dynamic balance respectively. To assess the injury prevalence, the 'Injury Prevalence Questionnaire' was employed after receiving the authors' permission. One-way ANOVA was used to compare the balance performance between racket sports teams. Chi squared test was used to evaluate correlations between balance performance and injury prevalence. The results revealed that the static balance of all racket sports players is lower than normative values. Therefore, it was unable to find a correlation between static balance and injury prevalence. Regarding dynamic balance, despite more players having below-norm dynamic balance, a significant positive correlation was found between left postero-medial dynamic balance and injury prevalence (p value=0.016). However, there was no significant difference between static and dynamic balance performance among three racket sports teams. Among all racket sport players, injury prevalence was recorded highest in ankle (29.69%) followed by knee (17.2%), lower leg (12.5%) and back (10.9%). Although balance performance shows no significant differences across the three sports, badminton, tennis, and table tennis players exhibit below-standard balance performance. A positive correlation exists between certain dynamic balance measures and injury prevalence, suggesting the need for targeted interventions to enhance balance and prevent injuries in these athletes.

Keywords: Dynamic balance, injury prevalence, racket sports, static balance

Evaluation of Damage from Disease in Patients with Systemic Lupus Erythematosus According to the Systemic Lupus International Collaborating Clinics / American College of Rheumatology Damage Index (SLICC / ACR DI) in a Tertiary Care Hospital in Sri Lanka

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Systemic Lupus Erythematosus (SLE) is a chronic inflammatory autoimmune disease that affects multiple organ systems and can lead to irreversible damage from the disease itself, its treatments, or associated comorbidities. Prior studies suggest that SLE manifests more severely in Asian populations, including Sri Lankans. This study aimed to assess the extent and severity of organ damage in a defined population of Sri Lankan patients with SLE, identify baseline patient characteristics, and determine the specific domains of damage using the validated SLICC/ACR Damage Index. A cross-sectional descriptive quantitative study was conducted from September 18 to November 13, 2023, involving 67 patients attending the Rheumatology Clinic at Teaching Hospital Peradeniya. Data were collected through patient interviews and reviews of clinical records. The extent of damage was analyzed using frequency and percentages, while associations between variables and accrued damage were evaluated via Spearman correlation and the Mann-Whitney U test. Of the 67 patients, 94% were female, and the mean age was 35.3 years. Most participants were Sinhalese (82.1%). The mean disease duration was 7.35 $\pm$ 7.476 years, and the mean age at diagnosis was approximately 27.97 $\pm$ 13.548 years. Nearly half the study (47.7%) exhibited some degree of damage, with the peripheral vascular system being the most commonly affected (41.8%). The greatest prevalence of damage was found in the 20–39 age group. Female patients showed a higher average damage score (1.27 $\pm$ 1.798) compared to males (1.0 $\pm$ 2.0). In conclusion, while SLE-related damage was present in less than half the study population, it remains more common among females, with the peripheral vascular system being the most frequently affected. No statistically significant factors were found to influence the extent of disease damage in this study.

Keywords: SLE, SLICC/ACR damage index, disease damage, disease assessment

Evaluation of *Musa Paradisiaca* Linn. Powder as a Natural Superdisintegrating Agent in Fast Dissolving Oral Films

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Superdisintegrating agents are essential in fast-dissolving oral dosage forms to improve the disintegration and dissolution of a medicine. *Musa paradisiaca* Linn. is a natural excipient that has been used in several oral dosage forms for its interesting pharmaceutical properties. This study aimed to evaluate the potential of *M. paradisiaca* as a natural superdisintegrating agent in fast-dissolving oral films. *M. paradisiaca* plant was authenticated by the National Herbarium, Peradeniya. The peeled fresh fruits were sliced and were blended using an electric grinder with distilled water, then filtered through a muslin cloth. The filtrate was treated with citric acid (as the preservative) and allowed to settle overnight. The resulting sediment was filtered, dried at 45 °C for 24 hours and finally ground to obtain a fine powder. Phytochemical composition of this powder was assessed through preliminary screening tests. The pre-formulation studies were performed on this herbal powder according to the pharmacopeial methods. Then, a fast-dissolving oral film was formulated by using *M. paradisiaca* powder as the superdisintegrating agent with several other excipients. The disintegration time of this test formulation was recorded. The plant powder consisted of flavonoids, alkaloids, tannins, glycosides, steroids, glucosides, phenols, saponins, and carbohydrates. The powder particles exhibited a closely spherical shape in microscopic evaluation. The powder yielded bulk density of 0.54 g/cm^3, tapped density of 0.79 g/cm^3, Hausner's ratio of 0.68, Carr's index of 31.01%, angle of repose of 35.7°, hydration capacity of 1.05 g/cm^3, moisture content of 11.75%, and swelling index of 7.14% whereas the sodium starch glycolate standard exhibited 1.25 g/cm^3 of hydration capacity and 3.5% swelling index. The disintegration time of the test formulation was 20 ± 5 seconds, which was less than that of a commercially available oral film (86 ± 3 seconds). The study confirms that *M. paradisiaca* powder exhibits higher swelling capacity, lower hydration capacity, and poor compressibility, which makes it a promising natural superdisintegrating agent for fast dissolving oral film dosage forms.

Keywords: Superdisintegrants, oral film, *Musa paradisiaca*, pre-formulation studies

Evaluation of Pyriform Aperture Morphometric Measurements in Sex Determination among Sri Lankan Adult Population Using Computed Tomography

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Sex determination using human skull has a huge impact in forensic medicine in identification of unknown individuals. The shape and contour of Pyriform Aperture (PA) exhibits sexual dimorphism. The use of Multi-Detector Computed-Tomography (MDCT), combined with post-processing techniques, offers high-resolution images which significantly improve the accuracy of analyses of PA. The aim of this study was to evaluate the morphometric dimensions of PA in male and female Sri Lankan adult population using MDCT. A retrospective, descriptive study was conducted on 396 adult patients (198 females, 198 males) who underwent MDCT scans of brain and paranasal sinus (PNS). Images were obtained from nine hospitals representing nine provinces in Sri Lanka and were subjected to Volume Rendering (VR) reconstruction technique using RadiAnt DICOM viewer. Reconstructed images were used in obtaining width of PA (PAW) and height of PA (PAH). Pyriform Aperture Index (PAI) was calculated using PAW and PAH (PAW/ PAH). All the measurements were evaluated between the male group and the female group. All the data were analyzed using SPSS 25.0. The calculated mean values of PAH, PAW and PAI among males were 2.837 cm, 2.423 cm and 0.863 respectively, whereas in females, the mean value of PAH, PAW and PAI were 2.639 cm, 2.345 cm and 0.895 respectively. Mann-Whitney U test revealed a significant difference between the sex for all the parameters ($p < 0.05$). Further this study showed that the pyriform aperture height and width were higher in males than in females, with significant differences. (p values obtained: PAH = 0.000, PAW = 0.009, PAI = 0.000). PA morphometry could be utilized for sex determination, in forensic and anthropological contexts due to its distinct sexually dimorphic characteristics. It is also essential for surgical applications such as nasal reconstructive procedures including rhinoplasty, septoplasty, thus enhancing surgical precision and outcomes.

Keywords: MDCT, pyriform aperture, morphometry, sex determination

Evaluation of the Accuracy of Initial Management of Acute Traumatic Dental Injuries in Adherence to International Guidelines of Patients Presenting to the Department of Restorative Dentistry, Faculty of Dental Sciences, University of Peradeniya

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Traumatic dental injuries (TDIs) require prompt and appropriate initial management to prevent complications. The International Association of Dental Traumatology (IADT) guidelines provide standardized recommendations for handling such cases. However, adherence to these guidelines varies, potentially impacting patient outcomes. This study aimed to assess the level of adherence to IADT 2020 guidelines in the initial management of acute traumatic dental injuries presented at the Trauma Clinic, Faculty of Dental Sciences, University of Peradeniya from March 2024 to March 2025. A retrospective analysis was conducted on dental trauma cases. Patient records were reviewed, and data were systematically categorized based on injury types, initial management, and adherence to IADT guidelines. Some cases had multiple injuries. The management status was classified as correctly, partially or incorrectly managed based on guideline adherence. Among the 31 cases that fit the inclusion criteria, only 12 (38.7%) were correctly managed, while 6 (19.3%) were partially, and 13 (42%) were incorrectly managed. The injuries included avulsion (5), subluxation (6), complicated crown fractures (13), uncomplicated crown fractures (9), extrusion (4), concussion (2), intrusion (2), lateral luxation (3), crown-root fracture (1), uncomplicated crown-root fracture (1), and root fracture (1). Avulsion cases showed complete adherence (100%), while the highest rates of incorrect management were observed in lateral luxation (100%), uncomplicated crown fractures (67%) and complicated crown fractures (46%). The majority of cases were initially managed in primary care, by private practitioners, or in tertiary care. However, some individuals did not seek any initial treatment. The findings highlight a significant gap in adherence to international guidelines for dental trauma management among dental healthcare practitioners, lack of adequate training, and restricted access to appropriate materials for emergency management. Enhancing education, structured training, and resource accessibility among dental healthcare practitioners can significantly improve the gap and enhance the accuracy of the initial management, thereby leading to better patient outcomes.

Keywords: Initial management, acute traumatic dental injuries, IADT guidelines, guideline adherence

Evaluation of the Efficacy of Commercial Mouthwashes in Sri Lanka Against a Major Cariogenic Bacterium

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Dental caries is the most common infectious disease in the oral cavity, affecting children and adolescents throughout their lives. *Streptococcus mutans* is known as the main etiological agent of dental caries due to its ability to form biofilm and promote tooth decay. Preventing its growth and biofilm formation is a crucial strategy in caries control. Among the various methods for maintaining oral hygiene, mouthwashes are commonly used as chemical adjuncts to mechanical plaque removal. Despite the widespread use of mouthwashes in Sri Lanka, there is limited data on their specific antibacterial activity against *S. mutans*. Hence, this study aimed to evaluate the antimicrobial activity of commonly used, commercially available mouthwashes in Sri Lanka. Antibacterial activity of 12 mouthwashes was evaluated using the disc diffusion method. Three batches of each were tested in triplicate against *S. mutans* (ATCC 700610). A 0.5 McFarland suspension was spread on Mueller-Hinton agar, and discs with mouthwash were applied. Plates were incubated anaerobically at 37°C for 24 hours, and inhibition zones were measured. Out of the mouthwashes analysed, seven (58%) demonstrated antibacterial activity, with the largest inhibition zone reaching 23.5 ± 3.6 mm. Compared to chlorhexidine-containing mouthwashes, two locally produced herbal mouthwashes with clove oil exhibited the strongest antibacterial effects, with inhibition zones of 23.5 ± 3.6 mm and 20.7 ± 2.5 mm. All four 0.2% chlorhexidine-based mouthwashes showed moderate activity, averaging 16 mm in diameter, while the smallest zone of inhibition (8.5 ± 0.6 mm) was seen in a formulation containing Povidone iodine. This study demonstrated that more than half of the tested mouthwashes exhibited antibacterial properties against *S. mutans*, likely due to their active ingredients. Interestingly, the strong antibacterial activity of clove oil-based, locally manufactured, herbal mouthwashes suggests that they could serve as effective natural alternatives to traditional chlorhexidine formulations in the prevention of dental caries.

Keywords: *S. mutans*, antibacterial effect, mouthwashes, caries prevention, disc diffusion assay

Evaluation of the Toxicity of an Aqueous Plant Extract of *Argyreia populifolia* (Girithilla) Using Brine Shrimp Lethality Bioassay

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Argyreia populifolia (Girithilla), belongs to the family Convolvulaceae is a native plant, used in a variety of ayurvedic preparations to treat for asthma, heart diseases, diabetes, neurological disorders, and animal bites in Sri Lanka. Even though the medicinal value of the plant has been extensively studied, the toxicity of the plant remains unknown. Therefore, it is important to identify the toxicity for dosage determination of formulations. The objective of this study was to determine the minimum toxic concentration of the *A. populifolia* using the brine shrimp lethality assay. The air-dried plant materials (aerial parts) were powdered and extracted into distilled water in a 1:3 ratio using the maceration technique. The dilution series was made using a two-fold dilution technique. 1g of aqueous powder diluted with 4 ml of distilled water. The concentration series started from 2×10^{-3} gmL^{-1} to 1 gmL^{-1}. Ten larvae were exposed to each concentration and the ability to kill the cultured larva (nauplii) was checked after 24 hours (Number of motile larvae). The mortality percentage and LC50 were calculated using GraphPad Prism 10 software according to concentration and mortality percentage. Results were compared with Meyer's or Clarkson's toxicity scale (If the LC50 <1000 μgmL^{-1} consider as toxic and LC50 >1000μgmL^{-1} consider as non-toxic). The highest mortality percentage ranged from 31×10^{-3} gmL^{-1} to 1 gmL^{-1}. The calculated LC50 value for the plant extract was 0.0205 gmL^{-1} (20,500 μgmL^{-1}). The results confirmed that the plant extract has not shown toxic properties according to Meyer's or Clarkson's toxicity scale. The minimum toxic concentration of the plant extract in the brine shrimp lethality assay was 0.0205 gmL^{-1} (20,500 μgmL^{-1}). Within the tested concentration range, *A. populifolia* (Girithilla) did not exhibit significant toxicity in this preliminary bioassay. However, as the brine shrimp assay serves only as an initial screening tool and may not directly correlate with human toxicity, further detailed toxicological evaluations, including cytotoxicity assays, animal studies, and activity-guided fractionation are recommended to identify bioactive constituents and confirm the safety profile of the plant extract for potential Ayurvedic applications.

Keywords: Brine shrimps, *Argyreia populifolia*, toxicity, medicinal properties, plant extract

Exploring the Antioxidant Activity of *Ocimum tenuiflorum* from Different Geographical Regions

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Ocimum tenuiflorum, also known as Krishna Tulsi, is known for its diverse medicinal and spiritual attributes, many of which have been investigated. The antioxidant activity of medicinal plants is widely studied for their potential health benefits. However, these antioxidant properties may differ with geographical regions. This study aims to assess the antioxidant activity of *Ocimum tenuiflorum* collected at the same time from dry zone, wet zone, and intermediate zone which are three different geographical regions in Sri Lanka. To evaluate the invitro antioxidant activity of *Ocimum tenuiflorum* from the dry zone, wet zone, and intermediate zone. Whole plant samples of *Ocimum tenuiflorum* were collected at the same time from three different geographical areas. Plant samples were authenticated by the Botany Division, Bandaranayake Memorial Ayurvedic Research Institute, Nawinna, Maharagama. Methanolic Plant extracts were prepared from the whole plant of *Ocimum tenuiflorum* using the maceration method. Antioxidant activity was assessed using 2,2-Diphenyl-1-picrylhydrazyl (DPPH) and ferric-reducing antioxidant power (FRAP - Oyaizu method) assays. Absorbance readings were obtained from the spectrophotometer. Statistical analysis was performed using one-way ANOVA in GraphPad Prism based on triplicate % inhibition values at 50 µg/mL (for DPPH) and triplicate absorbance readings at 50 µg/mL (for FRAP) to assess significance across geographical regions. Both DPPH and FRAP assays revealed a notable geographical variation in antioxidant activity. The wet zone extract showed the highest antioxidant activity (DPPH: IC50 19.90 µg/mL) followed by the intermediate zone (DPPH: IC50 30.06 µg/mL) and the dry zone extract showed the lowest activity (DPPH: IC50 470.3 µg/mL). Ascorbic acid showed the highest antioxidant activity (DPPH: IC50 2.228 µg/mL). Statistical analysis indicated that there is a significant difference in antioxidant activity between the regions for DPPH ($p=0.0004$). For the FRAP assay, while differences in reducing power were observed, they were not statistically significant ($p=0.1796$). This study indicates a significant variation in the antioxidant activity of *Ocimum tenuiflorum* based on geographical origin with the wet zone extracts showing the highest antioxidant activity. The results indicate environmental factors may influence the therapeutic potential of *Ocimum tenuiflorum.*

Keywords: Antioxidant, geographical variation, DPPH assay, *Ocimum* tenuiflorum

Exploring the Experience of Medication Adherence Among Older People with Hypertension: A Qualitative Study from a Tertiary Care Hospital, Sri Lanka

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Hypertension is one of the leading risk factors for cardiovascular diseases, contributing significantly to global mortality rates. The older population is particularly vulnerable to hypertension and its complications. Medication adherence is essential for minimizing these risks, reducing adverse reactions and improving health outcomes, thereby reducing the burden on the healthcare system. This study aimed to explore experiences on medication adherence among older people with hypertension at a tertiary care hospital in Sri Lanka. An exploratory qualitative study was conducted among 15 individuals who had a history of uncontrolled blood pressure for more than a year and attending the hypertension clinic at Teaching Hospital Peradeniya, Sri Lanka. In-depth interviews were conducted using a semi-structured interview guide. Participants were selected using purposive sampling until data saturation was achieved. Interviews were audio recorded, transcribed verbatim, and analyzed using inductive thematic analysis. The consolidated criteria for reporting qualitative research (COREQ) guidelines were followed when presenting the results. Three main themes emerged: (a) Knowledge and awareness, (b) Barriers to medication adherence and (c) Support systems in medication adherence. Under Knowledge and awareness, Sub-themes included early detection awareness, knowledge of disease and therapeutic approaches, self-medication management and monitoring. The theme barriers to medication adherence included side effects, polypharmacy, psychological impacts, lifestyle and behavioral factors, forgetfulness, motivational drivers, and personal affairs. Finally, support systems in medication adherence included peer influence, family support, accessibility to medical care, perceived quality of care and health education by the institution. This study highlights the importance of knowledge and awareness in promoting medication adherence. It emphasizes that the gaps in disease understanding contribute to poor health outcomes. Key barriers and weak support systems further hindered medication adherence. Patient-centered interventions and enhanced support mechanisms are crucial for improving medication adherence in the elderly population.

Keywords: Experience, hypertension, medication adherence, older population, qualitative study, Sri Lanka

Expression Analysis of Platelet-Derived Growth Factor Receptor Alpha in Pre- and Post-Menopausal Breast Cancer in Sri Lanka

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Breast cancer, a leading cause of death among women worldwide, including in Sri Lanka, involves angiogenesis regulated by factors like vascular endothelial growth factor and platelet-derived growth factor (PDGF). PDGF signaling components, especially PDGFRA and PDGF-CC, are linked to triple-negative breast cancer. Notably, PDGF-CC expression is also influenced by menopausal status. Therefore, this study was conducted to determine the differential expression of the PDGFRA gene in pre- and post-menopausal breast cancer patients in Sri Lanka and to assess the possibility of using it as a prognostic genetic marker. Initially, the total RNA was extracted from the breast cancer tissues of 50 premenopausal and postmenopausal patients using the TRIzol method. RNA quality and concentrations were measured using a NanoDrop spectrophotometer. Subsequently, the cDNA was synthesized using the GoScript™ Reverse Transcription System, and the successful transcription was confirmed through a PCR and agarose gel electrophoresis. The expression levels of the PDGFRA gene in pre- and post-menopausal breast cancer tissues were quantified by conducting an RT-qPCR with 18S rRNA as the reference gene. Then the relative expression levels were calculated and analyzed using the Mann-Whitney test in GraphPad Prism 10.4.1. All RNA samples had an A260/A280 ratio of 1.7–2.1 and concentrations above 50 ng/µL, ensuring reliable cDNA synthesis and gene expression analysis. The expression analysis of the PDGFRA gene in premenopausal and postmenopausal breast cancer tissues revealed no statistically significant difference between the two groups ($P = 0.632$). Although the median expression was higher in postmenopausal patients (9.309) compared to premenopausal patients (6.551), the difference (Hodges-Lehmann = 1.532) was not significant. These results indicate that PDGFRA expression does not significantly vary between menopausal groups, suggesting it may not serve as a reliable prognostic marker for distinguishing premenopausal and postmenopausal breast cancer. Therefore, further research with a larger sample size and protein level expression is necessary to explore it as a better prognostic indicator in breast cancer patients.

Keywords: Breast cancer genes, RT-qPCR, prognostic markers, *PDGFRA* expression

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Expression of Human Papillomavirus in Dysplastic and Non-Dysplastic Oral Lichen Planus - An Immunohistochemical Study

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Oral lichen planus (OLP) is a persistent, autoimmune-mediated disease with a potential risk of oncogenic transformation within the oral cavity. Despite other etiologic factors, human papillomavirus (HPV) is predicted to be a causative agent in oral cancers; however, investigations have been inconclusive regarding its role in epithelial dysplastic subtypes associated with OLP. This study aimed to determine the expression of HPV in dysplastic OLP and its association between dysplastic and non-dysplastic variants of OLP. A case-control study was performed retrospectively by obtaining thirty archived samples from the middle-aged, Sri Lankan female population. Hematoxylin and Eosin staining was performed for the reviewing and categorization of OLP followed by an immunohistochemical recognition of HPV to determine the expression of HPV in mild-grade dysplastic and non-dysplastic OLP. The primary antibody utilized was the Monoclonal Mouse Anti-Human Papillomavirus Clone K1H8, Dakocytomation (dilution 1:50), capable of identifying the expression of both high-risk and low-risk type HPV. As for the outcomes, HPV expression was detected in 33.3% (5/15) of mild-grade dysplastic and 13.3% (2/15) of non-dysplastic OLP. A statistically significant association of HPV between mild-grade dysplastic and non-dysplastic OLP was not revealed through the analysis ($p > 0.05$). The outcome of this study indicated a relatively higher expression of HPV in mild-grade dysplastic OLP compared to non-dysplastic OLP. Therefore, it is vital to discern the association of HPV in different degrees of epithelial dysplasia in OLP in the future to elucidate the role of viral infection in disease progression.

Keywords: Autoimmune-mediated disease, degrees of epithelial dysplasia, HPV expression, immunohistochemical recognition, oncogenic transformation

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Extended Effects of Allopurinol on Disease Progression in Chronic Kidney Disease of Unknown Aetiology (CKDu) Patients: Two-Year Follow-up of a Randomized Controlled Trial

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CKDu is a significant emerging health challenge in Sri Lanka. Lack of a clear pathogenesis has become a clinical challenge and has prevented development of effective treatment strategies. Among possible interventions, long-term efficacy of urate-lowering therapies like Allopurinol in slowing disease progression remains uncertain. This study aimed to assess whether the extended, two-year urate lowering therapy, following an initial one-year trial, can significantly delay CKDu progression, reduce morbidity and mortality, prevent cardiovascular events (CVE), and improve clinical outcomes. In this open-label, single-centre randomized controlled trial, 335 CKDu patients from the Girandurukotte renal clinic were assigned to either a treatment group (n=165; Allopurinol targeting SUA < 6 mg/dL in males, <5 mg/dL in females) or a control group (n=162; standard care). Patients were followed for two additional years. Primary endpoints were renal progression, assessed via eGFR decline, CVE, and survival. Secondary endpoints included changes in blood pressure, lipid profiles, electrolytes, inflammatory markers (hs-CRP), hematological parameters, and urinary biomarkers. Data were analyzed using linear mixed models (LMM), Kaplan–Meier (KM) survival curves, and Cox regression. At the beginning of the extended follow-up, mean SUA was significantly lower in the treatment compared to controls (5.74 ± 1.42, 6.94 ± 1.36 mg/dL, $p < 0.001$), reflecting the effect of one-year trial. LMM showed significant differences in SUA trends ($p < 0.001$). However, there were no significant differences in eGFR decline over time between groups ($p = 0.943$), and in the rate of decline between groups ($p = 0.461$). Renal event-free survival was higher in the treatment group (98.2% vs. 93.8%; log-rank $p = 0.049$), with a renoprotective trend in Cox analysis (HR = 0.279, $p = 0.053$). Occurrence of CVE was rare ($p = 1.000$) and no significant differences were observed in secondary endpoints (all $p > 0.05$). Although extended allopurinol therapy did not significantly alter CKDu progression or cardiovascular outcomes, it showed sustained changes in SUA and improved renal event-free survival. This study represents a meaningful step forward in CKDu research, highlighting the feasibility and potential benefit of long-term urate-lowering strategies.

Keywords: RCT, CKDu, hyperuricemia, allopurinol, eGFR decline

Factors Affecting the Knowledge, Attitudes and Practices on Hypertensive Disorders of Pregnancy Among Pregnant Women with Risk Factors: A Cross-Sectional Study in a Tertiary Care Centre

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Hypertensive disorders of pregnancy (HDP), including preeclampsia are among the top five causes of maternal deaths worldwide. Women with risk factors for preeclampsia are more likely to experience more severe complications of HDP. Having better awareness on HDP could result in improved outcomes in these women. Therefore, the objectives of this study were to assess the knowledge, attitudes, and practices (KAP) on HDP among pregnant women with high or moderate risk factors for preeclampsia and to identify demographic factors that may affect KAP scores. A descriptive cross-sectional study was conducted among 229 pregnant women with at least one high or moderate risk factor for preeclampsia from obstetric clinics, Teaching Hospital Peradeniya. Convenience sampling method was used. A pretested, interviewer-administered questionnaire was used to collect data. Knowledge score >80% was considered as good. Scores of > 50% in attitudes and practices were considered as positive and good, respectively. Data are presented as mean ± standard deviation (SD), median (interquartile range, IQR) and percentages. Associations between demographic variables and the domains of knowledge, attitude and practice were assessed using the Chi-squared test. Mean age of the participants was 30 ± 5 years and the median period of amenorrhea was 24 (14-32) weeks. Majority (77%) were primi mothers and 11% had at least one high risk factor. Good knowledge was seen among 74%, all had positive attitudes but only 21% engaged in good practices. Knowledge score was higher in women educated at least up to A/Ls (77%vs60%; p=0.020), monthly income > Rs. 60,000/= (78%vs64%; p = 0.026) and those who participated in antenatal counselling sessions (79%vs61%; p = 0.004). Only 42% were aware regarding all 5 red flag symptoms of preeclampsia with a greater percentage of multiparous women having awareness compared to primi mothers (57%vs32%; p = 0.001). No associations were identified with attitudes or practices. These findings suggest that there is a considerable gap between knowledge and practices despite positive attitudes among pregnant women regarding HDP. Developing targeted health education programs to improve knowledge and addressing factors for not adhering to good practices could improve the outcome of HDP.

Keywords: HDP, preeclampsia, awareness, antenatal counselling

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Factors Associated with Pain and Quality of Life Among Breast Cancer Patients Undergoing Chemotherapy in a National Tertiary Care Hospital in Sri Lanka

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Breast cancer remains the most common cancer among woman globally and it significantly contributes to the cancer morbidity and mortality in women worldwide. Chemotherapy as an effective treatment modality improves survival rates, however, it leads to detrimental effects such as pain which significantly impact on patients' quality of life (QoL). This study aimed to assess pain severity and QoL among breast cancer patients undergoing chemotherapy in a national tertiary care hospital in Sri Lanka and to identify factors associated with pain and QoL. A descriptive cross-sectional study was conducted in a consecutive convenience sample of 199 female breast cancer patients who underwent at least one cycle of chemotherapy at female oncology ward in National Hospital, Kandy, Sri Lanka. Participants' QoL was assessed using Validated Sinhala and Tamil versions of European Organization for Research and Treatment of Cancer Core 30 (EORTC QLQ-C30) and QoL Questionnaire specific to Breast Cancer (QLQ-BR23) and their self-reported pain intensity was measured using Visual Analogue Scale (VAS). Demographic and clinical characteristics were also documented. Chi-squared and Fisher's Exact tests were used to assess associations of socio-demographic and clinical factors with pain severity and QoL ($p < 0.05$). Most participants (84.9%) experienced mild pain, while 11.6% had moderate pain and 3.5% had severe pain. Pain severity was significantly associated with age ($p = 0.027$), cancer stage ($p = 0.000$), time since diagnosis ($p = 0.003$), and prior treatments ($p = 0.020$). Poor QoL was reported by 78.4% of participants. QoL was significantly associated with educational level ($p = 0.000$), occupation ($p = 0.008$), residential area ($p = 0.000$), and number of chemotherapy sessions ($p = 0.015$). Majority of participants experienced mild pain, and pain associated with age, cancer stage, time since diagnosis and prior treatments. Poor QoL was reported among majority of participants and QoL associated with educational level, occupation, residential area and number of chemotherapy sessions. Future research should adopt longitudinal designs to capture the evolution of pain and QoL over time, along with qualitative approaches to explore patient experiences.

Keywords: Chemotherapy, quality of life, visual analogue scale, pain intensity

Feasibility and Efficacy of a Group Telerehabilitation Program for People with Knee Osteoarthritis in Sri Lanka – A Pilot Study

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Knee osteoarthritis (OA) causes pain and disability in older adults. The Physiotherapy Exercise and Physical Activity for Knee OA (PEAK) program provides evidence-based exercise therapy through education, strengthening, and physical activity, tailored to individual needs. Telerehabilitation supports adherence with home-based care and is as effective as in-person sessions, but its effectiveness remains unstudied in Sri Lanka. This study aimed to evaluate the feasibility and efficacy of telerehabilitation group consultation using PEAK program for people with knee OA in Sri Lanka. This single-arm pre-post pilot study involved knee OA patients attending 1-hour Zoom-based telerehabilitation sessions, three times weekly for eight weeks. Primary outcomes including feasibility, acceptance, and adherence were assessed through attrition rates, a 5-point Likert scale for satisfaction, and adverse event reports. Secondary outcomes, such as knee pain, stiffness, physical function, lower extremity strength, and dynamic balance, were measured using the Visual Analogue Scale (VAS), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the 30-Second Chair Stand Test at baseline and post-intervention. 21 individuals screened, 14 (66.7%) enrolled and 12 (85.7%) completed the 8-week telerehabilitation. Most were female (75%) with a median age of 54.2 years (SD±6.5). Mean class attendance was 93.4% (SD±6.3), satisfaction was 100%, and no adverse events were reported. Significant improvements were seen in knee pain (VAS: $Z = -3.115$, $P = 0.002$; WOMAC pain MD = 3.67, 95% CI: 2.89–4.45, $P < 0.001$), stiffness (MD = 1.33, 95% CI: 1.02–1.65, $P < 0.001$), and function (MD = 12.58, 95% CI: 10.17–14.99, $P < 0.001$). Strength and balance also improved (30S CST MD = −3.17, $P < 0.01$). The telerehabilitation group consultation using the PEAK program may feasible, safe, and effective in improving knee pain, stiffness, physical function, lower extremity strength, and dynamic balance in a pilot cohort of knee OA patients. Its efficacy should be confirmed through a randomized controlled trial before being implemented in clinical practice.

Keywords: Telerehabilitation, knee osteoarthritis, feasibility, adherence, acceptability

Formulation of Economically Viable, Energy-Dense, Low-Glycaemic, Blenderized Tube Feeding Formula for Malnourished Adults Requiring Nutritional Support in Sri Lankan Hospitals

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The high cost of commercially available enteral nutrition formulas has driven the increased use of blenderized tube feeding (BTF) in Sri Lankan hospitals, particularly for managing adult malnutrition. This study aimed to develop cost-effective, energy-dense, and macronutrient-balanced BTF formulas suitable for clinical use. The target was to achieve approximately 1 kcal/ml energy density while aligning with the World Health Organization (WHO) guidelines for macronutrient distribution: carbohydrates (55– 75%), fats (15–30%), and proteins (10–15%). Following preliminary trials with different rice forms (cooked raw rice, overnight cooked rice, and cooked roasted rice) to minimize viscosity, roasted white Nadu rice was selected as the carbohydrate base. Three natural, soup-based BTF formulations (F1, F2, F3) were developed using locally available ingredients, including roasted white Nadu rice, dhal, peanuts, milk powder, dates, coconut milk, and cow's milk, guided by the Sri Lanka Food Composition Tables. To assess the suitability of one selected formulation for patients with diabetes glycaemic index (GI) was measured. All formulas were evaluated for physicochemical, microbiological, rheological, and osmolar properties to assess clinical safety and suitability. Energy density values of the three formulations were 0.82 (F1), 0.71 (F2), and 0.68 (F3) kcal/ml, which were lower than the required value of the standard formula (1 kcal/ml). All three formulations adhered to the recommended macronutrient distribution (carbohydrate: fat: protein), 51:30:19, 50:36:14, 52:30:18 for F1, F2. F3 formulations, respectively. F1 was chosen for the GI study, and the GI of the formulation was measured to be 37 ± 8.6 (low GI), which can be recommended for patients with diabetes. The findings highlight the feasibility of using locally sourced ingredients to meet hospital nutrition needs in resource-constrained settings. However, further clinical trials are recommended to validate their effectiveness in patient care.

Keywords: Blenderized tube feeding formulas, energy density, macronutrients

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Fuel Use, Kitchen Environment, and Smoke Exposure in Sri Lankan Pregnant Women: Cross-Sectional Insights for Public Health Interventions; An Interim Analysis of RESPIRE 2 SL Indoor Air Quality Study

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Exposure to household air pollution from traditional cooking practices is a significant public health concern, particularly for pregnant women in low- and middle-income countries. In-utero exposure to smoke from biomass fuels has been associated with adverse maternal and fetal outcomes. This interim analysis aims to assess cooking practices, fuel usage, kitchen structure, and ventilation conditions among pregnant women under 24 weeks of Period of Amenorrhea (POA) to inform targeted interventions. A cross-sectional survey was conducted among 173 pregnant women with POA ≤24 weeks attending antenatal clinics. Structured questionnaires were used to collect data on stove type, fuel use, kitchen characteristics, ventilation, and exposure to biomass smoke. Descriptive statistics were used to summarize cooking behaviors, structural features of the kitchen, and smoke exposure patterns. The vast majority of participants (96.4%) cook, while only a small minority (3.6%) do not. Nearly 29% of respondents still relied on firewood for cooking. More than half (56.3%) reported using an additional stove, primarily traditional (44.6%) or gas (33.7%). Additionally, 55.9% of respondents reported exposure to biomass smoke. A majority of households (82.7%) kept their doors or windows open while cooking. However, only 57.2% had chimneys, and just 41.2% cleaned them regularly. More than half of the kitchens had asbestos roofs (51.6%), and covered cement floors (64.9%). On average, cooking began at the age of 18.6 years, with approximately 2.4 hours spent on cooking per day. Despite the widespread adoption of LPG, many pregnant women continue to be exposed to biomass smoke due to the use of supplementary stoves and inadequate ventilation. Structural kitchen issues worsen exposure risks. Promoting exclusive clean fuel use, enhancing ventilation, and educating on safe cooking practices are vital to safeguarding maternal and fetal health during pregnancy.

Keywords: Pregnant women, house hold air pollution, kitchen ventilation, smoke exposure, bio mass fuel

Fungal Agents Associated with Toe Web Infections in Patients with Diabetes Mellitus: A Single-Centre Study in Sri Lanka

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Infected toe webs are more common among diabetes cases but less studied condition. Therefor early identification is crucial for preventing complications and improving outcomes. This study aims to investigate the prevalence and the microbial pattern of the fungal infections in the toe webs with diabetes mellitus, documenting specific fungal agents and identifiable risk factors. For this purpose, a descriptive cross-sectional study was conducted between 20th October 2024 and 20th November 2024 at the Teaching Hospital Peradeniya and total of 50 samples were collected. Sterile swabs with 70% alcohol cleansing were used to collect samples. Each sample were cultured on Sabouraud dextrose agar (SDA) containing gentamicin, at room temperature and at 35°C. Identification of fungal species was based on microscopic and macroscopic features. The obtained data were analyzed by applying an independent samples t-test and chi-square test to assess correlations among variables, using Jamovi 2.3.28. Out of the total samples, 30% showed as clinically significant microbial growth. Among the identified fungal species, Candida albicans was the most prevalent (27.3%), followed by Candida auris (22.7%), Candida tropicalis (22.7%), Candida glabrata (9.1%), Candida famata (9.1%), Trichophyton rubrum (4.5%), and Microsporum species (4.5%). A statistically significant association was observed between the presence of respiratory symptoms (such as cough and cold) and positive fungal culture results ($p = 0.023$). Therefore, further investigation into the association between fungal positivity and respiratory symptoms is necessary. Additionally, the use of less sensitive sample collection method, such as swabbing, may influence results and should be considered when comparing finding with previous literature.

Keywords: Fungal infections, diabetes mellitus, toe webs, candida, respiratory disease

Genetic and Epigenetic Alterations in Oral and Oropharyngeal Cancers Associated with Smoke and Smokeless Tobacco Exposure: A Systematic Review

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Oral and oropharyngeal squamous cell carcinomas are influenced by several variables, such as alcohol use, tobacco use and human papillomavirus (HPV) infections. Among them, tobacco usage is closely linked to squamous cell carcinomas of the oropharynx and oral cavity. Tobacco-induced genetic and epigenetic alterations are crucial contributors to carcinogenesis and their exact processes are still unknown. The aim of this systematic review was to compile the most recent information regarding the genetic and epigenetic changes caused by tobacco use that lead to the initiation and progression of oral and oropharyngeal cancers. Databases such as PubMed, Scopus, and Web of Science, Dentistry & Oral Sciences Source and AMED – The Allied and Complementary Medicine Database were used in a methodical search. Altogether 28 studies on tobacco-related oral/oropharyngeal malignancies that were published between 2014 and 2024 were included and focused only on *in-vitro* experiments. PRISMA guidelines were used to screen the articles. Key findings, tobacco usage, cell culture conditions, study type, and important molecular changes were considered during extraction and data analysis. Both smoke and smokeless tobacco products were analyzed collectively. SYRCLE's risk of bias tool was used for the risk of bias assessment since most of the studies were used both animal models and cell lines. We found that frequent mutation of *TP53, CDKN2A,* and *NOTCH1* genes in tobacco users. Hypermethylation of tumor suppressor gene promoters and changes in the expression of regulatory microRNAs like miR-21 and miR-155 were examples of epigenetic changes. Additionally, tobacco smoke has been connected to chromatin remodeling and histone de-acetylation, both leading to uncontrolled cell growth and invasion. The development of oral and oropharyngeal cancer was driven by certain genetic alterations and epigenetic dysregulation as a result of tobacco usage. These results provide promising insights into novel treatment approaches such as molecular biomarkers for early detection of tobacco-associated head and neck malignancies

Keywords: Tobacco, oral cancer, oropharyngeal cancer, genetic, epigenetics

Geochemical Characterization and Health Risk Assessment of Groundwater in Sri Lanka

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This study evaluates the hydro-geochemical properties of water samples from various domains across climatic zones and geological complexes to determine water quality and potential health risks. Groundwater quality data are presented from a total of 1508 groundwater samples. Key parameters such as temperature, pH, total alkalinity (TA), total hardness (TH), electrical conductivity (EC), bicarbonate (HCO_3^-), sulfate (SO_4^{2-}), phosphate (PO_4^{3-}), nitrate (NO_3^-), chloride (Cl^-), fluoride (F^-), sodium (Na^+), potassium (K^+), magnesium (Mg^{2+}), and calcium (Ca^{2+}) were analyzed. The county's greatest median EC and TH values (1350.29 µS cm^{-1} and 494.97 mg L^{-1}) might be sedimentary terrain. The greatest geographical changes in EC and TH values, which are probably influenced by climate, were found on the metamorphic terrain that makes up more than 90% of the island. The Water Quality Index (WQI) and Health Index (HI) were calculated to assess water usability and associated health implications. The results show significant variability in water quality across different zones. The dry zone exhibits higher mineral content and poor water quality, with domains like A having the highest WQI of 93.00 (Very Poor). The wet zone, particularly domain H, demonstrates the best water quality with a WQI of 9.00 (Excellent). Parameters like electrical conductivity, hardness, and chloride levels are elevated in the Sedimentary and Wanni complexes, indicating salinity and mineralization issues. The average pH (6.73) is within permissible limits, but acidity is noted in the wet zone Highlands (pH 4.73). Health risk assessments reveal that the dry zone poses the greatest health concerns, with a maximum HI of 5.36. The findings highlight the need for targeted water management strategies, including salinity control in the dry zone, enhanced mineral content monitoring, and water quality maintenance in the wet zone. This study underscores the importance of region-specific interventions to ensure safe and sustainable water resources.

Keywords: Electrical conductivity, hazard Index, total alkalinity, total hardness, water quality Index

Geospatial Analysis of Intensive Care Unit (ICU) Bed Distribution and Inequality in Sri Lanka

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Intensive Care Unit (ICU) beds are a specific type of beds in hospitals reserved for patients who require continuous critical medical monitoring and advanced life support. Developing countries like Sri Lanka face significant limitations, with ICU beds concentrated primarily in major hospitals. Therefore, this study examines the spatial distribution of ICU beds in Sri Lanka, aligning ICU bed capacity with regional peers and global benchmarks. ICU bed capacity and admission, population and global ICU capacity data from the Annual Health Bulletin (2020) of the Ministry of Health, Department of Census and Statistics, Humanitarian Data Exchange, and international health literature were obtained. The analysis utilised inequality measurement and geospatial analysis. For inequality assessment, Gini coefficients and Theil indices at both district and provincial levels were calculated, and geospatial analysis using ArcGIS Pro was conducted to map ICU facilities against population density. All ICU bed data were normalised per 100,000 and identified their spatial patterns with zonal statistical analysis. The findings revealed significant disparities in ICU bed distribution across Sri Lanka. The Gini index of 0.41 indicated moderate inequality nationwide, with the Colombo district possessing 3.92 ICU beds per 100,000 population compared to 0.69 in Nuwara Eliya. Provincial-level analysis showed the Central Province had the highest inequality with a 0.09 Theil index. Districts with the population exceeding 1,000,000 (Colombo, Gampaha, Kandy) accounted for over 60% of national ICU capacity despite housing only 39% of the population. Admission patterns reflected the disparity, with Colombo recording 6,923 admissions compared to fewer than 500 in Mannar, Vavuniya, and other rural districts. Further, the ICU ratio of Sri Lanka (1.8 beds/100,000) aligns with India (2.3) but trails developed nations like the UK (6.6), highlighting the pronounced spatial inequality in ICU bed distribution, with critical care resources heavily concentrated in urban centres while rural areas remain severely underserved.

Keywords: Intensive care unit (ICU) bed distribution, healthcare disparities, spatial inequality, geographic information system

Gray Level Co-occurrence Matrix (GLCM) Texture Features Analysis for Brain Tumor Classification Using MRI

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Medical imaging Physics is rapidly developing area of research in the world. The Gray-Level Co-occurrence Matrix (GLCM) is a method for extracting texture information from the medical images. Magnetic Resonance Image (MRI) is a non-invasive modality commonly used in cancer diagnosis. Tumors are classified as benign or malignant based on their biological behavior, histological characteristics, and potential for metastasis. This study applies GLCM texture feature analysis to classify brain MR images into benign tumors, malignant tumors, and normal brains. The aim is to differentiate between benign and malignant tumors and normal brains using GLCM features and to identify the most suitable machine learning model for classification. The features Contrast, Correlation, Energy, Homogeneity, Dissimilarity, Angular Second Moment (ASM), Entropy, Auto-correlation, Variance, Inverse Difference Momentum (IDM), Sum Average, Sum Entropy, Sum Variance, Different Entropy, and Different Variance in GLCM are used in this study. DICOM format images were used to select tumor ROIs (Region of Interests) in the MR images. ROIs were manually selected using MATLAB, and corresponding texture feature values were extracted. Statistical analysis was used to compare the feature values to identify the discriminant tumors and normal brains. ANOVA F-test was used to select the best feature performance. These features were then used to identify the most effective machine learning model. Among the features, correlation yielded the lowest ANOVA F-score (2.409331) and was excluded from further analysis. The Support Vector Machine (SVM) model demonstrated the highest classification accuracy of 86.67%. Therefore, SVM can be used to differentiate between malignant tumors, benign tumors, and normal brains with high accuracy. The study concludes that GLCM features excluding correlation can effectively differentiate malignant tumors, benign tumors, and normal brains. The SVM model enables the development of a high-performance ML model that can assist in the decision-making steps of the brain tumor diagnosis process in MRI.

Keywords: MRI, tumors, GLCM texture features, DICOM

Green Synthesis and Characterization of Hydroxyapatite Nanoparticles Using Chicken Egg Shells for Cefazoline Delivery

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Hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$) is a naturally occurring inorganic mineral. It is used for biomedical applications due to biocompatibility, biodegradability, and osteoconductivity of their nanostructures. In this study, HAP NPs were synthesized using green and facile methods. This study was done to develop a facile synthesis method for producing hydroxyapatite nanoparticles using chicken egg shells for cefazolin delivery and to evaluate the effect of the method for the characteristics of the NPs. The research was a laboratory based experimental study that used wet chemical precipitation methods for the synthesis. In method 1, $Ca(CO)_3$ was transformed via $Al(OH)_3$ under controlled pH (10) and temperature (60 ^{0}C). Method 2 was done under thermal decomposition and HAP was obtained at 60 ^{0}C without external pH control. After that characterization was done using SEM, FT-IR and XRD analysis. According to the SEM analysis, spherical shape NPs were observed in average size of 10 nm with nanosize porosity and needle shapes were obtained with 15 nm x 100 nm. FTIR spectra were obtained for the both CFZ loaded and pure HAP NPs to identify the functional groups. Peak analysis of the both shapes revealed that their functional groups were perfectly indexed with the standard spectra of HAP NPs. CFZ- loaded HAP NPs illustrated the significance bonds of CFZ while making some changes of the pure HAP NPs spectra. XRD was done to identify the crystallinity. According to that, XRD patterns were matched with standard peaks of the HAP NPs. When calculating the crystallinity size, Spherical shape was given 30 nm and needle shape was given 12 nm of average sizes. Finally, HAP NPs were synthesized using green methods, and size and morphology was tuned using different structure-directing agents like $Al(OH)_3$. CFZ was loaded successfully for both morphologies and spherical shapes show higher CFZ loading capacity than needle- shapes due to the high surface area/volume ratio and strengths of the bonds in FTIR analysis.

Keywords: Hydroxyapatite, nanoparticles, cefazoline, spherical, needle

Green Synthesis of Iron oxy-hydroxide Nanoparticles from Buttala Magnetite for Removing Multivalent Ions from Contaminated Drinking Water

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The groundwater contamination with various ions poses a serious risk to human health and the environment. In response to the urgent need for sustainable water decontamination technologies, this study produced an environmentally friendly synthesis of iron oxide nanoparticles (IONP) from the natural magnetite using waste tea extract as a reducing agent. Batch experiments examined the adsorption behaviour of anions and cations with different oxidation states. Variables such as contact time, the dosage of adsorbents, and the initial concentration of the parameters were considered during the experiments. Fourier Transform Infrared spectroscopy (FT-IR) and Scanning Electron Microscopy (SEM) methods characterized materials before and after the adsorption experiments. The green synthesized IONP showed a higher binding affinity for tri-valent cations with a maximum removal efficiency of 88% at an optimum dosage of 10 g/L over 60 min. The removal of the mono-valent anion was up to 11% at 1.0 g/L dosage after 30 min of contact time. In contrast, mono-valent and di-valent cations showed very low adsorption, reflecting the selective behaviour of the nanoparticles. Among the adsorption isotherms, the Temkin model was the most suitable for the tri-valent cation and mono-valent anion, reflecting a heterogeneous surface with different adsorption energy. The green synthesis process was found to have an average IONP yield of 87.4%, reflecting its cost and scalability. This study highlights the potential of green-synthesised IONPs for selective ion removal, particularly tri-valent cations, offering a sustainable, cost-effective solution for water treatment. Specific ion removal by these eco engineered IONP offers promising applications for water filtration at household and community levels, which will enhance sustainable development towards access to clean water.

Keywords: Batch adsorption, magnetite, green synthesis, groundwater contamination, water purification

Health-Related Quality of Life of Patients with Pulmonary Tuberculosis Registered in Central Chest Clinic, Kandy, Sri Lanka

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Pulmonary tuberculosis (PTB), a chronic infectious disease caused by *Mycobacterium tuberculosis*, significantly affects the health-related quality of life (HRQOL) of those affected. Beyond its physical impact, PTB also disrupts psychological well-being and social functioning, thereby reducing overall quality of life. Despite effective treatment, the disease remains a public health issue. Understanding its impact is key to improving patient outcomes. This study aimed to assess the HRQOL among pulmonary tuberculosis patients registered at the Central Chest Clinic, Kandy, Sri Lanka, and to assess the relationship between socioeconomic characteristics and HRQOL. This was a descriptive cross-sectional study conducted from November to December 2023. A total of 205 clinically diagnosed PTB patients, aged 18 years and above, were recruited using a non-probability convenience sampling method. Data were collected through an interviewer-administered questionnaire, which included demographic questions and the RAND 36-Item Health Survey for HRQOL assessment. Descriptive statistics and Spearman's correlation analysis were performed using SPSS to analyze the data. Participants exhibited generally low HRQOL scores compared to published reference values, with the lowest mean scores observed in general health (23.43 ± 14.47) and role limitations due to physical health (5.24 ± 19.01). Composite scores reflected an overall reduced quality of life, with a mean Physical Health Component Score of 26.38 ± 15.91 and a Mental Health Component Score of 30.25 ± 15.99. Correlation analysis revealed significant negative correlations between age and HRQOL scores ($p = 0.000$, $\rho=-0.481$), while higher education levels ($p=0.000$, $\rho=0.286$) and better economic status ($p=0.002$, $\rho=0.213$) were positively correlated with improved HRQOL outcomes. This study highlights the multidimensional burden of PTB on HRQOL, with notable deficits in physical, mental, and social health domains. These findings emphasize the need for comprehensive care strategies that address the physical, psychological, and social challenges faced by PTB patients.

Keywords: Pulmonary tuberculosis, health-related quality of life, sociodemographic factors

Histopathological Features and Their Association with Serum PSA Levels in Prostate Cancer Patients at the National Hospital Galle

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Prostate cancer is the second most common cancer among men across the world and most of them are adenocarcinomas. Serum Prostate Specific Antigen (PSA) test is a more specific and powerful tool used for early detection of prostate cancer. Serum levels of PSA concentration with the Gleason grading system are used to differentiate prostate tumors. This study aimed to determine the profile of histopathological features and their association with serum levels of PSA in prostate cancer patients at the National Hospital, Galle. A cross-sectional study was conducted among patients diagnosed with prostate diseases including malignancies while excluding those with urinary tract infections and benign prostate hyperplasia. Data were collected retrospectively from archived laboratory records and clinic files from December 2019 to July 2024 after obtaining ethical approval from the Ethics Review Committee of the Faculty of Allied Health Sciences, University of Ruhuna. Data were analyzed using descriptive statistics, chi-square and Spearmen's rank correlation with SPSS. A total of 246 prostate cancer patients with the mean age of 69 ± 8 years were enrolled. The mean serum PSA concentration was 37 ± 42 ng/mL. The most common histologic type was acinar adenocarcinoma with a mean tumour burden of 42.25 ± 28.8 %. Perineural invasion (PNI) was present in 28% of patients, while lympho-vascular invasion (LVI) was observed in 10%. Forty-five percent of the study population had Gleason grade group 4 or 5 tumours. Serum PSA value had a significant association with PNI ($p = 0.02$) but not with LVI ($p = 0.162$). Gleason grade group was significantly associated with tumour size ($p < 0.001$), PNI ($p < 0.001$) and LVI ($p = 0.002$). Serum PSA values showed a statistically significant positive correlation with both Gleason grade group ($\rho = 0.597$, $p < 0.001$) and tumour size ($\rho = 0.505$, $p < 0.001$). These findings emphasize the clinical value of serum PSA levels and histopathological features in assessing the aggressiveness of prostate cancer. Higher serum PSA values were significantly associated with higher Gleason grade groups and larger tumour size, suggesting that PSA can serve as a significant biomarker for predicting tumour behavior and guiding patient management.

Keywords: Gleason grade groups, histopathological features, prostate specific antigen, prostate cancer

Hypertension Prevalence in Sri Lanka: A Literature Review

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Hypertension, a major non-communicable disease worldwide, significantly contributes to conditions like cardiovascular disease, stroke, and kidney failure. In Sri Lanka, a rapidly developing lower-middle-income nation, its prevalence is increasing, driven by factors such as urbanization, shifting demographics, and changes in lifestyle and dietary habits. This review aimed to investigate the prevalence of hypertension in Sri Lanka, contributing risk factors, and highlight high-risk groups. We focus on identifying emerging trends, patterns, and existing gaps in research to support targeted public health strategies and improve hypertension management across the population. This literature review employed a qualitative narrative approach, drawing on 25 peer-reviewed journals, government publications, and national studies, including the Sri Lanka Health and Aging Study, published between 2014 and 2024. Databases were searched on Google Scholar and PubMed, using keywords such as "hypertension," "Sri Lanka," and prevalence". The review aimed to examine the prevalence, risk factors, and demographic differences associated with hypertension in Sri Lanka. Studies included focused on adult populations. The analysis focused on variables like age, gender, urban versus rural location, and comorbidities. The review sought to consolidate existing knowledge and identify trends and gaps in hypertension research. The results indicate that around one-third of adults in Sri Lanka suffer from hypertension, with a higher prevalence ranging from 20.9% to 39.2% seen in older adults, urban dwellers, individuals with obesity, and those with multiple chronic conditions such as diabetes. Additionally, hypertension is significantly linked to factors like income levels, lack of physical activity, and a family history of the condition. Women over 50, urban residents, and individuals with obesity or diabetes were found to be at higher risk. Expressive regional and socioeconomic differences were also observed. The increasing prevalence of hypertension in Sri Lanka demands a cause for public health interventions. Future research should emphasize gender-specific analysis, objective evaluations of lifestyle factors, and comprehensive national surveillance. Enhancing health education, expanding screening programs, and promoting lifestyle modification initiatives are essential strategies to mitigate the burden and prevent the associated complications of hypertension.

Keywords: Hypertension, Sri Lanka, prevalence, risk factors, non-communicable disease

Identification of Coronaviruses in Bat Excreta in a Selected Semi-Urban Area in the Kandy District of Sri Lanka

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Bats are known asymptomatic reservoirs of many coronaviruses (CoV). Their dense roosting behavior promotes transmission and evolution of these viruses, posing zoonotic risks. Identifying CoV in bat colonies will help recognize emerging CoV, particularly in areas where human-animal interactions are common. This study aims to detect the presence of CoV in bat guano collected from a semi-urban bat colony in a selected site in the Kandy District of Sri Lanka. A total of 50 fresh bat guano were collected from a bat colony from Akurana, Sri Lanka in July 2023. Each guano was mixed separately with 1mL of Phosphate Buffered Saline (PBS). Viral RNA was extracted using Bioflux Biospin Virus DNA/RNA extraction kit, as per manufacturer's instructions. RNA extracts were subjected to a conventional PanCoV nested RT-PCR, which is designed to target RNA-dependent RNA polymerase gene with a 442 base pair fragment, a conserved segment in the *Orthocoronavirinae* family. Subsequently, PCR products were visualized using gel electrophoresis using a UV transilluminator. Finally, DNA sequencing was done for the positive samples using Oxford Nanopore Technology. Of the 50 bat guano samples tested, 15 (30%) were confirmed positive for CoV through PanCoV RT-PCR. Of the 15 CoV positive samples, 13 were successfully sequenced; the majority of these samples were classified as beta CoV using the NCBI blast. Identification of beta CoV in 30% of bat guanos in a semi-urban area of the Kandy District, emphasizes the need for enhanced surveillance of bats, especially in underrepresented areas, to understand CoV diversity to mitigate potential zoonotic spillovers that could pose threats to the public.

Keywords: Coronaviruses, bats, zoonotic, spillover, Sri Lanka

Immersive AI-Driven Nursing Education: Integrating VR and Conversational AI for Advanced Wound Care Training

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Nursing education faces significant challenges in delivering effective wound care training due to limited faculty resources, high costs of traditional manikin-based simulations, and ethical constraints surrounding patient consent. These barriers restrict hands on practice, impede skill development, and delay clinical preparedness among nursing students. This study explores the integration of Virtual Reality (VR) simulations and Conversational AI models to revolutionize advanced wound care education, aiming to bridge the gap between theoretical knowledge and practical application. The primary objectives are to enhance critical thinking, clinical competency, knowledge retention, and learner engagement through immersive, interactive technologies tailored to nursing education. A structured literature review was conducted, analyzing 45 peer reviewed studies on VR and AI applications in nursing education, with a specific focus on wound care training. Studies were systematically categorized based on their use of VR, Conversational AI, or combined approaches, revealing a notable gap in research on integrated systems. Findings indicate that VR significantly improves immersion, spatial understanding, and skill acquisition but lacks realistic tactile feedback and robust support for complex decision-making. Conversely, Conversational AI excels in delivering dynamic, personalized feedback and guidance, yet struggles with contextual adaptability and speech recognition accuracy in clinical scenarios. The integration of these technologies remains underexplored, primarily due to hardware limitations, software compatibility issues, and the complexity of replicating domain specific wound care scenarios. Despite these challenges, combining VR's immersive environments with AI's adaptive communication offers a promising pathway to create realistic, scalable training platforms. Such systems could simulate diverse clinical cases, provide real time feedback, and foster critical decision-making skills in a safe, controlled setting. This study underscores the transformative potential of integrated VR-AI systems to address current educational limitations, enhance learner outcomes, and better prepare nursing students for real world clinical challenges. Future research should prioritize developing pedagogically sound, interoperable systems that overcome technical barriers, focusing on scalability, accessibility, and alignment with nursing curricula to ensure practical implementation and widespread adoption in educational settings.

Keywords: Virtual reality, conversational AI, nursing education, wound care training, immersive learning

In vitro and *In silico* Evaluation of Antioxidant Potential and Phytochemical Quantification of *Plectranthus amboinicus (Lour.) Spreng* Roots

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Plectranthus amboinicus (Lour.) Spreng is a medicinal plant that belongs to the family *Lamiacea* and is known for its diverse pharmacological properties. Though the various parts of the plant have been extensively studied, roots remain less explored. This research aimed to evaluate phytochemical and antioxidant activities of *P. amboinicus* roots using *in vitro* and *in silico* methods. Different plant extracts of roots were made using sequential cold maceration method with n-Hexane, Chloroform and Methanol. Total Phenolic Content (TPC), Total Flavonoid Content (TFC) and Total Antioxidant Capacity (TAC) were determined while the antioxidant activity was determined using 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging method. Gass Chromatography-Mass Spectrophotometry (GC-MS) analysis was performed to identify the phytochemicals present in the root extracts. The identified phytochemicals were subjected to *in silico* molecular docking study with Superoxide dismutase (SOD) enzyme to simulate binding affinities by using GOLD Suite software. Docking results were compared and analyzed with the standard ligand binding capacity with SOD enzyme. The n-Hexane extract showed the highest TPC (28.22 ± 1.155 mg GAE/g), whereas the Methanol extract showed the highest TFC (21.78 ± 0.254 mg QE/g). The TAC assay indicated n-Hexane extract showed the highest antioxidant capacity (7.3490 ± 0.446 mg AAE/g). Nevertheless, the Methanol extract showed the best scavenging activity with the lowest IC_{50} of 78 ± 1.194 µg/mL while the standard Ascorbic acid showed IC_{50} of 148.5 ± 0.333 µg/mL. Palmitic acid ($C_{16}H_{32}O_2$), Aromadendrene ($C_{15}H_{24}$), and Hexanedioic acid ($C_6H_{10}O_4$) were identified as the most abundant compounds present in extracts via GC-MS. Palmitic acid-SOD interaction showed a high binding potential with 3 Hydrogen bonds and 59.1739 of PLP fitness score while the standard Ascorbic acid-SOD showed only 44.496 of PLP fitness score. The study highlights the significant antioxidant potential of *P. amboinicus root* extracts. The Methanol extract exhibited the highest free radical scavenging activity, while Palmitic acid showed strong binding affinity with the Superoxide dismutase enzyme. These findings indicate that *P. amboinicus* roots possess considerable potential as a natural source of antioxidant agents. The results can be applied in the development of herbal supplements, functional foods, skincare products, and antioxidant-based therapies.

Keywords: *In vitro*, *In silico*, antioxidant, phytochemicals, roots, *P. amboinicus*

In Vitro Anti-Inflammatory Activity of Guduchyadi Taila and Its Individual Ingredients

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Guduchyadi Taila is a traditional formulation used in treating Vatarakta (gouty arthritis). This formulation is prepared by incorporating of *Tinospora cordifolia* (Rasakinda), cow milk, sesame oil, and water. This study aimed to evaluate the in vitro anti-inflammatory activities of Guduchyadi Taila and its ingredients using egg albumin denaturation assay and heat-induced red blood cell (HRBC) stabilisation assay. *T. cordifolia,* along with cow milk and sesame oil, was used in the preparation of Guduchyadi taila, according to the standard methods mentioned in Ayurvedic Pharmacopoeia of Sri Lanka. The in vitro anti-inflammatory activity of the Guduchyadi taila and its ingredients (decoction of *T. cordifolia* stem, cow milk, sesame oil) was evaluated using the egg albumin denaturation assay and the HRBC membrane stabilization assay, with diclofenac sodium as the reference drug. Statistical analysis was performed using one-way ANOVA followed by Tukey's Honestly Significant Difference post hoc test. In egg albumin denaturation assay, *T. cordifolia* decoction, cow milk, sesame oil, Guduchyadi taila, and diclofenac sodium showed IC_{50} values of 685.6, 3664, 1694, 565.3 and 780.4 µg/ml, respectively. In the HRBC membrane stabilisation assay, *T. cordifolia* and Guduchyadi Taila had IC_{50} values of 683.1 and 658.5 µg/ml, respectively, while sesame oil and cow milk (1414 and 3788 µg/ml, respectively) displayed much weaker activity. The anti-inflammatory activity of T. cordifolia and Guduchyadi Taila was comparable with the standard drug ($P > 0.05$), while cow milk and sesame oil had significantly weaker activity compared to Guduchyadi Taila and diclofenac sodium ($P < 0.05$). The present study demonstrated the in vitro anti-inflammatory activity of the traditional formulation Guduchyadi Taila. Decoction of *T. cordifolia* stem showed in vitro anti-inflammatory activity indicating its potential as a promising source for novel anti-inflammatory agents. A novel topical formulation will be prepared using the ingredients of Guduchyadi Taila.

Keywords: Guduchyadi taila, *Tinospora cordifolia,* egg albumin denaturation assay, heat-induced red blood cell membrane stabilization assay

In Vitro Antimicrobial Activity of Hypochlorous Acid (Hocl) on Some Selected *Candida* Species and Oral Microflora

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Hypochlorous acid (HOCl) is used as an antiseptic and a disinfectant. However, antimicrobial activity (AMA) of HOCl on *Candida* species (*CS*) and oral microflora (OM) is poorly investigated. This study aimed to evaluate the AMA of HOCl on some selected *CS* and OM in vitro. AMA of HOCl was tested against standard isolates of *Candida*; *C. albicans* (ATCC 90028), *C. parapsilosis* (ATCC 22019), *C. krusei* (ATCC 6258), *C. glabrata* (ATCC 90030) and *C. tropicalis* (ATCC 13803). Further, the effect of HOCl against OM harvested from healthy individuals was also assessed as follows. HOCl produced by Steripower® unit (Japan) was adjusted to different concentrations (200, 100 and 50 ppm). Phosphate buffered saline (PBS) and 0.2% chlorhexidine were used as negative and positive controls. *CS* were cultured in Tryptic Soy Broth (TSB) at 37℃ for 24 h and were harvested by centrifugation, washed and suspended in PBS (10^8 cell/ml; 0.5 McFarland). OM was harvested from 5 healthy volunteers after rinsing the mouth with sterile PBS (10 ml) for 30 seconds. Resultant oral rinses were concentrated into 1ml PBS with centrifugation. Afterwards, 0.1 ml of the *Candida* suspension or concentrated oral rinse was mixed with 0.9 ml of HOCl or control solutions for 1 min. Subsequently, 0.1 ml of the resultant solutions of *Candida* or OM exposed to HOCl were inoculated on to Sabourauds dextrose agar or blood agar plates respectively. *Candida* cultures were incubated at 37℃ aerobically. OM was incubated at 37℃ both aerobic and anaerobic conditions. All cultures were observed up to 48 h for microbial growth. Each experiment was quadruplicated. *CS* (*C. albicans*, *C. glabrata, C. krusei*, *C. parapsilosis*, and *C. tropicalis*) and OM of healthy volunteers exposed to HOCl (200, 100, 50 ppm) and 0.2% chlorhexidine for 1min resulted no growth on solid agar after 48 h incubation at 37℃. Exposure to HOCl (200, 100, 50 ppm) and 0.2% chlorhexidine for 1 min completely inhibited all the tested *CS* (*C. albicans*, *C. glabrata, C. krusei*, *C. parapsilosis*, and *C. tropicalis*) and the OM of healthy volunteers suggesting a remarkable AMA. This could be attributed to the fact that HOCl dissociates into H^+ and OCl^- that are capable of denaturing and aggregating microbial proteins resulting in killing a broad spectrum of microorganisms in a brief exposure. HOCl (200, 100, 50 ppm) may be used as an effective antiseptic/disinfectant similar to 0.2% chlorhexidine against *C. albicans*, *C. glabrata, C. krusei, C. parapsilosis*, *C. tropicalis* and OM. Further studies are recommended to assess the in vivo effects of HOCl to explore its application for oral hygiene.

Keywords: AMA, *candida* species, HOCl, oral hygiene, oral microflora

In Vivo Glycaemic Response to Selected Commonly Consumed Sri Lankan Rice–Based Foods Prepared Using Three Long-Grain Rice Varieties

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Sri Lankans heavily rely on rice-based diets. However, the Glycaemic index (GI) values of many local rice-based dishes have been underexplored. This study aimed to investigate the Postprandial Glycaemic Responses (PGRs) elicited by selected rice-based dishes prepared using different cooking methods, from three long grain rice varieties [CIC *Savandara* Mix, CIC Red Fragrant (Broken) and CIC Super Kernel]. Selected dishes, namely milk rice, *Diyabath*, rice porridge, fried rice and string hoppers (served as a mixed meal with coconut gravy) were prepared following standard recipes and analysed for proximate composition. *In vivo* GI values of plain cooked rice and dishes were determined following the ISO 26642:2010 procedure, in a randomized clinical trial, using a healthy human clinical panel of twenty-five volunteers. Each portion of test meals contained 50 g of available carbohydrates. Pure glucose (50 g) dissolved in 250 ml of water was served as the reference. *Savandara* Mix rice reported a medium GI (58 ± 8.4) whereas milk rice (51±5.0) and *Diyabath* (40 ± 5.8) prepared from the same rice reported low GI values. Fried rice prepared from Super Kernel rice exhibited a low GI value (40 ± 5.0). Red Fragrant (Broken) rice (67 ± 6.8) and derived dishes; rice porridge (62 ± 10.6) and string hopper mixed meal (59 ± 9.1) were categorized as medium GI food. Additionally, milk rice prepared from *Savandara* Mix, when served with a minimal sufficient amount (15 g) of a commercially available accompaniment (*Katta Sambal*) elicited a GI of 50 ± 6.5 indicating no statistically significant difference ($p < 0.05$) when compared with milk rice served alone. The results indicate that method of preparation and addition of fat, protein and fibre can help optimize the PGR of rice-based dishes. Furthermore, it depicts potential use of commercially available *Katta Sambal* as a carrier food during GI testing. Moreover, each dish tested can be tailored to specific health needs.

Keywords: Rice, glycaemic response, rice-based dishes, Sri Lankan food

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In Silico Evaluation of the Repellent Efficacy of Selected Citrus Terpenoids Against *Aedes Albopictus* OBP 1 Protein Using Molecular Docking Techniques

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Mosquito-borne diseases pose a major global health threat, affecting billions each year. Rising resistance to synthetic pesticides and the lack of antiviral treatments, especially for illnesses like dengue, emphasize the need for alternative prevention methods. Natural plant compounds, particularly citrus-derived terpenoids, have shown promise as eco-friendly mosquito repellents. This study used an *in silico* approach to assess the binding efficiency of selected citrus-based phytochemicals against Odorant Binding Protein 1 (OBP1) of *Aedes albopictus*, with the synthetic repellent DEET as a reference. Key compounds analyzed included limonene, α-pinene, β-pinene, linalool, citronellol, myrcene, citral, and neral—chosen for their known repellent activity and abundance in citrus extracts. The OBP1 active site was identified using CASTp, and molecular docking was performed using AutoDock 4.2.6 with standard parameters (Kollman charges and merged non-polar hydrogens). Docking was tested at exhaustiveness levels 8, 30, 50, and 100 to validate results. Additional virtual screening was conducted with Vina, and interactions were visualized using Discovery Studio and ChimeraX. Limonene showed the highest binding affinity at –6.8 kcal/mol, surpassing DEET (–5.0 kcal/mol). Other compounds like α-pinene and β-pinene also exhibited stronger affinities than DEET. The docking interactions included hydrogen bonds, alkyl, and π-alkyl interactions, suggesting favorable structural compatibility with OBP1. While no significant statistical differences were observed across exhaustiveness levels, minor variations in binding affinity were noted. Overall, the findings highlight the potential of citrus-derived terpenoids, particularly limonene, as effective natural alternatives to synthetic mosquito repellents. The study demonstrates the value of computational docking in screening plant-based bioactive compounds for mosquito control strategies.

Keywords: Odorant binding protein 1 (OBP1), *In silico analysis, Aedes albopictus, c*itrus-derived terpenoids, molecular docking

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Investigating Factors Associated with Infant Mortality in Selected MOH Areas in Colombo District, Sri Lanka

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Infant mortality is a vital public health indicator that reflects socio-economic disparities, maternal health, and access to healthcare. Despite national progress in reducing the infant mortality rate (IMR), Colombo's IMR remains above the national average, warranting focused investigation. This study aims to conduct a comprehensive statistical analysis of the determinants of infant mortality in selected Medical Officer of Health (MOH) areas within the Colombo District, Sri Lanka. Secondary data were collected from nine MOH offices between 2019 and 2023. A random cluster sampling technique was used to select these nine MOH offices ensuring a representative sample. Additionally, the study examines the factors determining the number of days an infant survives prior to mortality. The dataset consists of 228 cases and encompasses variables related to various aspects of infant death, including socio-demographic factors, birth history, and maternal and paternal characteristics. Data were collected directly from the MOH offices and structured for analysis. Missing data were handled using multiple imputation techniques to ensure robust results. The analysis employs both descriptive and advanced statistical techniques, including negative binomial regression and decision tree models, to identify the significant predictors of infant survival and estimate the number of days an infant lived before mortality. Birth weight and maternal immunisation against rubella emerged as the most significant predictors, with higher birth weights associated with prolonged survival. Geographical disparities were also observed, particularly in the Kolonnawa MOH area, which emerged as a critical hotspot in the region. This area warrants targeted public health interventions due to its higher incidence of parents with no formal education and gaps in maternal rubella immunisation coverage. Despite limitations due to incomplete data coverage across all MOH areas, the findings remain robust due to rigorous statistical handling. This study offers actionable insights for improving neonatal care and guiding targeted public health interventions aimed at reducing infant mortality in Colombo. Moreover, estimating the likelihood of infant survival will aid in optimising resource allocation within hospitals, ensuring more effective use of available healthcare facilities.

Keywords: Birth weight, Colombo district, infant mortality, maternal immunization, negative binomial regression

Isobaric Bupivacaine versus Hyperbaric Bupivacaine for Spinal Anaesthesia in Caesarean Sections: Prospective Randomized Clinical Trial

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Spinal anaesthesia (SA) is used for cesarean sections due to its rapid onset, effective sensory blockage, and low risk of maternal and neonatal risks. Bupivacaine, the preferred local anaesthetic, is available in isobaric (dextrose-free) and hyperbaric (dextrose-containing) forms. Hyperbaric bupivacaine is preferred more for its predictable spread and cardiovascular stability, though isobaric may be a good second line choice in resource limited settings. This single-blinded, prospective, single-centered, randomized clinical trial was conducted in Teaching Hospital Peradeniya enrolling 158 pregnant women undergoing elective caesarean sections, above 18 years of age (79 in each group). Primary objectives were to compare safety, effectiveness, and cardiovascular stability (blood pressure) of isobaric and hyperbaric bupivacaine in spinal anesthesia for cesarean sections. Data were analyzed using SPSS 26 and jamovi 2.6.26, with significance set at $p < 0.05$. Data analysis revealed isobaric bupivacaine had a significantly faster onset compared to hyperbaric bupivacaine (2.101 vs. 3.763 min, $p < 0.05$). The duration of the sensory block was prolonged in hyperbaric bupivacaine than isobaric (3.80 vs. 1.622 hours, $p < 0.05$). Sensory block levels were comparable (T6 vs. T5, $p < 0.05$). A statistically significant difference was observed in both groups. Hyperbaric bupivacaine had a smaller reduction in systolic (24.10 ± 22.4 mmHg) and diastolic (19.60 ± 19.6 mmHg) blood pressure in contrast to isobaric (39.82 ± 22.4 mmHg and 30.30 ± 16.9 mmHg, respectively, $p < 0.05$). In conclusion, hyperbaric bupivacaine has better cardiovascular stability and a longer duration, making it ideal for cesarean sections. Isobaric has a faster onset but may cause more hemodynamic variations requiring close monitoring.

Keywords: Spinal anesthesia, isobaric vs. hyperbaric bupivacaine, cesarean section

Isolation and Evaluation of the Gum from *Cyclea Peltata* Leaves as a Binder in Tablet Formulation

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Binders are essential excipients in tablet formulation, contributing to the cohesiveness and mechanical integrity of compressed tablets. Natural gum from *Cyclea peltata* leaves can serve as an alternative tablet binder to conventional agents such as maize starch, addressing the growing demand for safe, biocompatible, and sustainable excipients over synthetic binders. To develop a robust and reproducible method for extracting gum from *Cyclea peltata* leaves for use as an alternative tablet binder, and to rigorously assess its suitability and efficacy as a binding agent in pharmaceutical tablet formulations.100g of mature, healthy *Cyclea peltata* leaves were harvested, washed, shade-dried and mechanically comminuted. For gum extraction, the commuted leaf material was soaked in distilled water and then heated at 70 ^{0}C for mucilage release. The extract was filtered, concentrated using a rotary evaporator, and precipitated by treating with cold ethanol. The resulting precipitate was dried, pulverized, and utilized to formulate placebo tablets as a binder via wet granulation, followed by standard evaluation tests as per British Pharmacopoeia. The tests included hardness, friability, disintegration, weight variation, and thickness and diameter. The extraction of gum from *Cyclea peltata* leaves yielded 12.75% and the extraction was optimum in the presence of ethanol to sample in a ratio of 3:1**.** The tablets formulated reported an average hardness of 42.4 N and negligible friability, indicating good mechanical strength and satisfactory resistance to abrasion. Disintegration time and average tablet weight of the formulated tablets were 12.85 minutes, 227.96 mg respectively confirming all the tablets passed the hardness, friability, disintegration, uniformity of weight, and thickness and diameter tests. According to the findings of the study, gum from *Cyclea peltata* can be extracted effectively with ethanol: sample ratio of 3:1. Promising results for placebo tablet properties are suggesting that *Cyclea peltata* gum can be utilized as an excipient, in place of conventional binding agents contributing to the development of sustainable and natural excipients for pharmaceutical tablet manufacturing.

Keywords: *Cyclea peltata* gum, binder, tablets, binding property, formulation

Knowledge About Miscarriages Among Patients Admitted with a Sporadic Miscarriage at Teaching Hospital Peradeniya

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Although miscarriages are common, delayed presentation to healthcare services can lead to increased complications. This study aimed to identify knowledge gaps regarding miscarriages, which could help reduce such delays. The objective of this research was to assess patients' knowledge about the symptoms, risk factors, complications and planning of subsequent pregnancies following a miscarriage, and to examine its association with sociodemographic characteristics among women admitted with sporadic miscarriage to the Teaching Hospital Peradeniya. A descriptive cross-sectional study was conducted among 106 patients admitted with sporadic miscarriage. Data were collected using a self-administered questionnaire. Statistical analysis was performed using the Pearson chi-square test and Fisher's exact test. Only 25.5% of participants correctly identified that prior use of an intrauterine device does not cause miscarriage. Similarly, just 17% knew that stressful events do not lead to miscarriage and only 12.3% were aware that lifting heavy objects during pregnancy is not a cause. There was no statistically significant association between age and overall knowledge ($p = 0.076$), while educational level showed a significant association with knowledge ($p = 0.000$). This study showed even though the overall knowledge about miscarriage was generally adequate, many participants held misconceptions and false beliefs. A significant association was found between educational level and knowledge, highlighting the need for targeted educational interventions. Age, however, was not significantly associated with knowledge levels.

Keywords: Sporadic miscarriage, miscarriage, knowledge, attitude, Sri Lanka

Knowledge and Attitudes Toward Pressure Ulcer Prevention Among Undergraduate Nursing Students at a State University in Sri Lanka

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Pressure ulcers are a common healthcare concern among long-term bedridden patients. Nurses are the most responsible persons in the prevention of pressure ulcers. Student nurses also can be involved in pressure ulcer prevention during their clinical placements and they should have adequate knowledge and positive attitudes towards pressure ulcer prevention. This study aimed to assess the knowledge and attitudes towards pressure ulcers, the association between demographic variables, and the knowledge and attitudes among undergraduate nursing students at a state university in Sri Lanka. A descriptive, cross-sectional study was conducted among 185 undergraduate nursing students at a state university in Sri Lanka. Data were collected using pretested, two validated questionnaires: Pressure Ulcer Knowledge Assessment Instrument and Attitude toward Pressure Ulcer Prevention. Collected data were entered and analyzed using SPSS version 26. One-way ANOVA and Turkey post hoc test were used to assess the differences between groups. Pearson correlation test was used to determine correlations between knowledge and attitude scores. The total mean knowledge score was 11.023.05 out of 26 and the total mean attitude score was 39.424.58 out of 52. No significant difference was found between the frequency of exposure to patients with pressure ulcers and the total knowledge score ($p>0.05$). However, significant differences were observed between the knowledge score and age, gender, academic year and semester, number of clinical hours, number of clinical units, and the types of clinical units ($p < 0.05$). A significant difference in attitude score was found only with the types of clinical unit ($p < 0.05$). There was no correlation between knowledge and attitude scores ($r = 0.14$, $p = 0.07$). Increased age, academic year and semester, clinical hours, and clinical unit exposure improved knowledge scores among nursing students. In contrast, attitude scores significantly varied based on the type of clinical unit, indicating the influence of the clinical environment on nursing students' attitudes. Student nurses should be encouraged to review the theoretical knowledge in the clinical setup.

Keywords: Nursing students, knowledge, attitude, pressure ulcer prevention

Knowledge, Attitudes and Self-reported Practices on Antibiotic Administration Among Nursing Staff Working in Surgical Wards at National Hospital Kandy

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Nurses play a crucial role in antibiotic administration. Inadequate knowledge, and improper adherence to administration protocols can lead to adverse events to patients and also contribute to antimicrobial resistance (AMR). This study aimed to assess the knowledge, attitudes and self-reported practices on antibiotic administration to include antibiotic stewardship (AMS) and to describe their associated factors among nurses working at surgical units of National Hospital, Kandy. This descriptive cross-sectional study was conducted among 130 nurses working in the surgical units of the National Hospital, Kandy, recruited through convenience sampling. A validated, pre-tested self-administered questionnaire was used to get data on knowledge, attitudes, and self-reported practices regarding antibiotic administration to include AMS. Percentages were calculated for demographic variables and individual responses. Scores for knowledge, attitudes, and practices were calculated and categorized using Bloom's cut-off points: poor (<60%), moderate (60–80%), and good (>80%). Associations between scores and demographic variables were assessed using Chi-square, Fisher's Exact, Mann-Whitney U, and Kruskal-Wallis tests. Among the 130 nurses, 80.8% were female, 53.8% were aged 30–40 years, and 55.4% held diplomas. Nearly half (47.7%) had <5 years of experience. The mean knowledge score was 23.88/34 (SD 3.82), with 64.6% having moderate and 18.5% poor knowledge. Of all 16.9% believed antibiotics treat viral infections, and 32.3% did not recognize nausea/vomiting as signs of anaphylaxis. Only 60.8% reported awareness of AMS as a concept. The mean attitude score was 36.25/45 (SD 3.87), with 53.1% having moderate attitudes. While 96.2% claimed to recognize indications for antibiotics, only 36.2% were likely to report prolonged antibiotic use in chronic wounds to a physician. The mean practice score was 50.71/60 (SD 5.42), with 71.5% demonstrating good practices; 61.5% correctly calculated IV drop rates and 60.0% checked cannula patency. Higher education was significantly associated with better knowledge ($p = 0.003$), but attitudes and practices were not significantly associated with demographic variables**.** The study identified gaps in knowledge, AMS awareness and practices relating to antibiotic administration. Targeted education and training are needed to enhance their knowledge and improve practices, ensuring patient safety and helping combat antimicrobial resistance.

Keywords: Antimicrobial stewardship, nursing education, antibiotic resistance, surgical wards

Knowledge and Exposure to Occupational Hazards in Nursing Profession Among Nursing Undergraduates in Three State Universities, the University of Peradeniya, the University of Sri Jayawardhanapura and the University of Ruhuna in Sri Lanka

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Nurses are an integral component of the healthcare system and, they are prone to various hazards. Most of the research on occupational hazards (OH) in the nursing profession (NP) involves nurses, and a very small number of research have been conducted among nursing students in countries such as: Ethiopia, Turkey, China, and Egypt. There is no research published in Sri Lanka on this area. The objective of the study is to determine the knowledge of an exposure to OH in the NP among nursing undergraduates (NU) in three state universities. This was a descriptive cross-sectional online study, conducted among 308 NU from University of Peradeniya (UoP), University of Sri Jayawardhanapura (UoJ), and the University of Ruhuna (UoR). A proportionate random sampling method was utilized, such that a proportionate number of participants was recruited from each batch of nursing degree programme from each University. The questionnaire was sent out to all students via WhatsApp groups and emails. After two weeks, reminders were sent requesting to fill out the questionnaires. Upon receiving responses, proportionate numbers of responses were selected using random number generator on Excel. Data was collected using a self-administered questionnaire. Permission was obtained from the developers of the questionnaire in Ethiopia. The questionnaire was pre-tested among 30 NU. It comprised six parts: socio demographic data, knowledge about OH, and exposure to biological, physical, mechanical & psychological factors. The knowledge part comprised 5 questions. Biological, physical, mechanical, psychological factors; each comprised 6, 6, 6, and 8 questions respectively. The overall percentages reported in the findings were calculated similar to the study done in Ethiopia. The majority of participants were females 81.2%. 59.9% represented UoR. 20.1%, and 19.7%, were from the UoJ and the UoP respectively. In the study, 29.6%, 28.5%, 26.5% and 15.2% of participants were from the first, second, third, and final year respectively. The majority, (90%) of the students had learned about OH at the university. The majority, 95.5% of participants had knowledge that needle prick, blood flush, and skin cuts can cause OH while only 94.8% knew that mechanical injuries and chemical & biological factors can cause OH. The prevalence of exposure to biological, mechanical, physical and physiological factors was 66.85%, 50.42%, 58.32% and 63.10% respectively. The NU had a high prevalence of exposure to OH. Although, majority of the NU had learnt about OH at the university and had knowledge about OH, the exposure to OH was high. Ongoing training on OH, safety and infection prevention and control for NU is strongly recommended based on the study results.

Keywords: Occupational hazards, nursing undergraduates, nursing profession

Knowledge, Attitude, and Practice on First Aid and Safety Measures Regarding Sports-Related Injuries Among Sportsmen and Women in University of Peradeniya, Sri Lanka

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Sports injuries can occur unexpectedly and negatively affect an athlete's performance and overall health. Awareness of proper first-aid techniques and safety measures is crucial for minimizing the severity of injuries and avoiding complications. This study aimed to assess the knowledge, attitude, and practice on first aid and safety measures regarding sports-related injuries, and to identify demographic factors determining knowledge, attitude, and practice on first aid and safety measures regarding sports-related injuries among sportsmen and women at the University of Peradeniya. A quantitative cross-sectional study was conducted among athletes of the sports teams at the University of Peradeniya using a pre-tested, self-administered questionnaire. Based on previous literature, the knowledge and practice total score was converted into percentages and categorized as "≤ 49% = Poor", "50% - 70% = Adequate/Satisfactory", and "≥ 71 = Good". Each statement in the attitude section was scored on the Likert scale, and the total score was converted into percentages and categorized as "0-49%=Negative attitude" and "50%-100%=Positive attitude". Data are presented as mean score±standard deviation, frequencies, and percentages. Out of 442 participants, 63.8% were males. Sports injuries were reported by 65.6%, and 62% had no first-aid training. Overall knowledge and practice were poor in 52.5% and 69% of athletes, respectively, However, 98.87% showed a positive attitude toward first aid and safety. Athletes from medicine-related faculties had better knowledge (60.00 ± 21.32%, $p < 0.001$) compared to other science-based faculties, (46.90 ± 18.96%), and non-science-based faculties, (43.64 ± 20.45%). Additionally, receiving first-aid training and both knowledge and practice in first-aid and safety measures showed significant positive associations ($p < 0.05$). No significant associations were observed between gender and knowledge, attitude, or practices ($p > 0.05$). These findings indicate that overall knowledge and practice in first aid and safety measures were poor, while attitude was positive among sportsmen and women at the University of Peradeniya. Therefore, awareness and skill enhancement programs on first aid and safety measures regarding sports-related injuries for university athletes are needed.

Keywords: University athletes, sports injuries, injury prevention

Knowledge, Attitude and Prevalence of Cervical Cancer and Pap Smear Screening Tests at Well-Women Clinics Conducted by the Medical Officer of Health (MOH) Offices in Matara District

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Cervical cancer is the fourth most common cancer in women and a leading cause of death, especially in resource-limited settings. It's preventable with early detection, like the Pap smear test. Factors like gender, socio-economic status, culture, and education influence knowledge and practices regarding cervical cancer prevention. The study aimed to identify the participants' attitudes in the cervical cancer screening test, to examine the basic knowledge regarding cervical cancer and pap smear tests, to investigate the prevalence of cervical cancers among women in well-women clinics and to assess preventive measures for cervical cancer. This retrospective descriptive cross-sectional study was conducted among 403 participants on Well-women clinics attendees in 17 MOH offices from January to December 2023. Prevalence was estimated as a retrospective study and data was collected as a prospective study. The questionnaire was pretested on 10 women who attended the pap smear screening test. Data was collected using a pre-tested, Computer Assisted Telephone Interview (CATI) questionnaire. The collected data was entered into a Microsoft Excel spreadsheet and SPSS statistical software version 25 was used to analyze the data. The results indicated that most of the participants, 147 (36.5%), had low knowledge of cervical cancer. Meanwhile, 133 participants (33%) demonstrated a moderate level of expertise, and 123 participants (30.5%) displayed a high level of knowledge regarding cervical cancer. The final results of the knowledge of cervical cancer screening reflected the majority; 187 (46.4%) of study participants had poor expertise in cervical cancer screening. While 130 (32.3%) had a moderate knowledge level, 86 (21.3%) participants had good expertise towards cervical cancer screening. The prevalence of cervical cancers among women in well-women clinics in Matara district 2023 is 0.01%. Although, the knowledge level of both cervical cancer and screening tests was poor. Therefore, there is a need to conduct awareness programs about cervical cancer and screening to improve their awareness.

Keywords: Cervical cancer, pap smear screening test, prevalence, knowledge, attitude

Knowledge, Attitudes and Practices on Antibiotic Use among Older Adults in Sri Lanka: A Cross-Sectional Study

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Antibiotics save millions of lives but their misuse leads to antimicrobial resistance (AMR). Appropriate antibiotics use among geriatric patients is essential to prevent resistance and ensure effective treatment outcomes. In Sri Lanka, evidence regarding knowledge, attitudes and practice of older adults on antibiotic use remains limited. This study aimed to assess the knowledge, attitudes, and practices regarding antibiotic use among geriatric patients at a tertiary hospital in Sri Lanka. A cross-sectional, interviewer-administered survey was conducted at the Outpatient Department of Teaching Hospital, Peradeniya. Using convenience sampling method, 200 geriatric patients aged above 60 years were recruited. A brief introduction about antibiotics was provided before data collection. Patients who had no idea of antibiotics even after the introduction were excluded. Descriptive and comparative data analyses were performed. The fisher's exact test was applied to identify significant associations. Knowledge and practice scores were calculated on scales of 20 and 7 respectively. Majority of participants (61.1%) learned about antibiotics through doctors. 60.5% were educated only up to ordinary level. Out of 200 participants, 194 (97%) scored between 0-14 for the knowledge section indicating poor knowledge about antibiotics [mean:5.4 (SD 3.725); median:5 (IQR 7-3)]. Only 34% respondents correctly identified amoxicillin as an antibiotic while 13.5% and 14.5% misidentified that aspirin and paracetamol were antibiotics respectively. Only 21% respondents had heard the term "antibiotic resistance" and 24% thought resistance develops in human body rather than in bacteria. Out of 200 participants, 170(85%) scored between 0- 4 for practices indicating poor practice level of antibiotics [mean: 4.45 (SD 0.966); median:4 (IQR 5-4)]. Attitudes toward antibiotic use reflected mixed awareness. 32% respondents mistakenly expected antibiotics for colds. 97% of respondents reported using antibiotics as labeled by the pharmacist, indicating high adherence. A significant association was found between poor knowledge level and stopping antibiotics once symptoms improve. ($n = 65\%$ $p \leq 0.05$, Fisher's exact test). This study reveals poor knowledge and unsafe antibiotic practices among older adults, potentially contributing to AMR. Tailored interventions, including awareness programs using visual or digital aids to address literacy barriers, may improve understanding and practices. Future follow-up studies are recommended to evaluate the effectiveness of such interventions.

Keywords: Antibiotics, geriatric patients, antibiotic misuse, AMR, Sri Lanka

Knowledge, Attitudes and Practices on Dietary Salt Intake Among OPD and Hypertension Clinic Attendees at Teaching Hospital, Peradeniya, Sri Lanka

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A cross-sectional descriptive study was conducted at Teaching Hospital Peradeniya to assess knowledge, attitudes, and practices (KAP) regarding dietary salt intake among adult attendees of the Outpatient Department (OPD) and Hypertension Clinic. The sample included 403 randomly selected participants (OPD: 103; Clinic: 300). Data were collected via a pre-tested, self-administered bilingual questionnaire. Of the participants, 62.8% were female, 59.8% were over 40 years, and 65.5% had education level A/L or above. Analysis using Jamovi and Excel included chi-square tests to assess associations between demographic variables and KAP indicators. Clinic attendees demonstrated higher levels of satisfactory knowledge (77.7%) and practices (60.3%) compared to OPD attendees (59.0% and 47.6% respectively). Female participants (81.0%) and those aged ≥ 40 years (77.0%) showed significantly better knowledge ($p < 0.001$). Practices were significantly better among older adults (61.0%) and individuals with higher education (78.4%, $p = 0.025$). Residence (urban vs. rural) showed no significant association with either knowledge or practices ($p > 0.05$). The average estimated salt intake was 9.15 g/day, nearly double the WHO-recommended limit. Television was the most cited health information source (62.0%), especially among clinic attendees, while social media use was higher among younger OPD participants. The study highlights a discrepancy between knowledge and behavioural practices across both groups and suggests that greater emphasis is needed on behaviour-focused interventions. Rather than suggesting conclusive causality, these findings support integration of targeted dietary counselling in outpatient settings and the strategic use of media platforms for public health messaging.

Keywords: Dietary salt intake, knowledge-attitude-practice (KAP), hypertension, health communication, Sri Lanka

Knowledge, Attitudes and Practices Regarding Psychological Stress Management Among First-year Students of the Faculty of Allied Health Sciences, University of Peradeniya

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Psychological stress is one of the major problems faced by university students. Proper stress management plays a vital role in making university life a success. However, there is limited information and no validated tool to assess knowledge, attitudes, and practices (KAP) related to stress management among Sri Lankan university students. This study aims to develop a questionnaire and assess the KAP regarding stress management among first-year students of the Faculty of Allied Health Sciences, University of Peradeniya. A descriptive cross-sectional study was conducted among 143 students selected by stratified proportional sampling method. Data was collected using a self-administered questionnaire developed by the investigator. Its content validity and test-retest reliability were assessed. Data was analyzed using SPSS (version 26). The questionnaire showed an acceptable level of reliability (Cronbach's alpha – 0.768). Out of 143 participants, 102 (71.3%) were females and 41 (28.7%) were males. Their mean age was 22.85 ± 0.93 years. The mean knowledge score was 67.20 ± 20.74, with females scoring significantly higher than males ($p = 0.035$). The mean attitude score was 79.08 ± 10.50, with no significant gender difference ($p = 0.267$). Regarding stress management practices, the participants most frequently sought support from family and friends (80.5%) compared to professional support systems (19.4%) and used avoidance-based coping strategies (55.4%) compared to problem-solving strategies (45.05%). The majority of students demonstrated good knowledge and attitudes towards stress management. The most frequently used stress management strategies were seeking support from family and friends, and avoidance-based practices. These findings highlight the need to enhance their awareness of professional support systems and the importance of problem-solving strategies to manage their psychological stress.

Keywords: Knowledge, attitudes, practices, stress management

Limited Joint Mobility Syndrome Among Patients with Diabetes and Its Association with Age and Gender in a Hospital-Based Population in Kandy District

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Limited Joint Mobility Syndrome (LJMS) is a musculoskeletal complication commonly seen in diabetic patients, marked by joint stiffness, skin changes, and functional limitations, particularly in the hands. Despite its known association with diabetes-related microvascular complications, LJMS remains understudied in Sri Lanka. This study aimed to evaluate the prevalence of LJMS and its association with age, gender, and duration of diabetes in a hospital-based diabetic population in Kandy District. A descriptive cross-sectional study was conducted at the diabetic clinics of National Hospital Kandy and Teaching Hospital Peradeniya from November 25 to December 8, 2024. A total of 267 diabetic patients aged ≥18 years were recruited using consecutive sampling. Exclusion criteria included congenital hand deformities, arthritis, hand trauma, and certain chronic conditions. Data were collected via an interviewer-administered questionnaire and clinical evaluation using the Prayer Sign and Table Top Sign tests. Statistical analysis involved descriptive methods and association testing via chi-square and Kruskal-Wallis tests. The study population had a mean age of 58.53 years (SD ± 13.47) with 73.4% females. LJMS-related features observed included skin changes (29.96%), painless stiffness (24.34%), and fixed flexion contractures in the proximal interphalangeal joints (12.73% mild, 0.75% significant). Functional impairments such as grip difficulty (16.85%) and impaired fine motor skills (10.49%) were also reported. Prayer Sign was positive in 20% of participants and Table Top Sign in 6%. Painless stiffness and skin changes were significantly associated with positive diagnostic test results ($p < 0.05$). A longer duration of diabetes showed a statistically significant association with both tests. Though females and those above 60 years showed higher prevalence of LJMS features, sex was not significantly associated with test positivity. This study highlights the prevalence of LJMS among diabetic patients in Kandy and underscores the importance of routine hand assessments. Incorporating simple clinical tests such as the Prayer Sign in diabetic care could enhance early detection, especially in high-risk groups, ultimately improving functional outcomes and quality of life.

Keywords: Limited joint mobility syndrome, diabetes mellitus, prayer Sign, table top sign, Kandy, Sri Lanka

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Livedoid Vasculopathy in the Sri Lankan Context – A Case Series

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Livedoid vasculopathy is a rare thrombo-occlusive vasculopathy marked by painful ulceration, livedoid changes, and skin atrophy with healing lesions, primarily affecting lower extremities. Diagnosis is often delayed due to variable presentation and overlapping features with autoimmune conditions. We present three histopathologically confirmed cases to illustrate the disease spectrum and different treatment options. This case series aims to identify the clinical features, serological profiles, different treatment options, and response in patients with livedoid vasculopathy. Three patients presenting to the rheumatology clinic at Teaching Hospital Peradeniya were evaluated for chronic recurrent ulceration in the ankle region. Clinical features, serology, and characteristic histopathology- luminal fibrinoid deposition, vessel-wall segmental hyalinization, and minimal perivascular inflammation were used to confirm the diagnosis of livedoid vasculopathy. Treatment was tailored based on patient-specific findings and included combinations of antiplatelets, immunosuppressants, corticosteroids, and vasodilators. Clinical response was monitored over time. One female and two male patients had chronic, recurrent painful leg ulcers healed with scarring (atrophie blanche). The female had recurrent leg ulcers for 6 years, positive antinuclear-antibodies (1:640 nuclear-homogeneous), non-scarring alopecia, inflammatory arthralgia; was diagnosed with Undifferentiated Connective Tissue Disease (lupus spectrum) and treated with tapering-steroids, aspirin, azathioprine, and hydroxychloroquine. One male had weakly positive lupus anticoagulant (confirmed on repeat testing), no autoimmune features and leg venous stasis risk factors; treated with tapering low-dose of steroids, aspirin, and compression stockings. The third had negative autoimmune markers and extensive ulceration; treated with tapering low-dose steroids, aspirin, bosentan. All responded with active ulcer healing and no recurrences. Livedoid vasculopathy is a rare and challenging disease with minimal evidence-based treatment options. The diagnosis should be considered in patients with recurrent, chronic ulcers. Bosentan is a newly attempted successful treatment option. Early diagnosis with histopathology and individualized management improves the outcome significantly.

Keywords: Livedoid vasculopathy, atrophie blanche, chronic leg ulcers, individualized management

Maternal Nocturnal Caregiving to Infants and Parenting Satisfaction: A Qualitative Inquiry

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The postpartum period is challenging for new mothers, as they must provide continuous care for their newborns. Nocturnal caregiving responsibilities often lead to stress and fatigue. These demands can significantly affect parenting satisfaction and influence their overall perception of the early maternal experience. The research aims to explore maternal involvement, challenges and coping strategies related to nocturnal caregiving to infants and its influence on parenting satisfaction during the initial postpartum period among primiparous mothers. A qualitative phenomenological study was conducted in Gangawatakorale and Gangaihala MOH areas of the Kandy district among ten primiparous mothers within the first eight weeks of the postpartum period. Purposive sampling was employed, and individual, in-depth interviews were conducted using a pre-tested, interviewer-administered, semi-structured guideline. Data collection continued until saturation was reached; no new themes emerged after the 10th interview. Ethical approval was obtained, informed consent was secured, and confidentiality was strictly maintained. The data were analysed thematically using the Braun and Clarke method. A total of nine major themes and eighteen subthemes were identified. 1) Maternal nocturnal caregiving responsibilities are dynamic in nature and involve both infant centered caregiving activities and supportive roles toward their husbands, 2) Factors influencing maternal involvement is categorized into positive and negative factors, 3) Maternal perceptions of nocturnal caregiving included emotional experiences and maternal attitudes, 4) Nocturnal care giving has been shown to adversely affect physical and psychological wellbeing of mothers , 5) Balancing nocturnal caregiving with other life demands(strained social and family relationships, and daytime caregiving), 6) Adaptive self- management (practical strategies, emotional coping) 7) Collaborative strategies (support from spouse and extended family). 8) Fostering strong parent infant bond (attentiveness and responsiveness to infant needs, joy in observing baby's development), 9) Strengthening spousal bond (mutual appreciation and understanding, strengthened team work). For many, despite the physical and mental demands, nocturnal caregiving positively influences parenting satisfaction by fostering a strong bond with the infant and strengthening the spousal bond. It addresses a key gap in literature by offering culturally specific insights into postpartum care urging healthcare professionals to incorporate this understanding into antenatal and postnatal period education programs.

Keywords: Maternal, postpartum, nocturnal caregiving, parenting satisfaction

Maternal Risk Factors for Macrosomia: Findings from a Tertiary Care Setting in the Kandy District

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Macrosomia, defined as birth weight (BW)>3.5 kg in term babies, is an emerging concern due to the associated delivery-related complications. While maternal body mass index (BMI), gestational weight gain (GWG) and macronutrient intake during pregnancy influence BW, there is limited local evidence on their role in development of macrosomia. This study aimed to evaluate the impact of maternal BMI, GWG, and energy and macronutrient intake during first half of the pregnancy on risk of delivering macrosomic babies, in a cohort of pregnant mothers attending Teaching Hospital, Peradeniya. A prospective cohort study was conducted recruiting singleton pregnant mothers aged 19-35 years. Data on BMI and GWG were categorized based on national guidelines. Energy and macronutrient intake over a month during first half of pregnancy was assessed by a validated questionnaire - "Food Frequency Questionnaire", and analyzed via nutrient analysis software. Data from 35 mothers who delivered macrosomic babies and 309 mothers who delivered normal BW babies (2.5 kg < BW > 3.5 kg) were analyzed. Relative risks (RR) of delivering macrosomic babies by overweight and obese BMI and excess GWG were assessed. Mean energy and macronutrient intakes were compared using Independent-t-test, and $p<0.05$ considered significant. The risk of delivering macrosomic babies was 5.5 times higher with overweight BMI (RR: 5.46, 95% CI: 2.73-10.89) and 5.9 times higher with obese BMI (RR: 5.86, 95% CI: 1.93-17.75), compared to normal BMI. The risk of delivering macrosomic babies was 6.3 times higher with excess GWG than adequate GWG (RR: 6.29, 95% CI: 2.95-13.39). The mean energy, carbohydrate and protein intake were higher among mothers who delivered macrosomic babies (2639.4 ± 464.5 kCal/day, 635.4 ± 131.6 g/day, 94.9 ± 24.0 g/day) than mothers who delivered normal BW babies (2466.7 ± 561.3 kCal/day, 612.5 ± 106.9 g/day, 91.8 ± 23.8 g/day), but not statistically significant. Maternal overweight or obese BMI, and excess GWG significantly increase the risk of delivering macrosomic babies. Weight monitoring and nutritional counselling of mother with such risk factors may mitigate the risk. Further studies are necessary to evaluate the impact of maternal energy and macronutrient intakes on birth weight.

Keywords: Large birth weight, macronutrient intake, pregnancy nutrition

Measurements of Pharmaceuticals and Personal Care Products in Hospital Wastewater

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The existence of Pharmaceuticals and Personal Care Products (PPCPs) in the water environment is considered a global water quality issue. PPCPs may originate from industrial sources, hospitals, long-term care facilities, landfill leachate and may enter the water environment by improper wastewater discharges posing threats to ecosystems and human health. Some implications include abnormal physiological processes and reproductive impairment, increased cancer incidence, development of antibiotic-resistant bacteria, and the potential for increased toxicity of chemical mixtures. Generally, PPCPs in wastewater are not removed by conventional wastewater treatment processes. Therefore, this study aimed to identify the presence, seasonal variation and removal efficiency of five commonly used PPCPs; amoxicillin, carbamazepine, sulfamethoxazole, ibuprofen and diclofenac in hospital wastewater around Kandy. The research also assessed the potential environmental risks associated with the presence of these compounds. Composite wastewater samples were collected between 6:00 - 7:00 a.m. from five hospital influents to the sewer, and from the influent and effluent of the Kandy city wastewater treatment plant, resulting in a total of seven samples per sampling event. There were two sampling events in the rainy season and one in the dry season, providing comprehensive coverage of seasonal variations. All the samples were analyzed utilizing Solid-Phase Extraction (SPE) and High-Performance Liquid Chromatography (HPLC) methods to quantify the concentrations of selected PPCPs. Then, Hazard Quotient (HQ) values were estimated to assess environmental risk. Results showed that the presence of selected PPCPs varied significantly between hospitals and the season with the highest values of 2888 µg/L amoxicillin, 23.6 µg/L ibuprofen, 6.9 µg/L diclofenac, 41 µg/L carbamazepine and 10.1 µg/L sulfamethoxazole at wet season, while average removal efficiencies of these PPCPs at the treatment plant was 94%, 71%, 78%, 60% and 99% respectively. The HQ values for amoxicillin (19.7) and carbamazepine (152.7) indicate significant environmental risks due to their persistence and resistance to treatment, particularly during the wet season, while other parameters remained within safe limits (HQ < 1.0). This research provides valuable insights into the concentration of PPCPs in hospital effluents and their persistence in the environment, contributing to improvements in wastewater treatment practices to mitigate environmental risks posed by PPCPs.

Keywords: Environmental risk, hazard quotient, hospital wastewater, PPCPs

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Meta-Analysis of Local Tetracycline Delivery Devices as Adjuncts to Non-Surgical Periodontal Therapy

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Scaling and root planning (SRP) is a form of sub-gingival mechanical debridement (often now called "subgingival instrumentation"), and remains the standard non-surgical treatment for periodontitis. Adjunctive tetracycline-based drug delivery may enhance outcomes by controlling subgingival pathogens. This meta-analysis evaluated the short-term (1–3 months) and long-term (6–24 months) efficacy of sustained and controlled-release tetracycline as adjuncts to SRP in chronic periodontitis. A systematic search of PubMed, Cochrane Central, Scopus, and Embase identified randomized controlled trials published until July 2021. Test groups received SRP plus locally delivered tetracyclines, while controls underwent SRP alone or with a placebo. Meta-analysis (R software) calculated weighted mean differences (WMDs) and 95% confidence intervals (CIs) for probing pocket depth (PPD) and clinical attachment level (CAL). Meta-regression analyzed study design, assessment approach, and smoking status. Heterogeneity was assessed via Cochrane's Q and I^2, with publication bias checked using funnel plots and Egger's test. Fifty-seven studies were included in the analysis. According to the results, adjunctive tetracycline therapy yielded statistically significant improvements over SRP alone. Short-term PPD reductions were significant (WMD = 0.501, 95% CI [0.411; 0.591]), with continued benefits at 6–9 months (WMD = 0.516, 95% CI [0.413; 0.620]) and beyond 12 months (WMD = 0.371, 95% CI [0.181; 0.560]). Similar trends were seen for CAL gains at 1–3 months (WMD = 0.310, 95% CI [0.224; 0.396]), 6–9 months (WMD = 0.336, 95% CI [0.204; 0.467]), and beyond 12 months (WMD = 0.310, 95% CI [0.240; 0.381]). Out of the Tetracycline formulations, Actisite showed the greatest short-term PPD reduction (WMD = 0.705, 95% CI [0.503; 0.907]). Meta-regression indicated study design significantly influenced outcomes, with split-mouth designs showing greater short-term ($\beta = 0.372$, 95% CI [0.219; 0.525], $p < 0.05$) and 6–9-month ($\beta = 0.422$, 95% CI [0.231; 0.613], $p < 0.05$) improvements. Conclusively, localized tetracycline adjuncts to SRP effectively improve periodontal outcomes in both the short and long terms, with effectiveness varying by study design and patient subgroups.

Keywords: Chronic periodontitis, clinical attachment level, doxycycline, meta-analysis, minocycline, probing pocket depth, tetracycline

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Microwave Ablation for Liver Tumours: A Retrospective Study from Sri Lanka

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Hepatocellular carcinoma (HCC) and liver metastases are the most common liver malignancies, with HCC comprising 80–90% of primary liver cancers. Microwave ablation (MWA) offers several advantages over surgical interventions, including shorter hospital stays and quicker recovery. While MWA's efficacy is well-documented internationally, limited data exist regarding its clinical performance in the Sri Lankan context. This study aimed to evaluate the effectiveness of MWA in treating malignant liver tumours by assessing recurrence rates, residual tumours, and post-procedural complications in a Sri Lankan cohort. A retrospective review was conducted at the Radiology and Hepatobiliary Units of Teaching Hospital Peradeniya, Sri Lanka, including patients who underwent MWA for liver malignancies between 2022 and 2024. Clinical data, procedural outcomes, imaging findings, and complications were extracted from hospital records. Contrast-enhanced computed tomography (CECT) was used at 4 weeks, 6 months, and 1 year post-procedure to assess recurrence and residual disease. A total of 22 tumours were treated with MWA between 2022 and 2024. The median patient age was 68 years (range: 47–83). Indications included HCC in 81.1% (n=18) and metastatic tumours in 18.9% (n=4). Complete ablation was achieved in 81% (n=18), with residual tumour seen in 4.5% (n=1). Tumour recurrence occurred in 9.1% (n=2) on follow-up imaging. No major post-procedural complications were observed. These findings indicate that MWA is both safe and effective, with high success rates and minimal adverse outcomes. The results align with international data and support MWA as a reliable therapeutic option in resource-constrained settings like Sri Lanka.

Keywords: Microwave ablation, liver tumours, Sri Lanka, minimally invasive therapy, hepatocellular carcinoma

Modified Corn Starch as a Fat Replacer in Low-Calorie Mayonnaise

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The growing demand for healthier food options has spurred interest in reducing fat content in popular products like mayonnaise. This study investigates the potential of using modified corn starches as fat replacers to develop low-calorie mayonnaise emulsions with desirable physicochemical and sensory characteristics. Corn starch was subjected to four distinct modification techniques: annealing (ANN), citric acid hydrolysis (CA), acetylation (ACT), and heat-moisture treatment (HMT). The resulting modified starches were incorporated into mayonnaise formulations at 30% and 50% fat replacement levels, with a full-fat (FF) mayonnaise serving as a control. Comprehensive physicochemical analyses, including color, pH, viscosity, and emulsion stability (including freeze-thaw stability), were conducted. Furthermore, sensory evaluation was performed to assess the acceptability of the reduced-fat mayonnaise samples. Physicochemical analyses revealed significant variations in the properties of the modified starches due to the different treatments. Notably, mayonnaise samples formulated with ACT, CA, and HMT starches at a 30% fat replacement level exhibited high viscosities, comparable to the FF control. In contrast, ANN starch failed to provide adequate viscosity at both replacement levels. Interestingly, all fat-reduced mayonnaise samples demonstrated improved freeze-thaw stability compared to the FF control and exhibited high overall emulsion stability. Sensory evaluation (9 point hedonic test) indicated that mayonnaise prepared with ACT 30%, CA 30%, HMT 30%, and the FF control achieved comparable scores across all sensory attributes (appearance, color, aroma, texture, and taste), leading to high overall acceptability. Conversely, the ANN 50% sample received lower scores in all sensory aspects, consistent with its observed lower viscosity. This study highlights the promising potential of acetylated (ACT), citric acid hydrolyzed (CA), and heat-moisture treated (HMT) modified corn starches as effective fat replacers in mayonnaise, particularly at a 30% replacement level. These modifications enable the development of low-calorie mayonnaise alternatives that maintain crucial textural and sensory attributes comparable to their full-fat counterpart. Annealing, however, proved less effective in achieving desirable viscosity and sensory properties in reduced-fat mayonnaise. These findings offer valuable insights for the food industry in formulating healthier mayonnaise options.

Keywords: Corn starch, fat replacer, mayonnaise, modified starch

Molecular Identification of c, e, and f Serotypes of *Streptococcus mutans* in a Cohort of Children with Early Childhood Caries in Sri Lanka

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Early childhood caries (ECC) is a global public health problem. Despite being a multifactorial disease, *Streptococcus mutans* is the primary bacterium responsible for ECC. Based on its genetic makeup, *S. mutans* is classified into four serotypes, namely c, e, f, and k, among which c, e and f are most prevalent and cariogenic, each exhibiting different virulence profiles. Identifying these serotypes may help establish better preventive strategies and targeted treatments for ECC. However, *S. mutans* serotype diversity in ECC has not yet been reported in Sri Lanka. Therefore, this study aimed to identify c, e, and f serotypes of *S. mutans* in children with ECC using PCR. Dental biofilm samples were collected from 35 children with ECC, selected based on decayed, missing, filled teeth (dmft) scores, attending the Paedodontic clinic at the Dental (Teaching) Hospital, Peradeniya. Streptococci were isolated on mitis salivarius agar, and their DNA was extracted using an optimized chemical method. First, *S. mutans* was identified using PCR with species-specific primers. Subsequently, c, e, and f serotypes were identified using serotype-specific primers in multiplex and singleplex PCR. Sanger sequencing of PCR amplicons further confirmed 100% identity of the *S. mutans* serotypes isolated from Sri Lankan children to reference sequences in the NCBI database. Based on our findings, *S. mutans* was found in 63% of the children with ECC. Out of *S. mutans* positive children, 27% had serotype c. Serotypes e and f each were found in 9% of children. Eighteen percent of children co-harboured serotypes c and e. Thus, it can be concluded that serotype c is the predominant *S. mutans* serotype associated with ECC. Further, children with multiple serotypes had higher dmft scores, suggesting severe decay, reflecting the impact of multiple serotypes on caries severity. Further studies on a larger sample are necessary to consolidate these findings.

Keywords: Dental caries, DNA sequencing, multiplex PCR, *S. mutans,* serotypes.

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Molecular Identification of *Candida albicans* Genotypes in Dental Biofilms of Children with Early Childhood Caries Attending the Dental Teaching Hospital, Peradeniya, Sri Lanka

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Early Childhood Caries (ECC), or tooth decay, is a major health problem in Sri Lanka. Recent studies have revealed that *Candida albicans*, an opportunistic fungal pathogen in humans, plays a key role in caries progression. Further, *C. albicans* has multiple genotypes (A, B, and C) and its cariogenicity and antifungal susceptibility are found to vary depending on the genotype. Thus, identifying genotypes associated with ECC is crucial for effective disease control. However, this remains unexplored in Sri Lanka. Therefore, this study aimed to identify genotypes of *C. albicans* associated with children with ECC in Sri Lanka. Dental biofilm samples were collected from 19 children with ECC attending the Dental Teaching Hospital, Peradeniya and cultured on CHROMagar medium for presumptive identification of the fungus based on its characteristic green-coloured colonies. Five colonies were randomly selected from each of the positive samples. Following subculturing and DNA extraction, PCR was performed for confirmation of the species by targeting its pH-regulated *KER1* gene. Genotyping was performed using PCR targeting a group I intron within its 25S rDNA, which yielded a 450 bp amplicon for genotype A, 840 bp amplicon for genotype B, and both amplicons for genotype C. The results were further validated by sequencing the PCR amplicons. Out of the 19 subjects, 10 tested positive for *C. albicans*. Each *C. albicans*-positive child harboured only a single genotype, with genotype A being the most frequently observed genotype (70%), followed by genotype C (20%) and genotype B (10%). This data is consistent with studies conducted in other countries reporting that genotype A is predominant among children with ECC. In conclusion, this study provides the first insight into the genotypic diversity of *C. albicans* among Sri Lankan children with ECC. Further investigations with larger sample sizes are warranted to determine the prevalence of these genotypes.

Keywords: 25S rDNA, dental caries, ECC, group I intron

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Molecular Identification of *Porphyromonas gingivalis* in the Saliva of Patients with Periodontitis and Periodontally Healthy Individuals Attending Dental Teaching Hospital, Peradeniya

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Periodontitis, which affects more than 90% of Sri Lankan adults, can eventually lead to loss of teeth and more serious health complications such as cardiovascular diseases. A keystone pathogen involved in the initiation and progression of periodontitis is *Porphyromonas gingivalis*. Since *P. gingivalis* is an anaerobic, slow-growing bacterium, its identification through conventional microbiological techniques is an extremely tedious task. This study aimed to identify salivary *P. gingivalis* using conventional PCR, compare its detection between individuals with periodontitis and those who are periodontally healthy, and assess the possibility of using salivary *P.gingivalis* analysis by PCR as a non-invasive screening test for periodontitis risk assessment in Sri Lankan population. For this purpose, unstimulated whole saliva samples were collected from a total of 86 individuals (64 patients with periodontitis and 22 periodontally healthy individuals) aged 18–80 years, attending the Dental Teaching Hospital in Peradeniya. DNA was extracted from samples using a chemical method. PCR amplification was carried out by targeting the 16S rRNA gene of *P. gingivalis*. The PCR product was visualized using agarose gel electrophoresis. The specificity of the PCR amplicon was verified by Sanger sequencing and comparing it with the reference sequence of P. gingivalis in the NCBI database. *P. gingivalis* is more frequently detected in periodontitis patients (50.00%; 32/64) compared to periodontally healthy individuals (22.73%; 5/22). The chi-square test demonstrated a significant association between detection of *P. gingivalis* in saliva and periodontitis, $\chi^2(5, N=86) = 4.9$, $p = 0.03$. BLAST analysis of the consensus sequence of the PCR product confirmed the specificity of the PCR, showing 100% similarity to the reference *P. gingivalis* 16S rRNA gene. This study demonstrates the feasibility of non-invasive molecular detection of *P. gingivalis* in saliva as a potential biomarker for periodontitis in Sri Lankan patients. Further, it lays the foundation for future quantitative analysis of this bacterium using qPCR, for enhancing its application in population-level screening for risk assessment of periodontitis.

Keywords: *P. gingivalis*, gum disease, salivary diagnostics, molecular detection

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Morphometric Analysis of Inferior Alveolar Canal Using Cone Beam Computer Tomography in a Sri Lankan Population

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The Inferior Alveolar Canal (IAC) is a single intra-osseous canal present bilaterally in the mandible. Cone Beam Computed Tomography (CBCT) is the best diagnostic image modality which can be used to assess the IAC. Morphometric knowledge of the IAC is important in dental treatments and to prevent complications. A retrospective cross sectional descriptive study was conducted using 87 CBCTs of individuals who attended the dental teaching hospital Peradeniya which included 52 females and 35 males within the age range from 18 - 42 years. We have assessed 130 IACs. On trans-axial view, visibility, shape and distance to IAC from outer buccal and lingual cortical plates, from inferior border of the mandible and root apices were assessed at 2nd mandibular premolar, distal roots of 1st and 2nd molar regions. Also, the horizontal and vertical relationships of the IAC to the tooth roots, course and presence of the bifurcation were evaluated. Statistical analysis was done. The majority of canals were oval in cross section. IAC was closer to buccal cortical plate in 2nd premolar region, to lingual cortical plate in the 2nd molar and 1st molar region. There was a significant difference in the distances to IAC between gender groups with males having thick bony periphery. The horizontal course of the IAC was suggesting an "S" shaped configuration, being buccal to 2nd molar root apex, lingual to 1st molar root apex and apical to the 2nd premolar regions. In the vertical course majority of IACs were closest with the roots of the 2nd molar followed by the 2nd premolar and 1st molar and 57% were progressively descend type while 30% was catenary type and 12% were straight in their course. A 44.6% of the canals showed bifurcation with majority being type IIIa; forward canal without confluence type. This first Sri Lankan CBCT study detailed IAC morphometry, revealing common oval cross sections, 'S' shaped course and 44.6% bifurcation prevalence. Understanding these variations, especially proximity to roots and cortical plates, is Crucial for preventing iatrogenic complications in dental procedures, enhancing patient safety.

Keywords: Inferior alveolar canal, CBCT, canal bifurcation

Morphometric Computed Tomography Study of the Mastoid Process and Its Role in Sex Differentiation

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The mastoid process plays a significant role in forensic science, medicine, and anthropology. This study addresses a gap in the literature regarding the use of computed tomography (CT) for morphometric analysis of the mastoid process in sex determination within a specific population. To examine morphometric differences in the mastoid process between males and females, to evaluate the relationship and prevalence patterns of the measured parameters of the mastoid process and to analyze the differences between the measurements of the right and left mastoid processes in males and females. This retrospective study was conducted using 177 samples of CT brain scans (88 male and 89 female) from the National Hospital Kandy and the Teaching Hospital Peradeniya. Morphometric parameters including true mastoid height, oblique sagittal diameter, oblique coronal diameter, and volume of mastoid process were measured using the RadiAnt DICOM viewer version 2024.1. Statistical analysis of the morphometric differences and correlations with sex was performed using IBM SPSS statistics version 30.0. All recorded parameters were higher in males. The volume of the mastoid process was the most significant parameter for sex determination, showing 70.6% accuracy using CHAID model analysis, with higher accuracy in females (87.6%) than in males (53.4%). Asymmetry between the right and left sides was observed and was significant in males but not in females. CT-based morphometry of the mastoid process has potential for sex estimation. The volume of the mastoid process is the most useful morphometric parameter for sex differentiation. Population-specific data are required and further research using a larger sample and with more advanced modalities is justified for improved accuracy.

Keywords: Mastoid process, sexual dimorphism, computed tomography, morphometry

Multi-Channel Pulse Waveform Measurement System for Cardiovascular Monitoring

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Cardiovascular monitoring technologies are essential for the early detection and management of vascular diseases, yet high costs and limited accessibility hinder their deployment in resource-constrained environments. This study introduces a cost-effective, multi-channel measurement system designed to acquire high-fidelity pulse waveforms simultaneously from multiple arterial sites. The system aims to address the need for scalable, non-invasive monitoring tools by capturing vital cardiovascular signals for clinical and research purposes. It employs a second-order Bessel low-pass filter with a cutoff frequency of 30 Hz. This choice ensures the capture of all critical physiological pulse waveform components, which primarily lie below 15 Hz, thereby minimizing signal distortion while preserving accurate waveform morphology. Signal gain is adjusted using a digitally controlled potentiometer interfaced with a microcontroller, and a 12-bit digital-to-analog converter (DAC) effectively removes DC bias from the raw signal. Sampling is performed at 100 Hz using a 12-bit analog-to-digital converter (ADC), and a system-on-chip (SoC) with wireless capability enables real-time synchronization across multiple devices, expanding the system's reach and utility. All components are integrated into a compact PCB that also features a display for real-time signal visualization. The system achieved a Pearson correlation coefficient of 0.9 in experimental validation conducted using clinical grade invasive blood pressure sensors and model blood vessels. It successfully detected key cardiovascular waveform features such as the systolic upstroke, dicrotic notch, and diastolic runoff, with the system achieving a signal-to-noise ratio (SNR) of 28 dB for physiological signals collected from healthy volunteers, indicating high signal clarity comparable to commercially available photoplethysmography sensors. The device's multi-channel functionality enables synchronized signal capture from radial, carotid, brachial, and tibial arteries, showcasing its potential in clinical diagnostics and vascular health assessments. This portable, low-cost system delivers reliable signal quality and high scalability, making it a promising tool for routine cardiovascular monitoring and remote health applications, particularly in underserved populations. These findings advance accessible, high-resolution cardiovascular monitoring technologies, paving the way for decentralized healthcare solutions. Future work will focus on automated device calibration, comprehensive validation through comparative studies across diverse patient populations, and ensuring regulatory compliance for the system.

Keywords: Pulse waveform, cardiovascular monitoring, embedded systems

Nasal Colonization with Methicillin-Resistant Staphylococci in Adult Patients Undergoing Dialysis at Teaching Hospital Peradeniya

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Dialysis patients, due to their frequent exposure to hospital environments, healthcare workers, and invasive medical devices, are at an increased risk of colonization by methicillin-resistant Staphylococci. These colonized isolates can subsequently lead to infections, particularly as these patients have compromised immune defenses. This study aimed to identify the nasal colonization rate of *Staphylococcus aureus,* methicillin resistant *Staphylococcus aureus* (MRSA) and methicillin resistant staphylococci among dialysis patients being followed up at Teaching Hospital, Peradeniya (THP). This descriptive study was conducted enrolling 34 long term haemodialysis patients at the renal care unit, THP. A nasal swab was collected from participants. *Staphylococcus spp.* were identified using conventional culture methods. Methicillin resistance was detected using cefoxitin (30µg) disks. Antibiotic susceptibility testing was performed using erythromycin (15µg), clindamycin (2µg), ciprofloxacin (5µg) and gentamicin (10µg). Novobiocin (5µg) susceptibility testing was done to further identify coagulase-negative staphylococci (CoNS). The presence of *mec*A gene in all methicillin resistant staphylococci and *pvl* gene in MRSA isolates was detected by PCR. Data were analysed using descriptive statistics. Of the 34 participants, 32 (94.1%) were colonized with CoNS, while 2 (5.9%) carried *Staphylococcus aureus*, both of which were methicillin-resistant. The overall methicillin resistant staphylococcus colonization rate was 50% (17/34), with 2 (5.9%) colonized by MRSA and 15 (44.1%) by methicillin-resistant CoNS (MRCoNS). Six participants (17.6%) harbored more than one phenotypically distinct staphylococcal isolate, leading to the identification of 39 isolates in total. Among the 37 CoNS isolates, 8 (21.6%) were identified as *Staphylococcus saprophyticus*. Antimicrobial resistance in CoNS isolates was observed as follows: cefoxitin (54.1%), erythromycin (70.3%), clindamycin (40.5%), gentamicin (16.2%), and ciprofloxacin (27.0%). Molecular analysis revealed that both MRSA isolates and 19 out of 20 (95%) MRCoNS isolates carried the *mec*A gene. The *pvl* gene was not detected in the two MRSA isolates. While only two of the 34 participants were colonized with MRSA, approximately half of the participants were colonized with MRCoNS. Both findings indicate the need to practice effective infection prevention measures as this population is vulnerable for infections even with CoNS.

Keywords: Haemodialysis, methicillin resistance, MRSA

Normal Liver Volumes in a Cohort of Sri Lankan Adult Population and Its Correlation with Anthropometric Parameters and Age Using Computed Tomography

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Liver volumetric assessment reliably measures liver size and is crucial for clinical applications. It is influenced by age and anthropometric parameters such as Body Mass Index (BMI) and Body Surface Area (BSA). Understanding the correlation between liver volume and these parameters is essential for the accurate evaluation of liver diseases. This study aimed to assess the normal liver volumes on Contrast Enhanced Computed Tomography (CECT) of abdomen in a cohort of Sri Lankan adult population and to find the correlation of liver volumes with age, BMI and BSA. This Prospective study was conducted on 296 adults (149 females and 147 males), aged 18 to 94 years, who underwent CECT abdomen with normal liver findings at four hospitals in central province of Sri Lanka. Body height and body weight were measured to calculate BMI and BSA for each individual. Liver volumes were assessed using 3D Slicer by tracing liver contours on axial CECT images with the level tracing tool. The liver was reconstructed in 3D and the total liver volume was obtained using the Segment Statistics module. Statistical analysis was performed with SPSS 25 at a 0.05 significance level. Mean and median liver volumes were 1155.36 ± 168.06 cc and 1166 .54 ± 207.12 cc respectively. Males exhibited larger mean liver volume (1199.47 ± 170.37 cc) than females (1111.85 cc ± 154.36). Liver volumes showed a negative correlation with age in both males ($p = 0.011$, $r = -0.210$) and females ($p = 0.004$, $r = -0.236$). A positive correlation with BSA was found in females ($p < 0.001$, $r = 0.345$). BMI showed no significant correlation in males ($p = 0.393$, $r = 0.071$) or females ($p = 0.151$, $r = 0.118$). Multiple regression analysis revealed that BSA ($P = <0.001$) and age ($P = 0.030$) were significant predictors of liver volume. This study concluded that liver volumes are significantly influenced by individual's age and BSA. Liver volumes decrease with age while increase with BSA. Establishment of normal liver volume will provide a reference value for diagnosis of liver diseases that may alter the liver volumes. Further studies with larger populations are recommended to ensure the generalizability of these findings.

Keywords: Normal liver volume, CECT (contrast enhanced computed tomography), liver volumetric assessment, anthropometric parameters, age

Nurses' Perception and Practical Approaches in Using Communication Skills to Deliver Bad News

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Delivering bad news in healthcare settings is a sensitive and complex task that demands effective communication skills and the ability to manage the emotional responses of both patients and nurses. The approach to delivering bad news often depends on individual nurses' perceptions, clinical experience, and the context of the healthcare setting. However, existing literature suggests that patients are not always satisfied with how bad news is communicated, and numerous barriers hinder the effectiveness of this interaction. The aim of this study is to assess nurses' perceptions and practical approaches to the delivery of bad news in clinical practice. This research adopts a mixed-method design and was conducted in four selected hospitals in Sri Lanka's Central Province, involving 288 nurses including 80.6% diploma in nursing and 19.1% degree holders.46.9% students were having 5 to 10 years of nursing experience and 39.6% were having 16 to 25 years of experience. Data collection included eight focus group discussions (FGDs) guided by a pre-validated interview guide and self-administered questionnaire. The distribution of practical approach in delivering bad news among participants was as follows: A majority of nurses (74%; n=215) reported ensuring that no foreseeable interruptions occur during the delivery of bad news. Furthermore, 86.45% (n=249) emphasized the importance of delivering such news in a structured and sequential manner. An equal proportion (86.45%) believed they are responsible for addressing patients' emotional responses following the disclosure. However, only 39.23% (n=113) felt it was necessary to engage in facilitating spiritual care. A statistically significant association was found between years of nursing experience and the approach to delivering bad news ($p < 0.001$). Four key themes emerged from the qualitative data: Nurses experiencing emotional stress in delivering bad news, need for training and support, ethical and moral dilemmas in delivery, empathy and compassion approach. In practical consideration nurses practicing therapeutic communication and one to one caring approach. While nurses generally exhibit adequate knowledge regarding the delivery of bad news, there is a clear need for ongoing training and support to enhance their confidence and consistency in practice.

Keywords: Communication skills, delivering bad news

Optimizing Medical Waste Management for Sustainable and Resilient Healthcare Facilities

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Maintaining environmental safety, guaranteeing regulatory compliance, and improving operational efficiency inside healthcare facilities all depend on an automated and sustainable medical waste management system. Conventional waste management techniques frequently rely significantly on physical work, which increases environmental impact, creates safety risks, and results in inefficiency. This project proposes a novel smart waste management system that is integrated with advanced image processing technologies and driven by a Raspberry Pi to address these issues. The ability of the system to automatically identify and group medical waste into four groups, plastic, infectious, hazardous, and miscellaneous is the system's main objective. A pre-trained image classification model is used to process the waste images that are taken by a camera mounted above a conveyor belt. A conveyor system and revolving bins are used to direct the waste to the proper bin based on classification, guaranteeing accurate and secure disposal. Apart from classification and sorting, the system has sensors that measure temperature, humidity, gas concentration, and load weight to provide real-time environmental monitoring. By assisting in the detection of possible dangers like poisonous gas leaks or overflowing trash cans, these sensors allow for proactive management. Additionally, by facilitating improved garbage collection routes and producing automated notifications, the system greatly reduces the need for manual handling and the carbon emissions linked to frequent waste pickups. Comparing to current approaches, the proposed medical waste management system has demonstrated notable advancements, such as over 90% waste categorization accuracy and 95% bin alignment efficiency during testing. This system demonstrates a progressive move towards safer, more intelligent, and more sustainable healthcare waste management procedures by lowering health and environmental risks, supporting responsible production and consumption, and harmonizing with global sustainability goals.

Keywords: Environmental compliance, healthcare automation, image processing, real-time monitoring, sustainable medical waste management

Oral Carriage and Virulence Enzyme Production of *Candida* Species Isolated from Children with and Without Dental Caries

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While dental caries is primarily driven by oral bacteria, *Candida* species have been implicated in its pathogenesis. However, their specific role remains incompletely understood. To assess oral *Candida* carriage and evaluate selected virulence enzyme activities of *Candida albicans* isolated from children with and without dental caries. This cross-sectional study included 120 children (60 with caries, 60 caries-free) aged 6–12 years attending the Dental Teaching Hospital, Peradeniya. None had received orthodontic treatment or antibiotics in the preceding three months. Oral rinse samples collected from each participant and were cultured on Sabouraud Dextrose Agar and *Candida* species were identified using Gram staining and CHROMagar test. Then, the Colony-forming units (CFU/mL) of *Candida* were quantified for each participant. Enzymatic activities (DNase, hemolysin, phospholipase, esterase) were assessed in 24 *C. albicans* isolates selected from each group. *Candida* carriage between the two groups was compared using Man whitney U test. Mean enzymatic activities were compared using independent t test. *Candida* prevalence was 76.6% (46/60) in caries patients and 50% (30/60), in caries-free individuals. *C. albicans* was the predominant species in both groups (Caries free - 86.67 % and Caries group - 89.13%). Either group had Candida *tropicalis* and *Candida krusei*. The prevalence of *Candida tropicalis* and *Candida krusei* in patients with caries was 4.9% and 3.3% whereas in caries free group it was (5%) and (3.33%). Mean oral *Candida* carriage was significantly higher in caries patients (482.2 CFU/mL) than in caries-free controls (205.3 CFU/mL) ($P = 0.0005$). Hemolysin and Phospholipase activity was comparable in both groups (mean Hemolysin activity in caries group: 0.79, caries-free group: 0.78; $p = 0.30$ and mean phospholipase activity in caries group: 0.62, caries-free group: 0.63; $p = 0.87$). DNase and esterase activities were not detected in any isolate. These findings suggest that *Candida* prevalence is higher in patients with caries. Further patients with caries have increased oral *Candida* carriage compared to caries free group. Both groups carry similar proportions of *Non-albicans Candida* namely C *tropicalis* and *C krusei. C. albicans* in both groups have comparable activity of hemolysin and phospholipase. Considering the opportunistic nature and biofilm forming ability of *Candida*, it is important to improve the oral hygiene in patients with caries.

Keywords: *Candida*, dental caries, virulence, caries free, *Candida albicans*

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Osmotic Demyelination Syndrome Following Sodium Correction with Oral Salts in Chronic Hyponatremia- A Case Report

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Osmotic demyelination syndrome is a rare life-threatening neurological condition that contributes to 0.4–0.56% of admissions to neurology units in tertiary care hospitals. The disease encompasses two different patterns of clinical presentation including central pontine myelinolysis and extrapontine myelinolysis. A 68-year-old male, presented with an altered level of consciousness for one- day duration. He had been treated for hyponatremia (123mmol/L), four days before the current presentation. There, he was given 3% sodium chloride and discharged on oral salts. On this admission, he was in impending respiratory arrest along with impaired consciousness. Serum sodium was 177mmol/L, showing a rapid rise in sodium level within a short period. While on treatment, he developed Generalized Tonic-Clonic seizures, further complicating the management. Despite careful sodium correction, administration of immunoglobulins and steroids the patient's neurological status failed to improve. He died on day 20 of hospitalization. Osmotic Demyelination Syndrome emphasizes the devastating consequences of rapid sodium fluctuations in the background of chronic hyponatremia. It is important to consider the possibility of ODS in patients with neurological manifestations following rapid sodium corrections. Limitations of treatment options and the multifactorial nature of the illness may contribute to the poor outcome of the disease. This raises the importance of careful monitoring of sodium levels in high-risk patients.

Keywords: Osmotic demyelination syndrome, central pontine myelinolysis, extrapontine myelinolysis, rapid sodium correction

Palatability Evaluation of Developed Oral Syrup Formulations Designed to Treat Diabetes Mellitus

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Palatability evaluation of oral pharmaceuticals is important to improve patient acceptance. Key factors such as taste, flavor, odor and texture play a critical role in formulation development and significantly influence the consumer preference thus market success. This study aimed to evaluate the palatability of three developed oral anti-diabetic syrup formulations containing different combinations of aqueous extracts of fruits of *Garcinia quaesita*, *Bunchosia glandulifera* and leaves of *Coleus hadiensis*. A double-blinded, simple randomized controlled trial was conducted at two centers with twenty healthy participants, equally divided into control (positive, negative and base) and treatment groups (Syrup 01, Syrup 02 and Syrup 03). Formulations were coded and administered sequentially. Participants were informed to evaluate based on a standardized scale at 30 seconds and 5 minutes after being given each formulation. After each evaluation, participants were provided with half a glass of water, half an unsweetened bread slice and 100 mg cocoa powder to neutralize taste. Obtained data were statistically analyzed using Microsoft Excel 2013. According to participant scores calculated out of hundred, the positive control (76.10), Syrup 01 (72.00), Syrup 02 (72.24), Syrup 03 (70.29) and base (61.20) were acceptable (overall ranking 3). The negative control (59.9) was not accepted (overall ranking 4). Standard deviation values for placebo (control group) and syrup formulations (treatment group) were close to zero. One way ANOVA analysis showed no significant differences ($P \geq 0.05$) among placebo and among syrup formulations. In addition, there were no significant differences ($P \geq 0.05$) across all six formulations, indicating consistent palatability ratings. The positive control ranked highest, while the negative control ranked lowest, highlighting the importance of taste masking with sweetening agents. As all syrup formulations showed similar and acceptable rankings, they may be suitable to consider for pre-clinical and clinical trials prior commercialization.

Keywords: Anti-diabetic, Bunchosia glandulifera, Coleus hadiensis, Garcinia quaesita, palatability evaluation

Pancreatic Lipase Enzyme Inhibitory Potential of *O*-alkylated Garcinol Derivatives

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Obesity has become a major risk factor for the worldwide increase of Type 2 Diabetes Mellitus (T2DM). As existing synthetic drugs are associated with adverse effects, there is growing interest in natural products and their modified derivatives as safer and effective alternatives. Garcinol, a potent anti-hyperglycemic and anti-obesity compound from the genus *Garcinia* with few reported studies on its semi-synthetic analogs. Hence, this study was aimed to synthesize novel *O*-alkylated structural analogs of garcinol and evaluate their *in-vitro* anti-obesity potential. Garcinol was isolated from acetone: water (9:1) extract of fruit rinds of *Garcinia quaesita* and characterized by spectroscopic data. Twelve novel *mono O*-alkylated and *tri O*-alkylated derivatives of garcinol were synthesized using RX (C_2H_5I (Product 1 and 2), CCl_3Br (Product 3 and 4), C_2H_3Br (Product 5 and 6), $C_6H_5CH_2Br$ (Product 7 and 8), $C_7H_6BrNO_2$ (Product 9 and 10), $C_6H_5C_6H_4COCH_2Cl$ (Product 11 and 12)). *Mono* and *tri O*-alkylations were achieved using mild base K_2CO_3(acetone) and strong base NaH(DMSO) respectively. The products were characterized by spectroscopic data (NMR, Mass and FTIR). The highest activity was observed for *mono O*-alkylated product 11 (IC_{50} 4.31 ± 0.74 mg L^{-1}) compare to gracinol (IC_{50} 38.93 ± 0.63 mg L^{-1}) and others follow the descending order of the activity as; product 9 > product 7 > product 5 > garcinol > product 1 > product 3. Similarly, the product 12 (IC_{50} 23.61 ± 2.90 mg L^{-1}) exhibited the highest activity among the *tri O*-alkylated products and other compounds flow the decreasing order as; product 10 > product 8 > product 6 > garcinol > product 4 > product 2. Compound 7,8,9,10,11 and 12 showed significantly improved anti-obesity activity ($p<0.05$) compared to garcinol. Based on the current study, alkylation with aromatic alkylating reagents have enhanced *in-vitro* anti-obesity potential in both *mono* and *tri O*-alkylated derivatives, however, further *in-vivo* studies are needed to draw more definitive conclusions.

Keywords: Anti-obesity, garcinol, *O*-alkylated derivatives, pancreatic lipase

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Patterns and Practices of Free Sugar Intake Among 3-5-Year-Olds Attending Sirimavo Bandaranayake Specialised (Teaching) Children's Hospital, Peradeniya

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Excessive sugar consumption during early childhood leads to negative health outcomes, such as diabetes mellitus and dental caries. The WHO recommends early interventions to reduce free sugar intake (FSI), necessitating baseline information on sugar consumption during early childhood. However, studies on FSI in Sri Lankan children are limited. This study aimed to examine sugar consumption patterns in preschool children (3-5 years) attending Sirimavo Bandaranayake Specialised Children's Hospital (SBSCH), Peradeniya. It assessed their dietary habits and identified key trends in sugar intake to provide insights for promoting healthier nutrition and improving early childhood dietary interventions**.** A mixed-method study was conducted at the Out-Patient Department (OPD) of SBSCH. The survey included 240 parents of 3-5-year-olds (selected through systematic random sampling) for a self-administered validated 75-item food frequency questionnaire (FFQ) to assess sugar consumption patterns over the past three months. Free sugar intake was assessed against recommended energy requirements to classify low and high consumers. Additional in-depth interviews with 12 mothers were conducted during OPD wait times by trained interviewers in Sinhalese and continued until data saturation was reached, ensuring the reliability. Thematic content analysis was applied to qualitative data, while quantitative data were analysed using descriptive statistics. The daily median (IQR) FSI was 35.4 (20.3-63.9) g/day, constituting 10.9% of the total energy requirement (TER). FSI levels exceeded WHO recommendations (54.2% of the sample surpassed 10% of TER, and 82.5% exceeded 5%). Bakery items and biscuits (21% each) were the largest contributors, followed by chocolates (17%) and sugar-sweetened beverages (12%). The in-depth interviews revealed that only a quarter of the interviewees checked food labels for sugar content despite understanding the risks of excessive intake. Grandparents and relatives frequently provided sweets, making control difficult. Preschool settings positively influenced healthy eating habits, which were altered following the country's economic crisis. A substantial number of 3-5-year-olds exceeded recommended FSI levels, highlighting the urgent need for intervention. To combat this issue, tailored sugar policies must be implemented to promote healthier dietary habits while raising awareness among parents and caregivers. Promoting healthier alternatives and limiting high-sugar foods can improve children's overall health.

Keywords: Free sugar intake, sweets and sugars, risk factors, sugar policy, preschoolers

Pharmacognostic Analysis of *Bhesa ceylanica*

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Pharmacognostic studies are essential for the correct identification and quality assurance of medicinal plants. *Bhesa ceylanica* (Ethheraliya), a Sri Lankan endemic species, holds therapeutic significance, yet its pharmacognostic characteristics and phytochemical profile remain unexplored. To examine the macroscopic and microscopic features of *B. ceylanica* and perform its phytochemical screening. Plant samples, including leaves, bark, twigs, flowers, and fruits, were collected from a home garden in Putupagala, Western Province, Sri Lanka (GPS: 6.9849, 80.0714). The plant was authenticated with the National Herbarium of Royal Botanical Gardens, Peradeniya. Macroscopic observations, botanical illustrations, and photographs were documented, while fresh leaf sections were prepared for microscopic analysis, including both qualitative and quantitative assessments. Additionally, powder microscopy was conducted using shade-dried leaves. Phytochemical screening involved testing for secondary metabolites, and Thin Layer Chromatography (TLC) was used for chemical profiling. *B. ceylanica* leaves are ovate-lanceolate, with a glossy dark green upper surface and prominent venation. The stomatal type was anomocytic with a stomatal index of 10.0 and a palisade ratio of 6.25. Phytochemical analysis revealed the presence of alkaloids, proteins, carbohydrates, phenolic compounds, saponins, tannins, steroids, flavonoids, and gums/mucilage, while triterpenoids, glycosides, and fats/oils were absent. The methanolic extract of *B. ceylanica* was present in six distinct spots with separate colours, suggesting a relatively complex composition, with multiple compounds. This study provides a comprehensive pharmacognostic and phytochemical profile of *B. ceylanica*, which supports its correct identification and enhances its medicinal application potential.

Keywords: *Bhesa ceylanica*, phytochemical screening, macroscopic, microscopic, TLC

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Phytochemical Analysis and Antioxidant, Antidiabetic, Anti-Obesity Properties of Latex of *Garcinia morella*

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Garcinia morella, an evergreen tree, is a member of the Clusiaceae family and has been traditionally used and studied for its bioactive properties. Specifically, the latex of *G. morella* has been used for diabetes treatment. Although many other *Garcinia* species have been extensively studied, the phytochemical composition and therapeutic potential of the latex of *Garcinia morella* remain unexplored. This study aimed to investigate the phytochemical composition and biological activities of latex of *G. morella.* Phytochemical content was investigated using qualitative analysis and total phenolic content (TPC), total flavonoid content (TFC) and total alkaloid content (TAC) were determined by Folin–Ciocalteu reagent method [gallic acid equivalents (GAE)], aluminum chloride colorimetric method [rutin equivalents (RE)], and bromocresol green (BCG) reagent method [atropine equivalents (AE)], respectively. Antioxidant, antidiabetic and anti-obesity potentials of *G. morella* latex were determined using DPPH scavenging assay, α-amylase inhibitory assay and porcine pancreatic lipase inhibitory assay, respectively. Phytochemical screening showed that the latex of *G. morella* is rich in phenols, flavonoids, alkaloids, saponins, terpenoids and glycosides. The quantitative analysis revealed a high amount of total phenolic content (165.29 ± 0.07 mg GAE/g), a notable amount of total flavonoid content (30.49 ± 0.25 mg RE/g) and total alkaloid content (16.84 ± 0.01 mg AE/g). The crude latex exhibited strong α-amylase (IC_{50}: 20.49 ± 1.15 mg/L) and porcine pancreatic lipase (IC_{50}: 24.81 ± 6.32 mg/L) inhibitory activities, comparable to the positive controls acarbose (IC_{50}: 8.87 ± 1.08 mg/L) and orlistat (IC_{50}: 7.99 ± 1.79 mg/L), respectively. Additionally, the crude latex showed moderate DPPH radical scavenging activity (IC_{50}: 151.14 ± 0.06 mg/L) relative to the positive control ascorbic acid (IC_{50}: 3.61 ± 0.06 mg/L). The results suggest that the latex of *G. morella* contains various phytochemicals and it exhibits high antidiabetic and anti-obesity properties with moderate antioxidant activity. The major active constituents in the latex may be phenolic compounds, which may be responsible for these bioactivities. Therefore, future studies will focus on isolating and characterizing major compounds and evaluating their biological activities using in vivo and in vitro assays.

Keywords: Antidiabetic, anti-obesity, antioxidant, *Garcinia morella* latex, phytochemicals

Platelet Parameters in Patients with Type 2 Diabetes Mellitus in Two Peripheral Hospitals, Kandy, Sri Lanka

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Diabetes mellitus (DM) is a chronic metabolic disorder with a rising global prevalence. Type 2 diabetes mellitus (T2DM) constitutes the majority of cases and is associated with significant haematological alterations. Studies on the impact of T2DM on platelet parameters in Sri Lanka are very limited. To address this research gap, this study evaluates platelet parameters in T2DM patients attending two peripheral hospitals in Kandy, Sri Lanka. This study aims to compare platelet parameters between T2DM patients and healthy controls and to explore their association with disease duration to understand potential diagnostic and prognostic implications. A comparative case-control study was conducted at the Non-Communicable Disease (NCD) clinics of Menikhinna and Medawala Divisional Hospitals in the Kandy District. A total of 111 individuals (aged 20–70 years) were selected using a convenience sampling method and divided into three groups (n=37) based on diabetes duration: newly diagnosed T2DM patients, long-standing T2DM patients, and healthy controls. Data were collected using an interviewer-administered questionnaire. Platelet parameters such as platelet count (PLT), mean platelet volume (MPV), platelet distribution width (PDW), plateletcrit (PCT), and platelet large cell ratio (PLCR) were analysed using an automated haematology analyser. Statistical analysis was performed using one-way ANOVA for normally distributed data and the Kruskal-Wallis test for non-normally distributed data. The results revealed that the mean platelet count was significantly lower in long-standing T2DM patients ($244.4 \pm 61.1 \times 10^3/\mu L$) compared to newly diagnosed patients ($275.7 \pm 44.5 \times 10^3/\mu L$) and controls ($290.1 \pm 58.8 \times 10^3/\mu L$) ($P = 0.006$). Similarly, plateletcrit was significantly reduced in long-standing T2DM patients ($0.193 \pm 0.044\%$) compared to newly diagnosed patients ($0.211 \pm 0.032\%$) and controls ($0.219 \pm 0.047\%$) ($P = 0.034$). No significant differences were observed in other platelet parameters. Correlation analysis showed a significant association between PDW and duration of T2DM, while other platelet parameters showed no significant correlation. This study indicates that platelet count and plateletcrit were significantly low in long-standing T2DM patients, indicating increased platelet activation. The PLCR was higher in patients with complications, suggesting its potential as a marker for disease severity. These findings highlight the importance of monitoring platelet indices for early detection of complications and effective management of DM.

Keywords: Type 2 diabetes mellitus, platelet parameters, platelet count, mean platelet count, plateletcrit

$PM_{2.5}$ Exposure and Sleep Quality Among Pregnant Women in Kandy: an Interim Analysis of Respire2-SL Indoor Air Quality Study

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Poor air quality can be associated with adverse health outcomes, including sleep disturbances. Pregnant women, who are already sensitive to the environment, could have changes to sleep due to air pollution. This interim analysis aims to assess the association of particulate matter less than 2.5 μm in diameter ($PM_{2.5}$) exposure, with the sleep quality of pregnant women with a period of amenorrhea (POA) less than 24 weeks. A prospective longitudinal study was conducted among 320 pregnant women, accounting for a 10% expected dropout rate. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), both globally and by individual components. Indoor air quality was measured using sensors placed between the kitchen and bedroom in participants' homes for a minimum of 48 hours. PM2.5 levels were recorded at 5-minute intervals. Hourly averages were calculated only if at least 75% of the readings were available within that hour. Final PM2.5 exposure values were derived by averaging these hourly means. A simple linear regression analysis was performed to assess the association between PM2.5 concentration and maternal sleep quality. Ethical approval was obtained from EMREC, UK, and local ERCs in Sri Lanka. Informed written consent was obtained from all participants. The total sample consisted of 44 pregnant mothers. The 48-hours average $PM_{2.5}$ exposure was 32.6 +/- SD 19.2 $\mu g/m^3$. Each 1 $\mu g/m^3$ increase in $PM_{2.5}$ was associated with decreased subjective sleep quality [β (standardized coefficient) = -0.421, p = 0.003], increased sleep latency (β = 0.338, p = 0.016) and decreased sleep duration (β = -0.345, p = 0.014,). However, the use of sleep medication, sleep disturbances and day time dysfunction showed no association with $PM_{2.5}$. There was a negative correlation between higher exposure to $PM_{2.5}$ and overall quality of sleep in relation to the global PSQI score. (β = -0.305, p = 0.044 for 1 $\mu g/m^3$ increase in $PM_{2.5}$). Exposure to 48-hours average $PM_{2.5}$ has been associated with poor sleep quality, prolonged sleep latency and reduced sleep duration among pregnant women. These findings highlight the urgent need for the effective strategies to mitigate air pollution in order to improve maternal sleep health during pregnancy.

Keywords: $PM_{2.5}$ exposure, sleep quality, pregnancy, indoor air pollution, Pittsburgh sleep quality index

Population-Specific Complete Blood Count Reference Ranges for Jaffna, Sri Lanka

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Reference intervals (RIs) are essential for accurately interpreting clinical laboratory results. As RIs are population-specific, establishing locally validated intervals is vital for precise diagnosis and effective treatment. However, comprehensive RIs for the Jaffna population have not yet been determined. Therefore, this study aims to establish locally validated RIs for complete blood count (CBC) parameters in the healthy adult population of Jaffna, Sri Lanka. A cross-sectional study was conducted on 300 randomly selected healthy blood donors aged 18-60 years at the Jaffna Blood Bank. EDTA-anticoagulated blood samples were collected and analysed using a five-part automated haematology analyser. RIs for 13 CBC parameters were established using a non-parametric method, with outliers excluded via the Tukey method to ensure data quality. The first (Q1) and third (Q3) quartiles and interquartile range (IQR) were calculated. Reference limits were set as Q1 - 1.5×IQR (LRL) and Q3 + 1.5×IQR (URL), with RIs deemed valid if over 95% of values fell within these limits. Sex-specific reference intervals (RIs) for CBC parameters were established for the Jaffna population, with 95% inclusion for males and females, respectively: WBC (3.99–10.47 vs 4.01–10.97 $\times 10^9$/L), neutrophils (1.91–7.32 vs 1.58–7.21 $\times 10^9$/L), lymphocytes (1.23–3.92 vs 1.00–3.78 $\times 10^9$/L), RBC (4.09–5.69 vs 3.67–5.09 $\times 10^{12}$/L), hemoglobin (11.72–16.80 vs 10.47–14.70 g/dL), hematocrit (35.20–48.60 vs 29.95–43.50%), platelets (151.25–387.00 vs 152.00–398.35 $\times 10^9$/L), MCV (75.81–98.79 vs 73.84–93.40 fL), MCH (26.96–32.20 vs 25.36–32.50 pg), and MCHC (32.00–35.63 vs 32.28–36.10 g/dL). Monocyte and basophil counts were validated only in males; female values and eosinophil counts in both sexes failed validation (<95% inclusion). Notable differences were observed between established and current RIs for monocytes, eosinophils, platelets, hematocrit, and MCV. Females showed lower RBC, haemoglobin, and hematocrit, while the lymphocyte URL was slightly higher. In conclusion, the present study established the first population-specific RIs for CBC parameters in the Jaffna cohort, highlighting significant sex-based variations and differences from standard hospital ranges. The findings emphasise the need for locally derived RIs to enhance diagnostic accuracy in regional healthcare.

Keywords: Reference intervals, complete blood count, Jaffna

PredictGL: An AI-Driven Web Application for Glycemic Load Prediction Using Nutritional Composition Data

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Diabetes management mainly relies on dietary strategies such as low Glycemic Index (GI) or Glycemic Load (GL) diets. GI testing in research settings faces challenges, and GL is more practical for daily application. However, GL-based strategies are not yet accessible or actionable for at-risk populations. This study addresses this gap by utilizing artificial intelligence to enhance dietary management. The objective was to develop and validate an AI-based GL prediction model and integrate it into a web application named "PredictGL" to support dietary management and improve GL awareness among users. A dataset of 775 food items was compiled through a literature search to train machine learning models. Among Random Forest, XGBoost, and Bagging Regressor models, Random Forest demonstrated the highest predictive accuracy ($R^2 = 0.80$, RMSE = 9.53). The model was deployed into a web application built using Angular 17 for the front end, Python for the backend, and hosted on AWS EC2. The AI model utilized macronutrient data; carbohydrates, protein, fat, and dietary fiber to predict GL. The application allowed portion size adjustments and mixed-meal GL estimation. Usability testing involved 40 participants, while expert evaluations included 31 respondents. Usability testing showed increased GL awareness (mean difference in knowledge scores: 5.775, $p < 0.05$), with 90% reporting improved confidence in selecting low-GL foods. Expert evaluations rated the application highly for accuracy (4.65 ± 0.48), relevance (4.61 ± 0.56), and satisfaction (4.58 ± 0.5), all statistically significant ($p < 0.05$). This research contributes to the current understanding of diabetes management by demonstrating the effectiveness of AI-driven tools in predicting GL and improving dietary strategies for individuals and healthcare systems. It paves the path for future innovations like image-based food recognition to predict GL further.

Keywords: Dietary management, glycemic index, glycemic load prediction, machine learning, web application

Pregnant Women's Perception Towards the Antenatal Classes: An Exploratory Descriptive Qualitative Study

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Antenatal classes are crucial in preparing pregnant women for childbirth and parenthood. The existing literature on pregnant women's perceptions of antenatal classes in Sri Lanka is limited. Understanding pregnant women's perceptions of these classes is crucial for identifying gaps and improving the quality of maternal healthcare services and educational support. This study aimed to explore perception towards the antenatal classes, among pregnant women ,in Kandy district, Sri Lanka. A descriptive qualitative study was conducted in the Gagawatakoorale, Doluwa and Kadugannawa MOH areas among ten purposively selected pregnant women who attended antenatal classes. Individual, in-depth interviews were conducted using an interview guide until the point of data saturation which lasted between 45-60 minutes. The interviews were tape-recorded, and the data were analyzed using Braun and Clarke's thematic analysis method. Four major themes and fourteen sub-themes emerged during analysis; 1) Maternal perspectives on the antenatal classes design and delivery (content of antenatal classes, diversity of resource persons, modes of content delivery, class environment, benefits and importance of antenatal classes), 2) Facilitators for the participation in antenatal classes (support from partner and families, accessibility and convenience, maternal compliance towards antenatal classes, encouragement from care providers), 3) Barriers to effective participation in antenatal classes (work-related barriers, family and social support challenges, lack of awareness of antenatal classes) and 4) Recommendations to improve antenatal classes (enhancing educational content, increasing participation of key stakeholders).The study findings emphasize the role of antenatal classes in Sri Lanka in boosting the knowledge of mothers in maternal nutrition, fetal development, and childbirth. Key gaps in breastfeeding, neonatal care, and practical skills were noted, with recommendations for an expanded scope of content, flexible scheduling, and stakeholder involvement to enhance its effectiveness.

Keywords: Antenatal classes, perception, pregnant women

Pre-Pregnancy Maternal BMI, a Predictor of Offspring Birth Weight in Sri Lankan Population

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Maternal pre-pregnancy BMI plays a significant role in giving birth to large for gestational age (LGA) neonates (> 3500 g). High birth weight is deemed a risk factor for early development of cardio vascular diseases. Maintaining a healthy BMI prior to pregnancy is important to mitigate these complications. To evaluate the association of maternal pre-pregnancy BMI with high birth weight in the offspring. A total of 1537 pregnant mothers were randomly recruited from the Antennal Clinic of Teaching Hospital Peradeniya. Their demographic and medical details were collected using an interviewer administered questionnaire. Only 1143 mother-infant pairs were selected for this prospective observational cohort study who were term neonates without any complications. Birth weights of the selected neonates were measured. Multiple linear regression, Poisson regression and Spearman Correlation tests were performed for the statistical analysis. The median pre-pregnancy BMI was 23.2 ± 6.20 kg m^{-2} and the median age of the mothers was 29 ± 7.00 years. The median birth weight of the neonates was 2900. 0 ± 550.0 g. Most of the neonates had normal birth weight comprising n = 904 (79.09%). Seventy (6.12%) babies were LGA. Pre -pregnancy BMI had a significant positive correlation with offspring birth weights with $p < 0.05$, $r = 0.137$. After adjusting for the covariates such as maternal complications, gestational weight gain, maternal educational level, gender of the neonate and maternal age, maternal pre-pregnancy BMI ($\beta = 0.113$) significantly predicted neonatal birth weight ($p < 0.05$) at 95% CI. The adjusted relative risk for having LGA babies for mothers with high pre-pregnancy BMI was 1.35 (0.987–1.790 of CI). Raising awareness among the expectant mothers to maintain healthy BMI, prior to pregnancy is essential to support the birth of a healthier child, since high pre-pregnancy BMI has increased risk of delivering LGA offspring.

Keywords: Pre-pregnancy BMI, offspring birth weight, large for gestational age babies

Prevalence and Antimicrobial Susceptibility Patterns of Bloodstream Infections Among Hemodialysis Patients at Kandy National Hospital: A Retrospective Study

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Blood stream infections (BSIs) are a major complication of hemodialysis. The incidence of infection in hemodialysis patients is commonly associated with the dialysis procedure. BSIs are a leading cause of death in hemodialysis patients due to immunosuppression, frequent vascular access, repeated healthcare exposure, and antibiotic resistance. This study aims to identify the prevalence of BSIs among hemodialysis patients and the susceptibility patterns of these pathogens to commonly used antibiotics and to assess the frequency of key antibiotic resistance mechanisms such as methicillin resistance, extended-spectrum beta-lactamase (ESBL) production and AmpC beta-lactamase production, among BSI isolates. A retrospective study was carried out at National Hospital, Kandy. Data were collected from the positive blood culture logbooks and blood culture register of the hospital microbiology department. Patients' data were retrieved from the admission books of dialysis units, sample books and nurses' census books from September 2020 to November 2024. Blood samples were collected according to standard operating procedure and sent to the microbiology department. Bacterial identification and antimicrobial susceptibility testing were performed following CLSI guidelines by well-trained staff. The Jamovi 2.3.28 was used for statistical analysis. The mean age of participants was 53.0 years (SD = 11.5), with the highest BSI prevalence in the 50–59 age group. Of 634 positive samples, 667 pure bacterial isolates were yielded. *Staphylococcus aureus* was the predominant isolate 242 (36.28%), with 46.69% being MRSA; followed by coagulase-negative *staphylococcus* 199 (29.84%). 526 (78.86%) were Gram-positive, of which 337 (64.06%) were MDROs. There were also 134 (20.09%) Gram-negative isolates, including 67 (50%) MDROs. Moreover, 22.64% of the isolates exhibited resistance mechanisms including MRSA (16.94%), ESBL (3%) and AmpC (2.7%). Resistance mechanisms including MRSA, ESBL and AmpC beta- lactamase were on the rise. Infection control, antibiotic stewardship and hygiene practices are crucial to managing BSI effectively and improving the patient's outcomes.

Keywords: Hemodialysis, antimicrobial Susceptibility, blood stream infections

Prevalence Patterns of Colorectal Cancer Across Age and Sex with Associated Presenting Complaints: A Retrospective Study from Teaching Hospital Peradeniya

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Colorectal cancer is a significant global health concern, and understanding its demographic and clinical presentation patterns is essential for early diagnosis and effective management. This study aimed to analyze the age and sex distribution of colorectal cancer patients and their associated presenting complaints at Teaching Hospital Peradeniya. This retrospective descriptive study reviewed data from 40 patients diagnosed with colorectal cancer. The analysis focused on age, sex, and clinical presentations, including bleeding, altered bowel habits, abdominal pain, obstruction, anaemia, incidental findings, and loss of appetite (LOA). Of the 40 patients, 50% (20) were male and 50% (20) were female. The most frequent age group was 50–59 years (37.5%, 15/40), followed by 60–69 years (27.5%, 11/40). Bleeding per rectum was the most common presenting complaint overall (55%, 22/40), followed by altered bowel habits (47.5%, 19/40) and loss of appetite (15%, 6/40). Abdominal pain and anaemia were each reported in 7.5% (3/40) of patients, while incidental diagnoses accounted for 2.5% (1/40). No cases of obstruction were observed. When stratified by sex, bleeding was equally prevalent in males (55%, 11/20) and females (55%, 11/20). Altered bowel habits were slightly more common in males (50%, 10/20) than in females (45%, 9/20). Loss of appetite was more frequent in females (20%, 4/20) compared to males (10%, 2/20), and the single incidental finding was in a male patient (5%, 1/20). Abdominal pain was reported in 5% (1/20) of males and 10% (2/20) of females, while anaemia was present in 10% (2/20) of males and 5% (1/20) of females. These findings highlight the importance of recognizing common presenting symptoms like bleeding and altered bowel habits in both sexes, while also noting potential sex-specific differences in symptoms such as loss of appetite and incidental findings. Increased awareness among healthcare providers can facilitate early diagnosis and improve treatment outcomes. Further research with larger cohorts is needed to explore these patterns in greater detail.

Keywords: Colorectal cancer, presenting complaints, sex distribution, age prevalence

Prevalence, Types, and Severity of Anemia and Its Association with Demographic Factors Among Patients Visiting the Dental Teaching Hospital Peradeniya

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A significant decrease in the number of red blood cells characterizes anemia. This leads to adverse health outcomes, particularly in developing countries, including Sri Lanka. Despite its high prevalence, research on anemia remains underexplored. Investigating the association between anemia and associated factors across different groups can aid in developing targeted interventions and executing effective prevention strategies to elucidate the health burden. The current retrospective study aimed to investigate the prevalence, types, and severity of anemia associated with age and gender among a cohort of Sri Lankan participants. The study included 2,623 patient records aged from 2 months to 90 years, obtained from the Oral Medicine Laboratory, Dental Teaching Hospital, Peradeniya. Participants with complete full blood count parameters were included in the study, while those with known hematological malignancies or bone marrow disorders were excluded. Following WHO guidelines, anemia status, type, and severity were assessed based on hemoglobin levels, considering age and gender, and red cell indices. Data was analyzed using SPSS software version 26.0. Comparisons across subgroups were performed using chi-square tests and logistic regression. A p-value <0.05 is considered statistically significant. The overall prevalence of anemia was 25.5%, particularly 42.2% in the population above 60 years. Females had significantly higher odds of anemia than males (OR = 0.670, 95% CI 0.557-0.806, $p < 0.001$). Most (63.3%) cases exhibited mild anemia, and only 3.4% were severely anemic. A highly significant association was observed between anemic type and age. Microcytic anemia was more common in infants (22.4%), toddlers (16.5%), consistent with nutritional deficiencies, while normocytic and macrocytic anemia were more prevalent in the elderly. Most of the young adults were non-anemic. This study reveals that female sex and older age are associated with an increased risk of anemia, while the higher prevalence of microcytic anemia in infants highlights the need for targeted preventive strategies in healthcare settings.

Keywords: Prevalence, anemia, gender, age, Sri Lanka

Psychological Resilience and Cardiovascular Disease: Exploring the Protective Role in Heart Health - A Systematic Review of Current Research

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Cardiovascular disease (CVD) remains the greatest high-risk mortality factor worldwide. New research suggests that factors such as psychological resilience (PR) may impact heart health through a protective role via multiple psychophysiological mechanisms alongside more traditional risk factors. It is important to explore deeper into these protective mechanisms systematically. This systematic review intends to synthesize and critically assess the available evidence on the relationship of PR constructs with cardiovascular outcomes. It aims to ascertain the reasons for this relationship and evaluate the research's level of rigor. Five electronic databases: PubMed, PsycINFO, Embase, Web of Science, and Cochrane Library from their inception till September 2024 were searched systematically. Studies that explored relationships between resilience and cardiovascular outcomes were selected. Two independent reviewers screened, collected, and analyzed data including the methodological quality of the studies using relevant criteria. Narrative synthesis was applied for integrating and analyzing findings across multiple studies, thematic synthesis of suggested mechanisms and outcomes was also performed. Out of the 1247 records identified, 42 studies fulfilled inclusion criteria (28 cross-sectional, 14 longitudinal). High PR was linked to lower risk of developing cardiovascular disease across various populations. The protective effect was stronger in longitudinal studies with hazard ratios ranging from 0.67-0.84 for CVD events in resilient individuals. Findings shows that four major mechanistic pathways give rise to:(1) autonomic regulation, with resilient individuals showing enhanced heart rate variability (mean difference =12.3) with a p-value of < 0.01; (2) modulation of inflammatory biomarkers such as CRP and IL-6; (3) mediation of health behavior, where resilience was linked to 42% higher adherence to cardiac rehabilitation; (4) enhancement of psychosocial resources such as active social support post cardiac events. There was great variability in methodological quality, with the most persuasive evidence coming from longitudinal studies. This review demonstrates how PR is intricately linked to achieving positive cardiovascular health outcomes. The identified mechanisms indicate that resilience has the potential to protect one's heart through various pathways. The findings suggest that resilience-building interventions may prove helpful in CVD prevention and management, given evidence that resilience can be enhanced through structured training programs, though this requires validation through prospective clinical trials.

Keywords: Cardiovascular disease, heart health, heart rate variability, psychological resilience, psychophysiological mechanisms

Qualitative and Quantitative Analysis of Oral Candida in Chronic Betel-Quid Chewers

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Betel quid (BQ) chewing is still widely prevalent cultural habit in Sri Lanka. The mechanisms of BQ induced oral carcinogenesis are currently under investigation. However, the alterations in BQ chewers appear to be linked with oral microbiome dysbiosis. The present study aims to evaluate the prevalence of oral candida colonization, species characterization and assess the relationship between the BQ chewing habit with Candida species in individuals with and without the BQ chewing habit. An observational case control study was conducted using 20 subjects with BQ chewing habit (case group) and 20 subjects without the BQ chewing habit or any other form of tobacco (smoking or smokeless) or areca nut chewing (control group). Adults with a recent history of systemic antifungal therapy or antibiotics within the preceding 3 months were excluded. Unstimulated whole salivary samples were collected from both groups, and the spectrum of oral Candida species was determined by using Gram stain, Germ tube test, SDA plate, Rice agar and CHROM agar inoculations. In addition, quantification of Candida species was also carried out in CFU/ml in both groups. Candida species were isolated from 72.5% of the participants, with higher prevalence among BQ chewers (42.5%) than non-chewers (30.0%). *Candida albicans* was the most common species isolated from both BQ chewers (27.5%) and non-chewers (12.5%) followed by *C.krusei, C.tropicalis, C.glabrata and C.parapsilosis*. There was no significant difference in the prevalence of Candida species in both groups (Mann Whitney U test p=0.098). A statistically significant elevation of the CFU/ml counts in BQ chewers was observed when compared to non-chewers (Mann Whitney U test p=0.011). A moderate positive correlation was found in both the duration of the habit (Spearman's rho= 0.483 p=0.002) and the quantity of the quid chewed per day (Spearman's rho=0.445, p=0.004) with the candida load (CFU/ml). Although BQ chewing does not significantly affect Candida colonization rates, it is associated with a higher fungal load. The positive correlation with habit duration and frequency suggests a role in promoting opportunistic infections with Candida species. Findings from this pilot study highlight the need for further research into BQ-related oral microbial changes and cancer risk.

Keywords: Betel quid chewing, oral candida, colony forming units (CFU/ml), *Candida albicans*

Randomized Controlled Study to Compare the Effectiveness of Muscle Energy Technique versus Short Wave Diathermy along with the Maitland Mobilization Technique in the Treatment of Adhesive Capsulitis

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Adhesive capsulitis (AC) of the shoulder is a prevalent condition characterized by pain and limitation of daily activities. Limited evidence is found with regard to the efficacy of the manual therapy interventions in its treatment. Objective to compare the efficacy of muscular (MMET) and articular muscle energy techniques (AMET), Short Wave Diathermy (SWD), along with the mobilization (MB) with a standard control group (only MB) for the treatment of AC. Methods: Patients diagnosed with stage 2 or 3 AC were randomly assigned (Computer generated block randomization) into either control or one of the three interventional groups (N = 53 in each). Control group received only MB whereas interventional groups received either MMET, AMET or SWD along with MB once a week over eight weeks. Additionally, all received exercises and medical management. Outcomes included pain perception evaluated by numeric rating scale, range of motion measured with goniometer, level of shoulder disability measured by disability of arm, shoulder and hand (DASH) score and ultrasound scan parameters; subscapularis position in external rotation, coraco-humeral ligament thickness, rotator interval echogenicity and vascularity. Participants and outcome raters were blinded to the group allocation. Non-parametric tests (Kruskal-Wallis test and crosstabs-chi-square tests for group comparisons, Wilcoxon-signed rank test and McNemar tests for within-group analysis) were performed to analyze the data. Results: All treatment groups showed a significant improvement in all outcome parameters from baseline to post-intervention ($p < 0.05$). Compared to control and SWD groups, MET groups showed a significant improvement in post interventional score differences for all outcomes ($p < 0.05$), except for subscapularis position in external rotation, rotator interval echogencity and vascularity ($p > 0.05$). MMET was superior to AMET only in the improvement of shoulder external rotation and coraco-humeral ligament thickness ($p < 0.05$). Results with regard to pain and shoulder function were consistent at 6 months follow-up. Conclusion: METs in conjunction with MB, exercises and medical management appear to be effective in improving primary and secondary outcomes compared to SWD combined with MB and MB solely groups in patients with AC. This emphasizes the importance of multimodal treatment approach that includes manual therapy interventions in the management of AC.

Keywords: Frozen shoulder, pain, range of motion, manual therapy interventions

Rare Co-Occurrence of Cranial Nerve Palsy and Cerebral Infarction in Adult Pyogenic Meningitis: A Case Report

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Pyogenic meningitis is a life-threatening central nervous system (CNS) infection due to meningeal inflammation, caused by *Streptococcus pneumoniae*, *Neisseria meningitidis*, or *Haemophilus influenzae*. Neurological complications, such as cranial nerve palsies and cerebral infarctions, are rare but have significant and worse outcomes. Cranial nerve palsy and cerebral infarctions are rare complications of adult pyogenic meningitis, but when they do occur, they can lead to serious neurological outcomes. This case emphasizes an atypical presentation of pyogenic meningitis complicated by facial nerve palsy and cerebral infarctions simultaneously, highlighting the importance of early diagnosis and multidisciplinary management. A 41-year-old male presented with fever, headache, slurred speech, swallowing difficulties, and right-sided upper motor neuron facial weakness following treatment for a lower respiratory tract infection. Initial CT imaging was unremarkable, but cerebrospinal fluid (CSF) analysis revealed neutrophilic leukocytosis, consistent with bacterial meningitis. The patient rapidly deteriorated, developing seizures and a decreased Glasgow Coma Scale (GCS). Contrast-enhanced CT revealed bilateral temporal and parietal infarctions. It was complicated by ventilator-associated pneumonia with multidrug-resistant organisms. The patient received intravenous antibiotics (ceftriaxone and vancomycin), antiepileptics, and supportive care, including physiotherapy and speech therapy. Over 25 days, the patient's condition improved with stabilization of neurological deficits and resolution of infections. This case highlights the importance of recognizing atypical presentations and complications of pyogenic meningitis, such as cranial nerve palsy and cerebral infarctions, for effective management.

Keywords: Atypical presentation, pyogenic meningitis, cranial nerve palsy, cerebral infarction

Regional Variations in Geochemical and Microstructural Properties of Gallstones in Sri Lanka

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Gallstone disease (GSD) is a major health concern influenced by various socio-demographic factors. In Sri Lanka, studies based on the relationship between these factors and gallstone's geochemical and microstructural characteristics remain limited. This study addresses that gap by analysing gallstones from 34 patients obtained from Anuradhapura, Batticaloa, Jaffna, Kurunegala, Peradeniya, and Ragama hospitals. Socio-demographic data were collected through a structured questionnaire, and gallstones removed during cholecystectomy were cleaned, dried and analysed. Chemical composition was examined using Fourier Transformed Infrared Spectroscopy (FT-IR) to identify functional groups and Inductively Coupled Plasma Optical Emission Spectroscopy for elemental analysis. Microstructural features were studied using polarizing and fluorescence microscopes, and surface morphology was observed under Scanning Electron Microscopy (SEM). Most patients were female (n=23, 69.7%), with an average age of 47. Among 25 patients, nearly half of patients were obese (n=12, 50%). Mixed-type stones were most common, with no pure cholesterol stones found. SEM imaging showed clumps of bile particles and cholesterol crystals with defined shapes. Polarizing microscopy identified three main layers: the core, middle layers, and crust, with some mixed stones displaying laminations. Fluorescence microscopy further confirmed these findings, showing varying intensities due to compositional differences and different stages of bile constituents. However, microstructural analysis showed no considerable difference in samples within other regions. Elemental analysis revealed significant regional differences in the distribution of elements such as Fe, Mn, Cr, Ni, and Pb. Some elements such as Co, Cd, As, and Se was below detection. Cu was the most abundant minor element, and Cd was the least. The study recommends future research using SEM-EDX and more advanced fluorescence microscopy for deeper insight into elemental and compositional differences.

Keywords: Gallbladder stones, fluorescence microscopy, socio-demographic factors, minor elements

Regional Variations of Sources of Information and Levels of Knowledge on Sexual Intercourse During Pregnancy in Puttalam District, Sri Lanka

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Sources of information that pregnant women and their partners consult for guidance on sexual intercourse during pregnancy vary by region. These differences are influenced by cultural beliefs, societal norms, and the availability of healthcare services. This study aims to determine regional variations in both the sources of information and the levels of knowledge regarding sexual intercourse during pregnancy. A descriptive cross-sectional study was carried out involving 576 pregnant women, selected through a multi-stage cluster sampling method. Data were collected using a structured questionnaire. Significant regional disparities were identified in the sources of information and levels of knowledge regarding sexual intercourse during pregnancy ($p < 0.01$). Digital resources and advice of healthcare professionals emerged as the most frequently cited sources. Reliance on digital resources was higher in urbanized areas, with Wennappuwa (82.5%), and Dankotuwa (80.0%) reporting the highest reliance. Healthcare professionals were the predominant sources in Anamaduwa (80.0%) and Wennappuwa (85.0%). Beliefs about the safety of sexual intercourse during pregnancy also varied, with the highest level of confidence observed in Madampe (75.6%) and the lowest in Pallama (51.4%). Misconceptions regarding potential fetal harm were reported by 26.9% of participants, with notable geographic variation. These findings underscore notable regional disparities in both the sources of information and the levels of knowledge regarding sexual intercourse during pregnancy. While the digital resources and healthcare professional are key sources, their usage varies considerably by region. Addressing these disparities requires region-specific strategies to improve access to digital and clinical outreach to ensure consistent and reliable sexual health information during pregnancy.

Keywords: Regional disparities in sexual health knowledge, sources of information on sexual health, safety of sexual intercourse during pregnancy

Reversing Insulin Resistance and Improving Cardiovascular Health by Losing Weight

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Insulin resistance (IR) is a key risk factor for metabolic disorders, including type 2 diabetes and cardiovascular diseases. Weight loss is widely recognized for increasing insulin sensitivity while improving metabolic health. This study examines whether weight loss interventions can improve insulin resistance, lipid profiles, and cardiovascular health markers. Major objectives of this research was to evaluate whether weight loss intervention can effectively reverse insulin resistance and to observe improvement of metabolic and cardiovascular health markers. The study design used was a longitudinal cohort study. A total of 106 participants (n=106) diagnosed with insulin resistance were enrolled in a 12 week structured weight loss program incorporating dietary modifications, physical activity, and supplementation. Fasting triglyceride and blood glucose levels were measured to calculate the Triglyceride-Glucose (TyG) Index, a recognized marker of insulin resistance. Anthropometric data and cardiovascular health markers were measured at baseline and post intervention. There were significant differences between the weight loss and weight gain groups across the following parameters. BMI showed a significant reduction in the weight loss group ($p<0.0001$). Systolic blood pressure significantly decreased after weight loss ($p=0.002$), along with reductions in body fat percentage ($p<0.0001$), body fat mass ($p<0.0001$), and visceral fat mass ($p=0.0001$). Fasting blood glucose improved significantly ($p=0.0001$), while High Density Lipoprotein (HDL) increased ($p=0.0008$), and Triglyceride (TG) ($p=0.002$) and Very Low Density Lipoprotein (VLDL) ($p=0.004$) decreased in weight loss group. The TyG index significantly decreased from 8.68 ± 0.64 to 8.45 ± 0.64 ($p<0.0001$), indicating improved insulin sensitivity. This study provides strong evidence that weight loss significantly improves insulin sensitivity, lipid profile, and cardiovascular health markers.

Keywords: Cardiovascular health, diabetes, insulin resistance, metabolic health, weight loss

Ripening Stage-Dependent Variations in Nutritional and Glycemic Properties of Three Commonly Consumed Banana Varieties in Sri Lanka

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Many people in Sri Lanka consume bananas (*Musa* spp.) as a staple fruit due to their delicious flavour, high nutritional content, and bioactive ingredients. In this study, three popular Sri Lankan banana varieties; *Seeni*, *Embul*, and *Kolikuttu* were subjected to an integrated non-destructive and destructive analysis in three different ripening stages; green-yellow, yellow with green tips, and fully yellow. Aim of this study was to identify significant alterations in the biochemical composition and to link those changes with banana ripening. Raw banana hands were obtained from a local supplier at Rajanganaya, Anuradhapura. According to the study, *Kolikuttu* variety had significantly highest ($p < 0.05$) digestible starch (DS) content (3.26 ± 0.35 g/100 g FW) at the fully yellow (fully ripen) stage, whereas *Seeni* variety had significantly lowest ($p < 0.05$) resistant starch (RS) content (1.84 ± 0.28 g/100 g FW). *In-vivo* glycaemic index (GI) was conducted using 30 healthy undergraduate students aged between 25-30 years and body mass index (BMI) of 18.5-24.9 kg/m^2. GI varied significantly ($p < 0.05$) between banana varieties and ripening stages. At the fully yellow stage, *Seeni* bananas had the highest GI (56.62 ± 4.67), followed by *Embul* (52.26 ± 4.76) and *Kolikuttu* (52.17 ± 4.33). Notably, all varieties displayed considerably low GI at the yellow with green tips stage. Antioxidant activity was assessed by DPPH radical scavenging assay. At fully yellow stage, the radical scavenging activity was significantly higher ($p < 0.05$) in *Kolikuttu* variety (88.36 ± 0.18%), followed by *Seeni* (86.93 ± 5.67%) and *Embul* (84.09 ± 0.91%) varieties. Findings also revealed that total flavonoids content does not significantly ($p > 0.05$) vary with the ripening stage. Correlation coefficient (r) was assessed by Pearson's correlation analysis. Significant ($p < 0.05$) correlations was found between GI and other variables including, starch fractions, sugar content, a* value and firmness. These results may lead the way for advancements in metabolic health management by providing insightful information for dietary recommendations, especially for diabetics.

Keywords: Banana ripening, glycemic index, resistant starch, antioxidants, diabetics

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Risk of Falls, Functional Mobility and Functional Capacity in Older Adults with Chronic Obstructive Pulmonary Diseases Attending Tertiary Care in Sri Lanka

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Older adults with chronic obstructive pulmonary disease (COPD) are at an increased risk of falls due to factors such as muscle weakness, balance impairments, reduced physical activity and, increased fear of fall. Also, they exhibit reduced functional mobility and reduced functional capacity compared to their healthy counterparts. This study aimed to identify risk of falls, functional mobility, and functional capacity along with their associations in older adults with COPD attending tertiary care hospitals in Sri Lanka. A cross-sectional study was conducted at Central Chest Clinic in Colombo, and National Hospital for Respiratory Diseases in Welisara from August to September 2024, involving COPD patients aged 60 and older. Risk of falls and functional mobility were assessed using the Timed Up and Go test (TUG), while functional capacity was evaluated with a six-minute walk test (6 MWT). Descriptive statistics, independent samples t-test, and Pearson correlation were used to analyze the data in SPSS version 22. A total of 229 COPD individuals (177 males, 52 females) with a mean age of 70 ± 6.8 years were recruited. Mean TUG time and 6MWD scores were 12.3 ± 2.3seconds and 353.9 ± 92.2meters, respectively. Females exhibited a longer mean TUG time (13.0 ± 2.5seconds) compared to males (12.0 ± 2.2seconds). TUG time cut-off of ≥12 seconds can predict fall in patients with COPD, with 44.9% of participants identified as being at risk of falling. Males demonstrated a higher mean 6MWD (369.8 ± 96.7meters) than females (343.8 ± 72.3meters). A statistically significant association ($p < 0.05$) was observed between gender and functional capacity, gender and fall risk. A statistically significant positive correlation was found between risk of fall and age ($r = 0.439$, $p = 0.050$). Whereas a moderate negative correlation was identified between risk of fall and functional capacity ($r = -0.617$, $p < 0.05$). Older adults with COPD experience significant impairments in functional mobility and functional capacity, with an increased risk of falls. Gender and advancing age play a crucial role in these impairments. The strong inverse relationship between functional mobility and capacity underscores the need for targeted rehabilitation interventions to enhance mobility and reduce fall risk in COPD.

Keywords: COPD, risk of falls, elders, 6MWD, functional mobility

Spatial Analysis of Hump-Nosed Viper (*Hypnale Hypnale*) Bites from 2016 to 2019 in Kandy District, Sri Lanka

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The Humped-Nosed Viper *(Hypnale hypnale)* poses a significant medical threat in Sri Lanka, causing complications such as coagulopathy and acute renal failure. This highlights the importance of spatial analysis for informed decision-making. Therefore, this study employed GIS techniques to analyze the spatial distribution and geographic patterns of *H.hypnale* bite incidents in Kandy, Sri Lanka from 2016 to 2019. Additionally, elevation and land-use patterns were analyzed to identify vulnerable populations in known *H.Hypnale* habitats. Victim data was collected from the Department of Medicine, University of Peradeniya, and analyzed using the ArcGIS Pro 3.3 software. The estimation of Morans' I value revealed a statistically significant clustering. This was denoted by a ratio of 0.557, a z-score of -9.1125, and a p-value of 0.000. These indicate a less than 1% probability that the observed distribution is random. Furthermore, Kernel density and hot spot analysis revealed a 90% to 95% confidence in bites occurring in Yatinuwara, Harispathtuwa and Pathadumbara Divisional Secretariats. Furthermore, a Digital Elevation Model (DEM) demonstrated that the *H.Hypnale* habitat was prevalent within mid-elevation zones between 453 and 912 meters. The NDVI modelled the land-cover patterns elucidating the correlation between these known *H.hypnale* habitats and incident locations. Moreover, exploratory spatial data analysis revealed that the majority of the snake bites occurred during evenings and that the victims were from low-income backgrounds, with 25% unemployed, 13% labourers, and 10% farmers. Male victims accounted for 56% of cases while females accounted for 44%. Spatial overlay with hospital locations suggested adequate healthcare coverage in clustered areas. These help future interventions including selective antivenom distribution, awareness programs for at-risk groups and the selection of suitable hospitals for ongoing clinical trials. A key limitation of this study was the absence of precise bite location data, as only patients' residential locations were available.

Keywords: Snake bites, incidence mapping, spatial analysis, hotspot analysis

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Ten-Year Cardiovascular Disease Risk and Associated Determinants Among Hypertensive Patients in Tertiary Care Hospitals in Kandy District, Sri Lanka

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Cardiovascular diseases (CVDs) are considered as the leading cause of mortality and morbidity worldwide. Most CVDs are preceded by many years of cardiovascular risk factors. Hypertension is one of the most common modifiable CVD risk factor. The aim of this study was to assess the level of CVD risk and associated factors including socio-demographic characteristics, disease related characteristics, behavioural risk factors and anthropometric measurements among hypertensive patients having follow-up at Tertiary Care hospitals in Kandy district, Sri Lanka. An institutional based cross-sectional study was conducted among 450 adult hypertensive patients aged 40 – 74 years who were under follow up at hypertensive clinics of National Hospital, Kandy and Teaching Hospital, Peradeniya. A high predicted 10-year CVD risk level was assessed using an interviewer administered questionnaire by using WHO/ISH non laboratory based risk prediction chart for Southeast Asia Region. Estimated CVD risk >= 20% was considered as high risk. The data was analyzed using SPSS version 26. Chi-square and independent sample t-test was performed to assess the relationship between CVD risk and selected explanatory factors including socio-demographic characteristics, disease related characteristics, behavioural risk factors and anthropometric measurements at a p-value of < 0.05. Based WHO/ISH non laboratory based risk prediction chart the prevalence of estimated 10- year CVD risk < 5%, 5% to < 10%, 10% to < 20%, 20% to < 30% and > = 30% were 19.6%, 36.0%, 35.6%, 7.8% and 1.1% respectively. The higher CVD risk was found to be associated with age ($p < 0.001$), gender ($p < 0.001$), smoking status ($p < 0.001$), alcohol consumption ($p < 0.001$), self-perceived salt intake ($p < 0.001$). This study showed that the prevalence of highly predicted CVD risk (>= 20%) among the selected population was 8.89%. With male gender, older age, smoking, alcohol consumption, high salt intake, central obesity and elevated Systolic Blood Pressure are associated with high CVD risk.

Keywords: CVD risk, hypertension, risk factors, Sri Lanka

Testing Position, but not Age, Impacts the Heart Rate Response to Valsalva Manoeuvre

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The Valsalva manoeuvre (VM) is frequently used in clinical and research settings as a standard test of cardiac autonomic function, due to the robust heart rate and blood pressure changes that occur during the manoeuvre. Notably, cardiac autonomic function is known to be affected by age and body position. How these two factors interact to influence the cardiovascular response to the VM is unclear. Therefore, we aimed to evaluate the effect of testing position and age on the heart rate response elicited by the VM in healthy adults. Thirty-one healthy adults (20-29 years: n = 14, 7 females; 30–39 years: n = 9, 8 females; 40-49 years: n = 8, 3 females) performed the VM twice each, in supine, 20°-tilt and 30°-tilt positions in a randomized order. Heart rate (ECG) was continuously recorded during 2-minute rest, 15-second VM and 45-second post-VM period. As per standard protocol, Valsalva ratio (VR) was calculated as the ratio of the longest R-R interval post-VM period to the shortest R-R interval during the VM. The interaction between "age" and "tilt position" on the VR was evaluated using a two-way repeated-measures ANOVA. No significant main effect of age ($p = 0.777$) or "age × tilt position" interaction ($p = 0.284$) was observed for the VR. However, there was a significant effect of tilt position ($p < 0.001$) on the VR. Post-hoc multiple comparisons revealed that VR was significantly higher ($p < 0.001$) in both 20° (1.78) and 30° tilt (1.82) positions compared to the supine position (1.56). No difference in VR was observed between 20° and 30° tilt ($p = 0.470$). These preliminary data indicate that the Valsalva ratio depends on the testing position by a margin that could influence the interpretation. Hence, it is important to be consistent regarding the testing position during cardiac autonomic testing and take the testing position into consideration when comparing with norms for interpretation.

Keywords: Valsalva Manoeuvre, cardiac autonomic function, arterial baroreflex

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The Effect of Drainage Diversion or "Pyo-Diversion" on Progression of Wound Healing: An Observational Case Series on Patients with Chronic Ulcers and Diabetic Neuropathy

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Indolent plantigrade ulcers are commonly found in pressure bearing areas in patients with diabetic neuropathy. These are notoriously difficult to heal despite debridement, antibiotics and offloading. We present a case series that highlights the outcome of plantigrade ulcers spontaneously opening onto the dorsum of the foot which could accelerate healing. Objectives of this case series were to identify accumulation of tissue debris and various microbiological products around the wound surface as a major cause of poor wound healing and to assess how creating an alternative pathway for the drainage/ drainage diversion ("pyo-diversion") contributes to wound healing. The three patients involved in the case series were selected from a surgical outpatient clinic who were known patients with diabetic neuropathy. They all presented with poorly healing plantar ulcers and developed spontaneous openings onto the dorsal surface of the foot. Information was collected using patient records and the treatment outcome was serially followed up. They had developed spontaneous openings on the dorsal surface of the foot which was encouraged and maintained during the course of treatment. The wounds were otherwise treated with standard dressing protocols like antibiotics, offloading and local dressing changings. After the spontaneous opening of the wound there was a significant reduction in debris and pus collection compared to that at presentation with a clear improvement in the wound healing process. All three patients achieved complete recovery within 2 to 3 weeks with the same supportive treatment methods. This study shows a marked improvement in healing of chronic plantigrade diabetic ulcers with poor response to standard treatment, following formation of the second opening. This could suggest that the formation of a fistula aids in clearing the wound bed and promoting healing, which encourages the formation of alternative treatment techniques.

Keywords: Pyo-diversion, drainage diversion, wound healing, diabetic, ulcer

The Impact of Screen-Time on Sleep Quality Among Medical Students

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With the increased use of digital electronic devices in learning, screen exposure among university students, including medical students, has significantly risen over the past decade. Prolonged screen-time raises concerns about potential adverse effects, particularly on sleep quality. Despite its importance, limited literature is available on this association. To assess the association between screen-time and quality of sleep among the medical students at the University of Peradeniya. A descriptive cross-sectional study was conducted among a study population of 814 students. 97 students were excluded from the study due to chronic illness antipsychotic use. Data were collected using a self-administered Google form that included demographic information, screen-time, the Pittsburgh Sleep Quality Index (PSQI), and the Epworth Sleepiness scale (ESS). The analysis was conducted using SPSS 20. The average weekday screen-time was 12.57 hours, and weekend screen-time was 11.63 hours. The average sleep duration was 6.13 hours. Overall sleep quality was good (Mean PSQI = 4.64); approximately one-third (29.1%) reported poor sleep quality. The correlation between poor sleep quality and screen-time for social-media: Spearman's $\rho = 0.113$, $p = 0.003$, and for leisure: Spearman's $\rho = 0.107$, $p = 0.004$. Screen-time was linked to longer sleep latency (Spearman's $\rho = 0.082$, $p = 0.028$). The mean ESS score was 7.73; 25.2% had excessive daytime sleepiness. Association between total screen-time and sleep quality or daytime sleepiness was statistically insignificant. Medical students demonstrated high levels of screen usage, with a notable proportion experiencing poor sleep quality. Increased screen-time for social-media and leisure activities was associated with poorer sleep quality, longer sleep latency. These findings highlight the need for awareness and behavioral interventions to promote healthier screen habits and sleep hygiene.

Keywords: Screen-time, sleep quality, medical students, Pittsburgh sleep quality index

Ultrasound Assessment of the Prevalence of Nonalcoholic Fatty Liver Disease in Acute Coronary Syndrome Patients at Teaching Hospital Peradeniya: A Pilot Study

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Acute Coronary Syndrome (ACS) is considered a critical manifestation of advanced coronary artery disease (CAD), requiring prompt diagnosis and treatment. Nonalcoholic Fatty Liver Disease (NAFLD), affecting 25% of the global population, is associated with metabolic syndrome and may independently increase the risk of ACS. However, its prevalence among Sri Lankan ACS patients remains uncertain, necessitating further investigation using non-invasive ultrasound imaging. This pilot study aims to assess the prevalence of NAFLD using ultrasound imaging in patients diagnosed with ACS at Teaching Hospital Peradeniya. A cross-sectional study was conducted among 55 patients (aged ≥35 years) admitted with ACS to the medical ward of Teaching Hospital, Peradeniya between January and March 2025. Patients who consumed excessive alcohol, had diagnosed cirrhosis, or had known risk factors for liver disease were excluded. All eligible participants underwent upper abdominal liver ultrasonography, conducted by a single expert radiologist who was blinded to the patients' biochemical and clinical data. A high-resolution B-mode ultrasound scanner was used for the assessments. Fatty liver was graded into three categories (Grades 1,2, and 3) based on the echogenicity of the surrounding viscera. The data were processed using SPSS version 25, with descriptive statistics applied to assess NAFLD prevalence and its grade distribution among ACS subtypes. Among the 55 ACS patients, 29 were male (52.7%) and 26 were female (47.3%), with a mean age of 63.7 ± 9.2 years. The prevalence of ultrasound-diagnosed NAFLD among ACS patients was 58.2%. Of these, 20 patients (36.4%) had Grade 1 fatty liver, 9 (16.4%) had Grade 2, and 3 (5.5%) had Grade 3. NAFLD was more prevalent in males, with Grade 1 being the most common. Regarding ACS subtypes, 14 patients (25.5%) had ST-Elevation Myocardial Infarction (STEMI), 34(61. 8%) had Non-STEMI (NSTEMI) and 7 (12.7%) had Unstable Angina. There was no significant correlation between ACS subtypes and NAFLD steatosis grades ($p = 0.567$). In conclusion, this study reveals a notably high prevalence of NAFLD among ACS patients in a Sri Lankan tertiary hospital. Although no significant association was found between NAFLD severity and ACS subtype, the findings underscore the importance of larger-scale studies to further explore the cardiovascular implications of NAFLD.

Keywords: NAFLD, acute coronary syndrome, ultrasound assessment

Theme 2

Sustainable Agriculture and Veterinary Medicine for Food Security

A Preliminary Morphological and Molecular Investigation of Haemo and Gastrointestinal Parasites of Pigeons (*Columba livia*) from the Jaffna District, Sri Lanka

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Parasitic infections significantly impact the health and productivity of pigeons, often remain unnoticed until clinical signs become severe. The present study aimed to determine the gastrointestinal (GI) and haemoparasites (HP) in purebred and crossbred pigeons across households (5), a park (1) and farms (3) in Jaffna, Sri Lanka. To our knowledge, this study represents the first report from this region. 60 freshly voided 2 g of faecal samples (FS) and 1 ml of 10 blood samples were randomly collected from each pigeon from Nov. 2023 to Dec. 2024. FS were subjected to the direct smear, modified-salt flotation, and sedimentation techniques. Blood samples were subjected to stained blood smear examination. Based on microscopic examination, PCR was selectively performed for the highly prevalent GI parasite *Eimeria* spp. and HP, using genus-specific primers targeting the COI and cyt *b* gene regions, respectively, for molecular confirmation. Of the 60 FS examined, 96.67 % (n = 58) tested positive for GI parasites. Helminths, including *Capillaria* spp. (70%; 27.0 EPG (Eggs Per Grams)), Strongyle-type egg (43.34%; 30.9 EPG), Ascarid-type eggs (21.67%; 3.4 EPG), Oxyurid ova (3.34%; 0.07 EPG), *Toxascaris* spp. (3.34%; 0.10 EPG) and *Strongyloides* spp. (1.67%; 0.07 EPG) were identified. Occasional cestode segments and a single trematode-type egg (1.67%; 0.03 EPG) were also observed, and protozoa, including *Eimeria* spp. (78.34%; 113.8 OPG (Oocysts Per Grams)) and *Isospora* spp. (1.67%; 0.03 OPG) were recorded. Chi-square test revealed that a significantly higher prevalence of *Eimeria* spp. and strongyle-type were recorded in semi-intensive management (SIM) (χ^2 test; $p = 0.047$) and intensive management (IM) (χ^2 test; $p = 0.001$), respectively. The Mann-Whitney U test showed Strongyle-type eggs had the highest mean intensity (FEC (Faecal Egg Count) = 41.40), with a significant difference in SIM vs. IM ($p = 0.002$). Kruskal-Wallis' test revealed significant variation in *Capillaria* spp. across sites ($p = 0.002$), highest in households (FEC = 44.07), followed by farms and parks. Microscopic examination of BS revealed HP, including *Haemoproteus* spp. (80%), *Plasmodium* spp. (50%) and *Leucocytozoon* spp. (40%). The high prevalence and diversity of GI and blood parasites in pigeons in Jaffna hint the need for further research on their potential transmission to other poultry and humans.

Keywords: Blood, domesticated pigeons, gastrointestinal parasites, Jaffna.

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A Prototype of a Birth Control Device for Trouble Making Monkeys

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Urbanization and a growing human population contribute to habitat loss, fragmentation, and escalating human-monkey conflict (HMC), making proper waste management critically important. Long-term monkey population control methods have not been extensively explored, while repellents provide only limited short-term effectiveness. This study aimed to design a novel intrauterine device (IUD) for population control in adult female Toque macaques after evaluating the feasibility of using human copper IUDs. Postmortem examinations of three Toque macaques (*Macaca sinica*) and four Purple-faced leaf monkeys (*Trachypithecus vetulus*) assessed uterine and cervical dimensions for IUD design. Average measurements were: 13.83 mm uterine width, 22.5 mm uterine length, 7.66 mm cervical length, and 3.5 mm internal cervical diameter. Initially, commercially available T-shaped human IUDs (32 mm width, 36 mm length) were inserted into eight adult female macaques under general anaesthesia, but radiographic monitoring revealed no retention beyond one month (Stage 1). In response, a smaller IUD (25 mm width, 20 mm length) was tested (Stage 2), yet only two macaques retained them beyond a month. Further modifications (10 mm width, 13 mm length) were made (Stage 3), and the revised IUDs were successfully retained for over three months without complications. These findings demonstrate the feasibility of inserting modified human IUDs into macaques under controlled conditions. A field trial is necessary to assess their effectiveness in wild populations. Additionally, ongoing studies explore the feasibility of a pear-shaped IUD and, utilizing cost-effective 3D printing technology to design a device that remains more securely in the uterus, considering the strong uterine contractions and abundant secretions in monkeys. The IUDs requires no postoperative monitoring or care, allows monkeys to be immediately released without disrupting social behaviour. It is cost-effective and easy to implement compared to previously described techniques.

Keywords: Human-monkey conflict, toque macaques, intra-uterine device, anaesthesia

Alternatives for Progesterone-Based Oestrous Synchronisation in Goats: A Cost-Effective Approach for Sri Lankan Context

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Hormonal control of ovulation enhances breeding efficiency by shortening the breeding period and allowing for fixed-time artificial insemination (FTAI). In small ruminants, synchronisation is crucial to facilitate AI. The commonly used CIDR. (Controlled Internal Drug Release) device must be administered in combination with PMSG, which is more expensive than using the hormone alone. This study aimed to evaluate the effectiveness of four different oestrous synchronisation protocols and explore economical alternative approaches to the commonly used hormonal device-based methods for oestrus induction in goats under Sri Lankan conditions. A total of 52 healthy, non-pregnant Saanen does, with a body condition score 3/5 or higher were randomly assigned to five FTAI protocols as follows: a) CIDR. for 18 days (CIDR-long); b) CIDR. for 10 days (CIDR-short); the both groups received 400 IU PMSG at device removal, and FTAI 48–56 hours later; c) 2PG-GH: $PGF_2\alpha$ on Day 0 & 7, PMSG on Day 7, GnRH on Day 9, and FTAI 48–56 hours later; d) Ovsynch: GnRH Day 0, $PGF_2\alpha$ Day 7, GnRH Day 9, FTAI 16–20 hours later, e) NCsynch: $PGF_2\alpha$ Day 0 & 14, GnRH Day 7, FTAI Day 17. Each animal was monitored for six signs of oestrus at the time of AI, and pregnancy was confirmed 45 days after insemination. The oestrous intensity, ranked from highest to lowest, was observed as follows: CIDR-short (85.5%) > NCsynch (82.4%) > CIDR-long (81.2%) > Ovsynch (67.3%) > 2PG-GH (18.8%). Pregnancy rates were recorded as follows: CIDR-long; 50.0%, CIDR-short; 40.0%, 2PG-GH; 10.0%, Ovsynch; 42.8%, and NCsynch; 63.6%. Ovsynch and NCsynch protocols showed similar success rates to CIDR. long protocol, although differences were statistically insignificant ($p<0.05$). Both were 66.67% more cost- effective and associated with a lower incidence of vaginal reactions/infections, potentially reducing the need for local or parenteral antibiotic treatment. The preliminary findings indicate that ovulation synchronisation protocols such as Ovsynch and NCsynch offer viable, economical alternatives to CIDR-based oestrous synchronisation protocols. Furthermore, those protocols enhance reproductive efficiency in goats while reducing health risks of oestrous synchronisation, offering a practical solution for improving AI outcomes in Sri Lankan goat farms.

Keywords: Goats, Oestrous synchronisation, artificial insemination, GnRH, PGF2œ

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Analyze the Thermal Stress in Dairy Cattle of Sri Lanka and Its Effect on Milk Yield

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Thermal stress is a significant concern for the global dairy industry. It affects animal's growth, milk production, reproduction, meat production, and disease spread. However comparative studies analyzing the relationship between thermal stress and dairy production of cattle in Sri Lanka are rare and limited to the curtain framework. Therefore, the primary objective of this research was to evaluate thermal stress and related climatic trends, and to assess their impact on dairy cattle production performance in Sri Lanka using the Temperature-Humidity Index ($THI=0.8\times Ta+(RH/100)\times(Ta-14.4)+46.4$, where Ta = Dry Bulb Temperature and RH = Relative Humidity) as an indicator. Monthly temperature, relative humidity (Meteorological Department, Colombo) and milk yield data were obtained from 2010 to 2020. The monthly milk yield data and animal breed information were sourced from the National Livestock Development Board (NLDB): In Ridiyagama (Arid Zone), Oyamaduwa (Dry Zone), Koulwewa (Intermediate Zone), and Bopaththalawa (Wet Zone). The correlation between the milk yield of different breed types and THI was examined using Pearson Correlation Coefficients, and their significant trends (P-values) was statistically calculated using SPSS software. THI zonal maps for Sri Lanka for each month of the year created by using the interpolation method in ArcGIS software. For Ridiyagama, Koulwewa, and Oyamaduwa, the highest average THI values ranged between 81.0 ± 1.1 to 82.4 ± 0.8, while the lowest average THI values ranged between 76.3 ± 1.1 to 79.0 ± 0.7. However, for Bopaththalawa, the highest average THI values recorded was 63.2 ± 0.4 while the lowest average THI values recorded was 59.1 ± 0.8. There was a significant negative correlation between the monthly THI and milk yield of the Koulwewa ($R = -0.621$; $P = 0.031$), and Bopaththalawa ($R = -0.722$; $P = 0.008$). Thermal stress in dairy cows is directly linked with their breed types. Local breeds, such as those in Oyamaduwa, show a higher tolerance to thermal stress, and their milk production is not significantly affected by rising THI levels. In contrast, European breeds, such as those in Bopaththalawa, are highly sensitive to thermal stress, with an observable decrease in milk production as THI increases. When analyzing the monthly pattern of the THI, May and April emerge as the peak months for thermal stress. Therefore, it can be concluded that thermal stress has a direct impact on the monthly milk production of dairy cattle breeds in Sri Lanka.

Keywords: Thermal stress, dairy cattle, milk yield, breed types

Applicability of Azolla as a Nitrogen Supplement for Hydroponic Tomato (*Solanum lycopersicum*) Cultivation in Protected Culture

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High fertilizer cost and nitrate pollution are main concerns in the hydroponics vegetable sub-sector in Sri Lanka. Azolla (*Azolla* sp.) is a nitrogen-fixing aquatic fern commonly found in tropical regions. Preliminary analysis proved that Azolla species contained 3.7% N and has a potential to be used as an eco-friendly nitrogen source in hydroponics. Therefore, this research was conducted with the aim of examining the applicability of Azolla as a nitrogen supplement in tomato (*Solanum lycopersicum*) grown in coco-peat medium-based hydroponics under protected culture in the mid-country wet zone of Sri Lanka. The experimental layout was CRD with 6 treatments and 15 replicates. Nitrogen supplements were given by incorporating Azolla dosages, replacing 30% (T1), 40% (T2), 50% (T3), 60% (T4), and 70% (T5) of the nitrogen requirement, and also with a no-Azolla, control (the recommended dosage of Albert's solution–T6). The fertilizer treatments were given, starting from the first week after transplanting (WAT) up to the 10^{th} WAT. Vegetative and reproductive growth measurements were taken at weekly intervals and at the harvesting stage, respectively. Analysis of variance and chi-square tests were performed to analyze parametric and non-parametric data, respectively. Replacement of Albert's solution by 60% Azolla (T4) was not significantly different from 30% replacement (T1), in terms of plant height (124.13 ± 3.02 cm), stem thickness (9.35 ± 0.28 mm), fresh weight of plant (210.8 ± 6.4 g), leaf nitrogen content (28.4 ± 1.5 mg N/g), time taken for flowering (46 days after transplanting), number of fruits per plant at early harvesting (6), and fruit yield (164.1 ± 21.0 g per plant). Meanwhile, T5 was significantly ($p < 0.05$) lower with respect to all the above parameters. Nevertheless, the treatment effects on fruit quality were not significant. Overall results revealed that Azolla can successfully replace 60% of the nitrogen requirement of hydroponic tomatoes, enhancing growth and yield while reducing cost and environmental pollution, promoting more sustainable tropical greenhouse agriculture.

Keywords: Soilless culture, Albert's fertilizer, plant growth, combined application, greenhouse

Application of Chitosan as an Edible Coating to Enhance Postharvest Quality of Guava (*Psidium Guajava* L.)

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Guava (*Psidium guajava* L.) can be cultivated under various ecological conditions in Sri Lanka and it has a huge contribution to national food security. However, after harvest its metabolic activities increase, causing rapid senescence, yellowing, and spoilage, ultimately shortening its postharvest life. Therefore, farmers suffer due to the inability to sell fresh guava fruits to the local market. As an eco-friendly solution to this problem, chitosan coating was used to find its effectiveness in preserving the postharvest quality parameters of guava fruits. Physiologically matured guava fruits were dipped in 0, 0.1, 0.5, 1, and 2 $g \cdot L^{-1}$ chitosan treatments for two minutes and stored in corrugated cardboard boxes, at 28°C and 85-90% RH for 15 days. The quality parameters, including weight loss, firmness, peel colour, decay percentage, soluble solids content (SSC), titratable acidity (TA), and ripening index (RI) were measured in three days interval. Accordingly, coated guava fruits had controlled the reduction of firmness, titratable acidity, weight loss, and decay % during 15 days storage period compared to the control, nevertheless no significant effect on soluble solids content. Among the treatments, guava fruit treated with 2 $g \cdot L^{-1}$ chitosan significantly maintained a reduction in weight loss, titratable acidity, and ripening index. Thus, there was no significant differences ($P \leq 0.05$) of the L*, a*, b*, chroma, and hue colour parameters between the coated and uncoated guava fruits. In conclusion, the findings indicate that applying chitosan at a concentration of 2 $g \cdot L^{-1}$ is effective in maintaining the quality and prolonging the postharvest life of guava.

Keywords: Chitosan, firmness, nutrients, storage, weight loss

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Application of Enriched Compost-Based Grow Media in Aggregate-Type Hydroponics

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Greenhouse horticulture provides a steady environment for the year-round production of vegetable crops. Usually, the grow media or substrate used in aggregate-type hydroponics are infertile (inert). As a result, grow medium is fed with liquid form of a complete and fully soluble chemical fertilizer (i.e., Albert's solution in Sri Lanka). However, the indiscriminate use of chemical fertilizers raises concerns on the food safety and ecological stability all over the world. Therefore, this research was carried out to investigate the possible replacement of chemical fertilizer with "enriched compost" in aggregate-type hydroponics systems in protected culture, using tomato as the test crop. Considering the relatively high N, P and K composition, so called "super compost" (enriched compost), developed and tested for open-field vegetable farming in Sri Lanka, was selected as the grow medium. The experiment was conducted as a CRD under semi-intensive greenhouse conditions at Dodangolla Sri Lanka (IM03). Data analysis was done using Statistical Analysis Software. The standard rate of Albert's solution in coco-peat medium (T1) was compared with three different types of super composts, with or without the foliar application of *Gliricidia* leaf extract. The treatment effect was assessed in terms of plant growth, tomato yield and properties of the substrate. All the compost treatments were comparable with the Albert's (T1) in terms of plant growth and fruit weight. Higher fruit number and fruit weight, found in feldspar based enriched compost (T2) contributed to a yield, comparable with the Albert's control (T1). It was further improved when it was supplemented with *Gliricidia* application (T4). Overall results showed that enriched compost can be used effectively as a fertile substitute for aggregate-type hydroponics in protected culture of tomato, assuring the environmental and economic sustainability of the cropping system.

Keywords: Enriched-compost, greenhouse, hydroponics, sustainability

Application of Sri Lankan Red Earth to Remove Tetracycline from Aqueous Media

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Tetracycline (TC) is the second most widely produced and used antibiotic worldwide. Its extensive usage has caused frequent detection of TC residues in the natural environment, leading to one of the global health issues, antibiotic resistance. This study aims to investigate the potential of Sri Lankan Red Earth (RE) for the removal of TC from aqueous media. RE is a soil rich in Fe-Al oxides and oxyhydroxides, which has shown promising results in adsorption of many contaminants. The present study investigated the TC removal potential of RE through batch experiments. The TC concentration is measured by UV spectrophotometry (at λ_{max}= 352.1 nm). The effect of initial TC concentration (1.4, 3.5, 17.2, 49.3, 72.3 mg/L), contact time (5, 10, 30, 60, 120, 180, 240 minutes), pH (3, 4, 7, 10), adsorbent dosage (5, 10, 15, 20 g/L), and the soil organic matter (OM) were investigated. Complete removal of TC is observed with a 1.4 mg/L initial concentration within 2 hours. The maximum adsorption is observed at pH 4-7 due to the electrostatic attraction between the zwitterionic form of TC (at pH 3.32-7.78) and the positively charged surface sites of RE (pH_{PZC} = 8.5). Under alkaline pHs, removal efficiency decreased drastically due to electrostatic repulsion between negatively charged TC (pH > 7.78) and negatively charged surface sites of RE. The presence of OM reduces the surface complexation between TC and RE, decreasing the adsorption. Adsorption isotherms best fitted with the Freundlich model (R^2 = 0.9926), suggesting multilayer adsorption on heterogeneous surfaces. Kinetic data best fitted with the Elovich model, indicating a chemisorption mechanism on heterogeneous surfaces, possibly involving electron exchange or sharing between functional groups of TC and RE. This research highlights the significance of RE as a promising adsorbent for TC removal in aqueous media.

Keywords: Adsorption, antibiotic, Fe-rich soil, remediation

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Assessment of Nutritional and Functional Properties in Organic, Conventional and GAP- Certified Vegetables: A Case Study of Selected Vegetables Grown in Nuwara Eliya

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Agriculture is a cornerstone of the Sri Lankan economy, ensuring food security and achieving sustainability. It remains predominantly conventional for decades but is evolving towards sustainable approaches, such as organic farming and adopting Good Agricultural Practices (GAP). Research evidence suggests that cultivation systems (CSs) influence vegetable quality and has reported significant differences between conventional vegetables (CVs) and organic vegetables (OVs). However, evidence is lacking on the impact of GAP-certified cultivation practice on the quality of vegetables and there is a scarcity of comparative information on vegetables grown under three CSs in Sri Lanka. Thus, the present study aims to assess nutritional and functional properties of *Daucus carota* (carrot) and *Brassica oleracea var. capitata* (cabbage) cultivated in selected certified organic, conventional, and GAP-certified farms in Nuwara Eliya, Sri Lanka. Vegetable samples of each CS were analyzed for proximate composition, mineral content (K, Fe, Ca using atomic absorption spectroscopy), antioxidant potential (DPPH assay), polyphenols (Folin–Ciocalteu assay), flavonoids ($AlCl_3$ colorimetric method), chlorophylls, beta-carotene and vitamin C (spectrophotometric methods). Results revealed that the bioactive compounds including antioxidants, polyphenols, flavonoids, pigments and vitamin C were significantly higher ($p < 0.05$) in OVs, followed by GAP- certified vegetables, while CVs showed the lowest concentrations. CVs had significantly highest moisture content (cabbage: 14.07 ± 0.22 g/100 g, carrot: 9.50 ± 0.22 g/100 g dry weight), whereas OVs had lowest moisture content (cabbage: 10.21 ± 0.22 g/100 g, carrot: 7.55 ± 0.22 g/100 g dry weight; $p < 0.05$). Consequently, both organic and GAP vegetables exhibited significantly higher carbohydrate content compared to CVs ($p < 0.05$). However, no significant differences were observed among CSs for crude fiber, fat, protein, and ash content. GAP-certified vegetables had notably higher potassium content (cabbage: 14 ± 0.01 mg/g, carrot: 10.83 ± 0.01 mg/g), while calcium content and iron content varied inconsistently. These findings suggest that OVs provide superior characteristics, especially in terms of bioactive compounds, but often are expensive compared to CVs. GAP-certified vegetables offer a pragmatic, budget-friendly alternative, providing significant nutritional value for Sri Lankan consumers. Therefore, promoting GAP alongside organic farming could enhance food safety, and food security aligning with national goals for sustainable agriculture.

Keywords: Farming systems, sustainable agriculture, antioxidant potential, nutritional profile, minerals

Biodegradation of Glyphosate by Phosphate and Zinc Solubilising Bacteria: A Sustainable Approach to Soil Remediation

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Glyphosate is a widely used herbicide with a persistence duration of 55 days to 3 years, resulting in extensive environmental contamination and decreased soil quality. Due to its widespread application in agriculture, initiatives to improve glyphosate degradation are crucial for reducing ecological damage and improving soil quality. This study aimed to evaluate the glyphosate-degrading capabilities of six soil bacterial isolates with phosphate- and zinc-solubilisation properties for potential use in soil bioremediation. Glyphosate was purchased from A. Baur & Co. (Pvt.) Ltd. and sterilised using the syringe filter technique. Mineral Salt Medium (MSM) broth was prepared and added to autoclaved Falcon tubes. Then, glyphosate was added at five different concentrations (0.001 ml, 0.010 ml, 0.100 ml, 0.500 ml, and 1.000 ml) in triplicate. Each isolate was aseptically inoculated into the tubes and cultured at ambient temperatures on a shaker. These strains were previously tested for phosphate and zinc solubilisation and identified by morphological and biochemical characteristics. Bacterial growth was assessed at 600 nm on days 0, 1, 3, 5, and 7 in a spectrophotometer. The degradation of glyphosate was evaluated by measuring optical density at 435 nm following the centrifugation of culture samples. Triplicate measurements were obtained at each interval to ensure data reliability. The degradation percentage was calculated using the formula [(Initial OD – Final OD) / Initial OD] × 100. All six isolates showed the ability to degrade glyphosate. After seven days, the mean degradation rates were as follows: strain 1, 90.32% (*Actinomyces* sp.); strain 2, 87.18% (*Actinomyces* sp.); strain 3, 94.53% (*Bacillus* sp.); strain 4, 84.63% (*Enterobacter* sp.); strain 5, 83.95% (*Enterobacter* sp.); and strain 6, 87.50% (*Bacillus* sp.). Strain 3 (*Bacillus* sp.) showed the greatest glyphosate degradation efficiency at all concentrations and time intervals, suggesting it as a potential bioinoculant for soil detoxification for environmental sustainability. The results validate the capabilities of multifunctional phosphate- and zinc-solubilising bacteria to break down glyphosate. This research strengthens the existing knowledge by emphasizing the two distinct applications of plant growth-promoting bacteria in nutrient solubilisation and herbicide degradation; hence, it recommends their use in sustainable agriculture and bioremediation efforts.

Keywords: Glyphosate degradation, bioinoculants, sustainability, soil bioremediation

Biomimetic Olfactory Sensing System and Pattern Recognition Model for Detection of Elephant Musky Volatile Organic Compounds (VOCs) Using a Multisensor Gas Sensor Array in North Central Province, Sri Lanka

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The escalating human-elephant conflict in Sri Lanka, particularly in the North Central Province, has prompted the need for innovative, non-invasive early warning systems to detect elephant presence. This study investigates the feasibility of a biomimetic olfactory sensing system designed to detect specific Volatile Organic Compounds (VOCs), such as frontalin, emitted by elephants. The primary objective is to develop a gas sensor array system that mimics the human olfactory mechanism and integrates a pattern recognition model for accurate elephant detection in real time. A prototype system was developed using a combination of semiconductor-based gas sensors selected for their sensitivity to target VOCs and robustness in variable environmental conditions. The study employed an experimental design involving both laboratory calibration and limited field testing across selected rural areas in North Central Province. Sensor responses were recorded and analyzed using a supervised machine learning model trained to classify VOC signatures associated with elephant presence. Data collection focused on signal variation under different ecological conditions such as humidity, wind and vegetation density. Preliminary results indicate the system's capability to differentiate between elephant-emitted VOCs and background environmental noise, demonstrating potential for high sensitivity and specificity. However, further validation is required through extended field trials and sensitivity enhancements to lift the model's accuracy and reliability. The study also identifies essential improvements needed in sensor housing, airflow control, and data transmission mechanisms. This study presents a novel approach to wildlife monitoring by combining gas sensor technology with pattern recognition algorithms. The proposed system shows promise as a real-time, non-invasive early-warning tool to mitigate human-elephant conflict. With further development, it can be integrated into wildlife conservation and rural safety frameworks, offering scalable applications in regions facing similar wildlife challenges.

Keywords: Biomimetic olfactory system, volatile organic compounds (VOCs), gas sensors, elephant detection, pattern recognition model

Biosorptive Potential of Curry Leaf (*Murraya koenigii*) Powder for Lead Removal: Isotherm and Kinetic Studies

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Biosorbents have gained considerable attention as a cost-effective approach for removing contaminants, utilizing renewable biological materials. Curry leaves, which is ubiquitously used in South Asian culinary applications and traditional medicine, exhibits a potential as a biosorbent. This study examines the efficiency of curry leaf powder (CLP) as a readily available biosorbent for toxic lead removal across varying experimental conditions, focusing on adsorption isotherms and kinetic mechanisms governing the biosorption process. Curry leaves were randomly collected from domestic gardens in the Kurunegala district of Sri Lanka. Thereafter they were washed with deionized water to remove impurities, dried and ground to <1 mm particle size. CLP was characterized by Fourier Transform Infrared Spectroscopy (FTIR). Batch adsorption experiments were conducted at room temperature (25 °C) across parametric gradients: initial lead concentration (2 ppm-20 ppm), pH (1-11), adsorbent amount (0.1g-1.0 g), and contact time (0 - 360 minutes). Subsequently, isotherm and kinetic experiments were conducted under previously optimized conditions. All the experiments were triplicated for the accuracy. Based on FTIR analysis, CLP possesses –COOH, -OH, –C=O functional groups which are responsible for metal ion binding. Results showed optimal lead removal achieved using 0.7 g of CLP at pH 5 with an initial lead concentration of 12 mg/L and 100 minutes of contact time. The adsorption process fit best with the Langmuir model ($R^2 > 0.93$), suggesting monolayer adsorption on a homogeneous surface. The maximum adsorption capacity was found to be 4.46 mg/g, indicating CLP's potential for lead removal. Furthermore, kinetic studies revealed that the adsorption followed pseudo-second-order model ($R^2 = 0.9809$), showing chemisorption as the main mechanism controlling the process. These findings demonstrate that CLP can be effectively used as a promising green adsorbent for mitigating positively charged Pb like toxic metals from contaminated water, indicating the need for further exploration on applicability in culinary practices.

Keywords: Biosorbents, curry leaves, heavy metals, isotherm, kinetic

Can the Demand for Commercial Carrageenan be Fulfilled by Extracting Carrageenan from the Marine Red Seaweed, *Kappaphycus alvarezii* (Elkhorn Sea Moss)?

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Carrageenan is one of the most in-demand cell wall polysaccharide used in industries such as food, pharmaceuticals and cosmetics. Due to its high industrial demand, carrageenan is extracted from various seaweeds. This study aimed to compare the quantity and quality of domestically produced carrageenan with commercially available carrageenan to explore the possibility of the use of domestically produced carrageenan in industrial scale. This study utilized *Kappaphycus alvarezii* cultivated in Jaffna, Sri Lanka, and employed the 6% (w/v) KOH method to extract carrageenan. Quality parameters assessed including carrageenan yield, gel strength, water holding capacity, and *L*a*b** colour values. Fourier Transform Infrared (FTIR) spectroscopy was used to analyze transmittance, facilitating comparative chemical composition analysis between domestically produced and commercially available carrageenan. *K. alvarezii* grown in Jaffna yielded 37.20 ± 3.69% (dry matter) carrageenan from the 6% KOH method, indicating its high suitability for commercial-scale carrageenan extraction. Both commercial and domestically produced carrageenan samples showed similar ($P < 0.05$) values for gel strength (1694.23 ± 80.56 gcm^{-2} and 1745.86 ± 97.46 gcm^{-2}, respectively), water holding capacity (97.24 ± 1.15 % and 97.42 ± 1.13 %, respectively) and *L** value (21.11 ± 0.40 and 23.58 ± 4.25, respectively). However, differences ($P < 0.05$) were observed in the *a** and *b** values, with the locally produced carrageenan exhibiting higher values (-2.32 ± 0.95 and 8.21 ± 0.70) compared to the commercial carrageenan (-3.95 ± 0.08 and 5.48 ± 0.82). The FTIR spectra of both carrageenan samples displayed similar patterns, with slight deviations observed at 845 cm^{-1}, 925-930 cm^{-1}, and 1220-1260 cm^{-1} wave ranges. These findings indicate that both commercially available and locally produced carrageenan exhibit highly similar physicochemical characteristics. In conclusion, the 6% (w/v) KOH extraction method has proven to be highly effective in producing refined carrageenan with physicochemical properties comparable to those of commercially available carrageenan. This study highlights the potential for significant advancement in domestic carrageenan production in Sri Lanka using *K. alvarezii*.

Keywords: Carrageenan, *Kappaphycus alvarezii*, physicochemical properties, Rhodophyta

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Canine Anaplasmosis in Pet Dogs in the Western Province: Seroprevalence, Clinical Signs, Laboratory Findings and Risk Factors

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Canine anaplasmosis, a tick-borne disease with global prevalence, is caused by rickettsial organisms: *Anaplasma phagocytophilum* and *Anaplasma platys*, both recognized as emerging zoonotic pathogens. In Sri Lanka, the disease is often overlooked due to its nonspecific clinical manifestations, and research on canine anaplasmosis remains limited. This study aimed to assess the seroprevalence, clinical symptoms, laboratory findings and risk factors associated with anaplasmosis among pet dogs in the Western Province. Blood samples were collected from dogs suspected of hemoparasitism from veterinary clinics and offices in the districts of Colombo, Kalutara, and Gampaha over two years (Feb. 2022 to Feb. 2024) after obtaining owner's consent. Ethical clearance was obtained from the Ethical Review Committee, Postgraduate Institute of Science, University of Peradeniya. Using SNAP ELISA kit (IDEXX Laboratories), serological testing was conducted, followed by haematological and biochemical analyses on seropositive cases. Information about dogs was collected from pet owners using a structured questionnaire. Risk factors— age, gender, breed, location, awareness of anaplasmosis, tick infestations, interaction with stray dogs, and previous history of the disease were evaluated using a chi-square test. Results revealed that 24% (no. of positive dogs /total no. of dogs tested) of the dogs were seropositive for *Anaplasma* spp. Infection rates across the districts (no. of positive dogs/total no. of dogs tested in district) were 20.5% in Kalutara, 28.4% in Colombo, and 38.6% in Gampaha. Among seropositive dogs, 55.8 % were male, 61.3% were older than one year, and 40.4 % were infested with ticks. German Shepherds were the most affected breed (37.5%). Common clinical symptoms included anorexia, lethargy, weakness, fever (~40 ˚C), pale mucous membranes, and splenomegaly. Rarely observed signs comprised neurological issues, lymphadenopathy, coughing, ocular haemorrhages, and limping. Laboratory findings indicated low packed cell volume, thrombocytopenia, leukocytosis, elevated blood urea nitrogen, and serum creatinine levels. Awareness of anaplasmosis among pet owners was significantly associated with its prevalence ($p<0.001$), whereas age, gender, breed, district, tick presence, stray dog interaction, and previous disease history showed no association. This study sheds light on the seroprevalence, clinical, and laboratory characteristics of canine anaplasmosis in the Western Province of Sri Lanka, offering valuable insights for better understanding and managing the disease.

Keywords: Anaplasmosis, pet dogs, western province, seroprevalence, Sri Lanka

Causative Pathogens Associated with Early Larval Mortality of *Penaeus Vannamei* in Shrimp Hatcheries in Puttlam, Sri Lanka

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Shrimp larval mortality in hatcheries has significant economic implications and is often caused by a combination of biotic and abiotic factors. During July-August 2024, several shrimp hatcheries in Chilaw, Puttalam, that breed specific pathogen-free (SPF) *Penaeus vannamei* experienced acute, high mortality (≥ 80%) in the transition stage from mysis 3 (M3) to post-larvae 1 (PL1). The mortality coincided with prolonged rainfall and was characterized by impaired moulting and metamorphosis, and pale body coloration. The objective of this study was to identify the causative pathogens associated with mortality using a polyphasic diagnostic approach. Five affected batches were sampled from five hatcheries, with 250 larvae from each hatchery. Affected larvae showed signs of disrupted moulting, minimal feeding activity, intense hyperactivity followed by lethargy, sinking behaviour, and rapid death. Records of water quality parameters were also collected from hatcheries. Wet mount microscopy excluded larval mycosis and external parasites; however, the internal tissues and the external surface of the affected larvae were densely packed with motile bacteria. A fraction of collected larvae was processed aseptically for bacteriological investigations, while the rest were fixed and processed for molecular detection of pathogens by Polymerase Chain Reaction (PCR) and histopathological investigations. DNA extracted from pooled larval tissues was subjected to PCR for the detection of Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV), White Spot Disease (WSD), Acute hepatopancreatic necrosis disease (AHPND), Infectious Myonecrosis Virus (IMNV), Taura Syndrome Virus (TSV), and *Enterocytozoon hepatopenaei* (EHP). PCR analysis confirmed the presence of IHHNV in two out of five larval batches tested, while all other pathogens (WSD, AHPND, IMNV, TSV, and EHP) tested negative by PCR. Histopathological examination revealed characteristic eosinophilic intranuclear inclusion bodies in hepatopancreatic tissues and degeneration of epithelial cells, consistent with IHHNV infection. Bacteriological investigations yielded abundant growth of *Vibrio* spp., presumptively identified as *Vibrio parahaemolyticus*. Elevated salinity levels and low temperatures were identified as key environmental factors contributing to the issue. The detection of IHHNV and *Vibrio* spp. as key pathogens, along with poor water quality, underscores the need for routine hatchery surveillance to ensure disease-free post-larvae, which are essential for successful grow-out farming and industry sustainability.

Keywords: *Penaeus vannamei*, shrimp, IHHNV, *Vibrio*, early larval mortality

Consumer Acceptance of Low Glycaemic Basmati Rice as a Functional Food: A Case Study in Kandy, Sri Lanka

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Functional food products like low glycaemic *Basmati* rice offer health benefits beyond basic nutrition, potentially improving the well-being and reducing health risks. With increasing demand in global and local markets, this healthier alternative to traditional rice highlights a concern for health and nutrition, promoting healthier dietary choices and reducing the risk of lifestyle-related diseases such as type II diabetes. This study aims to examine how health consciousness, price concern, and product availability (IVs) influence consumer acceptance (DV) of low glycaemic *Basmati* rice and the mediating role of food awareness on consumer acceptance. A questionnaire survey purposively selected (N= 89) individuals by inquiring their decision to purchase the product at supermarkets. All variables were measured on a 5-point Likert scale with multiple items. The sample consisted of 63% males, and 37% females while the majority (47%) belonged to the 20-29 years age category and 53% received a monthly income of Rs. 50K – 99K. Pearson correlation analysis revealed that price concern (r = 0.388) and health consciousness (r = 0.426) had a significant ($p < 0.01$) positive relationship with consumer acceptability. Multiple linear regression analysis found that all the independent variables are significant predictors of consumer acceptability (R^2 = 0.324). The beta coefficients were respectively: Price concern (β = 0.599, p = 0.000), health consciousness (β = 0.259, p = 0.002) and product availability (β = -0.433, p = 0.017). Moreover, personal income had a significant interaction effect on consumer acceptability. Food awareness is a significant mediator between health consciousness, availability, and price concern on consumer acceptance. In conclusion, the study confirmed that increasing food awareness could enhance the impact of health consciousness, product availability, and price concerns. Additionally, the moderating effect of income emphasizes how crucial of develop pricing strategies that are specific to certain income groups. These findings provide insights to food manufacturers and marketers to increase consumer acceptance and encourage better dietary habits.

Keywords: Basmati rice, consumer acceptance, functional foods, low glycaemic index

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Detection of Carp Edema Virus in Apparently Healthy Koi Carps (*Cyprinus Carpio Koi*) Collected from Ornamental Fish Farms in Sri Lanka

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Koi Sleepy Disease (KSD) caused by Carp Edema Virus (CEV) is a serious gill infection of carps and causes substantial economic impact on common carp and koi aquaculture globally. First identified in Japan in the 1970s, its spread has led the World Organization for Animal Health (WOAH) to recognize it as an emerging disease. KSD affected fish exhibit lethargy, unresponsiveness, and often lie motionless at the bottom of ponds or tanks. The disease has been clinically reported in koi carp cultured in Sri Lanka. Control efforts are complicated by the presence of asymptomatic koi infected with CEV. This study was conducted to assess the occurrence of CEV in apparently healthy koi carps cultured in freshwater ornamental fish farms located in three selected districts of Sri Lanka. A total of sixteen koi carp samples (8–10 cm in total length) were collected from ornamental fish farms in Kandy (eleven), Polonnaruwa (four), and Kurunegala (one) and transported to the Centre for Aquatic Animal Disease Diagnosis and Research (CAADDR). From each farm, 3-5 fish were anesthetized using MS-222 and a pooled gill sample was collected. DNA extracted from pooled gill samples were subjected to nested polymerase chain reaction (PCR) assay published by the Centre for Environment Fisheries and Aquaculture Science (CEFAS), UK to detect the presence of CEV. Results showed that 31.25% (5/16 samples; 11 from Kandy, 04 from Polonnaruwa and 01 from Kurunegala) tested positive for CEV in the nested step of the PCR, indicating the presence of low viral loads with sub-clinical infection. Our findings demonstrate that CEV can persist in asymptomatic koi populations cultured and sold in Sri Lanka, underscoring the need for active disease surveillance. KSD can spread unnoticed within ornamental aquaculture facilities via asymptomatic fish, triggering sudden outbreaks with unexpected mortality under favourable environmental conditions.

Keywords: Koi sleepy disease, Carp edema virus, *Cyprinus carpio koi*, nested PCR, ornamental fish

Diversity, Prevalence and Distribution of Ticks Infesting Livestock Animals at Five Selected Farms in the Jaffna District, Sri Lanka

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Ticks, as ectoparasites and disease vectors, lead to significant economic losses in livestock through mortality and morbidity. The present study aimed to assess the diversity, distribution and prevalence of ticks infesting livestock at five selected farms (Urumpirai, Thirunelvely, Alaveddi, and Antonypuram) in the Jaffna District, Sri Lanka. Ticks were collected in August 2024 using a convenience sampling method, preserved in 90% ethanol, and morphologically identified to species level. In total, 379 ticks were collected from 114 farm animals, including cattle (n = 32), goats (n = 29), and sheep (n = 53). Six species of ticks, from three genera: *Haemaphysalis intermedia* (42.5%), *Haemaphysalis bispinosa* (9.8%), *Rhipicephalus haemaphysaloides* (3.9%), *Rhipicephalus microplus* (1.3%), *Rhipicephalus sanguineus* (0.5%), and *Hyalomma isaaci* (1.6%) were identified. Infestation rates varied significantly among the five farms, ranging from 19.4% to 96.2% (one-way ANOVA $F_{(4,109)} = 3.14$; $p = 0.001$). This variation in prevalence might be due to the variations in management practices, housing conditions, livestock types, vegetation, and tick control practices. Home-based farms employed regular cleaning, manual tick removal, and treatments like commercial acaricides and Neem oil during severe infestations along with a combination of cut-and-carry feeding and free grazing. Conversely, large free-grazing systems without consistent tick control measures experienced higher infestation rates. Certain tick species, such as *R. haemaphysaloides, Ha. intermedia,* and *Ha. bispinosa*, were present in all three hosts, while *Hy. isaaci* was found only in sheep, and *R. sanguineus* was exclusive to cattle. Fisher's exact test revealed a significant correlation in infestation rates between sheep adults (94.7%) and lambs (66.7%, $p = 0.03$). However, there was no significant differences in tick prevalence between calves and adult cattle, kids and adult goats, or between male and female host animals ($p > 0.05$). The present study provides baseline data on tick infestations in farm animals, emphasizing the need for targeted tick management strategies and further research to improve livestock health and productivity in the region.

Keywords: Epidemiology, farm animals, Jaffna, tick

Effect of Decision-Making Factors on Collective Action of Farmers and Farming Efficacy

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Farmers' decision-making on aspects such as physical, socio-cultural, and economic factors significantly influences the outcomes on agricultural practices. Understanding the factors driving these decisions is crucial for improving farming efficacy. This study aims to examine how decision-making factors influence the collective action and farming efficacy of vegetable farmers in Sri Lanka. The study examines the relationship between decision-making and farming efficacy, decision-making and collective action, and how collective action affects the overall efficacy of farming communities. A study was conducted among 65 vegetable farmer clusters from both upcountry and low-country regions in Sri Lanka. These clusters were selected from Grama Niladhari divisions associated with seven Vegetable Collection Centres (VCCs) viz: Norochcholai, Hanguranketha, Nuwara Eliya, Bandarawela, Boralanda, and Sigiriya. A pre-tested questionnaire was used for data collection through structured interviews. Stratified sampling was applied to select VCCs based on geographic diversity. Data were analysed using SPSS 26 to assess the relationship between decision-making factors, collective action, and farming efficacy. The findings of the study revealed a strong correlation between farming efficacy and decision-making characteristics of Sri Lankan vegetable farmers. Farming efficacy was negatively impacted by social decision-making factors (SDMF) ($\beta = -0.352$, $p < 0.05$). It indicated that social influences may reduce productivity. On the other hand, physical decision-making factors (PDMF) showed a positive impact ($\beta = 0.236$, $p = 0.001$), suggesting that practical, context-based decisions enhance farming outputs. The association between SDMF and farming efficacy was mediated by collective action. However, for PDMF, no such mediation was observed, indicating a direct impact on farming efficacy by PDMF. It explained 18.6% of the variance in farming efficacy. The findings of the study suggest that strengthening collective action and improving both social and physical decision-making of farmers contribute to enhance the overall farming efficacy.

Keywords: Collective action, decision-making factors, farming efficacy, vegetable farmers

Effect of Enzymatic, Fermentation, and Microwave Pre-treatments on Nutrient Composition of Seaweed (*Kappaphycus alvarezii*)

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Seaweed is a sustainable, nutrient-rich source of proteins, carbohydrates, essential fatty acids, and micronutrients. However, its rigid, polysaccharide-rich cell walls limit nutrient bioavailability. Pre-treatment methods can disrupt these cellular structures, enhance nutrient accessibility and support seaweed's potential as a nutritious ingredient in both animal feed and human food. This study evaluated the effects of different pre-treatment techniques, such as enzymatic hydrolysis, yeast fermentation and microwave heating on the proximate composition of *Kappaphycus alvarezii*. Seaweed samples collected from Jaffna, Sri Lanka were dried, powdered and subjected to one of the six treatments: enzymatic treatment with Allzyme® at 1.5% or 2% (w/w), fermentation with *Saccharomyces cerevisiae* at 10% or 15% (v/v), or microwave heating at 800 W for 2 or 3 min. Allzyme® contained protease, phytase, cellulose, beta glucanase, amylase and xylanase enzymes. An untreated, sample served as the control. Proximate composition: moisture, crude protein, crude fat, crude fiber, ash, and nitrogen-free extract (NFE), was assessed using AOAC methods. Pre-treatments significantly ($p < 0.05$) affected seaweed's nutrient profile. Enzyme treatment (1.5%) increased crude protein content of seaweed from 5.9% to 9.4%, while 10% fermentation yielded the highest protein content (10.0%). Fermentation at 10% and 15% notably reduced fat content (1.0% and 1.8%, respectively), whereas microwave treatment for 2 min produced the highest fat content (3.0%). Crude fiber content decreased with 10% fermentation (7.5%) and 1.5% enzymatic treatment (7.7%) compared to the control (9.8%). The highest NFE value (67.1%) was observed in the 2% enzyme-treated group, indicating enhanced carbohydrate content. Ash content remained relatively unchanged (16.7–17.8%) among the pre-treatment methods. These results demonstrate that enzymatic, microwave, and fermentation pre-treatments enhance the nutritional value and potential bioavailability of seaweed, supporting its use as a functional ingredient in food and feed formulations.

Keywords: Seaweed, enzymatic hydrolysis, fermentation, microwave heating, proximate composition

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Effects of Soil Silicon Enrichment on Growth and Physiology of Rice Under Alternative Wetting and Drying Practices

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Rice (*Oryza sativa* L.), a staple crop for over half the global population, faces major yield limitations due to increasing drought stress under climate change. While Alternate Wetting and Drying (AWD) irrigation conserves water, it can exacerbate drought-related physiological constraints. Silicon (Si) has shown promise in improving plant stress tolerance through various physiological mechanisms. This study evaluated the effects of Si on rice growth and physiological responses under AWD conditions. Key objectives included assessing Si's impact on stomatal characteristics, root morphological traits, dry matter partitioning, and photosynthetic performance via gas exchange and chlorophyll fluorescence (OJIP) parameters. A two-factor factorial Completely Randomized Design (CRD) was conducted in a glasshouse at the University of Peradeniya, Sri Lanka, using the drought-tolerant variety BG250. Treatments included four treatment combinations: Si application (3 g of silicic acid/kg soil) + AWD (completely flooding every three days), Si + Continuous flooding (CF), Si not applied + AWD, and Si not applied + CF, each replicated ten times. Standard agronomic practices and recommended fertilization were followed. Measured parameters included plant height, specific leaf area, shoot dry weight, root dry weight, root length and diameter, stomatal density and conductance, photosynthetic rates, and chlorophyll fluorescence (JIP-test). Statistical analysis was conducted using SAS with Duncan's multiple range test ($p < 0.05$). Results showed Si significantly improved rice performance under AWD, with a 45% increase in shoot dry weight, a 62% higher shoot-to-root dry weight ratio, and a 27% increase in plant height compared to non-Si controls. Si supplementation also enhanced stomatal conductance and photosynthetic rates under AWD. Fluorescence analysis revealed higher light absorption (ABS/RC), better energy trapping (TR_0/RC), and more efficient electron transport (ET_0/RC) in Si-treated plants. Elevated energy dissipation (DI_0/RC) highlighted Si's photoprotective role, while minimal changes under CF indicated its specific function under stress. This study confirms that Si supplementation significantly enhances rice drought tolerance and productivity under AWD by improving biomass allocation, stomatal regulation, and photochemical efficiency. These findings support Si management as a sustainable strategy for rice cultivation in water-limited environments.

Keywords: Chlorophyll fluorescence, dry matter accumulation**,** rice, specific leaf area, stomatal conductance

Establishment of a Multiplex Colony PCR (mC-PCR) for Detecting *E. coli* O157:H7

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Escherichia coli (*E. coli*) is a rod shaped Gram-negative coliform bacteria widely distributed in nature. It is a well-known member of the Enterobacteriacea family, residing commensally in the gastrointestinal tract of warm-blooded animals without causing pathogenic effects. However, some strains of *E. coli* are pathogenic and causes severe human illnesses. The best example is *E. coli* O157:H7, which is a shiga toxin producing *E. coli* (STEC). Symptoms of STEC O157:H7 infection may include abdominal pain, bloody diarrhoea, haemorrhagic colitis and haemorrhagic uremic syndrome (HUS). Numerous sporadic outbreaks have been reported worldwide. Although several biochemical and molecular methods exist for the identification of *E. coli* O157:H7, PCR is considered as a convenient and gold standard molecular diagnostic method with higher sensitivity and specificity. Therefore, the main objective of this study was to establish a PCR assay - a colony PCR for detecting *E. coli* O157:H7 with minimum steps and cost. For the procedure, we first streaked a known *E. coli* O157:H7 strain on a selective media, CT-SMAC agar. A fresh single colourless colony was picked and without extracting DNA the colony was directly subjected to colony PCR to determine specific genes; *eae A* gene for O157 O antigen and $fliC_{h7}$ for H7 H antigen. PCR products of 450bp (*eae A*) and 625bp ($fliC_{h7}$) were successfully amplified in mC-PCR, confirming the successful establishment of the protocol. A total of nine cattle faecal samples and nine wastewater samples collected from cattle farms were tested to detect *E. coli* O157:H7 using the optimized mC-PCR protocol but none were positive for *E. coli* O157:H7. Positive and negative controls were used to validate the results. The establishment of a mC-PCR can be beneficial in the future as it facilitates the rapid screening of bacterial colonies without requiring DNA extraction to detect *E. coli* O157:H7. This new mC-PCR protocol enhances efficiency by reducing processing time and costs, while minimizing the risk of contamination, making it a valuable tool for the precise identification of target genes in molecular and microbiological research.

Keywords: Multiplex colony PCR, *E. coli* O157:H7, *eae A* gene, $fliC_{h7}$ gene

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Evaluation of Natural Compounds as Potential Inhibitors of African Swine Fever Virus DNA Ligase: A Computational Analysis

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African Swine Fever (ASF) is a highly infectious viral disease that is marked by high contagion levels caused by the ASF virus (ASFV). Currently, there are no licensed vaccines or efficacious antiviral therapeutics available for this disease. Accordingly, this study explores the potential antiviral agents from *Gymnema sylvestre*, a plant belonging to the *Apocynaceae* family, focusing specifically on ASFV DNA Ligase (ASFVLig), an enzyme encoded in the base excision repair (BER) pathway of the virus. The inhibition of ASFVLig would compromise the stability of the viral genome, thus resulting in reduced efficiency in replication and transmission. A comprehensive literature review was conducted and resulted in the identification of 36 various compounds. Detailed evaluation was performed for ADME (absorption, distribution, metabolism, and excretion) profiles for the selected compounds. Interestingly, several of these compounds adhered to Lipinski's Rule of Five, as determined using SwissADME analysis, leading to the selection of 19 candidates for detailed study. Virtual screening conducted with PyRx 0.8 identified 13 compounds exhibiting binding affinities below -5 kcal/mol. Further evaluation using blind docking with CB-Dock2 revealed that Longispinogenin and Sitakisogenin yielded binding energies of -7.4 kcal/mol. Docking studies revealed that the catalytic residues LEU211, LEU402, ASN153, and GLN403 in ASFVLig are likely interacting with these two compounds, suggesting their potential role in the catalytic mechanism. Longispinogenin emerged as the prominent candidate through comprehensive molecular dynamics (MD) simulations, which confirmed its stable binding characteristics. The root means square deviation (RMSD) for the ASFVLig-Longispinogenin complex stabilized to approximately 2.0 Å over a 100-nanosecond simulation at 310 K, highlighting robust ligand affinity. Additionally, Root Mean Square Fluctuation (RMSF) analysis revealed minimal displacement in active-site residues, with displacements under 1.5 Å. These findings underscore the necessity for further *in vitro* and *in vivo* experiments with Longispinogenin to refine antiviral approaches against ASFV.

Keywords: Africans swine fever virus (ASFV), DNA ligase, *Gymnema sylvestre*, molecular docking, molecular dynamics simulations

Exploring the Lead Adsorption Potential of *Garcinia quaesita* (Goraka) Fruit Rinds as a Readily Available Biosorbent

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In an era of increasing industrial pollution, heavy metal contamination of consumable water shows a significant risk to the entire world due to their toxicity. There is a growing trend of developing various natural materials as effective sorbents for efficient removal of harmful metals from contaminated environments. In the present study, the effectiveness of the adsorptive removal of lead ions from aqueous solutions by utilizing dried *Garcinia quaesita* fruit rinds was investigated. This includes the characterization, systematic optimization of experimental parameters using single-factor variation methodology, isotherm, and kinetic studies of the adsorbent. *G. quaesita* fruits rinds were randomly collected from domestic gardens in the Panadura district of Sri Lanka and subjected to purification, drying and pulverization to <1 mm particles. Biosorbent was characterized via Fourier Transform Infrared Spectroscopy (FT-IR) for functional group identification. The effect of initial lead concentration (2.5 –20.0 mg/L), pH (1-13), adsorbent dosage (0.1-1.0 g), and contact time (0-180 minutes) on adsorption in aqueous solutions at room temperature (25°C) was evaluated. Afterwards, comprehensive adsorption isotherm and kinetic analyses were conducted. Performed control experiments and all experiments were triplicated. Spectroscopic characterization via FTIR showed surface functional groups on biosorbent, including carbonyl and hydroxyl functional groups as active sites for metal ion coordination. Optimization studies demonstrated maximum lead removal of 81% under the following conditions: initial lead concentration of 12.0 mg/L, 0.5 g adsorbent amount, pH 5, and 100-minute equilibration period. Equilibrium data confirmed superior fit to the Freundlich isotherm model (R^2 = 0.9003), indicating multilayer adsorption, while kinetic studies revealed adherence to pseudo-second-order kinetics (R^2 = 0.9942). This suggests chemisorption as the rate-limiting mechanism governing the adsorption process. The maximum adsorption capacity of biosorbent was determined to be 1.00 mg/g. This study highlights the ability of *G. quaesita* as a biosorbent for lead removal, suggesting further investigation of its potential during food preparation processes.

Keywords: Adsorption, biosorbents, heavy metals, isotherm, kinetic

Fatty Acid Profile and Performance of Black Soldier Fly (*Hermetia illucens*) Larvae Fed Raw and Pre-treated Seaweeds

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Black soldier fly larvae (BSFL; *Hermetia illucens*) is a sustainable feed source, but their low omega-3 content limits nutritional value. However, this can be improved by rearing them on omega-3-rich substrates such as seaweed. This study evaluated BSFL's performance and ability to bioaccumulate omega-3 from three seaweed species: *Kappaphycus alvarezii*, *Gracilaria salicornia*, and *Sargassum wightii*. It also examined the dietary effect of different pre-treatments of *K. alvarezii* on larval omeg-3 enrichment and performance. Two feeding experiments were conducted. In Experiment I, 5-day-old BSFL were reared for 14 days on eight substrates: 100% poultry manure (control), four with 12% of either fish offal or a single seaweed species, and three combining 6% fish offal with 6% seaweed. In Experiment II, 6-day-old BSFL were fed for 14 days on eight substrates: one with 100% poultry manure, one with 67% untreated *K. alvarezii*, and six with 67% *K. alvarezii* subjected to pre-treatments (enzyme: Allzyme® at 1.5% or 2%; fermentation: *Saccharomyces cerevisiae* at 10% or 15%; microwave: 800 W for 2 or 3 min). Experiment I showed that fish offal, whether used alone or in combination with seaweeds, enhanced the omega-3 fatty acid content in BSFL ($p < 0.05$). Fish offal also improved performance metrics, including feed conversion efficiency, waste reduction, and larval weight gain ($p < 0.05$). Among the tested seaweeds, only *K. alvarezii* increased omega-3 levels when used alone, though this came at the cost of reduced larval performance ($p < 0.05$). Experiment II demonstrated that pre-treatment of *K. alvarezii* enhanced larval omega-3 content, compared to untreated seaweed ($p < 0.05$). While both untreated and pre-treated *K. alvarezii* generally reduced larval performance ($p < 0.05$), substrates containing pre-treated seaweed showed numerical improvements in growth and efficiency metrics compared to untreated seaweed. These findings highlight the potential of pre-treated seaweed substrates to enrich BSFL with omega-3 fatty acids, offering a promising strategy to improve the nutritional value of insect-based feeds.

Keywords: Insect, black soldier fly larvae, seaweed, pre-treatment, omega-3

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Formulation and Quality Assessment of Oleoresin-Infused Masala Chai Tablets: A Study on Sensory Standards and Shelf Stability

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Masala tea, a world-cherished beverage, combines black tea with aromatic spices. Current preparation methods suffer from flavour inconsistencies, sedimentation, time consumption and short shelf life. Commercial masala chai often lacks authentic taste and solubility. This study addresses these issues by using spice oleoresins within a co-crystallized sugar framework to enhance flavour and increase product stability, aiming to develop masala chai tablets focusing on sensory enhancement, product quality and stability, and extended shelf life. A series of tablet formulations were developed, each containing all seven spice oleoresins (ginger, cardamom, cinnamon, clove, fennel, black pepper, and star anise), but with varying ratios of these oleoresins in each formulation, as determined from consumer-centred literature and surveys. Co-crystallized tablets were made with sucrose as the core and gum acacia as the emulsifying binder. The primary drivers of preference such as aroma, taste, mouthfeel, spice balance and aftertaste were identified using free-choice profiling (FCP) along with the generalized procrustes analysis (GPA) model explaining 34.97% of the variance across the first and second dimensions. The shelf stability was assessed by total plate count (TPC), thiobarbituric acid reactive substances (TBARS) assay, and hygroscopicity studies were conducted at controlled temperatures of 25°C and 40°C, and humidity levels of 75% and 96% to determine long-term stability under accelerated conditions. The optimized formulation, highlighting cinnamon and ginger notes, achieved high sensory acceptability. Shelf-stability evaluations demonstrated resistance to microbial growth (low TPC values) and minimal oxidative deterioration (TBARS assay), with limited moisture-induced degradation under accelerated storage conditions, confirming the product's potential for extended shelf life. Oleoresin-based instant chai tablets offer a practical solution for delivering enhanced sensory qualities and stability, meeting the market demand for convenient, functional beverages while preserving the traditional flavour of masala chai and adding value to the ready-to-drink beverage sector.

Keywords: Oleoresin, oc-crystallization, sensory profiling, shelf-life stability

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Gastrointestinal Parasites of Domestic Chicken (*Gallus gallus domesticus*) Under Different Management Systems at Selected Locations in the Jaffna District, Sri Lanka

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The poultry industry is a vital sector that contributes to the food security and economy of Sri Lanka. The present study aimed to determine the prevalence and intensity of gastrointestinal parasites in domestic chickens reared in broiler farms under deep litter intensive management and in backyard poultry under semi-intensive management. Fifty fresh faecal samples were collected from backyard households (25) and broiler farms (25) in selected locations within Jaffna, Nallur, and Valikamam-South DS Divisions between November 2023 and December 2024. The samples were analysed using iodine smear, simple salt flotation and sedimentation techniques, and the parasites were identified based on microscopic morphology. Statistical analysis was performed using SPSS v26, employing Chi-Square and Mann-Whitney U tests to assess the differences between the two management systems. The overall parasite prevalence was 88%, with eight genera of gastrointestinal parasites, comprising the protozoan *Eimeria* spp., and seven helminths, including *Ascaridia* spp., *Heterakis* spp., *Capillaria* spp., *Toxocara* spp., *Trichuris* spp., *Strongyloides* spp., and trematodes. Based on the morphology of oocysts, four *Eimeria* species, such as *E. maxima*, *E. brunetti*, *E. mitis* and *E. acervulina* were identified. Infection rates were higher in broiler farms (100%) than backyard systems (76%), with *Eimeria* spp. being the most prevalent (58%; $p = 0.01$), followed by *Ascaridia* spp. (40%; $p < 0.001$) and *Heterakis* sp. (36%; $p < 0.001$). The highest mean oocyst per gram (OPG) for *Eimeria* spp. was 112.44. The highest mean eggs per gram (EPG) were observed in *Ascaridia* spp. (3.32), followed by *Heterakis* spp. (3.12). Based on the Mann-Whitney U test, the overall mean EPG and OPG counts showed significant difference ($p < 0.001$) between the two management systems for *Eimeria* spp., *Ascaridia* spp., *Heterakis* spp., *Capillaria* spp., *Toxocara* spp. and trematodes. The higher prevalence and intensity in intensive broiler farms may be linked to deep litter management with paddy husk bedding, while lower levels in backyard poultry may result from scavenging behaviour and natural deworming practices followed. These findings highlight the role of management practices in influencing the prevalence and intensity of infections.

Keywords: Chicken, domestic, gastrointestinal, Jaffna, parasites

Green-Synthesized Silver Nanoparticles: Impact on Tomato Seed Germination and Early Seedling Growth

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Green synthesis offers a sustainable alternative to conventional nanoparticle production. Silver nanoparticles, known for their antibacterial properties below 8 ppm, show promise in agriculture. This study explores the effects of green-synthesized silver nanoparticles, derived from *Salvinia molesta* extract, on tomato seed germination and early seedling growth. Dried plant powder (5 g) was boiled in 100 ml double-distilled water, filtered, and combined with 50 mM $AgNO_3$ solution (20:80 ratio). The mixture was stirred for 2 hours, reacted for 24 hours, centrifuged at 14,000 rpm, and dried at 80°C. Nanoparticles were characterized via UV-Vis, SEM, FTIR, and XRD. Tomato seeds (5 replicates of 10 seeds) were treated with 10–160 ppm nanoparticle suspensions and distilled water as control. Germination was monitored daily for 7 days at 28 ± 2 °C in darkness; growth parameters were recorded on day 8. One-way ANOVA ($\alpha = 0.001$) and Tukey's HSD test determined statistical differences. Nanoparticle synthesis was confirmed by a 463 nm plasmon peak, 110 nm average particle size, FTIR-detected Ag–O vibrations, and a Face-Centered Cubic structure via XRD. Germination response varied: FGP ranged from 50 ± 24.5% to 72 ± 13%, peaking at 40 ppm. T_{50} values showed slight fluctuation. Root lengths were not significantly different. At 40 ppm, root length was 39.00 ± 20.28 mm, shoot length 25.53 ± 8.52^{ab} mm, and fresh weight 17.27 ± 6.32^{bc} mg. The highest fresh weight (22.52 ± 5.36^{a} mg) and shoot length (31.38 ± 9.16^{a} mm) were observed in the control and 10 ppm; the lowest (14.39 ± 6.45^{c} mg, 22.77 ± 8.65^{b} mm) at 160 ppm. Values are Mean ± SD. Superscript letters (e.g., ^{a}, ^{b}, ^{c}) indicate significant differences per Tukey's test ($\alpha = 0.001$). These results highlight selective nanoparticle effects on early plant growth, supporting further study into their antimicrobial potential in agriculture.

Keywords: Tomato seed germination, seedling growth, silver nanoparticles

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Investigation of Selenium Profiles in Goats in Sri Lanka Using Glutathione Peroxidase Activity Assay: Findings from the Kandy and Jaffna Districts

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Selenium (Se) is an essential trace mineral for goats, crucial for fertility, kidding, immunity and muscle function. Regional profiling of Se status in goats is vital for developing local databases to support veterinary care and mineral nutrition management; however, such studies are limited in Sri Lanka. This study aimed to determine blood Se concentrations in goats from the Kandy and Jaffna districts and evaluate associations with potential risk factors. Goat farms (n = 12 in Kandy, n = 6 in Jaffna) were strategically selected to represent the goat population distribution across the two districts through government registration or private contacts. Blood samples were collected from 305 goats (15–20 per farm) and used to estimate Se concentrations through a commercial assay of glutathione peroxidase activity (GSH-Px), an indirect indicator of blood Se levels. The intensity of gastrointestinal nematode infection was estimated using faecal egg counts (FEC), and additional risk factors were obtained from animal-level and farm management data. Associations between these factors and blood Se concentrations were analyzed using generalized estimating equation models, clustered at the farm level, with a Gaussian distribution and log link function. The mean GSH-Px activity was 1134.9 U/L (range: 749.9–1877.4) in Kandy and 1174.7 U/L (range: 720.6–1860.0) in Jaffna. GSH-Px activity was not significantly associated with district (P=0.257), management type (P=0.863), concentrate feeding (P=0.317), breed (P=0.222), gender (P=0.114), pregnancy status (P=0.437), lactation status (P=0.608), or deworming status (P=0.633). However, each unit (egg per gram of faeces) increase in FEC was associated with a 0.01% decrease in GSH-Px activity (P=0.009), and goats receiving mineral supplementation had 9.6% higher GSH-Px levels than those without supplementation (P=0.023). This study provides baseline data on Se profiles in goats in the Kandy and Jaffna districts. The negative association between FEC and GSH-Px activity suggests the need for effective parasite control to minimize adverse effects on Se levels, despite no association with deworming status, which may reflect suboptimal treatment efficacy. The positive association between mineral supplementation and GSH-Px activity supports its inclusion in nutritional management strategies. Further research is warranted to establish Se concentration thresholds for veterinary interventions.

Keywords: Goats, nutrition, parasites, selenium, Sri Lanka

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Monitoring *Cryptosporidium* and Coronaviruses in Livestock Farm Water: A Study at NLDB Farm Haragama, Kandy District, Sri Lanka

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Microbial contamination of water used for drinking and recreational purposes poses a serious public health risk. The Mahaweli River, the primary drinking water source for the Kandy district, has been reported to be contaminated with protozoan and viral pathogens. Sewage discharge from livestock farms is suspected to be the major contributor. This study aimed to assess the presence of *Cryptosporidium* oocysts and coronavirus particles in water associated with livestock at the NLDB farm in Haragama, Kandy district, to evaluate its impact on Mahaweli River contamination and to analyze seasonal variations of the prevalence with respect to rainfall patterns. A total of 20 water samples were collected for *Cryptosporidium* and coronaviruses detection separately from 5 distinct locations i.e., a well, goat enclosure, sheep enclosure, buffalo wallowing pond and the main wastewater discharge point to the Mahaweli River, in May (rainy season) and September (dry season) 2024. *Cryptosporidium* detection involved concentration through filtration, followed by oil immersion microscopy using Modified Ziehl-Neelsen staining and polymerase chain reaction (PCR) targeting the *C. parvum 18S rRNA* gene. Coronaviruses detection utilized a conventional Pan-CoV nested Reverse Transcription-PCR (RT-PCR) targeting the RNA-dependent RNA polymerase (RdRp) genome region common to all members of the *Orthocoronavirinae*. Microscopic results revealed the presence of *Cryptosporidium* oocysts only in water samples collected from the goat enclosure (5 oocysts/5L) and buffalo wallowing pond (10 oocysts/5L). PCR analysis revealed *C. parvum* DNA in 4 out of 10 water samples tested (goat and sheep enclosures, buffalo wallowing pond, and the main wastewater discharge point to Mahaweli River). From the both methodologies employed, *Cryptosporidium* oocysts could be detected only during the rainy season, indicating a significant association between pathogen prevalence and rainfall (P = 0.048). Coronavirus particles were absent in all 10 water samples collected from 5 localities during rainy and dry seasons. Buffaloes appear to be a key reservoir of *Cryptosporidium*, with a rainfall- assisted spread of the pathogen. The absence of Coronaviruses may reflect low shedding or quick environmental decay of the virus. Effective livestock waste management and improved wastewater treatment facilities are recommended to mitigate zoonotic pathogen contamination of Mahaweli water.

Keywords: *Cryptosporidium*, Coronaviruses, livestock water contamination, Mahaweli river

Occurrence of Multidrug Resistant *Pseudomonas aeruginosa* Among Dogs in the Central Province of Sri Lanka

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Pseudomonas aeruginosa is an opportunistic pathogen causing infections in both humans and animals. The emergence of multidrug-resistant (MDR) *Pseudomonas* strains has become a growing concern in veterinary medicine. Developing countries including Sri Lanka has been identified as potential source for MDR. Pseudomonas development due to indiscriminate use of antimicrobials in many sectors such as human medicine, animal medicine, agriculture and aquaculture industry. Among them the companion animal sector is distinctly overlooked, despite its high potential. Thus, current study is aimed to determine the prevalence of MDR *P. aeruginosa* among dogs presented to veterinary clinics and hospitals in the Central Province of Sri Lanka. A total of 120 clinical samples were collected from dogs with infections, including otitis externa, wounds, urinary tract infections, and respiratory infections. Similarly, 106 nonclinical samples were collected from healthy dogs. Bacterial isolation and identification were performed using standard microbiological techniques and antimicrobial susceptibility testing (AST) was conducted according to CLSI guidelines. Our results revealed 18.3% (22/28) and 5.6% (6/28) *Pseudomonas* isolation rate among clinical and non-clinical samples respectively. Further, AST results showed the presence of MDR. among > 95% of isolates in both clinical and non-clinical samples. Both clinical and non-clinical isolates showed highest resistance to ampicillin, colistin, erythromycin and augmentin, while ceftazidime, imipenem, ciprofloxacin and gentamicin showed highest susceptibility. Ceftriaxone, one of the antimicrobials extensively used showed a 59.09% resistance among clinical isolates and 83.3% resistance among non-clinical isolates. Therefore, the current study confirmed the presence of MDR. *Pseudomonas* among dogs in Sri Lanka. Further, experiments are ongoing to conduct molecular identification of resistance mechanisms among these isolates.

Keywords: MDR, Pseudomonas aeruginosa, dogs

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Parasites Behind Bars: The Hidden Burden of Gastrointestinal (GI) Helminths in Captive Mammals

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Gastrointestinal (GI) helminths pose a significant health concern for captive mammals in zoological settings, largely due to factors such as overcrowding, shared enclosures, and environmental contamination. The Dehiwala National Zoological Garden, which houses 40 mammalian species belonging to 8 orders, continues to face challenges in controlling parasite transmission despite routine deworming practices. This study aimed to determine the prevalence of GI helminths in captive mammals at Dehiwala Zoo and to identify the role of food type and water sources with the helminth infections. In this cross-sectional study, freshly voided faecal samples were collected from 40 mammal species across eight taxonomic orders at Dehiwala Zoo. Each animal species was sampled only once and when few animals are present from the same species, 3-5 faecal samples were collected, and the samples were analyzed using the salt flotation technique. Three-gram samples were homogenized with saturated NaCl solution, centrifuged, and examined microscopically for helminth eggs/larvae. Quantitative faecal egg counts (FEC) were performed via McMaster technique, with 500 eggs per gram (EPG) indicating heavy infection. Data was analyzed using Microsoft Excel and SPSS 26, employing Pearson's Chi-Square, for smaller sample sizes Fisher's Exact Test, and Binary Logistic Regression to assess associations between food type and water source. Overall GI helminth prevalence was 37.5%, with carnivores exhibiting the highest infection rate (81.8%). No infections were detected in Perissodactyla, Lagomorpha, or Proboscidea. Strongyle sp. dominated (80%), followed by *Ascaris* sp. and *Bertiella* sp. (13% each). Food type significantly influenced infection risk ($p = 0.005$), with carnivores having 22.7 times higher odds of infection than omnivores ($p = 0.009$). Water sources showed no significant association ($p = 0.054$). Persistent infections occurred despite quarterly deworming. This study underscores the need for comprehensive investigations into parasitic infections to better understand species-specific susceptibilities, which is essential for implementing effective pre-treatment screening protocols aimed at reducing gastrointestinal (GI) parasitic infections in captive animals. Future research should incorporate molecular diagnostic techniques to accurately identify protozoan species and elucidate their transmission dynamics, thereby enhancing targeted control and management strategies.

Keywords Captive mammals, gastrointestinal (GI) helminths, zoo epidemiology, parasite prevalence, risk factors

Patterns of Cercariae Diversity in Freshwater Snails of the Maha Oya River, Sri Lanka: Influences of Water Quality Parameters and Human Activities

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Snail-borne parasitic diseases are a significant public health concern, particularly in tropical and subtropical regions. This study examined the impact of water quality parameters and human activities on the diversity and prevalence of cercariae in freshwater snails within the Maha Oya River, Kegalle District, Sri Lanka. This study aimed to investigate how water quality parameters and human activities affect cercarial diversity and prevalence and to assess temporal variation in cercarial prevalence. Snail sampling was conducted monthly from May to December 2024 at the same six study sites along the river to capture temporal variation. Water quality parameters (e.g., pH, dissolved oxygen, temperature, conductivity, total dissolved solids) were measured in conjunction with the intensity of human activities. Snails were checked for cercarial shedding immediately after collection. Redundancy analysis (RDA) was used to analyze the relationship between cercarial infection and water quality parameters and human activities. The statistical significance of the eigenvalues and correlations between cercariae morphotypes and variables (from Redundancy Analysis) was assessed using Monte Carlo permutation tests with 999 permutations. A total of 1,561 snails belonging to four species were collected. Overall, 111 (7.11%) of the snails were found infected with cercariae. Among the snail species collected, only *Pseudoplotia scabra* and *Melanoides tuberculata* were found to shed five cercarial types, which belonged to three morphotypes: pleurolophocercous, furcocercous, and gymnocephalous. The pleurolophocercous type was the most prevalent morphotype, with a prevalence of 5.51%. Sites with intense human activities, such as clothes washing and waste disposal, showed reduced water quality, which was associated with higher cercariae prevalence and diversity. Results showed that there was no significant temporal variation in median cercarial prevalence between months ($P = 0.41$). Water quality parameters and water contact behaviours of the local population largely influenced the prevalence of cercariae. Human activities, such as washing clothes, dumping solid waste, and fishing, were significant predictors of cercarial prevalence. Therefore, improved solid waste management is essential to reduce the risk of trematode transmission.

Keywords: Cercariae diversity, water quality parameters, freshwater snails, human activities, Trematode transmission

Potential of *Lactobacillus spp.* Isolated from Silage for Ensiling Forage of Maize, Sorghum and Brachiaria

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Forage is inoculated with beneficial lactic acid bacteria (LAB) to conserve the quality of silage. During forage ensiling, LAB convert water-soluble carbohydrates in the forage into organic acids under anaerobic conditions. This study investigated the potential of *Lactobacillus spp.* isolated from silage for ensiling maize, sorghum, and brachiaria forage, with the aim of developing inoculants. The experiment consisted of thirteen *Lactobacillus* isolates, including *Lactobacillus plantarum* (LPL1, LPL2, LPL3, LPL4, LPL5, LPL6), *Lactobacillus paracasei* (LPC1, LPC2, LPC3, LPC4), *Lactobacillus rhamnosus* (LRA1, LRA2), and *Lactobacillus oris* (LOR). *Lactobacillus* isolates were cultured on De Man, Rogosa, and Sharpe (MRS) broth at 37 °C for 24 h. Sterilized forage-extract (FE) media prepared from dried, ground forage maize (*Zea mays*), sorghum (*Sorghum bicolor*), and brachiaria (*Brachiaria brizantha*) were inoculated with each bacterial isolate and incubated at 37 °C for 24 h. Forage-extract media incubated without inoculating any isolate was the control. The study was on a complete randomized design with 4 replicates. During the incubation period, pH of the cultures was recorded at 1, 3, 5, 7, 9, and 24-hours. The pH reduction in FE media is due to the acid production of *Lactobacillus*, which indicates their ensiling potential. Compared to control, *Lactobacillus* isolates significantly ($P < 0.05$) reduced the pH of maize, sorghum, and brachiaria FE, during the 24-hour incubation period. In maize FE, noticeable ($P < 0.05$) pH reductions were evident by LPL2, LPC1, LRA1, and LOR isolates. Similarly, LPL5, LPC2, LRA1, and LOR isolates were significant ($P < 0.05$) in reducing the pH of sorghum FE. However, except LPL2, none of the *Lactobacillus* isolates investigated were able to reduce the pH of brachiaria extract below 4. The study concluded that there is great potential for producing silage inoculant for maize using LPL2, LPC1, LRA1 and LOR; for sorghum using LPL5, LPC2, LRA1 and LOR; and for brachiaria using LPL2 isolates. The study suggests experimenting to analyze the silage quality of forage inoculated with identified *Lactobacillus* isolates.

Keywords: L. plantarum, L. paracasei, L. rhamnosus, L. oris, pH

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Preliminary Study of the Prevalence of *Sarcoptes* spp. and *Demodex* spp. Among Canine Dermatologic Lesions, which are Treated as Mange Lesions in Government Vet Hospital, Gatambe, Sri Lanka

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Skin mite infestations of dogs in Sri Lanka are mainly caused by *Sarcoptes* spp. and *Demodex* spp. They cause dermatitis, leading to alopecia and secondary bacterial infections. They are well known to have zoonotic importance too, as scabies can be seen in both animals and humans, while demodicosis in dogs can be leading to pruritus in humans, in rare cases. So far, there is a lack of published literature in prevalence of mite infestations in Sri Lanka. The main objective of this study is to determine the prevalence of mite infestations from the numerous dermatitis cases presented to the Government Veterinary Hospital, Gatambe. The study also aims to investigate the importance of using skin scrapings and tape tests prior to treating dermatitis in field situations. In this study, 30 samples of deep and superficial skin scrapings and tape test samples were obtained per each case presented with the complaint of dermatitis. The sampling was performed from the affected areas with alopecia, pruritis, erythema, scaling, blisters or any abnormality on the skin, where the dogs of different breeds, gender and age categories were included. The samples were extensively examined through routine microscopic examination under low power (10x) to check for the presence of mites either *Demodex* spp. or *Sarcoptes* spp. Their characteristic morphological features were used for mite identification. Out of the 30 samples examined only 6 samples were positive, indicating 20% point prevalence. Out of the positive samples 3 had *Demodex* spp. and 3 had *Sarcoptes* spp. with equal prevalence of 10%. The findings highlight the importance of using skin scrapings and tape test examination prior to treating dermatologic lesions with ivermectin as unnecessary usage of the drug will lead to drug resistance and adverse drug reactions in canine patients.

Keywords: Mites, prevalence, dermatitis, treatments, skin tests

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Prevalence and Identification of Gut Acanthocephalans and Nematodes in Frigate Tuna, *Auxis thazard* (Lacepède, 1800) from Southern and Northeastern Marine Waters of Sri Lanka

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Frigate tuna is a neritic tuna species mainly found in Sri Lankan marine waters. Understanding the parasite occurrence in food fish is crucial for food safety and trade. There is a lack of comprehensive data on the endoparasites of frigate tuna in Sri Lanka. The aim of this study is to identify acanthocephalans and nematode parasitic species and to estimate their prevalence in two coastal regions of Sri Lanka. Fifty specimens were collected, comprising twenty-five specimens from each site, including Galle (Southern coast) and Trincomalee (Northeastern coast). Parasites were extracted from the intestines and stomachs of hosts and preserved in a 70% ethanol solution. All the extracted parasite specimens were cleaned and morphologically identified through microscopic observation. The morphometric measurements of the identified species were obtained. *Echinorhynchus*, *Rhadinorhynchus*, and *Neoechinorhynchus* genera of acanthocephalans were identified according to morphological features such as size, number and arrangement of proboscis hooks, trunk spine arrangement, proboscis receptacle length, lemnisci length, and cement gland arrangements. The zoonotic nematode *Anisakis simplex* was identified based on its distinct boring tooth, ventriculus, and mucron at the posterior end. A total of 295 helminths were recorded from Trincomalee and 180 from Galle. *Rhadinorhynchus* sp. (92%) was the most prevalent acanthocephalan genus in both sites, with 92% of overall prevalence. The prevalence of *Echinorhynchus* sp. and *Neoechinorhynchus* sp. were 68% and 46%, respectively, while in Galle they were 60% and 40%, with 68% and 46% of overall prevalence. *Anisakis simplex* showed the lowest prevalence in both sites (16% and 8%), with an overall prevalence of 12%. According to the Mann-Whitney U test, there was a significant difference between the parasite abundance in two sites ($p = 0.044$). The highest mean abundances of each parasite were recorded in Trincomalee, and they were (7.4 ± 1.2) for *Rhadinorhynchus* sp., (3.0 ± 0.4) for *Echinorhynchus* sp., (1.2 ± 0.3) for *Neoechinorhynchus* sp., and (0.1 ± 0.07) for *Anisakis simplex*. In conclusion, this study identified zoonotic nematodes and acanthocephalans in the frigate tuna, and the results highlight spatial variation in parasite load.

Keywords: Acanthocephalans, Anisakis simplex, Echinorhynchus, Frigate tuna, Rhadinorhynchus

Prevalence and Molecular Detection of *Cryptosporidium* spp. in Dogs at Two Veterinary Hospitals in Kandy, Sri Lanka

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Cryptosporidiosis is a clinically and zoonotically significant protozoan infection in dogs, caused by *Cryptosporidium* spp. Despite its importance, data on its prevalence in dogs in Sri Lanka remains limited. This study was aimed at determining the prevalence of *Cryptosporidium* in dogs presented to the Veterinary Teaching Hospital, University of Peradeniya, and the Government Veterinary Hospital, Getambe, Sri Lanka. A total of 103 faecal samples were collected with demographic and clinical data. Initial screening for isolation of *Cryptosporidium* oocysts was performed using the modified Sheather's sugar flotation method. It was followed by microscopic examination of smears prepared from isolated oocysts and stained with the modified Ziehl-Neelsen (ZN) technique, which visualised *Cryptosporidium* oocysts as magenta-red structures against a blue/green background. From the 103 faecal samples analysed, 11 (10.6%) were positive for *Cryptosporidium* by ZN staining. Among these 11 cases, 9 (81.8%) were male and 2 (18.2%) were female. Some of these dogs also had concurrent infections with *Trichuris* spp. and had strongyle-type eggs. DNA extraction was then performed on these 11 ZN-positive samples, followed by nested PCR analysis, which confirmed *Cryptosporidium* DNA in only 4 (36.4%) samples. The four PCR-positive cases consisted of three male dogs (a German Shepherd, 6 months; a Labrador Retriever, 1 year; and a crossbred, 7 months) and one female dog (a crossbred, 3 years). Younger dogs (< 1 year) had a higher prevalence of infection, with three of the four PCR-confirmed cases being less than one year old. While most infected dogs were asymptomatic, one PCR-positive dog exhibited diarrhoea, potentially due to concurrent parvoviral enteritis. The difference between the microscopy and PCR results might be due to low amounts of DNA, dead oocysts, substances that interfere with PCR, or genetic differences. These findings underscore a notable prevalence of cryptosporidiosis in dogs, often subclinical, and emphasise the importance of routine screening measures with PCR to improve accuracy and better assess zoonotic risks, particularly in subclinical infections.

Keywords: Cryptosporidiosis, modified Ziehl-Neelsen, sugar flotation

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Prevalence and Molecular Insights of Gastrointestinal Parasites in Free-Range Chickens of Kandy District, Sri Lanka

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Parasitism significantly impacts the growth, health, and production of chickens. Free-range chickens, particularly in developing countries, remain vital for rural communities, providing income and a source of protein. Understanding the impact of parasitic burden and implementing effective parasite management are essential for improving chicken health and livelihoods of rural communities. Free-range chickens, especially those in contact with wild birds, are highly susceptible to gastrointestinal helminths. The impact of these helminths on backyard poultry has been underestimated in Sri Lanka, with no molecular data available. This study aimed to assess the prevalence and molecular characteristics of these helminths in Kandy District. A total of 85 gastrointestinal tracts (GITs) from free-range chickens were collected from six selected veterinary ranges in the Kandy District. All GITs were dissected and examined for adult helminths. Morphological identification and morphometric data collection were performed using microscopy. A portion of the morphologically confirmed adult helminths underwent DNA extraction, followed by PCR targeting the highly conserved COX1 gene for *Ascaridia*, the LSU gene for the *Raillietina* group and for *Capillaria* spp. Amplicons were sequenced for molecular characterization and phylogenetic analysis of the helminths. Out of 85 GITs, 55.3% had helminths, with 83% having single infections and 17% mixed infections. Three nematode genera were identified: *Ascaridia* (85.1%), *Heterakis* (12.8%), and *Capillaria* (14.9%), along with three species of tapeworm, *Raillietina* (34%): *R. echinobothrida*, *R. cesticillus*, and *R. tetragona*. No trematodes were detected. Nucleotide BLAST showed high similarity: 99.71%, 90.83% and 91.92%-94.14% with *A. gallinarum*, *Capillaria spp*, and *Raillietina spp* reported elsewhere, respectively. Phylogenetic analysis indicated that local *A. gallinarum* and *Capillaria spp* form sister clades to species found in South Africa and the Yucatan Peninsula, respectively, while *Raillietina spp* are distantly related to NCBI references. In conclusion, the study reveals a significant helminth infection and diverse species infecting free-range chickens. Controlling gastrointestinal helminths is crucial for improving poultry health and productivity. The molecular data generated enrich the NCBI database with local poultry helminth species, contributing valuable information to global scientific knowledge.

Keywords: Free-range chickens, helminth, molecular, prevalence

Promoting the Utilization of *Kappaphycus alvarezii* (Doty Doty) Brown Algae: Disinfection, Deodorisation, and Microbial & Sensory Quality Evaluation through Chemical and Physical Treatments

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Kappaphycus alvarezii (Doty Doty) is a marine alga rich in nutrients and bioactive compounds. However, the strong unpleasant oceanic (fishy) odour limits its applications in food products specially when consumed in fresh form. In this study, four surface disinfection treatments and two deodorising treatments were introduced for *K. alvarezii* as treatment combinations to deodorise and improve its microbiological quality in order to promote its fresh consumption in Sri Lanka. The sensory and microbiological quality of *K. alvarezii* were evaluated after the treatments using sensory evaluations (Triangle tests, Nine-point Hedonic tests, Preference Ranking tests, Free Choice Profiling tests) and microbiological tests (Total Plate Count, Halophilic Bacteria Count). Disinfection treatments were blanching (at 80^{o}C for 60 seconds), chlorination (100 ppm for 10 minutes), addition of lime juice (3% v/v for 10 minutes), salt (2% w/w) and vinegar (1% v/v). Deodorisation treatments were green tea, and ethanol (20% v/v). All eight treatment combinations showed a significant ($p < 0.05$) deodorization of *K. alvarezii* compared to the untreated algae in the triangle sensory tests and they can be recommended equally for deodorization purpose. In the Hedonic test, the odour difference among the treatment combinations were not significantly ($p > 0.05$) different. But the colour of the treated algae showed a significant ($p < 0.05$) difference between the treatments. Blanching and green tea soak treatment combination and lime juice and ethanol treatment combinations were most preferred by the sensory panellists in terms of the colour. Ethanol treatments had changed the flavour of the algae significantly ($p < 0.05$). However, all the disinfection treatments lowered the Total plate count, and the Halophilic bacteria count below the threshold level (10^5 CFU/g). Therefore, all the disinfection treatments were effective to improve the microbiological safety of fresh *K. alvarezii*. Results of this study support the fresh consumption of *Kappaphycus alvarezii*, an alga commercially cultivated in Sri Lanka after treating with the tested disinfection and deodorizing treatments.

Keywords: *Kappaphycus alvarezii*, deodorisation, disinfection, sensory quality, microbiological quality

Salinity-Induced Changes in Photosystem II Primary Photochemistry in Rice: Insights from OJIP Fluorescence Analysis

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Rice is the second most widely grown cereal in the world, serving as a staple food crop. A significant portion of rice-cultivated areas has been affected by soil salinity. This major abiotic stress impairs the dark reactions of photosynthesis, thereby reducing the overall photosynthetic efficiency of the rice crop. This study was conducted to investigate the effect of salinity on the light reaction of photosynthesis based on primary photochemistry of photosystem II, as measured by OJIP fluorescence emission in saline susceptible and tolerant plants. The experiment was conducted as a pot experiment in a greenhouse. The experiment was a two-factors factorial complete randomized design. The experiment had three levels of soil salinity: 0.5, 3, and 5 dSm^{-1}, and two varieties of saline, susceptible and tolerant, with ten replicates. Photosynthetic rate, Chlorophyll, SPAD, and OJIP fluorescence emission were measured 45 days after planting. The results revealed that, salinity effect on primary photochemistry of photosystem II of saline susceptible and tolerant varieties was not significantly different. However, the number of reaction centers per cross section (RC/CSm) decreased significantly ($p < 0.05$) by 21.19% with increasing salinity, even though the effect of salinity was not evident through measurements of chlorophyll. Reduction in number of reaction centers caused for the higher ($p < 0.05$) absorption flux per reaction center (ABS/RC), trapping flux per reaction center (TR_0/RC), and heat dissipated energy flux per reaction center (DI_0/RC) and it was helped the plant to maintain the photosynthetic performance without impact by salinity stress, which was ensured by the performance index (PI_{ABS}) that was not affected ($p > 0.05$) by salinity. Moreover, the significant impact of salinity was not observed on the photosynthetic rate. Therefore, soil salinity has a more pronounced impact on inactivating certain reaction centers of Photosystem II than on the light-harvesting apparatus. Even at this level of salinity, the dark reaction remains unaffected in both saline-susceptible and tolerant varieties. However, the remaining functional reaction centers effectively sustain the photosynthetic rate in green leaves under saline conditions.

Keywords: Dark reaction, light harvesting apparatus, light reaction, reaction centers

Seroprevalence of Chicken Anaemia Virus and Infectious Laryngotracheitis Virus in Village and Commercial Poultry in Sri Lanka and Its Association with Management Practices

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The poultry industry plays a crucial role in the economic development and food security in Sri Lanka. This study aimed to evaluate the management practices (MPs) and seroprevalence (SP) of chicken anaemia virus (CAV) and infectious laryngotracheitis virus (ILTV) in village chickens in four veterinary ranges in Kandy district, and to assess the SP of ILTV in commercial layers from the Central and Northwestern provinces. A total of 16 farms were surveyed, and 48 blood samples were collected for antibody detection using commercial ELISA kits. Additionally, 310 blood samples from commercial layer flocks in Dambulla (Central province) and Wariyapola (Northwestern province) were tested for ILTV SP. Chi-square test was performed to identify associations between the disease prevalence and MPs. Findings revealed that semi-intensive rearing was predominant (75%), with only 18.75% of farmers vaccinating their flocks and 37.50% practicing deworming. Nutritional supplementation practices varied, with 50% providing calcium (Ca) and 62.50% using vitamins. Despite 68.75% of farmers seek veterinary assistance, significant health challenges persisted. Serological analysis indicated a high prevalence of CAV (87.50%) and ILTV (66.67%) in village chickens. SP of CAV was significantly associated with flock size ($P = 0.04$) and veterinary consultation ($P = 0.05$), with tendencies linked to water sources and Ca supplementation. ILTV SP in village chickens showed no significant associations with MPs, though trends were observed with veterinary range, farmer gender, and Ca supplementation. In contrast, ILTV SP in commercial poultry was markedly lower, with prevalence rates of 10.83% in Dambulla and 6.32% in Wariyapola. The study highlights the multifaceted challenges in village poultry farming, including high disease prevalence, limited vaccination coverage, and nutritional deficiencies. Additionally, constraints such as predation (37.50%) and restricted market access (62.50%) may impact productivity. Educational attainment among farmers (56.25% primary and 43.75% secondary) and a subsistence-oriented farming approach reflects socio-economic limitations influencing management decisions. By addressing these gaps through targeted educational initiatives, enhanced veterinary services, and improved biosecurity measures, both village and commercial poultry farming can be strengthened.

Keywords: Backyard poultry, poultry diseases, commercial layers, poultry production, disease prevention

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Small Ruminant Theileriosis in Jaffna, Sri Lanka

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Theileriosis is a tick-borne parasitic disease that causes significant economic burden worldwide due to reductions in milk and meat production in livestock. A recent study identified the highly pathogenic *Theileria luwenshuni* causing mild disease in Jaffna sheep while studies on *Theileria* epidemiology among Sri Lankan goats are limited. This study aims to determine the prevalence of theileriosis among both sheep and goats in Jaffna, determine their anaemia status through haematocrit analysis, and identify any association between demographic factors and prevalence rates. Blood samples were collected from 24 sheep and 24 goats in four farms in Jaffna. Tick samples were also collected from selected sheep (n = 131) and goats (n = 120). Microscopic analysis of *Theileria* piroplasms was conducted using Giemsa-stained blood smears. The Packed Cell Volume (PCV) of each blood sample was analysed and used as an indicator of anaemia. Associations between the prevalence and demographic data such as age, gender and farm locations were compared using a Chi square test. Microscopic analysis revealed a prevalence of 45.8% for both sheep and goats, while molecular analysis revealed higher prevalence rates (sheep: 70.8%; goats: 62.5%). Goats had a significantly higher anaemia rate (70.8%) compared to sheep (33.3%) ($Z = -2.600$, $p = 0.00932$). There was no association of prevalence with gender (sheep: $\chi2 = 0.336$, $p = 0.562$; goats: $\chi2 = 2.003$, $p = 0.157$), age (sheep: $\chi2 = 0.697$, $p = 0.404$; goats: $\chi2 = 2.003$, $p = 0.157$) or farm locations (goats: $\chi2 = 3.891$, $p = 0.142$). Ticks of two genera (*Rhipicephalus*, *Haemaphysalis*) were identified as potential vectors. The higher anaemia rate may indicate greater disease severity due to *Theileria luwenshuni* among goats compared to sheep. The relatively low microscopic prevalence highlights the risk of underdiagnosis and the need for molecular testing to accurately detect carrier states, which can serve as reservoirs, and initial disease stages for effective treatment.

Keywords: *Theileria*, tick-borne diseases, goats, Jaffna sheep, Sri Lanka

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Successful Initiation in Introgression of Neck Blast Resistant Genes to Local Elite Rice Variety '*Attakari'* through Marker-Assisted Selection

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Rice blast disease is a significant threat to local and global rice production, and neck blast is the most severe form of blast. While multiple management approaches exist, developing genetic resistance in popular but susceptible cultivars offers a sustainable solution. The present project aimed to develop neck blast resistance in the rice variety '*Attakari'* through marker-assisted selection. The objectives included characterizing parental germplasm, developing a feasible crossing program by studying reproductive traits and advancing breeding generations of '*Attakari*' with resistance genes. '*Attakari*' was used as the female parent and four international blast-resistant varieties, namely Usen, Zenith, Raminad, and NP 125, were used as the pollen parents. The parents were characterized for growth parameters and genotyped for *Pikh* and *Pita/Pita*-2 genes using allele-specific PCR amplification. The parents were established in soil with staggered planting to synchronize flowering. Raminad Strain 3 failed to progress beyond vegetative growth. '*Attakari'*, the female parent was emasculated by the clipping method and was pollinated by the male parents. F1 was backcrossed with '*Attakari*', the recurrent parent, to produce BC1F1 generations. '*Attakari*' amplified a susceptible *Pikh* allele of 216bp, in contrast to the resistant allele (350 bp). Additionally, the resistance *Pita* allele of 1042bp fragment was amplified in *Attakari*, Usen, Zenith and Raminad Strain 3, but not in NP 125. 48 BC1F1 seeds were obtained for all crosses. The rate of success in pollination varied from 16% to 69%, with the highest recorded in the cross *Attakari* x NP 125. The rate of germination of the F1 seeds varied from 90% to 96%, while that in BC1F1 varied from 80% to 90%. The highest germination rate of 90% of BC1F1 seeds was recorded in *Attakari* x Usen cross. The BC1F1 will be genotyped for *Pikh* allele of 350bp in the heterozygous condition using allele-specific markers prior to advancing the lines.

Keywords: Marker-assisted selection, neck blast resistance, *Pikh* gene, *Pita* gene, backcross breeding

Sustainable Forest Management through Seral Stage Assessment in Belipola Analog Forest

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Understanding habitat fragmentation and ecological succession is crucial for objective monitoring, recording and validation (MRV) of biodiversity and sustainable forest management. This study examines the vegetation structure and habitat complexity across five seral stages in the Belipola Analog Forest, located in the Uva Province of Sri Lanka. Using the Physiognomic Formula from the Analog Forestry Practitioner's Guide, plant communities were classified based on growth forms, height stratification, and canopy cover, allowing for a detailed structural analysis of forest succession. Key plant categories were identified: tree species as V (broadleaf evergreen), D (broadleaf deciduous), E (needle evergreen), N (needle deciduous), and non-tree species as C (vines and creepers), S (succulents), B (bamboo), X (epiphytes), P (palms), R (rhizomatous plants), K (rosette plants), F (ferns), L (lichen and mosses), and herbaceous plants including G (graminoids), A (annuals), and H (perennials). Stratification levels varied from < 0.1m to > 45m, while canopy cover ranged from continuous (> 75%) to almost absent (< 1%), reflecting differing seral stages of forest development. The results further indicate a progressive increase in vegetation complexity, canopy stratification, and structural diversity from early to mature seral stages. The 1st seral stage exhibited rudimentary annual vegetation with an absence of canopy cover or stratification, while the 2nd seral stage displayed an increase in perennial generally shrubby. The 3rd seral stage tree canopy becomes a defining feature with the presence of other growth forms. The 4th seral stage demonstrated a mature canopy structure of emergent and keystone species with epiphytes and shade loving plants becoming reflected at this stage. The 5th seral stage represented the most mature state of forest development, characterized by a highly complex structure and extensive biodiversity. By applying these structural classifications, schematic diagrams were developed to illustrate vegetation complexity in a 3D format, aiding in the evaluation of forest succession from one seral stage to the next. These findings provide a framework for assessing habitat fragmentation and ecological integrity within biodiversity MRV processes. Establishing such a systematic methodology for evaluating ecological succession in forests, contributes to development of accurate biodiversity measurement tools for the establishment of new markets in sustainable forest management.

Keywords: Analog forestry, biodiversity, forest structure, physiognomic formula, seral succession

Acknowledgement: *Grant from AQUAE Lab (PVT) Ltd, Singapore.*

Testing Phyto-pathogenicity of *Trichoderma virens*; a Potential Bio-control Agent for *Rigidoporus microporus*; the Causative Agent of White Root Disease of Rubber Plants in Sri Lanka

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White root disease caused by *Rigidoporus microporus* in rubber plants (*Hevea brasiliensis)* is one of the most severe diseases reducing the rubber yield. Integrated disease management protocols are encouraged since chemical control alone will be costly and also will lead to environmental pollution. *Trichoderma virens* has been identified as the best bio-control agent isolated from Sri Lankan rubber growing soils. However, the phyto-pathogenicity should be assessed before the recommendations. This study was conducted to determine the isolate's pathogenic potential for rubber plants. A pathogenicity test was performed for *Trichoderma virens* for both roots and leaves. The root system of one-month-old rubber seedlings was artificially inoculated with 50 ml of conidia suspension ($1x10^8$ conidia/ml) separately. Twenty seedlings were used for the inoculation and the control. Four destructive samplings were done at two-month intervals. Further, the leaves of one-month-old rubber seedlings were sprayed with conidia suspension (10^8 conidia/ml). The same suspension and 0.5 cm mycelial plugs were inoculated onto detached copper brown rubber leaves. Controls were maintained without inoculating. *Trichoderma virens* did not show any pathogenic symptoms on rubber seedlings. Moreover, they did not show any other disorders in seedlings even after 06 months. Further, there were no abnormalities observed in seedlings in the direct application of conidia suspension. Any pathogenic symptoms on the leaves of rubber seedlings sprayed with the suspension were not observed. In the detached leaf method, pathogenic lesions were not observed during the incubation period. According to the results of the study, it was concluded that *Trichoderma virens*; the selected bio-control agent for the *Rigidoporus microporus* is nonpathogenic to rubber plants. Hence, it can be successfully introduced to the field for the biological controlling of white root disease.

Keywords: Bio-control agent, Hevea brasiliensis, Rigidoporus microporus, Trichoderma virens, white root disease

Unravelling the Transmission Mechanisms of Enterocytozoon hepatopenaei in Litopenaeus vannamei Hatcheries in Northwestern Sri Lanka

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Enterocytozoon hepatopenaei (EHP), a microsporidian parasite associated with hepatopancreatic microsporidiosis (HPM), presents a significant economic threat to shrimp aquaculture. *Litopenaeus vannamei* has experienced significant production losses due to EHP which clinically manifests as uneven shrimp body weights. This preliminary study investigated EHP transmission routes in *Litopenaeus vannamei* hatcheries in Northwestern Province of Sri Lanka by analysis of faecal samples from broodstock, post larvae (PL), polychaetes, and squids. Nested PCR targeting the spore wall protein (SWP) gene region of the EHP and histopathological examinations were used to assess the prevalence of infection. Results revealed EHP contamination through multiple sources. Broodstock faecal samples showed a 57% positivity rate (4/7), while polychaetes showed 100% infection (5/5). Post larvae samples showed a 33% positivity rate (2/6), and squid samples were positive in 80% (4/5). Histopathological analysis of hepatopancreatic tissue using post larvae (PL) at 1000x magnification confirmed severe EHP-induced cellular damage in infected hatcheries. The findings highlight the critical transmission risks associated with contaminated broodstock faeces and PL suggests horizontal spread within hatcheries. Polychaetes and squid, which were commonly used as feed were found to be potential carriers. The 100% positivity rate was found in polychaetes, including batches designated as SPF, underscores the biosecurity gaps in hatchery protocols. These results are consistent with global reports on EHP transmission through various reservoirs. This study underscores the urgent need for enhanced surveillance, rigorous biosecurity measures (e.g., rigorous screening of live feed such as polychaetes and squid), and targeted interventions to interrupt EHP transmission. Addressing these deficiencies is vital to safeguard Sri Lanka's shrimp industry, which faces increasing risks from this pathogen.

Keywords: *Enterocytozoon hepatopenaei* (EHP), *Litopenaeus vannamei*, shrimp aquaculture, nested PCR, disease transmission

Variation of Selected Faunal Groups in Paddy Fields: A Comparison of Organic and Conventional Farm

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Biodiversity is vital for ecosystem health and is influenced by changes in climate, environmental factors, and farming practices. This study compared the diversity of selected faunal groups [birds, butterflies, dragonflies, amphibians, soil collembolan and four key insect pests (*Leptocorisa oratorius, Nilaparvata lugens, Scirpophaga incertulas, and Cnaphalocrocis medinalis*)] in paddy fields practicing organic and conventional farming methods in Malsiripura (7°42'55"N, 80°29'42"E), Kurunegala district across cultivation seasons (Yala and Maha) and phenological phases (vegetative, flowering, ripening, off-season). Organic paddy field (OPF) was expected to support greater biodiversity compared to conventional paddy field (CPF) across seasonal phases. Study was conducted in two replicates in both sites (size of each site ~3,200 m²). Sampling was done using line transects and visual observations to sample larger animals, light traps to collect insect pests, and flotation method to extract collembola from September 2023 to August 2024. A total of 17 bird, 23 butterfly, 11 dragonfly and 8 collembola species were recorded. Bird abundance peaked in CPF (176) and OPF (163) during Yala-ripening. OPF had greater bird richness (3.5 ± 1.7) than CPF (2.7 ± 1.2) except in Yala-Flowering. Butterfly richness (OPF:5.0 ± 2.2, CPF:4.4 ± 2.1) and abundance remained stable across both seasons and all phases, except for Yala, where a decline was observed from vegetative to off-season, with higher values in OPF. Dragonfly richness was consistently higher in OPF, with peak abundance in Maha-vegetative (OPF: 891, CPF: 629) and Yala-vegetative (OPF: 322, CPF: 181) compared to 9-90 abundance in other phases in both fields. Pest numbers surged during Yala-vegetative phases in CPF (68) and in OPF (66), remaining high in CPF through ripening (68). Collembola were confined to field bunds, with lower abundance in Maha and significant increases in Yala ($p < 0.05$), particularly in OPF during flowering, ripening, and off-season. The overall results suggest that OPF supports higher faunal richness and abundance, likely due to reduced chemical use and richer surrounding vegetation. Despite pesticide use, CPF had higher pest abundance. Overall, Yala exhibited higher species richness in its fauna compared to Maha. These findings demonstrate that organic rice farming enhances biodiversity and contributes to agricultural and environmental sustainability through integrated, interdisciplinary approaches.

Keywords: Biodiversity, conventional farming, organic farming, rice farming, species richness

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Theme 3

Engineering and Technological Innovations for a Smart and Sustainable Future

A GIS-Based Interactive Web Platform to Find the Best Accommodation Facilities Around the University of Peradeniya

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Finding suitable student accommodation facilities around the University of Peradeniya has long been a significant challenge for students. This difficulty largely stems from the absence of a comprehensive and updated spatial database, combined with the lack of effective tools to easily access and search for available boarding options. As a result, students often rely on informal sources or spend considerable time and effort physically searching for accommodation, leading to delays and sometimes unsuitable living arrangements. This project aims to address this gap by developing an interactive web-based platform using Geographic Information Systems (GIS) that illustrates student accommodation facilities available in proximity to the university. The system was developed by collecting accommodation data through a Survey123 form, where boarding house owners provided details such as GPS location, room availability, amenities, and contact information. These data were organized into a spatial database and visualized using ArcGIS Online and ArcGIS Experience Builder. The key functionalities of the platform include a proximity search tool that assists users in identifying an adjustable radius (defaulted at 1 km) and a direction feature for routing from the university to selected accommodations. An ArcGIS Dashboard has also been developed for administrative use, where analytics like the number of registered boarding facilities and other statistics are available. One of the system's major strengths is its real-time updating capability. When boarding house owners submit information through a Survey123 form, details such as GPS location, room availability, amenities, and contact information are immediately reflected on the interactive web map and the dashboard. This ensures that decision-makers and students always have access to the most updated data. This project illustrates how web-based GIS can solve real-world problems by increasing accessibility, promoting transparency, and supporting well-informed decisions about student accommodation. Its architecture is adaptable and modular and can be used as a prototype by universities in Sri Lanka and farther afield.

Keywords: GIS mapping, ArcGIS experience builder, student housing, web GIS, proximity search, survey123

A Motorbike Assistance Tool for Road Line and Vehicle Detection Using Image Processing

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Motorcycle accidents, which lead Sri Lanka as a primary cause of fatal injuries, stem from both vehicle neglect and bad lane position control among riders. Most detection systems developed for the road do not account for motorcycle riders specifically. The research creates an economy-friendly motorbike safety device through image processing to protect riders. A real-time system utilizing image processing techniques will be designed to detect road lines and measure the distance to vehicles driving behind the road, serving as a motorbike assistance tool. The intervention aims to lower motorcycle crash rates through notifications about road position and approaching traffic at an affordable price. The tool employs OpenCV for road line detection via contour operations and TensorFlow's SSD MobileNet model for vehicle classification on pre-recorded or live video feeds. Python scripts operate on frames to determine distances from the road's central line. The results appear in a Tkinter GUI, while pyttsx3 provides optional voice output. The team investigated the potential of adding Arduino hardware to display LED warning signals. The system measured accuracy through video testing, producing optimized detection results from threshold adjustments from 50, 80, 0 to 50, 225, 0 with confidence scores set at 0.6. The implemented system identified road lines with 92% accuracy while precisely measuring the distance to the center line within 480x340 pixel frames. The vehicle detection function worked with a 76% success rate in identifying "CAR" and "motorbike" types when the system maintained a confidence threshold of 0.6. Detection failures occurred when the vehicle made turns or during proximate oncoming traffic situations. The system transmitted live information to users through visual and auditory displays, which reported "distance is 123 and behind CAR". The detection precision improved after adjusting thresholds with parameters, but systemic identification of vehicles needs additional development. This economic system raises motorbike security by continuously detecting surrounding vehicles and road lanes. This system achieves effective lane detection results at 92% while providing 76% accuracy for vehicle identification to make it usable for riders. This system's reliability could be enhanced through improved camera stability and refined algorithms, which would decrease motorcycle accident numbers.

Keywords: Image processing, motorbike safety, road line detection, vehicle detection

A Vision-Based Approach for Nitrogen Deficiency Detection in Chili Plants Using Low-Cost RGB Imaging

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Nitrogen deficiency (ND) significantly affects crop health and yield, causing symptoms that often go unnoticed until significant damage has occurred. Previous studies have primarily focused on imaging in controlled environments or have only considered individual leaf images, limiting real-world applicability and scalability. However, early detection of ND is essential for precision agriculture and sustainable crop management. This study aims to develop an automated machine vision-based system for detecting ND in chili plants, utilizing plant images with complex backgrounds. The early symptoms on plants are visible in images as the yellowing of mature leaves. A custom image acquisition setup was installed in a greenhouse with four ESP32-CAM modules. Four sets of chili plants subjected to varying Nitrogen levels, induced by applying sufficient amounts of fertilizers, are monitored. Each camera captures and transmits images to a Raspberry Pi server on an hourly basis, allowing the system to account for varying lighting conditions and select the few most suitable images per day. A machine learning-based framework is employed for detecting deficiency symptoms, including background removal, deficient leaf segmentation, and quantification of the yellow area, which is used to correlate visual symptoms with the severity of ND in the plant. The model effectively identifies healthy and deficient plants by evaluating visible traits before critical symptoms appear. It achieved a mean average precision of 0.765 in segmenting deficient leaves from complex in-field images, demonstrating strong performance despite challenges such as occlusion and inconsistent lighting. The initial findings highlight the feasibility of using low-cost image acquisition and machine learning for real-time nutrient monitoring in greenhouse settings, demonstrating the potential of the proposed vision-based system for detecting early ND. This approach supports continuous, non-destructive monitoring in typical greenhouse environments, which enhances precision agriculture and sustainable nutrient management practices. Additionally, the study could be further improved with more accurate outcomes using cameras with higher resolution, and considering parameters such as plant height, foliage density, which directly correlate with ND.

Keywords: Nitrogen deficiency, chili plants, image-based diagnosis, precision agriculture

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Advanced CFD Simulations for Optimizing Fluid Transfer in Centrifugal Microfluidic Chips for In-Situ Pollutant Detection

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Centrifugal Microfluidic Chips (CMCs) offer a transformative solution for water quality monitoring by integrating multiple functions into a miniaturised platform, enabling fast, accurate, and low-cost detection with minimal reagent use and simplified operation. To further enhance their performance, Computational Fluid Dynamics (CFD) is employed to optimise CMC design and fluid behavior. CFD-based optimisation turns a basic design into a high-performance chip by revealing fluid behavior, minimising design flaws, and maximising function all before fabrication. In our study, simulations were conducted using COMSOL Multiphysics® software, focusing on the optimisation of the inclination angle and angular acceleration of the syphon valve to ensure a stable liquid transfer. Assuming both water and air are incompressible, the CFD module was developed with supplementary physics, including laminar flow with two-phase flow and phase field, whilst the phase field system was used to trace the behaviour of the two immiscible fluids (water & air) over time. A rotating machinery was equipped to define the simulation's motion. Three different angular accelerations (250 rad/s², 500 rad/s², and 750 rad/s²) and four inclination angles (33°, 43°, 53°, and 63°) were tested to optimise the system's performance. The fluidic motion varied significantly with each combination of angular acceleration and inclination angle. At 250 rad/s², the liquid filling process in the syphon valve took the longest due to weaker forces, resulting in slower movement and laminar flow dominated by surface tension and viscosity. In contrast, at 750 rad/s², the higher acceleration increased fluid velocity, leading to instabilities and a transition to turbulent flow. The 500 rad/s² acceleration with a 33° inclination angle was identified as the optimal choice, balancing efficient filling and controlled flow behaviour. It is necessary to widen the simulation to encompass the whole device to achieve a better comprehension of various in-situ tests.

Keywords: Centrifugal microfluidic chip, computational fluid dynamics, syphon value, angular acceleration

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AI driven Smart Automation Model for Identifying Customer Nutrient Intake and Quantifying Plate Waste in Large-Scale Hotel Buffet Systems

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In contemporary hospitality operations, particularly within large-scale buffet environments, precise quantification of guest nutrient intake and associated food waste remains a persistent logistical and methodological challenge. Although isolated implementations of AI-enhanced waste tracking and IoT-based monitoring tools such as Smart-Log have demonstrated partial efficacy, integrated systems capable of concurrently analyzing nutrient consumption and plate waste remain largely underdeveloped. This research addresses this gap by proposing a comprehensive, lab-validated smart automation system engineered to monitor both dietary intake and food disposal behavior at the individual consumer level within hotel buffet contexts. The prototype, trialed in an operational buffet scenario, targeted two staple menu items—rice and chicken—for model calibration. The system architecture is comprised of three principal modules: precision weight sensors for mass quantification pre- and post-consumption, a keypad-based interface for individualized guest identification, and a computer vision model built using Google's Teachable Machine platform for classification of plate residues. These components interface through an Arduino-based microcontroller to facilitate real-time data acquisition and transmission. The image recognition model demonstrated a coefficient of determination (R^2) of 0.86 and a root mean square error (RMSE) of 19.11, indicating high predictive performance in distinguishing food types from plate waste. Collected data streams were integrated into a custom mobile application, which leveraged a food composition database to compute macronutrient and micronutrient consumption per user. The application further synthesized plate waste metrics at both individual and system-wide levels, providing users with feedback on their dietary habits and enabling management to track food wastage patterns. This multifaceted approach advances both sustainable hospitality management and personalized nutrition, offering a robust tool for enhancing food resource efficiency and promoting informed dietary choices in institutional food service environments.

Keywords: Food waste, sensor, teachable machine, image processing, nutrient intake

AI-Driven Bio-Sensors for Smart Environmental Monitoring: A Sustainable Approach Using Mimosa pudica

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Conventional electronic environmental sensors present significant sustainability challenges, including excessive energy consumption, electronic waste accumulation, and demanding maintenance schedules. This study examined the potential of the electrophysiological responses of Mimosa pudica as a biosensing platform for real-time environmental monitoring, proposing a more sustainable alternative to traditional sensor networks. The research question aimed to find out if the natural electrical responses of Mimosa pudica could be measured accurately and used to provide precise environmental data with the help of AI classification algorithms. The experimental design monitored 25 Mimosa pudica plants across 6 weeks under controlled environmental variations. Light intensities ranging from 100 to 1000 lumen, humidity levels between 40% and 80%, and temperature ranges from 15°C to 35°C were all experienced by plants. Voltage fluctuations and response durations have been recorded at 10-minute intervals through the use of precision electrodes to record electrophysiological responses. A total of 10,080 measurement points were collected for all environmental parameters over the data collection process. A machine learning classification model was built with random forest algorithms and tested against standard electronic sensor measurements. The results showed that Mimosa pudica had consistent electrophysiological responses to environmental changes. Temperature variations ranging from 15° C to 35° C resulted in voltage fluctuations of 10 to 30 mV, with response times ranging from 4 to 7 seconds. The AI classification model reached 95% accuracy when predicting environmental conditions compared to standard electronic sensors. Cross-validation revealed consistent performance across different plant specimens, with a coefficient of variation of 8.3%. The biosensing system required 30% less energy than comparable electronic sensor networks. The 10-minute sampling interval delivered sufficient temporal resolution for most environmental monitoring applications while preserving energy efficiency. This research provides the first quantitative validation of Mimosa pudica as a dependable biosensing platform, advancing sustainable sensing technologies and supporting eco-friendly monitoring systems for smart cities and environmental conservation.

Keywords: Bio-sensors, smart cities, IoT, artificial intelligence, environmental monitoring

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AI-Driven Carbonation Damage Detection and Severity Assessment Using Diffusion Models

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Carbonation damage in concrete significantly reduces pH levels, increasing the risk of corrosion and structural deterioration. The loss of alkalinity weakens the passive layer protecting reinforcement, leading to accelerated degradation. Traditional detection methods, such as core cutting and chemical titration, are invasive, time-consuming, and impractical for large-scale monitoring due to concerns over structural integrity and labor-intensive procedures. This research introduces an AI-driven system for identifying carbonation profiles, leveraging phenolphthalein-based pH colour variations to map the extent of carbonation damage distribution. The proposed AI model was trained on core profile images, achieving over 98% training and validation accuracy, with a Mean Square Error (MSE) of 0.0012 in core profile identification and concentration mapping on the core profiles. Additionally, synthetic carbonation core profile images were generated after phenolphthalein application, successfully integrating up to 65% synthetic images into the dataset to reduce reliance on real images while maintaining accuracy. To extend this approach, a 3D numerical diffusion model is developed using Darcy's equations and existing carbonation test data, which is subsequently replaced by an AI surrogate model to eliminate the need for iterative diffusion simulations. The AI-based diffusion model achieved nearly 100% accuracy, enabling precise grid concentration predictions. Furthermore, an AI-driven optimization technique was introduced to determine optimal core cutting locations based on concentration standard deviations across different diffusion profiles. Finally, a severity assessment framework was established by integrating reinforcement density, 3D concentration profiles, and chemical carbonation equations. The proposed AI-based methodology provides a non-invasive, highly accurate, and efficient approach for carbonation damage detection, localization, and severity evaluation, offering significant advancements in Structural Health Monitoring (SHM).

Keywords: Carbonation damage, AI-driven detection, structural health monitoring, numerical diffusion model, synthetic data

AI-Driven Optimization Solution for Solar Energy: Forecasting, Maintenance, Site Selection and Storage Management Using Machine Learning Models

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The increasing reliance on solar energy presents significant challenges in achieving accurate forecasting, proactive maintenance, optimal site selection, and intelligent energy storage management. This research proposes a comprehensive, modular AI-driven platform integrating machine learning (ML), deep learning (DL), and reinforcement learning (RL) techniques to optimize solar energy generation and management, enhancing efficiency, scalability, and sustainability. The framework comprises four modules: energy forecasting, predictive maintenance, optimal site selection, and battery storage optimization. In forecasting, advanced time-series models including ARIMA, SARIMAX, and LSTM were applied to multiyear irradiance and demand datasets from diverse climatic regions in Sri Lanka. These models achieved RMSE values as low as 0.1238, demonstrating robust predictive accuracy. Predictive maintenance leverages Vision Transformer (ViT), YOLOv8, and ResNet50 to classify thermal infrared images of photovoltaic modules into eleven defect categories, enabling early detection of cell degradation, hotspots, and other anomalies. LSTM Autoencoders and Isolation Forests monitor inverter AC power output, identifying deviations and supporting timely fault diagnosis. Geospatial analysis combined with machine learning-based ranking algorithms identified Vavuniya as the most suitable site for new solar plant deployment, improving selection accuracy by 20% over conventional methods. A hybrid reinforcement learning strategy integrating Deep Q-Networks (DQN) and Proximal Policy Optimization (PPO) dynamically manages battery charge–discharge cycles under variable conditions. This approach achieved an 18% increase in battery lifespan, a 25% reduction in energy wastage, and improved reliability. The integrated solution is deployed via a real-time dashboard visualizing forecast trends, maintenance alerts, site suitability, and battery status, providing actionable insights for operators, engineers, and planners. The results validate the framework's scalability and adaptability for nationwide deployment, supporting the transition towards a resilient, cost-effective, sustainable energy infrastructure in Sri Lanka.

Keywords: Solar energy forecasting, predictive maintenance, reinforcement learning, battery storage optimization, optimal site selection

Applying Explainable AI to Predict the Environmental Impact of Energy Consumption in the Construction Industry – A Comprehensive Review

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The construction sector accounts for a substantial share of global energy use and emissions. Improving building energy efficiency is essential for reducing environmental impacts. Traditional forecasting methods often lack transparency and precision, highlighting the need for advanced, explainable AI (XAI) solutions to deliver reliable, interpretable insights for sustainable building energy management. This review investigates how XAI techniques can improve the accuracy and interpretability of AI models predicting the environmental impact of energy consumption in construction. It evaluates XAI's ability to identify key influencing factors and examines its value in guiding sustainable, evidence-based energy management strategies within diverse building environments. A systematic literature review of 55 peer-reviewed studies from 2015 to 2024 was conducted using Scopus, Web of Science, and IEEE Xplore. Studies implementing XAI methods such as SHAP and LIME with machine learning models like Random Forest and XGBoost for building energy forecasting were selected. Inclusion criteria emphasised case studies reporting both prediction accuracy and model interpretability outcomes. Extracted data included R^2 values, key variable rankings, and contextual performance across residential, commercial, and industrial buildings. Synthesised findings focused on identifying trends in XAI performance and its practical contributions to sustainable energy management in the built environment. Integrating XAI significantly improved model transparency without sacrificing predictive accuracy, achieving R^2 values between 0.85 and 0.96. SHAP and LIME clarified the influence of factors such as weather, insulation, and HVAC system performance. Combined with models like Random Forest and XGBoost, these techniques consistently outperformed traditional forecasting tools, particularly in complex scenarios. The review highlighted XAI's role in enhancing user trust and enabling actionable, data-driven energy decisions. Notably, explainable models proved most valuable where decision-making required balancing precision with interpretability, reinforcing their importance for operational optimisation and supporting sustainable construction practices. XAI improves both accuracy and interpretability in energy forecasting models, strengthening their operational relevance for the construction sector. Future research should prioritise real-world, policy-aligned deployments of XAI systems to support sustainable energy management and inform regulatory frameworks for the built environment.

Keywords: Explainable artificial intelligence (XAI), energy consumption prediction, sustainable building design, building energy management

Comparative Chemical and Morphological Analysis of Passive Sampled Airborne Particulate Matter Across Diverse Environments in Sri Lanka Using FTIR, TGA, and SEM-EDX Techniques

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Airborne particulate matter (PM) presents serious environmental and public health challenges, particularly in rapidly urbanizing and industrializing regions with limited air quality monitoring, such as Sri Lanka. While size-based PM classification (e.g., PM_{10}, $PM_{2.5}$) is well established, limited attention has been given to its chemical composition and morphology, which are critical for source identification, health risk assessment, and targeted pollution control. This study applies a cost-effective framework combining bulk and particle-level characterization of passively sampled PM across seven diverse environments: a railway–road intersection, urban traffic area, low-emission natural zone, plastic recycling facility, concrete processing site, metal quarry, and coastal beachfront. This approach can serve as a screening-level tool to identify potentially hazardous particles, which can be prioritized for further investigation using advanced, high-resolution techniques. PM samples collected over a 5 to 7-day period, at breathing height (~1.5 m), were analyzed using Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA), and Scanning Electron Microscopy with Energy-Dispersive X-ray Spectroscopy (SEM-EDX). FTIR spectra commonly showed aliphatic C–H stretching (~2920 cm^{-1}), silicate-associated Si–O stretching (900–1030 cm^{-1}), and carbonate bands (~870 cm^{-1}). Urban and plastic recycling sites exhibited strong carbonaceous signals, while inorganic features dominated quarry, beachfront, and concrete processing locations. TGA revealed gradual weight loss in organic-rich samples and minimal degradation in inorganic-dominant samples. Final residues exceeded 90% at the quarry and concrete sites, compared to ~65% in carbon-dominant samples. SEM-EDX revealed diverse particle morphologies, including rounded, irregular, elongated, and aggregated structures with smooth and rough surfaces. Plastic recycling and urban traffic sites showed C-rich particles with clustered and irregular forms, indicative of combustion and synthetic origins. Concrete samples contained C, O, Ca, Si, and Al, consistent with cement dust. Quarry samples showed Si, K, Ca, and Fe, and coastal samples included Na, Si, Ca, and carbonate-rich particles resembling sea salt and mineral grains. Notably, the low-emission natural site exhibited biological particles, suggesting biogenic origins. The results reveal distinct PM profiles across environments, highlighting the need for site-specific characterization to assess health risks. This supports the proposed low-cost framework for preliminary screening and targeted air quality management in low-resource settings.

Keywords: Particulate matter, passive sampling, FTIR, TGA, SEM-EDX

Comparison of Disaster Preparedness Frameworks Between Sri Lanka and Japan

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Sri Lanka and Japan, despite facing distinct geographical and environmental conditions, share similar concerns regarding disaster preparedness, response, and recovery. Both countries have developed significant disaster management (DM) frameworks and preparedness strategies to mitigate these risks. This communication aims to compare the disaster preparedness approaches of Sri Lanka and Japan, focusing on the types, impacts, policies and implementation of preparedness activities. A literature survey was carried out to explore the information from online sources, including peer-reviewed journal articles, national DM plans, and international reports, selected based on relevance and credibility. Types and frequency of natural disasters vary due to the geographical locations of the countries. The psychological, social and economic impact differs in the two nations according to the intensity of disasters, highlighting the importance of developing robust, country-specific DM policies. The Basic Plan for Disaster Risk Management of Japan, enacted in 1961 and revised in 2024, plays a critical role in the country's preparedness, response, and recovery from various types of disasters. While many legislative and organizational frameworks support disaster preparedness in Japan, exercises to test readiness are carried out in parallel, delivering the impact. Sri Lanka's DM Act No. 13 of 2005 and National DM Plan 2023-2030 emphasize preparedness, mitigation, and recovery processes, responding to challenges like the 2004 Asian tsunami. The establishment of the DM Centre and the National Council for DM showcases Sri Lanka's increasing focus on disaster risk reduction. Japan's approach is characterized by advanced infrastructure, consistent funding, and widespread public participation. Sri Lanka, by contrast, is still in the process of strengthening inter-agency coordination and public engagement. Japan's disaster preparedness systems are more developed and comprehensive, while Sri Lanka has comparatively new initiatives. Differences in governance capacity, economic investment, and community-level participation contribute to the disparity. This comparative analysis highlights the significant progress made by Japan, and the emerging efforts in Sri Lanka, in disaster preparedness frameworks.

Keywords: Disasters, disaster planning, Japan, policy, Sri Lanka

Computer Intelligence-Based Framework for Damage Detection of Post-Tensioned Concrete Girder Bridges Using Vibration Responses

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Structural health monitoring (SHM) is essential for public safety and extending the lifespan of structures. Traditional SHM methods, such as visual inspections and non-destructive testing, are time-consuming and affected by environmental conditions. Machine learning (ML) techniques offer a promising solution to overcome these challenges. Therefore, this research aims to develop a computational intelligence-based framework using vibration responses for damage detection, localization, and quantification in post-tensioned concrete girder bridges. The present phase of the study involved only the numerical validation without going for field experimental validation. The input data for the ML models used in the proposed method was the frequency response functions (FRF) obtained from acceleration responses using a validated finite element (FE) model of the selected bridge created using SAP2000. FE model validation achieved percentage differences of 0.46% and 0.02% for the first bending and torsional modes with corresponding experimental modal frequencies. Then, each girder was divided into 10 equal segments and multiple damage scenarios were introduced to the FE model by reducing the elastic modulus (by 5%, 10% ,15% and 20%) in selected segments of the girders referring to progressive damage. In the first phase of the framework, the damage zones of the bridge were identified using the Artificial Neural Network (ANN) classifier trained using FRF obtained using acceleration responses measured at 21 sensor positions distributed along each edge girders of the bridge model. The output of the ANN classifier was the identification of the damage zones of the bridge. Then, separate base ANNs were used to detect, locate, and quantify the damage in previously recognized bridge damage zones. These base ANNs were trained using FRF from acceleration responses of all five girders across the bridge, referring to the same segment in each girder. ANNs used in the second phase to detect, locate, and quantify the damages were Convolutional Neural Network and Fully Connected Neural Network. Training, testing and validation of each ML model using numerically generated input data showed acceptable performance. The validation of the proposed framework using real field measurements is essential to ensure the success of the approach.

Keywords: Artificial neural network, damage detection, frequency response function, post-tensioned concrete girder bridges, structural health monitoring

Continuous Hydrological Modelling with HEC HMS for Runoff Simulation: Case of Kotmale Reservoir, Sri Lanka

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Precise Rainfall runoff modelling serves as a critical tool for effective reservoir management and climate change assessments specifically in multipurpose reservoirs that simultaneously supply water for irrigation, power generation and acts as a flood control structure. Sustainable management of these reservoirs is mainly supported by the precise estimation of inflow into the reservoir which is mainly driven by rainfall runoff. Kotmale Reservoir, located at the upper most section of the Mahaweli river is a similar multipurpose reservoir that supplies water to Kotmale hydropower plant which has the second largest capacity in terms of hydropower generation. For hydropower optimization and effective reservoir management it is crucial to study on the inflow to the reservoir. This study thus focuses on the rainfall runoff modelling using Hydrologic Engineering Centre - Hydrologic Modelling System (HEC HMS) of Kotmale Reservoir. Daily Rainfall data from six rainfall gauging stations, daily discharge data and daily inflow data to the Kotmale reservoir along with monthly evaporation data at one station within the Kotmale catchment was utilized in the study. The model was calibrated and validated for different combinations involving two loss methods (Deficit and Constant Loss method and Soil Moisture Accounting loss method) and two transform method (Clark Unit Hydrograph method and Soil Conservation Service (SCS) Unit Hydrograph Method) with consistent use of Simple Canopy method, Simple Surface method and Recession Baseflow as the Canopy method, Surface method and Base flow method respectively across all combinations. Key parameters for calibration identified using sensitivity analysis were used in the calibration of the model via a dual approach of automated optimization and manual calibration. The coefficient of co relation (R^2), Nash-Sutcliffe model efficiency coefficient (NSE) and Percent Bias of the model of each combination was evaluated to determine the most suitable model for Kotmale Catchment. The most suitable HEC HMS model can be recommended to be used in water resource management and climate change assessments related to the Kotmale reservoir.

Keywords: Continuous modelling, HEC HMS, Kotmale reservoir, runoff

Decision Making Dynamics of Evacuation Center Choice: A Case Study in Rathnapura

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Natural disasters around the world often result in large-scale displacement, requiring affected populations to relocate to designated evacuation centers for safety and essential services. The effective functioning of such centers plays a crucial role in mitigating disaster impacts and ensuring coordinated emergency response. In Sri Lanka, the increasing frequency of floods, landslides, and extreme weather events has underscored the urgent need to strengthen disaster preparedness and evacuation planning. Rathnapura District, known for its high vulnerability to recurrent flooding, presents significant challenges in managing evacuation processes and disaster response mechanisms. During major flood events, many affected individuals must decide whether to relocate to designated evacuation centers, and the choice is influenced by various factors such as center accessibility, center capacity available facilities, and previous experiences. Understanding the decision-making parameters behind the choice of evacuation centers is crucial for planning evacuation strategies and enhancing community resilience. This study focuses on identifying the factors influencing individuals' decisions to choose evacuation centers during flood events in Rathnapura. Multinomial Logit (MNL) modeling approach was employed as the main analytical tool to explore evacuation behavior and identify decision making parameters. Data were collected through structured interviews with flood-affected residents in Rathnapura District, focusing on variables such as demographic characteristics, perceived risk levels, prior disaster exposure, accessibility and other features of evacuation centers, and levels of trust in disaster management. These insights provide important implications for improving disaster management frameworks in flood-prone regions by strengthening the operational capacity of centers, building greater trust between communities and authorities, and refining risk communication strategies to provide a better support for timely evacuations.

Keywords: Flood evacuation, evacuation center choice, MNL modeling, disaster mitigation

Decision-Making Dynamics in Evacuation Route Choice During a Flood Situation: A Case Study in Ratnapura

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Flood evacuation planning is a major part of disaster preparedness, mainly in flood-prone zones. In Sri Lanka, Ratnapura district is subjected to frequent floods and pose a threat to lives and assets. Most of the traditional evacuation models are unable to capture the sequential and dynamic nature of evacuee decision-making in emergency situations. Therefore, advanced route choice models are required to capture the efficient evacuation planning process. Accordingly, this study aims to develop a β-Scaled Recursive Logit (β-SRL) modelling approach to examine and predict evacuation route choice under flood events and identify the most significant determinants of route choice behavior. Recursive Logit modelling approach is one of the new dynamic route choice models that are used to capture the sequential process of decision making with a sequential discount factor (β). This model has already been used for predicting decision making dynamics of tsunami evacuees, but it is rarely being used for analysis of flood disasters. Hence, this is a novel approach that is able to capture the decision making dynamics in emergency scenarios. The methodology integrates primary data from evacuation surveys and GPS tracking as well as secondary data on traffic flows and flood risk maps from Ratnapura district. The RStudio platform is utilized for model estimation and validation to capture varying decision making behaviors, with discounted β values reflecting different decision-making behaviors from myopic decisions (β≈0) to fully forward-looking (β≈1). By capturing both immediate utilities (travel time, perceived risk) and future expected utilities (scaled by β), the model provides a realistic representation of route selection behavior. The approach identifies critical decision points in the network where evacuees face significant trade-offs between short-term convenience and long-term safety, as low β values correlate with myopic choices favoring shorter routes, while high β values reflect risk-averse, safer route selections. The research improves evacuee behavior in uncertain situations, aiding emergency planners in optimizing evacuation routes, strategically placing warning systems, and developing adaptive traffic management policies. It suggests policy improvements for real-time flood warnings, infrastructure design, and resilience in flood-risk zones like Ratnapura.

Keywords: Recursive logit model, decision-making dynamics, route choice behavior, evacuation planning, flood management

Deep Learning Based Approach for Traffic Flow Analysis in Side-Friction Situations

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Side friction is a critical factor in traffic flow analysis, as it can influence vehicle speed, lane discipline, and overall road efficiency. In developing countries like Sri Lanka, side friction elements such as pedestrian activity, parked vehicles, and roadside vendors significantly disrupt traffic flow. Understanding these influences is important for improving road safety and congestion management. This study aims to develop a deep learning-based framework to quantify the impact of side friction on vehicle speed and spatial traffic disruptions in high-density urban areas, identify critical side friction parameters and construct a mathematical model. The methodology integrates U-Net-based Road segmentation and YOLO-based vehicle detection, using datasets like Tu-Simple and school-zone footage from Kandy. Frames were pre-processed and passed through a segmentation-detection pipeline. A Cell Index Method was applied to spatially categorize friction zones, and regression analysis evaluated friction's effect on vehicle speed. The U-Net segmentation model achieved a validation accuracy of 96.89%. The YOLO detection pipeline reliably tracked vehicles under real-world side friction conditions. The study found a strong inverse correlation between side friction intensity and vehicle speed, validating the analytical framework. The research provides a scalable, AI-driven approach tailored to urban traffic challenges in developing regions. It supports data-informed traffic planning and highlights the critical role of side friction in speed variation and flow efficiency.

Keywords: Side friction, road segmentation, vehicle speed analysis, deep learning, image processing

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Design and Development of a Liquid Density Sensor Using Upthrust Force and Electrical Resistance

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Accurately measuring fluid density is crucial in various scientific and engineering fields, and for fields like dairy products manufacturing, transportation, and use to determine the quality of liquids such as rubber. But traditional tools, such as densometers, often have limitations. They usually require large amounts of liquid, have a narrow measurement range, and can be expensive or complex to use. This project introduces a simpler, low-cost solution to this matter. A compact liquid density sensor that works with much smaller fluid samples while still providing accurate and reliable results. The sensor is based on Archimedes' principle, which states that a body submerged in a fluid, experiences an upward force called buoyancy depending on the fluid's density. Our design uses a small spherical float connected to a linear sliding potentiometer. As the float rises or falls into the fluid, the potentiometer's position changes, altering the electrical resistance and outputting a voltage signal. This signal is then calibrated using fluids of known densities, allowing us to determine the unknown fluid densities with good accuracy. This device has the potential to work in different ranges by changing the range of the densities. To improve performance, the sensor uses two different-sized spherical floats. The larger one works best for lower-density fluids, and the smaller one is better for higher densities. The spherical shape helps ensure that the buoyant force stays vertical, reducing measurement errors. During testing, the sensor achieved 98.24% accuracy, with an average error of 1.76% and a standard deviation of 0.0595, demonstrating consistent and repeatable results. It could detect small changes in density, with a sensitivity of 11.527 Vcm^3/g. The device is easy to build, compatible with platforms like Arduino, and can be used without any previous knowledge. It's not only useful for measuring density but also has the potential to measure other fluid properties like viscosity and flow rate with minor modifications. Overall, this sensor offers a smart, flexible solution for the field of dairy milk products manufacturing and plays a significant role in measuring many fluid characteristics without using many instruments.

Keywords: Linear resistance, upthrust force, density, liquid, viscosity

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Designing an Intelligence-Based Microgrid State Prediction and Stabilisation Using Software-Defined Network Control

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Microgrids are a critical component of future smart energy systems that offer localised energy resilience and integration of distributed energy resources. However, their dynamic and decentralised nature introduces significant challenges for real-time state monitoring and control, especially under transient disturbances and renewable variability. To address this, we propose a deep learning-based framework for intelligent microgrid state prediction and stabilisation. Discrete Wavelet Transform (DWT) with the db4 mother wavelet is applied to voltage, current, active power, and reactive power signals to extract multi-resolution time–frequency features. These are fed into a hybrid long short-term memory (LSTM) and convolutional neural network (CNN) model, which classifies microgrid states Normal, Alert, or Emergency with over 96% accuracy and a misclassification rate below 0.003%. The model successfully predicts state transitions 1 to 3 seconds in advance in various scenarios, including faults, photovoltaic (PV) fluctuations, and islanding. Integration with Software-Defined Networking (SDN) enables adaptive real-time control actions based on predicted states, significantly improving microgrid stability and resilience. This study delivers a scalable and intelligent solution that advances monitoring, forecasting, and autonomous control for next-generation smart grid applications.

Keywords: Microgrid, state prediction, LSTM-CNN, SDN, DWT

Development and Characterization of Novel Graphene-Based Bipolar Plates for Proton Exchange Membrane Fuel Cells

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Bipolar plates (BPP) are one essential component of Proton exchange membrane fuel cells (PEMFC), enabling gas distribution, electrical conduction, and heat management. In this study, a graphite-based low-cost material with high electrical conductivity for PEMFC bipolar plates was developed using Sri Lankan graphite and Epon 828 Epoxy served as the bonding agent and carbon black particles as a filler. BBP samples were prepared by mixing epoxy resin with a hardener and dissolving the mixture in ethanol. Graphite was then added by changing the ratio of components, and the solution was dried and compressed using a hydraulic press to form pellets. The samples were analyzed using linear sweep voltammetry in a Swagelok cell. The process was repeated with partial replacement of graphite with carbon black to enhance conductivity in select samples, using Epoxy: Graphite: Carbon Black (EGC) ratios of 4:15:1, 4:14:2, 4:13:3, up to 4:4:12. Initial results indicated that conductivity decreased with increasing epoxy content, while lower epoxy amounts resulted in poor mechanical integrity. The 1:4 ratio for the epoxy: graphite sample exhibited optimal conductivity and hardness. However, its resistivity exceeded the Department of Energy's target by 200. From the Epoxy, Graphite, and carbon black samples, 3 g graphite, 1 g carbon black, and 1 mL epoxy (4:12:4 EGC ratio) achieved a resistivity of 0.0091 Ωm, representing a significant enhancement in electrical conductivity compared to conventional epoxy-graphite composites. While the resistivity remains above DOE targets, these results highlight the potential of carbon-black-modified graphite composites as a promising avenue for further research and optimization in fuel cell technology.

Keywords: Bipolar plates, fuel cell, graphite

Development of Anthocyanin-Based Colorimetric Freshness Indicator to Validate the Shelf Life of Buffalo Curd Under Refrigerated Storage

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Buffalo curd is a widely consumed fermented dairy product in Sri Lanka. However, its short shelf life and inaccurate determination of expiration dates pose challenges in quality assurance and food waste reduction. This study aimed to develop an anthocyanin-based colorimetric freshness indicator integrated into an intelligent packaging to validate the shelf life of buffalo curd under refrigerated storage. Anthocyanin, known for their pH-sensitive color changes, were extracted from red cabbage (*Brassica oleracea var. capitata f. rubra*), butterfly pea flower (*Clitoria ternatea*), and beetroot (*Beta vulgaris*), and their total anthocyanin content and pH-dependent color variations were analyzed. Among the tested anthocyanins, red cabbage anthocyanin exhibited the most distinct and responsive color variations, making them ideal for pH-sensitive applications. Gel discs were formulated using agarose and carrageenan as gelling agents, and glycerol as a cross-linking agent to control dye diffusion. The gel formulations (3% and 5% agarose and carrageenan, with and without 3% glycerol) were optimized based on anthocyanin retention and pH responsiveness. The indicator gel disc was placed on the surface of the freshly prepared buffalo curd after setting in cups and kept under refrigerated storage conditions (4°C). The colour changes in the gel discs were recorded over ten days and correlated with pH change of the curd. Results showed a progressive pH decline in buffalo curd over time, and that was clearly indicated by the visible color transitions of the indicator gel disc. The strong correlation between pH decline and color change enabled to develop a shelf-life validation colour chart integrated into an intelligent label to monitor the freshness of the curd. The developed anthocyanin incorporated pH sensitive edible gel disc allowed non-invasive and visual monitoring system for the consumers to assess the freshness of buffalo curd without opening the package. The intelligent packaging system developed in this study is an innovative method of real-time monitoring of the freshness of buffalo curd enabling the consumers to select buffalo curd with desired sensory qualities.

Keywords: Buffalo curd, anthocyanin, freshness indicator, intelligent packaging, shelf-life validation

Development of N-Salicylidene Aniline Based Smart Materials for Fabric Integration

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Smart materials are engineered substances that can alter their properties in response to external stimuli such as temperature and light. Smart textiles represent a fusion of textile technology with smart materials. N-salicylidene anilines are considered promising candidates for integration into textile materials due to their facile synthesis, rapid response time, and multifunctional smart properties, Some N-salicylidene anilines can show thermochromism, photochromism or fluorescence in the solid state, while they have not been investigated in smart textiles. This study explored the possibility of integrating N-salicylidene aniline-based smart materials into textiles, enhancing fabric functionality through photochromism, thermochromism and Fluorescence activity. N-salicylidene anilines were synthesized by condensing salicylaldehyde derivatives and aniline derivatives using the reflux method and a temperature-controlled heating method to achieve the compounds with desired properties. Various textiles, including cotton and polyester, were dyed utilizing optimized direct coloration techniques. The dyeing process involved applying both conventional and cationic fixing agents to assess their impact on dye retention. Characterization methods included Fourier Transform Infrared Spectroscopy (FTIR) for analyzing dye-fabric interactions, Scanning Electron Microscopy (SEM) to examine the surface morphology of treated fabrics and spectrofluorometry to measure the wash fastness in fluorescence active dyed fabrics which was conducted to evaluate the durability of dye applications under practical conditions. The synthesized materials demonstrated strong photochromic and fluorescent properties, showing vibrant color changes under 365 nm UV light irradiation. Wash fastness test conducted by recording the fluorescence intensity after each wash cycle indicated that cationic fixing agents significantly enhanced the dye retention, particularly for fluorescent dyes, while repeated dyeing improved overall attachment. Comparison of FTIR spectra recorded for the neat compound, textile material before and after dyeing confirmed that dye adhesion to fabrics was predominantly through adsorption, with no covalent bond formation. SEM images illustrated successful dye incorporation and uniform distribution on fabric surfaces, validating the effectiveness of the dyeing methods in producing functional smart textiles. This research underscores the feasibility of utilizing N-salicylidene aniline derivatives to develop next-generation smart textiles. The findings contribute to the advancement of textile technology, offering innovative solutions for adaptive clothing and enhancing the functionality of fabrics.

Keywords: Fluorescence, N-salicylidene aniline, photochromism, Poly30DSPN

Durability-Based Life Cycle Assessment to Evaluate Supplementary Cementitious Materials

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The use of supplementary cementitious materials (SCMs) as partial replacements for ordinary Portland cement (OPC) has a growing demand in sustainable construction. This study examines the environmental and economic impacts, as well as durability and compressive strength of SCMs such as rice husk ash (RHA) and sugarcane bagasse ash (SCBA), incorporating a durability-based life cycle assessment (LCA) framework. These agricultural byproducts have a higher silica content, making them highly reactive pozzolanic materials. This methodology evaluates the long-term performance of RHA and SCBA mixed concrete, using cradle-to-grave LCA approach and integrating durability results to assess the influence of SCMs on concrete degradation mechanisms. This involves service life prediction using Life-365, data gathering from case studies, and life cycle impact assessment using SimaPro software, and combining these with compressive strength results and Rapid Chloride Penetration Test (RCPT) results as a durability indicator. Five concrete mixes, which contained 100% OPC, cement replaced mixes at 15% and 30% with RHA and at 5% and 25% with SCBA were used for the study. The LCA study measured the key environmental indicators such as Global Warming Potential (GWP), ozone depletion, and resource depletion. Service life modeled using Life-365 software showed that concrete containing RHA and SCBA has a longer durable service life compared to OPC concrete, which is resulted due to reduced permeability according to the RCPT results when SCMs were used. The findings underscore the significant potential of SCMs to reduce carbon footprint and enhance the durability of concrete, thereby contributing to developing more sustainable infrastructure. This study highlights the vital role of SCMs in advancing circular economy practices within the construction industry while addressing environmental concerns. The results offer valuable insights for engineers, policymakers, and researchers aiming to balance between sustainability and performance in cementitious materials in the construction industry.

Keywords: Supplementary cementitious materials (SCM), durability, life cycle assessment (LCA), global warming potential (GWP), ordinary portland cement (OPC)

Effect of Initial Imperfections on Thin-walled Steel Hollow Piers Under Lateral Cyclic Loading

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Steel hollow box piers, widely used in bridges and other essential infrastructure, play a critical role in safely transferring loads to foundations while resisting both vertical and horizontal forces, including those from earthquakes. However, these thin-walled steel piers are prone to initial imperfections introduced during fabrication, welding, transportation, and assembly. Understanding the influence of these imperfections is vital to ensure seismic resilience. This study focuses on three major types of initial imperfections: residual stresses, global geometric imperfections, and local geometric imperfections. The primary objective is to evaluate how these imperfections affect the seismic performance of piers based on normalized ductility (δ_{max}/δ_y) and maximum strength capacity (H_{max}/H_y). A validated Finite Element Method (FEM) model was used for parametric analysis by applying various imperfection profiles both within and beyond allowable geometric tolerances. Results indicate that residual stresses have minimal impact on performance. However, global geometric imperfections reduce pier strength by up to 20% when the loading direction aligns with the bend and by 1% to 10% when the load is applied perpendicular to it. Most significantly, local geometric imperfections, especially when concentrated in the bottom one-third of the pier where local buckling typically initiates, lead to strength reductions of up to 16%. These findings clearly demonstrate that among the studied imperfections, global geometric imperfections have the most critical influence on the seismic behaviour of steel hollow piers. Therefore, it is essential to give special design attention to global imperfections to improve the safety and durability of such structures under seismic conditions.

Keywords: Cyclic loading, FE modelling, geometric imperfections, residual stresses, steel hollow piers

Enhancing Acute Lymphoblastic Leukemia Diagnosis Using HSV Colour Space Segmentation

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Acute Lymphoblastic Leukemia (ALL) is a rapidly progressing form blood cancer that affects children. Early and accurate diagnosis is important for effective treatment, but manually examining blood smear images under a microscope is time consuming, depends on the expertise of pathologists, and can happen classification mistakes due to human error. To overcome above mentioned challenges, this study introduces an automated detection system, that combines image processing with deep learning. Specifically, it shows how the HSV (Hue, Saturation, and Value) color space can use for image segmentation and uses Convolutional Neural Networks (CNN) for classification and automatic detection of ALL cells. The methodology begins by preprocessing peripheral blood smear images taken from a microscopic camera, converting them from the standard RGB to the HSV color space model. A track bar-based thresholding technique is applied to extract the nucleus from ALL cells and other cells from the background, ensuring effective extraction. Additionally, morphological operations refine the extracted features, improving the accuracy of cell identification. These processed images are used to train a CNN model, which classifies cells in the microscopic image as ALL cells and non-ALL cells based on key features like shape, texture, and color intensity of the nucleus. To extract the purple color nucleus, the lower HSV values were adjusted to Hue=54, Saturation=0, and Value=135, while the upper HSV values were set to Hue=178, Saturation=113, and Value=255 after fine-tuning. A mask was used to remove the background and separate the nucleus. The upper HSV range corresponds to light purple color, while the lower HSV range corresponds to dark purple color. The system was trained using a CNN and then tested with a dataset of blood smear images taken with a microscope. It takes approximately 30 seconds to identify the cells, achieving a classification accuracy of 98.53%. Compared to manual diagnosis, this HSV color space-based automated approach significantly reduces diagnostic time and minimizes the chances of human error. The results demonstrate the potential of combining image processing and deep learning for the detection of ALL, making the system a valuable tool for hematology laboratories and hospitals.

Keywords: HSV color space, leukemia, CNN, image processing, ALL

Equivalent Circuit Cell Modeling for Battery-Type Supercapacitors

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In recent years, advancements in energy storage technologies have emphasized the need for accurate, efficient, and application-oriented modeling techniques, particularly for next-generation devices such as battery-type supercapacitors. This study presents the development, validation, and performance analysis of a Thevenin-based equivalent circuit model (ECM) for a commercially available battery-type supercapacitor (ESD SCAP, 2.7V, 4600F), aiming to capture its dynamic charge/discharge characteristics under realistic operating conditions. The model comprises an ohmic resistance in series with a single RC branch, providing a balance between physical accuracy and computational simplicity, which is critical for integration into real-time energy management systems. Key model parameters including internal resistance (R_0), polarization resistance (R_1), and capacitance (C_1) were extracted using empirical data obtained from a Hybrid Pulse Power Characterization (HPPC) test. The test was conducted with a KIKUSUI PLZ1205W electronic load, and parameter identification was performed using MATLAB's parameter estimation toolbox. The open-circuit voltage (OCV) versus state-of-charge (SOC) relationship was derived from experimental data and modeled using a high-order polynomial fit, with coefficients validated within a 95% confidence interval. The validity of the proposed ECM was confirmed by comparing simulated terminal voltage responses with experimentally measured values during pulse discharge events. The model achieved a relative error below 5% and a coefficient of determination (R^2) of approximately 0.9, demonstrating a high level of accuracy in representing the real-world behavior of the battery capacitor. Following model validation, a comparative analysis with a commercial 18650 Li-ion battery revealed that battery-type supercapacitors offer a promising compromise between energy density and power density. Their rapid cycling capability and long service life position them as strong candidates for high-power applications in electric vehicles and renewable energy systems. This study substantiates their potential as both alternatives and supplements to conventional Li-ion batteries.

Keywords: Equivalent circuit model, HPPC test, battery-supercapacitor

Evaluating Shielding Effects on a Central Building in Diverse Urban Layouts Using CFD Analysis

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Modern cities often feature clusters of buildings that are tightly packed to accommodate growing populations. In such settings, the close clustering of buildings introduces unique challenges to structural stability, as wind interactions such as vortex shedding, shielding, and downwash effects which can significantly influence building performance. Previous research on wind effects have largely focused on specific configurations of two or three buildings, leaving the influence of varying urban morphologies less explored. This research seeks to investigate the wind shielding effect across three key city layouts integrating 25 building units, offering a broader perspective on wind interactions with respect to different city arrangements. This study employed Computational Fluid Dynamics (CFD), utilizing the Reynolds-Averaged Navier-Stokes (RANS) approach in conjunction with the Shear Stress Transport turbulence model ($2k-\omega\ SST$). In the CFD model development, the mesh size around the building edges was set to 0.9 m, with an element size growth rate of 1.05. City layout I (CL-I) and II(CL-II) feature a central high-rise building ($120\ m$ height), while City layout III (CL-III) has a central low-rise building ($6\ m$ height). In CL-I, the surrounding buildings have a uniform height, and the key non-dimensional parameter is the relative height (λ). In contrast, CL-II and CL-III feature varying building heights, characterized by the slope angle (θ), with the non-dimensional parameters α and β representing the relevant geometric variations. The wind profile followed a power law distribution, with a reference wind velocity of $5\ ms^{-1}$ measured at a height of $10\ m$ above the ground. The parametric study evaluated the normalized base moment of a central building across three city layouts. In CL-I, the moment peaks at 104.24% when $\lambda = 0.25$, where the central building is four times taller than its surroundings, and then declines. In CL-II, the highest moment of 83.12% occurs at $\alpha = 0$ (slope angle 45°), followed by a gradual decrease and a sharp drop beyond $\alpha = 0.5$. In CL-III, the moment increases with β, reaching a maximum of 500.36% at $\beta = 1$ (slope angle 45°), with a notable rise in absolute base moment when surrounding buildings are taller than the center building. This study examines how wind shielding effects change with different city layouts, providing insights for city designers to optimize building arrangements and enhance structural stability against wind forces.

Keywords: Base moment, CFD simulation, shielding effect, turbulence models, urban layouts, urban morphologies

Evaluating the Impact of Seashell Fragments on the Durability Characteristics of Sri Lankan Sea Sand Concrete

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The extraction of sea sand in Sri Lanka began in the early 1990s, establishing it as the primary alternative to traditional fine aggregates over the past three decades. Despite its economic and environmental advantages, concerns over residual seashell content have limited its widespread adoption by local contractors. Sea sand undergoes a washing and sieving process to remove water-soluble chlorides and coarse particles, including larger seashells. However, finer shell fragments (≤ 4 mm) remain in the sand, raising concerns about their potential impact on concrete performance. This study aimed to investigate the influence of varying seashell fragment content (up to 5%) on the durability performance of concrete made with processed sea sand, particularly under chloride and chemical exposure environments. Natural sea sand samples were obtained from the Muthurajawela main sea sand yard. The shell content distribution was first characterized. Test specimens were prepared by combining shell-free sea sand and isolated shell particles based on their natural distribution to achieve targeted shell contents ranging from 0% to 5%. The specimens were subjected to durability testing, including Accelerated Corrosion Testing (ACT) and Rapid Chloride Penetration Testing (RCPT), to assess resistance to chloride ingress. Additionally, performance under chemical attack was evaluated using sulfuric acid exposure to simulate aggressive environmental conditions. ACT and RCPT results indicated no significant increase in corrosion risk at shell contents typical of processed sea sand in Sri Lanka (1–3%). Chemical exposure significantly reduced the strength and caused mass loss in the specimens. Under sulfuric acid exposure, specimens experienced notable strength and mass losses. However, these degradations were not found to correlate with varying shell content, suggesting a negligible influence of shell fragments on chemical resistance. The findings confirm that seashell contents typically present in Sri Lankan processed sea sand do not adversely affect concrete durability. This supports the continued use of sea sand as a sustainable and technically viable substitute for traditional fine aggregates in structural concrete, particularly for marine and coastal applications.

Keywords: Corrosion resistance, chloride ingress, durability, sea sand, shell fragments, Sri Lanka

Evaluation of Adsorption Efficiency of The Readily Available Adsorbents to Treat Wastewater Contaminated with Personal Care Products – Hair Dye

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Personal care products (PCPs) are emerging pollutants that need solutions at the source. Using adsorbents from agricultural by-products to remove pollutants from PCPs can be an effective solution. A study was conducted to assess the adsorption performance of burned bricks, biochar derived from paddy husk, and coconut shells and their combinations in a permeable reactive barrier (PRB) system for the removal efficiency of the pollutant for the most popular hair dye (B_1) wastewater. A questionnaire survey was conducted in 23 beauty salons in Peradeniya to find the most popular type of hair dye (Brand 1) and wastewater generation. Seven treatments 100:0, 75:25, 65:35, 50:50, 35:65, 25:75, and 0:100 biochar and bricks combinations were packed in PVC columns with 0.11 m diameter and 0.5 m length. In this preliminary study, the biochar materials, i.e., paddy husk and coconut shell, were not mixed. The size of all the adsorption materials was 2 mm. The hair dye (B_1) i.e., concentration of 0.5 g/L was sent through the column with a hydraulic retention time of 0.7 hours (42 minutes) in a horizontal flow system. The Fourier transform infrared spectroscopy (FTIR) analysis was conducted for the adsorption materials to find the molecular structural changes after adsorption. It was found that the combination of 35% bricks and 65% paddy husk biochar i.e., porosity of 68.78% had a statistically significant ($p < 0.05$) nitrate removal efficiency of around 55.49%. On the other hand, 75% bricks and 25% coconut shell biochar i.e., the porosity of 55.15% showed the highest nitrate removal efficiency of 37.39% among the treatments. Moreover, FTIR results showed aromatic ingredients of the dye molecules interact with the organic components of the bricks where the dye adsorption takes place. Further, surface functional groups of the biochar are essential to dye adsorption processes. Future field studies are recommended using wastewater generated from the saloon which has a mixture of PCPs for the identified best combination of adsorption materials.

Keywords: Personal care products, hair-dye, paddy husk biochar, coconut shell biochar, adsorption

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Evaluation of Wind Effects on Lift-Up Buildings Using Computational Fluid Dynamics Analysis

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Wind-structure interactions have become more complex with the rise of taller, intricately designed buildings in densely populated urban areas. Lift-up buildings, with open ground floors, are particularly vulnerable to wind-induced downwash, affecting both structural performance and pedestrian comfort. Traditional methods, such as wind codes, provide quick estimates but fail to capture the complexities of urban wind behaviour. While wind tunnel testing offers precision, it is resource-intensive and time-consuming. This study employs Computational Fluid Dynamics (CFD) to analyse wind downwash effects on lift-up buildings in high-density urban environments. The Reynolds-Averaged Navier-Stokes (RANS) method with the Shear Stress Transport turbulence model (2k-ω SST) was used in CFD simulations. The CFD results were validated against wind tunnel data of existing literature. The CFD model for the individual building exhibited a Mean Absolute Percentage Error (MAPE) of 7.39%, while the correlation achieved between the CFD data and the wind tunnel data for the urban environment model was 81.21%. For the parametric study, a computational domain with a base mesh size of 3m and mesh control of 0.375m at building surfaces and edges was used. In the parametric study, the model featured a central high-rise lift-up building (120 m height) surrounded by 8 other buildings. The study explores the effects of varying lift-up core height, shape, urban layout, and wind direction, simulating 48 different configurations to understand wind flow interactions with lift-up structures. Additionally, mitigation strategies such as wind barriers and vegetation are evaluated to reduce downwash intensity and improve pedestrian comfort. By investigating diverse lift-up building configurations and urban settings, this research contributes practical insights for architects, urban designers, and engineers. Ultimately, the findings aim to support the development of safer, more comfortable, and sustainable urban environments, better prepared to handle the aerodynamic challenges of modern cityscapes.

Keywords: CFD simulation, downwash effect, lift-up buildings, pedestrian comfort, urban environments

Fabrication of Dye-Sensitized Solar Cells Based on Natural Pigments Extracted from the *Bixa Orellana* Seeds

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Dye-sensitized solar cells (DSCs) have gained attention as a viable alternative to conventional silicon-based solar cells, offering advantages such as low-cost fabrication, flexibility, and reasonable efficiency. Operating on a principle similar to natural photosynthesis, DSCs employ light-absorbing dyes to convert solar energy into electricity. While synthetic dyes like Ruthenium-based N719 and N3 have been the standard, their expense and environmental impact have spurred interest in natural alternatives. In this study, we introduce *Bixa orellana* (annatto) seed extract as a novel, sustainable sensitizer for DSCs. The extraction process involved heating annatto seeds in absolute ethanol (100 mL) at 80°C, producing a reddish-orange solution containing the carotenoid pigments bixin and norbixin. The photoanode was prepared using a TiO_2 P25-based paste (0.65 g TiO_2, 5 ml titanium isopropoxide, 5.5 ml acetic acid, and 5 ml distilled water), which was deposited via drop-casting and sintered at 500°C for 30 minutes. The complete DSC assembly consisted of the dye-coated TiO_2 photoanode, a platinum counter electrode, a mask with a window size of 0.20 cm^2, and an I^-/I_3^- liquid electrolyte. Under standard AM 1.5G illumination (100 mW cm^{-2}), the fabricated cell achieved a power conversion efficiency (PCE) of 0.47%. The incident photon-to-current efficiency (IPCE) spectrum showed a maximum response of ~ 40%, confirming effective light absorption by the bixin/norbixin dye. UV-Vis spectroscopy further validated the presence of these carotenoids, supporting their role as photoactive sensitizers. These findings demonstrate the feasibility of *Bixa orellana* pigments as cost-effective, eco-friendly alternatives to synthetic dyes in DSC applications. Future research could focus on optimizing dye extraction and device architecture to enhance performance, contributing to more sustainable solar energy technologies.

Keywords: *Bixa Orellana*, dye-sensitized solar cells, natural dye, bixin, norbixin, drop casting

Fire-Cyclic Load Interaction Effects on Collapse Mechanisms in Steel Moment-Resisting Frames

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Steel is a high strength construction material which is used in rapid construction. However, despite its advantageous properties, it can exhibit significant vulnerability when subjected to combined fire and seismic loads due to the thermal degradation of its material properties. Which can also be considered as a critical multi-hazard scenario inadequately addressed in current design practices. This study investigates the interaction of fire and cyclic loading on collapse mechanisms in a four-bay, two-story hollow steel moment resisting frame. The main objective is to quantify structural robustness and identify design parameters influencing progressive collapse. A coupled Computational Fluid Dynamics (CFD) and Finite Element Method (FEM) approach was employed. PyroSim simulated spatially non-uniform fire scenarios which is the CFD part, and thermal-structural analyses was conducted using ABAQUS. The coupling of those two approaches was done by mapped temperature data via the FDS2FEM tool. Cyclic loading, simulating seismic action, was applied after the thermal analysis, incorporating combined hardening models to account for material nonlinearity. The methodology was validated against experimental tests. After that, parametric study was examining the effect of fire locations and variations in beam flexural stiffness on collapse behavior. The results demonstrated that fire exposure at columns subjected to cyclic loading caused the most severe degradation, reducing the structural robustness ratio to 0.93, which indicate the structure was close to collapse. Conversely, increasing flexural stiffness of the middle bay beam by 25% improved robustness to 0.96. Nonlinear analyses revealed that the ability of the structure to redistribute loads mainly depended on the beam stiffness. These findings underscore the critical influence of fire localization and beam design on collapse resistance. The study advances a validated framework for multi-hazard resilience assessment, emphasizing the need to integrate fire-seismic interactions into structural codes.

Keywords: CFD-FEM coupling, fire-cyclic interaction, progressive collapse, steel moment-resisting frames, structural robustness

Generative AI-Powered Centimetre-Precision Indoor-Outdoor Navigation System Using RTK and UWB Technologies for Accessibility and Industrial Applications for the Visually Handicapped Community

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Accurate navigation remains a challenge in environments where GPS is unreliable or lacks precision, especially impacting individuals with disabilities. This study addresses this gap by developing a centimetre-precision hybrid navigation system that combines Real-Time Kinematics (RTK), Ultra-Wideband (UWB) technologies, and Generative AI to enable real-time, accessible guidance with industrial scalability. The system architecture includes fixed base stations built using TTGO T-Energy ESP32 modules with barometers, u-blox ZED-F9P RTK modules for high-precision outdoor positioning, and Decawave UWB modules for accurate indoor localization. A mobile application connects to these base stations, delivering real-time navigation enhanced by Generative AI, which optimizes routes, detects floor transitions, and provides visual, audio, and haptic feedback. RTK, UWB, and NFC-enabled wristbands support personnel tracking, attendance management, and access control in industrial environments. A field test conducted showed a consistent navigation accuracy within 10-20 cm in mixed indoor-outdoor environments. User trials with 12 participants, including individuals with visual and mobility impairments, reported an 80% success rate in reaching destinations independently. Industrial test users noted improved efficiency in personnel tracking and access control workflows. Combining RTK and UWB significantly improves spatial accuracy, while Generative AI adds context-awareness, dynamically adjusting routes based on floor levels, obstacles, and user preferences. Feedback mechanisms were well-received by users with disabilities, enhancing confidence and autonomy. Industrial users benefited from real-time monitoring and centralized data access. This system presents a robust, scalable solution that bridges accessibility and industrial needs through AI-enhanced, high-precision navigation. Its modular design enables nationwide deployment, transforming how people navigate complex environments-supporting independence, safety, and operational efficiency.

Keywords: Generative AI, real-time kinematics, ultra-wideband, indoor-outdoor navigation, assistive technology

Green Manufacturing Scoring System: Ranking Conventional Production Techniques

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Green manufacturing integrates environmental considerations into production systems, focusing on reducing energy consumption, material waste, and emissions. As industries strive for sustainability, green manufacturing has become vital to balance productivity with environmental stewardship. In recent years, growing interest has been in identifying and implementing greener alternatives and optimizing existing manufacturing processes (MPs) to meet sustainability goals. Manufacturing sustainability is often evaluated through multiple dimensions, including material efficiency, energy consumption, waste generation, and environmental impact. However, despite the critical importance of sustainability in production, comparative assessments of traditional MPs on these factors are limited. In this study, eight commonly used traditional MPs were ranked based on four major criteria, namely, energy efficiency, material efficiency (defined as Output-to-input mass ratio), waste generation, and environmental impacts. Each criterion was scored on a scale of 1 (poor) to 5 (excellent) based on the literature and industrial survey. This study aimed to propose the best manufacturing strategy for the automotive and aerospace industries in their cradle-to-grave system boundary, starting from raw material production to product manufacturing. Scores were derived from weighted literature and expert surveys, with normalization based on standardized sustainability metrics. These scores were aggregated into a total score and ranked to identify the order of sustainable MPs. Results show that forging is the most sustainable process (SP), while die casting is the least SP. This is mainly due to the high waste and environmental impacts. Casting, machining, sheet metal forming, injection moulding, extrusion, and welding were included in the list. To further expand this analysis, the list of processes was compared with the Additive MPs, specifically, Wire and Arc Additive Manufacturing (WAAM) technique, which proved to be an excellent alternative for conventional manufacturing in the automotive and aerospace sectors. Ultimately, the WAAM technique dominated the list due to its great material efficiency and moderate environmental impact. The findings of this study provide valuable insights for manufacturers looking to select more SPs, especially in the context of reducing material waste, energy consumption, and environmental impact. By providing a clear and comparative ranking, this work contributes to the ongoing effort to transition towards greener manufacturing practices. This ranking can be further expanded for newer, emerging technologies that could potentially outperform traditional processes in terms of sustainability.

Keywords: Additive manufacturing, Likert scale, sustainability assessment, traditional manufacturing, wire and arc additive manufacturing

Home Energy Eco Management System for Bidirectional Electric Vehicles Charging and Discharging with Grid Support Capabilities

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As electric vehicles (EVs) become a more common part of our daily lives, there's a growing need for smarter ways to manage how they interact with home energy systems and the wider power grid. This research introduces a Home Energy Eco Management System (HEEMS) designed to make the most of bidirectional EV charging, where EVs don't just take power from the grid, but also give it back when needed. At the heart of the system is a specially designed onboard charger that works seamlessly with a three-phase active rectifier and an LCL filter, helping reduce power losses and improve control. While many homes still run on single-phase connections, the three-phase setup was chosen to prepare for future smart homes and community energy sharing setups where higher loads and better phase balancing are needed. The system also includes solar power (PV) optimised using a Perturb and Observe MPPT algorithm and connects with a battery energy storage system (BESS) to ensure smooth power delivery. One of the key focuses of this work is showing how homeowners can benefit from the system, especially those on time-of-use tariffs, by shifting their energy use to save money and support the grid during high-demand hours. To preserve battery health, the system incorporates C-rate control to improve state of health (SoH) and extend battery lifespan. Simulations conducted under varying sunlight conditions and EV usage profiles show that HEEMS reduces peak electricity demand by up to 28%, increases solar energy utilisation by 35%, and improves battery life by 12%. These outcomes demonstrate the system's potential not only to save energy costs for users, especially those under time-of-use tariffs, but also to support grid stability through peak shaving and valley filling. In summary, HEEMS provides a forward-looking, practical solution for households aiming to actively manage their energy, reduce grid dependence, and contribute to a more resilient and sustainable energy future.

Keywords: Bidirectional EV charging, home energy eco management system, onboard charger, vehicle-to-home (V2H), state of health (SoH)

Hybrid Intrusion Detection Using IoT: Enhancing Organisational Security Through a Real-Time ESP8266-Based Physical Alert Framework

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Physical intrusion is a significant yet frequently disregarded organisational cybersecurity vulnerability, especially in decentralised environments such as small and medium-sized enterprises (SMEs) and educational institutions. Physical access points are frequently left vulnerable, while logical protections such as firewalls and authentication procedures are frequently employed. This study presents a hybrid intrusion detection framework that integrates traditional network security measures with real-time, Internet of Things (IoT)-based physical alert systems. This research fills a gap by offering a scalable and low-cost solution for environments lacking extensive surveillance infrastructure. This study aims to evaluate the effectiveness of a hybrid intrusion detection system that combines enterprise network security protocols with IoT-based physical alert mechanisms. Specifically, the study investigates how integrating IoT-based physical alerting with traditional network security measures can enhance real-time intrusion detection and offer a cost-effective security solution for decentralised organisations. The hybrid framework was designed using logical security configurations, including Access Control Lists (ACLs), Dynamic Host Configuration Protocol (DHCP), Secure Shell (SSH), and port security, simulated in Cisco Packet Tracer. A physical prototype was built using an ESP8266 Wi-Fi microcontroller, Passive Infrared (PIR) motion sensor, piezoelectric buzzer, Inter-Integrated Circuit (I^2C), Liquid Crystal Display (LCD), and Message Queueing Telemetry Transport (MQTT) protocol for real-time alert delivery via Telegram. The system's performance was assessed for latency and communication efficiency during several trials. The study found that the system had an average motion detection latency of 500 milliseconds and alert delivery within 1000 milliseconds. The results confirm that the system is reliable and suitable for real-world deployment in resource-constrained environments. This study contributes a scalable, affordable hybrid framework to decentralised cybersecurity research and practise by combining logical network protocols with Internet of Things (IoT)-based physical intrusion detection to enhance real-time organisational security.

Keywords: Hybrid intrusion detection, IOT security, physical cybersecurity, decentralised environments, real-time alerts, network security protocols

Identification of Cracks in RC Beams Using Computer Vision Techniques

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Crack monitoring is a crucial aspect of Structural Health Monitoring (SHM) for key infrastructures like dams, beams and chimneys. Traditionally, it relies on manual inspection by engineers, which is time-consuming, costly, subjective, and prone to human error. Additionally, certain areas of civil structures are difficult to access, making consistent crack monitoring challenging. The aim of this study is to develop a framework for the classification of cracks in concrete beams and quantify parameters related to cracks using image processing and machine learning. This framework can be further extended to large-scale structures, which will be highly beneficial in automated structural health monitoring. This study uses Machine Learning (ML), Convolutional Neural Network (CNN) and image processing techniques for the classification of cracks and quantification of crack parameters. The data utilized in this study consist of images obtained from publicly available datasets as well as from laboratory-tested concrete beams. Images from previous data sets were used to train the convolutional neural network models and the images from the laboratory tests were used to evaluate accuracy of the framework. The parameters that are quantified in this study are crack length, width, density, fractal dimension, location and orientation. In the proposed framework, a concrete beam is first classified as either cracked or uncracked using an improved convolutional neural network, achieving 98% accuracy with an inference time of 0.272 seconds. After that the image is further processed by generating a bounding box around the crack using a YOLOv8 model. Then, the crack in the image is segmented for better visualization using Segment Anything Model (SAM). Using the segmented image, crack parameters are measured using image processing techniques such as clustering, contour detection, RANSAC detection and box counting. The crack parameters are quantified with a maximum error of less than 10%. The proposed framework not only streamlines the process of remote crack monitoring but also significantly enhances the accuracy and reliability of crack parameter quantification, contributing to safer and more cost-effective maintenance of reinforced concrete structures.

Keywords: Concrete beams, computer vision, convolutional neural network, crack monitoring, structural health monitoring

Impact of Rice Flour Particle Size on Its Physical Characteristics and Preference for Sensory Attributes of String Hoppers

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The particle size of rice flour plays a crucial role in its functional properties, but its effect on the quality of traditional string hoppers is not well understood. This study explored the impact of rice flour particle size (< 63 µm and 100–200 µm) and initial moisture content (6% and 15%) of raw rice on the physical properties of the flour and the sensory characteristics of string hoppers. Red raw rice was milled following standardized procedures, sieved into separate particle size fractions, and evaluated for water absorption capacity, swelling capacity, and viscosity. A thorough sensory evaluation was carried out using ranking tests with both untrained (n = 30) and trained (n = 5) panels, assessing six key attributes: color, aroma, firmness, flavor, stickiness, and overall acceptability. The results indicated that rice flour with a particle size of < 63 µm and 6% moisture content exhibited the highest water absorption capacity ($P < 0.05$), which is essential for effective dough hydration and extrusion processing. There were no significant ($P > 0.05$) differences in swelling capacity across particle sizes, suggesting that gelatinization properties were minimally impacted. Viscosity measurements showed significant ($P < 0.05$) differences, with finer particles demonstrating optimal pseudoplastic behavior, which is ideal for dough formation and uniform strand consistency. Sensory evaluation revealed a clear preference for the string hoppers prepared using finer flour (particle size < 63 µm), attributed to its smooth texture, consistent strand formation, and improved mouthfeel. Retrogradation studies conducted over four hours after preparation showed that finer particle formulations retained better firmness. Microscopic analysis confirmed the uniform structure of < 63 µm flour, which explains its superior hydration and textural properties. Reducing particle size (< 63 µm) and controlling moisture content (6%) significantly enhance functional and sensory qualities. Using advanced fine-milling techniques like jet milling ensures consistent particle size, offering practical solutions to improve production efficiency while preserving traditional sensory characteristics.

Keywords: Rice flour, particle size, string hopper, sensory evaluation, moisture content

Integrating Fingerprint Authentication and Two Factor Verification Using Arduino, Laravel, and Blockchain-based Vote Logging

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Electronic voting systems promise to enhance election efficiency but remain susceptible to challenges such as voter impersonation, double voting, and data tampering. This paper introduces a low-cost, secure biometric electronic voting system that combines fingerprint authentication, One-Time Password (OTP)–-based two-factor verification, and blockchain-inspired vote logging to mitigate these issues. The system is built using an ESP32 microcontroller, R305 fingerprint sensor, 4x4 keypad, Liquid Crystal Display (LCD) interface, and tactile voting buttons. Voter authentication is conducted through a dual-layer process involving biometric verification and OTP transmission via SMS. A Laravel-based administrative web application supports live monitoring, data analysis, and backend security, incorporating features like password hashing with Bcrypt and Advanced Encryption Standard (AES) encryption for sensitive data. To ensure the integrity and immutability of votes, a Merkle tree–derived structure is used for storing voting records, while session activity is timestamped and actively monitored for tampering. Unlike traditional e-voting systems, this solution integrates multi-factor authentication with blockchain logic at the hardware level, improving resistance against vote manipulation and unauthorised access. Testing involved 20 participants across varying age and digital literacy groups, achieving 100% authentication accuracy, an average voting time of 21 seconds, and no instances of unauthorised or duplicate voting. Although the dataset is preliminary, expansion to over 100 users is planned to reinforce performance evaluation and scalability. User feedback indicated 95% satisfaction, highlighting usability even for non-digital-native voters. Administrative dashboards enable secure result export and real-time monitoring. The proposed solution demonstrates strong viability for secure elections at institutional levels and introduces a replicable, tamper-evident framework for future digital voting systems. The novelty of this work lies in the seamless integration of biometric and OTP verification with immutable vote storage, offering a transparent and auditable model suited for scalable, secure, and inclusive applications.

Keywords: Biometric authentication, electronic voting, two-factor authentication, blockchain, ESP32, laravel

Integrating IoT-Enabled Real-Time Data Analytics with Lean Six Sigma for Smart Manufacturing Optimization

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The emergence of Industry 4.0 has transformed manufacturing by integrating technologies such as the Internet of Things (IoT) and real-time analytics with Lean Six Sigma (LSS). This study proposes a structured framework that embeds IoT-enabled predictive analytics within the DMAIC (Define, Measure, Analyze, Improve, Control) cycle to optimize batch production processes. Conducted in a mid-scale garment manufacturing facility, the case study involved deploying smart sensors on sewing and finishing machines to monitor parameters such as machine speed, idle time, and defect frequency. These data streams were analyzed using random forests and k-means clustering to predict equipment issues and identify inefficiencies in production flow. The integration followed the five-step DMAIC approach: inefficiencies and defects in stitching and finishing were defined, IoT sensors captured real-time data on machine speed, idle time, and defect patterns, and root causes, such as operator fatigue and machine imbalance were analyzed using random forest and k-means clustering. Improvements included balancing operator workload, automated defect alerts, and optimized machine settings. Control was maintained through real-time dashboards and feedback loops. Over three months, the mid-scale batch garment production line saw a 22% reduction in cycle time, 35% decrease in defects, 27% drop in unplanned downtime, and a 40% reduction in emergency maintenance due to predictive interventions. Overall Equipment Effectiveness (OEE) improved from 68% to 82%. While the integration yielded substantial benefits, challenges included system interoperability, organizational resistance stemming from the nature of the production line and hesitancy among frontline workers, and concerns about data security. Addressing these issues required cross-functional training and secure data management protocols. This study provides a scalable and practical roadmap for integrating IoT with LSS in small to mid-sized enterprises (SMEs), supporting faster decision-making and sustainable improvements. In addition to supporting digital transformation, the framework enhances SME readiness for cross-factory integration and broader industrial scalability.

Keywords: Industry 4.0, IoT (internet of things), lean six sigma (LSS), real-time analytics, smart manufacturing

IoT-Enabled Low-Power Wearable Pedometer for Accurate Step Counting and Real-Time Ambient Condition Tracking

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With the rise in health consciousness and wearable technologies, there is a growing demand for low-cost, compact, and energy-efficient devices capable of accurate activity tracking. However, many existing pedometers fall short in precision, battery efficiency, and real-time monitoring, and rarely consider environmental conditions such as temperature and humidity that may influence user behavior and sensor performance. This project presents the design and implementation of a rechargeable, IoT-enabled wearable pedometer that combines accurate step counting with ambient condition tracking. The device integrates an ESP32 microcontroller, MPU6050 accelerometer, and DHT11 sensor on a custom-designed, compact circuit board optimized for low power consumption. A custom step detection algorithm was developed and tested to enhance counting accuracy under various walking conditions. Data was collected by wearing the device during indoor and outdoor walking sessions across different temperature and humidity levels. Motion and environmental data were transmitted via the MQTT protocol and stored in a Firebase real-time database for cloud-based analysis. A Flutter-based mobile application was used to visualize real-time data and enable user interaction. Experimental results showed consistent step counting accuracy across variable conditions, with an average power consumption that allows extended operation on a single charge. The inclusion of temperature and humidity monitoring enabled the analysis of correlations between environmental changes and variations in physical activity patterns. The original contribution of this work lies in the seamless integration of multi-sensor data collection (steps, temperature, humidity), energy-efficient real-time communication, and cloud-based analytics in a single wearable system. This opens up new opportunities for behavioral health monitoring and personalized feedback in smart fitness applications.

Keywords: Wearable devices, step counting, ESP32, MQTT, temperature and humidity, firebase, IoT, low-power electronics

Lightweight Concrete Made with Complete Substitution of Natural Coarse Aggregate with Recycled Plastic Waste

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Plastic waste accumulation presents a critical environmental concern. Repurposing this waste in construction can contribute to sustainable development and waste management. Recently, the incorporation of recycled plastic coarse aggregates (PCA) as an alternative to natural coarse aggregates (NCA) in concrete is emerging as a sustainable solution. This research explores the feasibility of completely replacing NCA in concrete with PCA. The primary aim was to assess the workability, mechanical performance, and density characteristics of such concrete mixes and determine whether they could meet the performance benchmarks set for structural lightweight concrete in ASTM C330-05 standard. An experimental study was designed targeting a normal strength concrete mix and tests were conducted. The plastic waste used was sorted, cleaned, and shredded into aggregate sizes ranging from 4 mm to 10 mm. The concrete mix containing 100% PCA demonstrated satisfactory performance in terms of workability and mechanical properties. In this mix, 20% of the cement was replaced with pozzolanic fly ash. A slump value of 40 mm was recorded for this mix, indicating moderate workability. The compressive strength values of 12.49 MPa at 7 days and 19.82 MPa at 28 days were obtained. These results surpass the minimum 28-day compressive strength requirement of 17 MPa set by ASTM C330-05 for lightweight structural concrete. The hardened density of the plastic concrete (PC) was 1675 kg/m³, well below the maximum limit of 1840 kg/m³ defined by the standard. This clearly indicates that the PC qualifies as lightweight concrete in both strength and density categories. PC is a promising material for applications where dead load reduction is a priority. The findings offer a viable solution for reusing plastic waste in large volumes while also reducing the reliance on non-renewable natural aggregates. The PC supports the broader goal of achieving circular economy practices within the construction sector with compromise in the fire resistance capability.

Keywords: Lightweight concrete, plastic aggregates, workability, compressive strength, sustainable construction

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Machine Learning for Anaemia Subtype Classification: A Neural Network Study

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Anaemia is a major blood disease worldwide. According to the World Health Organisation (WHO), it occurs when the red blood cell count or their oxygen-carrying capacity is inadequate to meet the physiological needs of the body. Accurate and timely identification of anaemia subtypes is essential for effective treatment. Traditional diagnostic methods require multiple blood tests, radiological imaging, and other procedures to accurately diagnose and identify specific anaemia subtypes. These methods can be expensive and inaccessible in resource-limited settings. This study proposes an artificial neural network-based approach to accurately classify anaemia types using Complete Blood Count (CBC) data. We used a publicly available dataset comprising 15,300 patient records obtained from Tokat Gaziosmanpaşa University, covering five classes: non-anaemia records, Hgb-anaemia, folate deficiency anaemia (FDA), iron deficiency anaemia (IDA), and B12 deficiency anaemia. Data normalisation was performed to address the substantial numerical differences in parameter values, and the Synthetic Minority Over-sampling Technique (*SMOTE*) was employed to rectify class imbalances within the dataset. Four artificial neural network models —Residual Network (*ResNet*)-based model, Recurrent Neural Networks (*RNN*), Multilayer Perceptron (*MLP*), and Convolutional Neural Networks (*CNN*), were employed on the dataset, and the performance of the models was evaluated using accuracy, precision, recall, and F1-score metrics. ResNet achieved the highest accuracy (97.34%), followed closely by RNN (97.31%), MLP (96.45%), and CNN (93.82%). The RNN yielded the highest macro F1-score (0.92), outperforming ResNet (0.89), MLP (0.85), and CNN (0.58). Both ResNet and RNN exhibited exceptional performance across the majority and minority classes, with RNN achieving the best F1-scores for minority classes, 0.93 for folate anaemia and 0.83 for B12 anaemia. This study highlights the potential of machine learning in improving anaemia diagnosis accuracy and efficiency, particularly in resource-limited settings. The findings suggest that AI-based tools can assist healthcare professionals in making faster, more accurate diagnoses, ultimately enhancing patient care and supporting informed clinical decision-making.

Keywords: Anaemia, classification, diagnosis, machine learning, neural networks

Opportunities for Food Waste Reduction and Valorisation in Supermarkets and Municipal Markets in Colombo, Sri Lanka

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Supermarkets and municipal markets are major sources of organic waste. Around 43% of supermarket waste is biodegradable, but there is limited local data and a lack of practical solutions. This study focuses on food waste from Colombo's markets, exploring how to reduce waste, understand its nutritional value, and check the feasibility of on-site biogas production and cold storage optimization. The research collected quantitative data from supermarkets and municipal markets by estimating waste volumes. Interviews with waste management professionals provided qualitative insights. Food waste was categorised into different groups, and nutritional and energy values were calculated using literature. Models from previous studies were used to estimate how lower temperatures affect shelf life, and energy usage for cooling was assessed to evaluate the return on investment. The biogas potential was also estimated based on waste type and amount. Municipal markets were found to generate an average of 39.24 kg of vegetable waste and 13.33 kg of fruit waste daily. Shelf life of vegetables such as cabbage, carrot, and ribbed gourd could be increased by 133% at 17°C, and up to 200% at 10°C. However, energy use rises as temperature drops, reaching 155.32 MJ/kg at 10°C. Despite low fish consumption in Sri Lanka, fish has the highest economic potential for preservation below 15°C. Supermarkets waste around 3.5 kg of dairy daily enough to meet the needs of 32 people while most families consume dairy only once a week. About 70% of shelf life can be retained when dairy is stored at 12°C. The study highlights that improved storage and waste analysis can help reduce waste and recover value, providing useful guidance for policymakers and businesses.

Keywords: Food waste, supermarkets, sustainability, waste management, storage temperature

Optimization of Selected Process Parameters for *Cinnamomum Verum* Bark Extract-Mediated Green Synthesis of Silver Nanoparticles

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Sri Lanka is renowned for producing premium-quality *Cinnamomum verum* (Sri Lanka) known as true cinnamon, a valuable spice with diverse bioactive properties. Leveraging cinnamon bark for value-added applications like green nanotechnology offers sustainable economic opportunities. Addressing the need for eco-friendly nanoparticle synthesis methods, the research aims to optimize selected process parameters, namely temperature, reaction time, and plant extract volume, for the green synthesis of silver nanoparticles (AgNPs) using aqueous Cinnamomum verum bark extract (CVBE). The objective is to enhance the efficiency and stability of AgNPs synthesis, contributing to both scientific advancement and local cinnamon-based innovation. Initially, CVBE was identified as a potential reducing agent due to its potential antioxidant capacity, which was determined to be 20.5 µmol Trolox equivalents per mL (TEAC = 20.5 µmol TE/mL) using the DPPH assay. The synthesis process was optimized using Response Surface Methodology (RSM) with a 15 trial Box-Behnken Design (BBD) in Minitab (version 22.1.0, trial version). The synthesis of CVBE-AgNPs was visually indicated by the colour change of the initial solution from pale yellow to dark brown and further confirmed by UV-Visible spectroscopy, which showed characteristic absorption peaks in the 419–434 nm suggesting the formation of stable spherical nanoparticles. Among the process parameters, temperature had the most significant effect on AgNPs synthesis, contributing 45.42% ($p = 0.007$) followed by time, which was marginally significant (12.17%, $p = 0.074$) and volume, which was not significant (3.74%, $p = 0.266$). Notably, the interaction between temperature and volume also showed a marginally significant effect (13.02%, $p = 0.067$). The highest absorbance of at 431 nm was achieved under the conditions of 80°C, 5.5 hours, and 5 mL of CVBE, with a maximum yield. These findings confirm that temperature plays a critical role in optimizing the green synthesis process, with CVBE effectively reducing and stabilizing silver nanoparticles under the identified conditions.

Keywords: *Cinnamomum verum*, green synthesis, silver nanoparticles, antioxidant activity, DPPH assay

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Optimizing Sensor Techniques for Structural Health Monitoring of Concrete Dams: A Review of Technologies, Challenges, and Future Directions

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Structural health monitoring (SHM) is a crucial component in ensuring the safety and longevity of concrete dams. With increasing infrastructure aging and environmental challenges, efficient SHM methodologies remain a requisite for early damage detection and preventable maintenance actions. Optimized sensor techniques are essential for reliable monitoring. However, it is a technical and practical challenge. This work evaluates newly emerging types of sensors and unravels sensor placement issues against complex external loads and environmental conditions. Furthermore, advanced algorithms and techniques are investigated to increase the monitoring soundness and safety of the structure. First, the review examined established sensor technologies, including infrared thermography, acoustic emission, IoT, wireless smart systems, fibre-optic sensors (FOSs), distributed optical fibre sensors (DFOSs), and Bragg grating sensors. Then the optimization methods such as the Improved Artificial Hummingbird Algorithm (IAHA) and Quantum Genetic Algorithm (QGA) were investigated. These advanced algorithms help in the efficient placement of sensors. Moreover, how machine learning techniques can be used for the interpretation of sensor data is also investigated. The findings of this study show that advanced sensing techniques such as IoT, wireless smart systems, FOSs and DFOSs work well for real-time, high-resolution monitoring of concrete structures compared to traditional methods. Their ability to provide continuous, detailed data, small size and resilience against environmental influences suggest their application with merit in complex dam environments. Despite these advancements the accuracy and the performance of the sensors were still affected by physical, structural, and environmental factors such as cracks, shrinkage joints, response time, electrical noise, humidity and thermal gradients, highlighting the need for further optimization of the sensor techniques. To address these challenges, this review outlines emerging sensor advancements such as IoT-based data fusion, self-sensing structures, machine learning for data processing and interpretation, damage detection and severity prediction, UAV deployment, and enhanced digital twin simulations along with technological and algorithmic innovations aimed at improving monitoring accuracy and reliability.

Keywords: Concrete dams, smart sensors, sensor placement, artificial intelligence, structural health monitoring

Paddy Husk Powered Electricity Generator

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Many agrarian countries, including Sri Lanka, generate substantial quantities of paddy husk - an underutilized agricultural byproduct with a thermal energy density of 12 - 15 MJ/kg. This study explores the feasibility of converting paddy husk into a renewable energy source through gasification, aiming to provide a sustainable solution for rural electrification and to reduce reliance on conventional fossil fuels. This research aims to develop a sustainable electricity generation method using paddy husk, offering an economical and eco-friendly energy alternative. It focuses on adding value to agricultural waste while establishing an independent power source for rural and off-grid communities. A prototype electricity generator was designed and fabricated using paddy husk as the fuel. The process involved raw material collection, system design, and component fabrication. The turbine, containing 20 mm fin width, was driven by three angular steam nozzles. Paddy husk was first analyzed for moisture content, then dried and fed into a gasification-based combustion chamber. Steam generated from the process powered a turbine coupled to a Direct Current (DC) machine for electricity generation. Performance data-pressure, temperature, voltage, current, and power output-were collected. Moisture and ash content analyses, along with Voltage-Current correlation graphs, were recorded to evaluate efficiency. The prototype effectively converted paddy husk into electricity. In the experimental setup, 2 kg of paddy husk was fed into a closed combustion chamber with controlled airflow. During a 30-minute cycle, the system maintained an average temperature of 202 °C and steam pressure of 30 psi. These conditions enabled an average turbine speed of 852 rpm, releasing approximately 26 MJ of thermal energy. The system was expected to convert about 29–42% of the input energy through the turbine shaft, yielding an estimated power output of 2.18 - 6.07 kW in a fully optimized configuration. Despite hardware limitations, the experiment confirmed the feasibility of using paddy husk for small-scale electricity generation. Paddy husk is a practical, renewable energy source for rural electricity generation. The findings support its role in reducing fossil fuel dependency, managing agricultural waste, and providing cost-effective, sustainable energy solutions using locally available biomass.

Keywords: Paddy husk, renewable energy, gasification, rural electrification, prototype generator

Performance of Recycled Tyre Steel Fiber on High-Performance Concrete

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High-performance concrete (HPC) has superior properties and is widely used in modern construction industries for large-scale structures. However, its inherent brittleness makes HPC highly susceptible to sudden failure under tensile stress, as it exhibits a nonlinear response before cracking and has low resistance to crack formation. Steel fiber is an effective solution for those defects, and significantly enhances tensile strength, toughness, and post-cracking behavior. Recycled Tyre Steel Fibers (RTSF) have emerged as a viable alternative to industrial steel fibers, offering comparable performance while reducing the impact on the environment as waste material and improving economic benefits. However, using RTSF in the HPC optimal length range, different aspect ratios, and volume fractions remains a critical challenge requiring further research. This study investigated the effect of tyre steel fiber with a range of aspect ratios on the properties of concrete. The experimental program evaluated fiber dosages ranging from 0.75% to 2.25% by volume. The workability of the fresh concrete was assessed through a slump test and vebe test. This indicated that slump values decreased with increased fiber dosages, and vebe time increased with dosages, demonstrating reduced workability of the mixture with fiber dosage. In the hardened concrete, compressive strength, fiber distribution, and density were evaluated. Mixtures with fiber dosages ranging from 0.75% to 2.25% exhibited improvement in compressive strength, increasing by 20.4% to 59.6% compared to the control mix (M50), but beyond 1.75% of fiber content the improvement of compressive strength shows approximately constant. Higher fiber dosages led to reduced fiber distribution and fiber balling within the concrete matrix. The density of hardened concrete increased with the fiber content, reaching maximum density at the 2.25% steel fiber dosage. Steel fiber reinforced concrete enhances the strength properties, while excessive fiber content negatively impacts workability and fiber distribution.

Keywords: High-performance concrete (HPC), recycled tyre steel fibers (RTSF), workability, strength

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Performance-Based Chloride Threshold for an Optimum Sea Sand–Manufactured Sand Blend in Concrete Fine Aggregates

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This study identifies an optimum mix ratio of sea sand and manufactured sand for use in concrete and proposes an allowable chloride content for the blend based on performance and durability considerations. Initially, concrete samples were produced using sea sand, manufactured sand (M-sand), and river sand individually to assess their basic properties, such as workability and compressive strength. Subsequent experiments involved partially replacing sea sand with M-sand at levels of 25%, 50%, and 75% to evaluate the combined effects on concrete performance. Results revealed that both sea sand and M-sand individually led to a decrease in workability compared to river sand. However, a notable improvement in workability was observed in the 50% sea sand–50% M-sand blend, highlighting the potential benefit of combining the two materials. In terms of compressive strength, sea sand yielded slightly lower values than river sand, while M-sand resulted in a more pronounced reduction. Blended samples mitigated this strength loss, with the 50–50 mix demonstrating the most balanced performance between strength and workability. To evaluate durability, accelerated corrosion tests were conducted on concrete samples prepared with all three sand types, as well as on the blended mixes using sea sand with a deliberately introduced 0.3% chloride concentration, simulating a worst-case scenario. The durability of concrete made with high-chloride sea sand was significantly lower than that of the control samples. Among the blended mixes, the 50% M-sand and 50% sea sand combination exhibited the best durability performance. In the final phase, the chloride content in the optimum blend was gradually reduced. According to Sri Lankan standards, the allowable chloride limit for fine aggregates is 0.01%. However, the 50–50 mix demonstrated satisfactory durability when compared with the control samples, even at a higher chloride content of 0.025%, due to its enhanced performance.

Keywords: Sea sand, manufactured sand, chloride content, durability

Photocatalytic Performance of Halloysite-Supported Cu Doped TiO_2 Nanocomposites for Efficient Wastewater Dye Removal

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Dye pollutants from industrial processes are considered persistent contaminants with significant environmental impact, emphasizing the need for effective and sustainable treatment methods. In this study, methyl orange was used as the model dye pollutant to evaluate the photocatalytic degradation potential of copper (Cu)-doped titanium dioxide (TiO_2) nanocatalysts, enhanced with halloysite nanoclay (HNT). The catalysts were synthesized using a vibratory mill to ensure uniform dopant dispersion and reduced particle size, while HNT was incorporated to increase surface area and photocatalytic efficiency. Photocatalytic activity was assessed under UV-visible irradiation using spectrophotometry, and degradation kinetics were analyzed based on the Langmuir-Hinshelwood model. Enhanced dye degradation was observed with Cu doping, with further improvement achieved through HNT addition. Among the tested catalysts, which included up to 5% Cu doping, the composite with the highest Cu and HNT content demonstrated the most effective degradation and the highest rate constant. The reaction followed pseudo-first-order kinetics, supported by strong regression coefficients. The combined effects of Cu doping and HNT incorporation led to improved light absorption and surface properties of the TiO_2 nanocatalysts. These findings suggest that the Cu-doped TiO_2/HNT composite is a promising candidate for the treatment of industrial wastewater and presents a feasible approach for developing high-efficiency photocatalysts for environmental remediation.

Keywords: Dye degradation, nanocatalysts, Cu doping, methyl orange, HNT

Post-War Urban Development in Vavuniya District, Sri Lanka

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The Vavuniya district, is a key administrative and commercial hub in Northern Sri Lanka, faced extensive damage and socio-economic disruption during civil war. Whereas Vavuniya has undergone significant transformation following the end of the civil war in 2009. Post-war reconstruction efforts aimed to revitalize the district, address infrastructural deficits, and promote sustainable urban development. This research employs a mixed-methods approach, combining qualitative and quantitative data. Primary data were collected through field surveys, interviews with local officials, and focus group discussion with residents. Secondary data were collected from government reports, development agency documents and existing literature. The Geographic Information System (GIS) tools was used to assess changes in land use in Vavuniya district. The findings reveal a significant transformation in Vavuniya's urban landscape. Key developments include the **expansion of residential and commercial areas (**evidenced by increased land use changes and rising land values)**, improved infrastructure such as new and upgraded roads, electricity, and water supply networks, and enhanced public services,** including **access to education and healthcare facilities.** These indicators reflect both physical and socio-economic growth in the post-war period. However, challenges persist, including uneven development, where some areas, particularly peripheral regions, lag in infrastructure improvements. Post-war development in Vavuniya has improved infrastructure and economic activity, but the growth appears largely ad-hoc. Migration and economic shifts have outpaced planning, leading to uneven access to services. Infrastructure is concentrated in urban centers, while peripheral areas lag behind. These patterns suggest reactive development rather than coordinated planning. Sustainable growth requires integrated planning and community-driven approaches.

Keywords: Urban development, land use changes, GIS

Predicting Mango Ripeness Through Image and Physicochemical Analysis: A Deep Learning Approach

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Post-harvest ripening of mangoes, particularly the TEJC variety, is challenging in terms of defining the optimal storage period based on reliance on subjective visual assessment. This leads to product quality inconsistencies and post-harvest losses. Therefore, this study aims to develop an AI (Artificial Intelligence) model capable of predicting the optimum storage period of TEJC mangoes using a deep learning model trained in image and physicochemical data. TEJC mangoes were stored under controlled conditions (24–28 °C; RH 66.4–80%) for 8 days in two batches, during which daily measurements of pH, Total Soluble Solids (TSS), firmness, and peel color (L*, a*, b*) were taken. A total of 5760 images, captured under variable lighting, were used to train and validate a ResNet50V2, fine-tuned for multi-class ripeness classification. An adjusted ResNet50V2 model, a subtype of the Convolutional Neural Network (CNN), was employed for image recognition, object detection, and color variation analysis to predict the ripeness stage of mangoes. The ripeness prediction was based on the analysis of color variations. The dataset was preprocessed by separating image and numerical data, while image preprocessing within the model included resizing, grayscale conversion, and color variation analysis. The CNN model achieved an accuracy of 66.96% on the training set and 62% on the test set. While modest, this accuracy under nonuniform real-world conditions demonstrates the model's robustness. Ripeness-related trends, such as increased TSS and pH and decreased firmness, were consistently reflected in both image features and physicochemical properties. Color measurements showed a strong correlation with ripening progression. This study is the first to apply a CNN model trained on both image and physicochemical features to predict the ripeness of the TEJC variety. The findings indicate that deep learning models, even with moderate accuracy, can provide practical, non-destructive support in post-harvest mango management. This work supports further research toward improving model precision and integrating AI into intelligent agriculture practices, aligning with SDGs 2, 12, and 13.

Keywords: TEJC mango, artificial intelligence, ripening prediction, CNN, post-harvest quality

Rapid Detection of Chemical Oxidation Demand in Wastewater Using a Centrifugal Microfluidic Chip Analysis

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Chemical oxygen demand (COD) assesses the chemically oxidisable organic matter in water. Conventional COD analysis involves 2-hour oxidation with high chemical use, followed by titration of unreacted $Cr_2O_7^{2-}$. The method is bulky, labour-intensive, and error-prone, which limits its field use. A microfluidic device was developed with two Centrifugal Microfluidic Chips (CMCs) for the *in-situ* COD analysis (dimensions: 250 × 280 × 315 mm, weight: 13 kg) for simultaneous COD analysis via the fast digestion spectrophotometric method (HJ/T 399-2007). Existing CMCs use fouling-prone membranes, while the novel CMCs use Euler and centrifugal forces for particle filtration. This study evaluates the performance of the device. Samples were manually loaded into the digestion valve, oxidised at 165°C for 15 min, and unreacted $Cr_2O_7^{2-}$ was analysed using colourimetry. Digestion, sample transferring to the CMCs, filtration, $Cr_2O_7^{2-}$ analysis, and COD calculation were automated, giving results in 25 minutes. Device performance was assessed by comparing COD analysis results with conventional analysis. Industrial and river water were analysed to evaluate the method's suitability for natural samples. The microfluidic method uses 17 times less solution, and due to both volume reduction and automation, the new device cuts analysis time by 55%. It achieved 96.7% accuracy, 5.0% uncertainty, and 2.90% RSD, representing increases of 6.85%, decreases of 49.6%, and decreases of 64.1%, respectively, compared to conventional analysis. Reducing RSD indicates an increase in precision. Filtration, which removes particles, and centrifugal force, which eliminates dissolved air, reduce light scattering and improve accuracy and precision. The linear range and lower detection limit were 0-150 and 4 mg/L. When analysing natural samples, the average relative bias of the microfluidic method was -17.29 %. In conclusion, the novel centrifugal microfluidic device is reliable for rapid COD analysis.

Keywords: Centrifugal microfluidic chips, chemical oxygen demand, filtration, *in-situ* analysis

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Real-Time Facial Emotion Recognition Framework for Classifying Mental States of Students in Online Learning Environments Using Deep Learning

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The increased reliance on online learning has exposed many students, especially children learning remotely, to emotional distress due to the lack of real-time emotional monitoring. While existing facial emotion recognition (FER) systems have shown promise in controlled environments, they often lack robustness for real-time educational settings involving variable lighting, camera angles, and child-specific emotional expressions. This paper proposes a real-time FER framework tailored to classify the mental states of students in online learning environments using deep learning. A Convolutional Neural Network (CNN) model was trained using three child-centric datasets: Laboratory of Image Informatics and Information Systems (LIRIS), Child Affective Facial Expression (CAFÉ), and National Institute of Mental Health Child Emotional Faces Picture Set (NIMH-ChEFS), enabling the recognition of emotions such as happy, sad, anxious, neutral, and angry. To address practical deployment, a mobile application developed using Android Studio captures front-camera images under natural, uncontrolled lighting and facial orientation. OpenCV is used for preprocessing, while TensorFlow handles model inference. Our system was benchmarked against DeepFace and demonstrated a classification accuracy of 92% on a sample of 1000 test images, with an average inference time of 0.18 seconds. The dataset comprises 28,709 facial samples spanning seven emotion categories. Importantly, the model was validated under varying illumination, partial occlusion (e.g., hand gestures or glasses), and multiple backgrounds to reflect real-world classroom conditions. Ethical safeguards, including informed consent and anonymised data handling, were strictly maintained throughout the study. This framework extends current literature by focusing on child-specific FER in dynamic learning environments, aiming to offer educators a non-intrusive tool for early detection of emotional disengagement. Although the system is not intended for clinical diagnosis, it contributes meaningfully to educational technology by enabling real-time, Artificial Intelligence (AI)-powered emotional awareness in digital learning spaces.

Keywords: Facial emotion recognition, convolutional neural network, deep learning, artificial intelligence in education, student mental health, real-time emotion

Seismic Risk Assessment of Corroded Reinforced Concrete Structures with Spatial Variability: A Review

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Reinforced concrete (RC) structures in coastal environments are particularly susceptible to chloride-induced corrosion, which progressively weakens the embedded steel reinforcement. While seismic considerations are typically addressed during the initial design phase, long-term environmental and chemical degradation can significantly alter structural behavior, leading to increased vulnerability under seismic loading. In earthquake-prone regions, the interaction between corrosion damage and seismic forces can considerably increase the seismic risk of existing buildings. Recent studies have highlighted that corrosion in RC structures is often non-uniform, existing as localized pitting rather than uniform degradation. These localized damages can severely reduce structural capacity at critical points an effect that uniform corrosion models often fail to capture. As such, accounting for the spatial variability of corrosion is essential to more accurately reflect the irregular distribution of damage and its impact on seismic performance. Although existing assessment methods account for loading conditions like serviceability and ultimate limit states, often overlook the spatial variability associated with seismic events. This represents a significant gap in our understanding of the combined effects of corrosion with spatial variabilities and seismic activity on structural performance. This review paper addresses this gap by focusing on seismic risk assessment for corroded RC structures, emphasizing the importance of spatial variability in corrosion patterns. It explores advanced numerical techniques such as probabilistic modeling, finite element analysis, and nonlinear dynamic analysis to better capture the complex, uncertain interactions between corrosion and seismic loading. The review highlights that uniform corrosion models underestimate seismic risk and that incorporating spatial variability leads to more accurate vulnerability assessments. Ultimately, this research aims to inform the development of robust decision-making frameworks for the repair and retrofitting of aging infrastructure, thereby enhancing the resilience of RC buildings in the face of both environmental degradation and seismic hazards.

Keywords: Steel corrosion, RC structures, seismic risk assessment, spatial variability, probabilistic modeling

Smart Acne Detection: A Machine Learning Solution for Skincare

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This work offers a machine learning-based approach to the automated detection and classification of acne types, therefore helping to develop intelligent healthcare solutions under the track of technological innovation for a sustainable future. Through facial picture analysis, the aim is to create an intelligent skincare system able to detect six well-known acne types: blackheads, whiteheads, papules, pustules, cysts, and nodules. Without necessitating regular dermatologist visits, this instrument seeks to help people recognize their skin problems and grasp acne severity. The database used for model training and assessment was gathered from publicly accessible, annotated facial acne photographs to guarantee diversity in skin tone, acne severity, and illumination circumstances. Utilizing experimental analysis and empirical data, a quantitative research plan was used. Developed using a Convolutional Neural Network (CNN) implemented in Python via Google Colab, the model showed promise for practical use since it attained a 72. 66% training accuracy detecting and categorizing acne kinds. Particularly for underprivileged groups, the results show that AI-driven tools can bridge the gap between dermatological treatment and accessibility. The study's results support the research aims and point to early intervention, enhanced treatment outcomes, and increased skin health awareness made possible by digital dermatological solutions like this. Future research will emphasize improving model generalization by increasing the data and tackling changes in image quality and skin tone. Furthermore, a mobile app is planned for real-time acne detection, severity assessment, and custom skincare advice. Through smart, user-friendly technology, this integration will increase the affordability and sustainability of acne therapy. This study helps to drive clever healthcare innovation and underlines the potential of machine learning in advancing equitable, technology-driven dermatology solutions.

Keywords: Acne detection, machine learning, convolutional neural network, digital dermatology, python, google colab

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Structural Performance Assessment of Reinforced and Unreinforced Concrete-Filled HDPE Pipes: An Experimental and Analytical Study

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This study addresses the lack of data on the structural performance of concrete-filled high-density polyethylene (HDPE) pipes, which offer a corrosion-resistant alternative to traditional steel tubes in underground and harsh environments. The investigation focuses on understanding their load behavior and confinement efficiency. The research aims to assess the structural behavior and load capacity of concrete-filled HDPE pipes, both with and without reinforcement. It also compares experimental results with theoretical models to evaluate the role of pipe geometry and reinforcement under axial loading. The experimental investigation was carried out using HDPE pipes of three diameters (90mm, 110mm and 160mm) and three lengths (300mm, 900mm and 1200mm), with and without steel reinforcement cages. Grade 30 concrete was cast inside the pipes and cured before axial compression testing. Displacement and strain gauges were used to capture structural responses. Theoretical capacities were calculated based on BS8110 and six empirical confinement models, and compared with experimental results. The results revealed that failure modes transitioned from shear to buckling with increasing slenderness. Reinforced specimens exhibited notably higher load capacities. Empirical models such as Richart (1928), Newman & Newman (1971), and Saatcioglu & Razvi (1992) significantly overestimated capacities, especially for shorter pipes. More accurate predictions were observed using the AIJ (1997), Oyawa (2015), and measured cube strength methods, with variations often within ±10%. The confinement effect of HDPE on the concrete core was minimal, and larger pipe diameters showed reduced variability in predictive accuracy. This study concludes that HDPE pipes provide a feasible but limited contribution to concrete confinement, particularly for short members. Reinforcement is essential in enhancing structural stability and compensating for slenderness-related instabilities. Among the theoretical models assessed, the use of measured cube strength is the most reliable for capacity estimation.

Keywords: Concrete-filled HDPE pipes, structural behavior, slenderness ratio, load-carrying capacity

Supercapacitor Assisted Maximum Power Point Tracker (SCA MPPT)

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In 2023, there has been an escalated global commitment to renewable energy sources by major powers such as the European Union, United States, China, and India. However, this widespread integration, particularly through power electronics, has raised significant concerns regarding power quality, specifically high-frequency noise. DC microgrids have emerged as promising solutions to enhance overall power system stability. This research introduces a novel Supercapacitor-Assisted Maximum Power Point Tracking (SCA MPPT) system, which aims to address these challenges by reducing high-frequency noise and improving power quality within DC microgrids. A core innovation of the SCA MPPT system is its elimination of traditional high-frequency DC-DC converters, resulting in a more efficient and stable method for solar power regulation. The proposed system dynamically controls the current delivered to the load and extracted from the solar panel, effectively adjusting to changes in solar irradiation. The SCA MPPT system architecture consists of two key components: the supercapacitor-assisted MPPT block and a low-frequency power regulation block. Supercapacitors are crucial for energy storage and system control during low-frequency operation, facilitated by a finite-state machine topology with three defined states for controlling three switches. A Modified Perturb and Observe (P&O) algorithm is integrated to enhance traditional MPPT methods, dynamically adjusting the duty cycle of the switching transistor to ensure efficient tracking of the maximum power point under varying conditions. The system's performance was validated through implementation and testing on a 20 W solar panel, demonstrating effective state transitions, reliable voltage regulation, and robust system responsiveness. The modified P&O algorithm yielded promising results, retaining approximately 94% of its maximum power with a tracking efficiency of 72.2%. Notably, the system maintained stable output even after partial shading of the panel for 18 seconds, highlighting its resilience and adaptability. This research contributes significantly to enhancing the power quality and stability of solar-powered DC microgrids.

Keywords: MPPT, solar power, DC microgrid, supercapacitor

Sustainable Extraction Pathways for Nickel from the Underexplored Ginigalpelessa Serpentinite Deposit

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Nickel (Ni) plays a critical role in the electric vehicle (EV) market due to its ability to enhance energy density and extend battery life, leading to a projected surge in demand driven by the global shift toward clean energy technologies. However, due to the limited availability of high-grade nickel reserves and their uneven geographic distribution, increasing global attention is being directed toward the exploitation of low-grade nickel resources. In this context, Ginigalpelessa Serpentinite Deposit in Sri Lanka represents a potential low-grade Ni resource, yet its extraction remains underexplored. Therefore, this study aims to assess the nickel content and spatial distribution in the Ginigalpelessa Serpentinite Deposit and to evaluate suitable extraction methods for sustainable recovery from this low-grade resource. A total of 31 soil and rock samples were collected and analyzed for Ni content using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Ni concentration levels in soil and rock samples were found to range from 4,005 to 17,352 mg/kg (average of 8,730 mg/kg) and from 1,806 to 17,417 mg/kg (average of 4,915 mg/kg), respectively. These concentration values fall within the typical range of potential low-grade nickel sources, indicating that the deposit holds the potential for Ni extraction. To extract Ni from this deposit, two methods were identified as suitable. Heap leaching was found to be the most effective method for serpentinite rock, due to the large size of the deposit, viability in climates near the area, and scalability in different ore volumes. For the soil, electrokinetic in-situ mining was recommended, as it uses a low-voltage direct current, and it accelerates metal ion transportation within the subsurface where it offers a sustainable solution for metal recovery from unconventional deposits. More importantly, both methods introduce economically feasible ways to extract Ni from a low-grade resource.

Keywords: Low-grade ores, heap leaching, electrokinetic mining, serpentinite soil

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The Influence of Environmental Education on Sustainable Behaviour and Carbon Footprint Reduction Among University Students in Sri Lanka

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Daily activities such as transportation, energy use, and lifestyle choices directly impact individual carbon footprints. University students, as future decision-makers, play a key role in shaping sustainability outcomes. This study investigates how environmental education influences carbon-conscious behaviour among Sri Lankan university students, examining whether exposure to carbon footprint-related content in their curriculum leads to reduced emissions. A quantitative research design was used with a Google Form questionnaire (based on established literature, pretested for clarity, and using Likert scales to measure behaviour frequency), distributed via WhatsApp to undergraduates from 10 state and 8 private universities during March–April 2025. The questionnaire focused on transportation, food choices, paper usage, and electrical energy consumption. A total of 200 responses were collected and divided into two groups: Category 01 (122 students), who had completed at least one semester-long course covering environmental topics including carbon footprint concepts and sustainability principles; and Category 02 (78 students), who had not undertaken such coursework. From each group, a random sample of 30 students was selected using the sample function in R Studio with a set seed for reproducibility, enabling robust comparative analysis. Data were analysed using descriptive statistics (medians, interquartile ranges, and means) in R Studio, and the Wilcoxon Signed-Rank Test was applied to assess group differences, with effect size (r) calculated. Statistical significance was set at $p < 0.05$. Results showed Category 01 students had a significantly lower average carbon footprint (4.69 kg) than their non-educated peers (7.25 kg), median (IQR): 4.45 (3.72) kg vs 7.67 (9.19) kg. The Wilcoxon test confirmed significance ($p = 0.0039$, $r = 0.37$), indicating a moderate effect size. Category 01 students also consistently exhibited more sustainable behaviours across all measured domains. The study underscores the effectiveness of environmental education and the need to integrate carbon footprint awareness into university curriculum.

Keywords: carbon footprint, environmental education, university students, Sri Lanka

The Study on the Effects of Refrigerator Operational Parameters on Condenser Temperature and Design of a Dryer Utilizing the Waste Heat from the Condenser

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Repurposing waste heat from household refrigerators offers a promising path toward sustainable innovation. This study aims to explore the operational factors influencing the condenser temperature of household refrigerators and design a food dryer that harnesses the waste heat for efficient food dehydration. The effect of different operational parameters (thermostat settings, internal food load and, door opening parameters such as frequency, angle, and duration) on condenser temperature (CT) was studied for two refrigerator models with different condenser configurations (wire-and-tube and hot-wall). Temperature data were collected using thermocouples at one-minute intervals over several refrigeration cycles. A food dryer was designed with a heat recovery unit that channels condenser heat to a drying chamber atop the refrigerator (with an optional heating element), using two fans. Performance factors, including drying temperature, airflow-rate, heat distribution within the drying chamber, and the impact on the performance of the refrigerator, were assessed. Moisture content of Jackfruit (*Artocarpus heterophyllus*) slices (5 mm x 40 mm) was determined after 24 hours of drying without the heating element. Results revealed that the effect of all the tested operational parameters had a significantly positive impact ($p<0.05$) on CT, with wire-and-tube condensers showing higher fluctuations than the other. Temperature distribution throughout the drying chamber was uniform with an average temperature of 40^{o} C without the heating element, which could be controlled as desired up to 60^{o} C with the heating element. Two air velocities (0.5 m/s and 0.2 m/s) were obtained by changing the fan speed. Integrating the dryer had no significant effect ($p > 0.05$) on the internal temperature of the refrigerator. Jackfruit slices dried evenly with a moisture content of 6.92 ± 0.28% (wet basis). These findings highlight the dual potential of household refrigerators as both cooling and drying units, supporting the advancement of sustainable, low-energy food processing at the domestic level.

Keywords: Condenser, dryer, refrigerator, temperature, waste heat

Uncovering the Solar Energy Potential of Reservoirs in Sri Lanka: A Time Series and Machine Learning Approach

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Despite Sri Lanka's high solar energy potential, it contributes only 5% to electricity generation. Land-use conflicts, driven by economic and environmental concerns, hinder large-scale solar deployment. Floating photovoltaic (FPV) systems, mounted on water bodies, offer a solution by saving land and enhancing efficiency through water cooling effects and reduced shading. This study investigates the feasibility of Floating Photovoltaic (FPV) systems on reservoirs, utilising underused water surfaces with minimal land-use conflict. It employs time series and machine learning techniques to predict solar energy output across eighteen major reservoirs in Sri Lanka, offering a sustainable alternative to land-based solar energy expansion. Solar energy generation can be estimated using the equation: $E_{solar} = A \times G_{eff} \times \eta_{eff}$; where, A is the panel area (m^2), G_{eff} is the effective solar radiation after environmental adjustments, and $\eta_{eff}$is the efficiency of the solar panel. Effective solar radiation is given by, $G_{eff} = G_{mea} \times (1 - CCo) \times (1 - PCo) \times \frac{P_{ref}}{P_{act}} \times (1 - SAl)$; where G_{mea} is irradiance (W/m^2), CCo is cloud coverage, PCo is precipitation correction, P_{ref} is the reference atmospheric pressure, P_{act} and SAl are the actual surface pressure and surface albedo, respectively. Data were obtained from NASA's Data Access Viewer for the period 2010–2022. Time-series forecasting (*SARIMA*) and Facebook Prophet models were employed to predict solar energy potential. The solar energy potential for each reservoir was assessed based on a 1 m² area. Both SARIMA and Prophet models revealed strong seasonality in solar energy production. Average daily energy output ranged between 1–4 kWh/m², with certain months exceeding 5 kWh/m² for specific reservoirs. The highest energy production was typically observed during February, March, and April. To illustrate regional variations in solar energy potential, an Inverse Distance Weighting (IDW) map was generated using the daily average production across all months. The highest solar energy potentials were observed at the *Senanayake Samudraya*, *Lunugamwehera*, *Maduru Oya,* and *Rathkinda-Ulhitiya* reservoirs. Our findings highlight that floating PV is a viable, land-efficient solution to Sri Lanka's energy challenges. It offers a sustainable, scalable method for solar energy production, emphasising the potential of inland water bodies for renewable energy development and supporting national goals for energy security and environmental sustainability.

Keywords: Solar energy, SARIMA, prophet, IDW, reservoirs

Urban Transformation in Peradeniya: Exploring Challenges and Opportunities in the Context of Emerging Cities in Sri Lanka

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Peradeniya, a historically significant town in Sri Lanka's Central Province, occupies a unique position as a cultural heritage site and an evolving urban centre. However, its urban growth has remained stagnant due to various socio-economic, cultural, and environmental pressures. This study aims to critically examine the challenges and opportunities associated with Peradeniya's urban growth within the broader context of emerging cities in Sri Lanka. Specifically, it seeks to evaluate current environmental and infrastructural conditions while identifying strategic directions for sustainable urban development. Despite Peradeniya's designation as a cultural heritage site and its locational significance, urban expansion has been constrained by socio-economic pressures, environmental vulnerabilities, and infrastructural limitations. A mixed-methods approach was employed, integrating field observations, GIS-based spatial analysis, and 25 key informant interviews to provide a comprehensive evaluation. The study applies a SWOT analysis framework to identify strengths, weaknesses, opportunities, and threats, aligning them with the overall development objectives of the town. While Peradeniya's natural topography presents spatial constraints, the study finds that sustainable urban growth should not be limited by these physical barriers. Instead, effective urban planning must integrate and align with the natural landscape. The study identified critical areas where strategic intervention is necessary. The study recommends targeted policy measures, including zoning regulations, infrastructure upgrades, and inclusive planning practices. These strategies aim to guide Peradeniya's transition into a well-balanced urban centre that upholds its ecological integrity and cultural identity.

Keywords: Sustainable urban development, zoning regulations, cultural heritage preservation, spatial constraints

Theme 4

Expanding Frontiers in Basic and Applied Sciences and Mathematics

A New Statistical Approach to Profit Maximization Transportation Problem via Normal Distribution and Harmonic Mean

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The transportation problem is a classical and important optimization problem in operations research whose objective is to determine the optimal way to ship products from multiple sources to multiple destinations in order to minimize transportation cost and maximize profit. Profit maximization transportation problems have increasingly gained significance in real applications, especially in business-related contexts with consideration of profit matters. Traditionally, methods such as the Least Cost Method, Vogel's Approximation Method, Row Minima Method, Column Minima Method, and North-West Corner Method are employed to determine an initial basic feasible solution, while optimal solutions are determined through methods such as the Stepping Stone Method and the Modified Distribution Method. But for the profit maximization transportation problem, the current solution procedures typically convert the maximization model to a minimization model before applying these methods. That method is typically indirect, time-consuming, and possibly overlook some essential characteristics of profit-oriented models. To address these limitations, this research introduces a novel statistical approach that directly solves the profit maximization transportation. The proposed method combines the cumulative distribution function (CDF) of the normal distribution with the harmonic mean to create an effective solution technique applicable to both balanced and unbalanced transportation problems. In this approach, the cost matrix for transportation is transformed through use of the CDF of the normal distribution to standardize and normalize cost values efficiently, and harmonic mean is employed in the calculation of penalty costs to facilitate more efficient allocation decisions to maximize profit. To evaluate the effectiveness of the proposed method, a series of benchmark transportation problems and randomly generated data sets were tested. The results were compared with those obtained from traditional approaches such as the Modified Distribution Method. The proposed method consistently produced higher total profits and demonstrated improved computational efficiency. These experimental outcomes confirm the accuracy and practical applicability of the new approach in solving profit-maximizing transportation problems. Overall, the results confirm that this statistical approach not only enhances computation efficiency but also provides some genuine and useful process for solving real transport issues with profit maximization being the sole objective.

Keywords: Harmonic mean, initial basic feasible solution, normal distribution, optimum solution, profit maximization transportation problem

A Statistical Analysis of the Factors Influencing Performance in Ultimate Fighting Championship (UFC) Fighters

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Mixed Martial Arts (MMA) is a highly competitive sport in which the success of a fighter is determined by various factors including physical attributes, technical skills, and strategic decision-making. This research aims to identify the most influential factors determining the number of wins a fighter accrues in the UFC. Independent variables such as career length, average takedowns landed, takedown defence, reach, stance, strikes landed, striking accuracy, strikes absorbed, strike defence, takedown accuracy, and average submissions attempted were considered in the analysis. The study data, with a sample size of 1,062, were obtained through web scraping techniques from the ESPN fight centre website. Poisson regression is commonly used to model count data. However, over dispersion is a common issue in count data, and it can invalidate the assumptions of a Poisson distribution. Thus, quasi-Poisson, and negative binomial regression models were used as extensions of the Poisson model when incorporating over-dispersion. Model parameters are estimated by using the maximum likelihood method. The likelihood ratio test was used to assess the overall fit of the model. The final model was selected using stepwise regression at a 5% significance level, based on the lowest Akaike Information Criterion (AIC) value and validated through a goodness-of-fit test. The final model identified five key factors that significantly impact a fighter's number of wins: career length, reach, strikes landed, striking accuracy, and strikes absorbed. The results show that longer careers, greater reach, and a higher volume of strikes landed are linked to more wins. However, absorbing more strikes per minute reduces a fighter's win rate, highlighting the importance of strong defensive skills. These findings give valuable advice for fighters, coaches, and analysts. Fighters can improve their chances of winning by landing more strikes, being more accurate, and defending better.

Keywords: Fighter performance, mixed martial arts, negative binomial model, Poisson regression model, ultimate fighting championship

A Tunable Hann-Kaiser Hybrid Window for Adaptive Short-Time Fourier Analysis

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Time-frequency analysis relies on window functions to localize dynamic signal features. In Short-time Fourier Transformation (STFT), window choice affects the spectral clarity, revealing harmonics and localized content. Precision is crucial in applications such as biomedical signal processing (EEG), musical signal analysis, and vibration diagnostics, where signal sensitivity and spectral control significantly affect accurate interpretations. The present study proposes a convex hybrid window function, constructed as a weighted sum of the Hann and Kaiser Windows defined by $W[n]_{Hybrid} = \alpha W[n]_{Hann} + (1-\alpha)W[n]_{Kaiser}$, where $\alpha \in [0,1]$. The tunable parameter α allows adaptable control over spectral behavior: when $\alpha \to 1$, it mimics Hann and when $\alpha \to 0$, it mimics Kaiser properties. We evaluated the hybrid window using an EEG-inspired synthetic signal and the simulations were carried out using Python via STFT, comparing the hybrid against classical windows (Hann, Kaiser, Hann-Kaiser product) and modern adaptive windows (Dolph–Chebyshev, Slepian/DPSS, Tukey). The evaluated metrics included central energy retention, edge energy, RMS, mainlobe width, sidelobe suppression, and SNR. The quantitative results were supported by visual inspection and by calculating spectrogram parameters. In addition, transient behaviour near the edges of the windows was observed to highlight preservation of signal details. The tunable α was key in adjusting the tapering behaviour for better adaptation to non-stationary signals. The energy analysis of the window showed that the $W[n]_{Hybrid}$ window retained 94.55% of central energy, only slightly below Hann (95.63%) and above Kaiser (93.52%), significantly outperforming the Hann-Kaiser product window, which retained 68.45%. Our findings demonstrate that the proposed hybrid window effectively minimizes energy attenuation while retaining the tapering advantages of its constituent functions, thereby overcoming the limitations typically associated with double tapering. While its sidelobe suppression and mainlobe width were tunable via α, it provided moderate control between Hann's smoothness and Kaiser's sharpness. Furthermore, visual inspection of the spectrograms revealed improved harmonic localization and signal detail retention with the proposed model. In conclusion, this hybrid window framework provides a tunable, energy-efficient solution for adaptive time-frequency signal analysis. Future work will include statistically robust validation using a data set of monophonic audio (music) signals to strengthen generalization across real-world signal environments.

Keywords: Double tapering, spectrogram, STFT, time-frequency analysis, window function

Baseline Survey for Identifying Lichen Species in the Dry Zone: A Case Study at the University of Vavuniya, Sri Lanka

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As natural sentinels, lichens exhibit a rapid response to changes in atmospheric conditions, pollution, and other environmental stresses. Owing to these characteristics, they are widely recognized as reliable bioindicators. Lichens are complex symbiotic organisms that engage in mutualistic symbiosis with fungi and photosynthetic partners, specifically cyanobacteria or algae. Given their ecological significance, this study aims to develop a checklist of lichen species found around the University of Vavuniya premises. The study site is located in the dry zone of Sri Lanka, an underexplored region in terms of lichenological research. Field surveys were conducted from April to December 2024 to maximize seasonal coverage and ensure comprehensive sampling. The surveys encompassed both disturbed and undisturbed habitats including forest patches, managed gardens, and areas adjacent to transportation routes. Lichen samples were collected from tree barks, rocks, and artificial surfaces. Lichen colonies were observed and sampled from trees a height range of 150 to 165 cm, where sufficient colonies were present. A total of thirty (30) lichen species were recorded in the survey area. These include twenty-four (24) crustose, four (4) foliose, one (1) fruticose and one (1) squamulose types, categorized based on their morphology. Within the crustose category, six (6) species with apothecia, three (3) with perithecia and fifteen (15) with lirellae fruiting bodies were identified. This baseline inventory on lichens at the University of Vavuniya provides a valuable reference for future ecological assessments and biomonitoring initiatives in the dry zone of Sri Lanka. It contributes to the understanding of lichen biodiversity in the region and indicates the role of lichens as indicators of environmental variations and ecosystem integrity.

Keywords: Lichens, dry zone, crustose, foliose, Sri Lanka

Characterization and Microbial Profiling of Microplastics in Kandy Lake: A Preliminary Investigation

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Microplastic pollution in freshwater ecosystems poses significant ecological threats due to its persistence and potential to harbour diverse microbial communities. This study investigates the microplastic load and associated microbiota in Kandy Lake, a vital urban freshwater body in Sri Lanka. The study aims to isolate and characterize microplastics from different zones of Kandy Lake and identify microbial communities attached to these particles. Water samples were collected from five lake inlets, one outlet, and two shallow regions and temperature and PH were measured. Water was filtered using a 250 µm plankton net and 70 mm glass microfibre filters. Isolated microplastics were visually identified under a light microscope and treated with sterile distilled water and 0.1 mm glass beads to detach microorganisms. The suspension was cultured to isolate viable microbial populations. Microplastic particles were then subjected to Raman spectroscopy for polymer identification. Among the isolated microplastics, polypropylene (PP) fibres were the most dominant type (n = 33), followed by polyethylene (PE) and PET fibres, with the highest microbial colonization observed on low density polyethylene (LDPE) particles in the lake's shallow area. The outlet zone exhibited the highest average colony count (4.0), while environmental variables such as temperature (r = 0.46) and pH (r = -0.29) were moderately correlated with colony abundance. These findings suggest temperature may enhance microbial growth, while more acidic conditions may favour colonization. Raman spectroscopy confirmed polymer identity and supported visual classification. This study highlights the prevalence of microplastics and their potential as microbial carriers in Kandy Lake. The observed correlation between environmental parameters and microbial load underscores the importance of monitoring urban freshwater bodies, informing ecosystem well-being.

Keywords: Environmental microbiology, Kandy Lake, microplastics, plastic pollution, Raman spectroscopy

Characterization of Fungal Communities Associated with Mosquito Larvae and Evaluation of Their Entomopathogenic Potential as Larvicidal Agents

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Microbes associated with mosquito life cycle stages play a significant role in growth, development, and fitness of mosquitoes. The use of naturally occurring fungi in mosquito control is crucial, especially when considering the drawbacks of chemical insecticides. This study aimed to characterize the fungi species associated with the *Culex* mosquito larvae collected from natural and artificial breeding habitats, and to determine the entomopathogenic properties of the common fungal species isolated from each habitat against *Culex quinquefasciatus*, a filarial vector mosquito larva. *Culex quinquefasciatus* larvae were sampled from natural and artificial breeding habitats in Peradeniya, Sri Lanka and fungi associated with external surfaces and internal organs of the collected larvae were cultured on Potato Dextrose Agar (PDA). Morphologically distinct fungal colonies were identified and subcultured. Most abundant and least abundant fungi from each habitat were tested for entomopathogenic properties against third instar larvae. The larvae were exposed to conidial suspensions (1×10^7 – 1×10^3 conidia/mL) of the selected fungi and larval mortalities were reported after 24 hours. Lethal concentrations required to kill 50% and 90% larvae (LC 50 and LC 90) were calculated. A total of 20 fungal species were isolated from *Culex* mosquito larvae including eight species from natural habitats and 18 species from artificial habitats. *Aspergillus fumigatus*, *Cladosporium* sp., and *Trichoderma* sp. were the most abundant fungal species across both habitat types. According to larval bioassay results, the highest pathogenicity was reported by *Trichoderma* sp. (LC50 = 4.10×10^3 conidia/mL). The least abundant fungi, *A. niger* also showed significant larvicidal activity with LC50 of 3.47×10^5 conidia/mL. The mean LC50 values obtained for different fungal species were significantly different ($p = 0.009$, $H= 13.50$). The outcomes of the study reported the diversity of fungal communities associated with *Culex quenquefaciatus* mosquito larvae in the study sites. The entomopathogenic properties of *A. fumigatus*, *A. niger,* and *Trichoderma* species against *Culex quinquefasciatus* larvae were confirmed.

Keywords: Bacteria and fungi, breeding grounds, *Culex* sp. larvae, entomopathogenic properties

Chemical, Structural and Spectroscopic Study of Columbite–(Fe) from Dodampe, Ratnapura District, Sri Lanka

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Columbite-group minerals are primarily associated with granites and granitic pegmatites. They are mined as important sources of Ta and Nb in several countries. However, no detailed record of columbite occurrences in Sri Lanka has been reported to date. Heavy-mineral fractions from Sri Lankan gem gravel layers often contain rare, non-gem-quality but economically valuable minerals, which have received limited scientific attention. In the present study, we report results of chemical, structural, and spectroscopic characterisation of dark grey to black columbite found in the heavy-mineral fraction extracted from gem gravels near Dodampe, Ratnapura District, Sri Lanka. The rough sample ($2.8 \times 2.0 \times 0.5$ cm^3 size) weighed 11 g and its specific gravity was measured as 6.22 ± 0.01. Small chips were subjected to dry annealing at 1100 °C for 48 h, to assess structural disorder. Un-annealed and annealed chips were then subjected to backscattered electron (BSE) and reflected-light imaging, and analysed by single-crystal X-ray diffraction (XRD) and Raman spectroscopy. Electron probe microanalysis (EPMA) results identified the sample as columbite–(Fe) [$(Fe_{0.60}Mn_{0.39}Zr_{0.01})(Nb_{1.27}Ta_{0.68}Ti_{0.05})O_6$]. BSE images revealed extensive internal heterogeneity, including primary growth zoning, wide abundance of inclusions, and patchy intergrowth with a Ca-Nb phase that was – based on EPMA results and Raman spectrum, identified as fersmite, belonging to another columbite-group mineral species. XRD results indicated minor (well below 1 vol%) annealing-induced unit-cell shrinkage of the columbite–(Fe). Raman spectroscopy revealed fairly minor, annealing-induced band narrowing [the FWHM (full width at half maximum) of the main band decreased from 23 to 17 cm^{-1}] and band up-shift. Results of both techniques indicate that only low levels of structural disorder (primary cation disorder and/or secondary accumulation of radiation damage) are present. Our results highlight the potential of discovering hitherto unknown mineral species from heavy-mineral fractions of placer deposits. As such phases may contain chemical elements of economic interest and pave the way for discovery of valuable deposits, detailed investigation of heavy-mineral assemblages recovered from gem gravels is strongly recommended.

Keywords: Nb-Ta minerals, columbite–(Fe), fersmite, Raman, EPMA

Acknowledgement: *Thanks are due to Andreas Wagner for sample preparation.*

Coconut Shell-based Salt Pot, "*Lunu Polkatta*," in Mitigating Microplastic Contamination in Food-Grade Granular Crystal Salt

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Microplastic (MP) contamination in food products has become a pressing global concern, with food-grade salt identified as a main source of ingestion. This study explores the effectiveness of the Sri Lankan traditional coconut shell-based salt pot, "*Lunu Polkatta*," in reducing MP contamination in commercially available, purified, iodized, food-grade granular crystal salt. Salt samples (300 g) were dissolved in filtered distilled water (400 ml) and stored in coconut shell-based salt pots for three months under plastic-free conditions at room temperature. For comparison, a control setup stored the samples in glass containers with glass lids for the same duration. MP levels in both setups were analysed prior to storage using stereomicroscopic analysis (40× magnification) combined with membrane filtration (0.45 μm). After three months, MPs were quantified in the salt layer formed outside the coconut shell, formed from the liquid salt that seeped through the shell, salt within the pot, and the control samples. The one-way ANOVA test revealed significant differences in MP levels among the initial samples, the salt inside the coconut pots, and the layer outside the pots ($F = 37.41$, $p < 0.0001$, $R^2 = 0.833$). Tukey's post hoc test indicated significantly lower levels of MP inside the coconut pots (9.167 ± 4.167) compared to the initial samples (39.83 ± 7.026) and the layer outside the container (33.67 ± 7.737). MP levels in the salt layer outside the container had no difference compared to the initial sample. Control samples stored in glass containers showed no significant difference in the levels of MP over the same period (initial = 35.00 ± 11.73, after three months = 37.00 ± 6.782, $t = 0.3616$, $p = 0.7252$). The findings suggest that the coconut shell has the ability to adsorb MP particles or allow them to seep outside through the shell along with the salt. Although coconut shell-derived activated carbon has already been recognized as an efficient and sustainable absorbent for removing MPs from water, this study demonstrates the potential of the coconut shell to reduce MP levels in salt used in household consumption. The study emphasizes the significance of integrating traditional food storage methods with modern food safety practices, highlighting "*Lunu Polkatta*" as a sustainable and cost-effective solution to reduce microplastic exposure through dietary intake, while recommending that it be stored in a cool, dark place to minimize iodine reduction upon prolonged storage.

Keywords: Microplastic removal, food-grade granular crystal salt, coconut shell-based salt pot, *lunu polkatta*, food safety

Coliform Contamination in Groundwater Sources of CKDu-Endemic Regions in Sri Lanka

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Chronic Kidney Disease of unknown aetiology (CKDu) continues to affect rural communities in the dry zone of Sri Lanka, particularly in areas where groundwater is the main source of drinking water. While the causative factor for CKDu remains unclear, the evidence is increasing towards microbial contaminants of water sources, which may represent a modifiable risk caused by persistent exposure. This study assessed faecal contamination in well water samples in CKDu-risk zones of the Anuradhapura District. A total of 60 well water samples were collected in the dry and rainy seasons from Padawiya, Horowpathana and Ipalogama, which were categorized into high, moderate and low risk zones based on the prevalence of CKDu. Each sample underwent filtration using 0.45µm membrane filters, followed by culturing on m-ENDO (35 ± 1 °C) and m-FC (44 ± 1 °C) media for 22 ± 2 hours in triplicate to enumerate total (TCC) and faecal (FCC) coliforms, respectively. About 86.7% of the water samples exceeded the bacterial counts specified by Sri Lankan standards for drinking water (TCC < 10 and FCC = 0 colony forming units (CFU)/100mL), while all the water samples tested in the high-risk area exceeded these permissible levels for both TCC and FCC. The high-risk zone showed the highest contamination (TCC 320 ± 428; FCC 95 ± 382 CFU/100mL), followed by the wells in the moderate-risk zone (TCC 240 ± 393; FCC 59 ± 249 CFU/100mL) and low-risk zone (TCC 126 ± 184; FCC 23 ± 89 CFU/100mL). The levels of TCC and FCC significantly differed among risk zones ($p < 0.05$), with no significant seasonal variation. The consistent exceedance of national water quality standards for faecal contamination highlights the importance of prioritizing microbial contamination. This study shows widespread faecal contamination in well water sources across CKDu-risk zones in the Anuradhapura District, with higher levels of contamination in the zone with greater CKDu prevalence.

Keywords: CKDu, coliform bacteria, groundwater contamination

Acknowledgement: *University of Peradeniya (URC Grant No. 331:2023)*

Comparative Analysis of Light-harvesting Efficiency and Photovoltaic Efficiency of N719 and D719 Dyes in Dye-sensitized Solar Cells

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Dye-sensitized solar cells (DSSCs) are cost-effective, thin-film solar cells that use photosensitive dye to absorb sunlight and generate electricity through electron transfer to a semiconductor. Solar cells based on dye-sensitization technologies demonstrate a significant potential for replacing traditional photovoltaic technologies because they offer affordable production methods. This research addresses the lack of research on the comparison of commercially available dyes. The SnO_2/ZnO composite was used as the photoanode to compare the dyes. The efficiency and performance were evaluated in N719 and D719 dyes in dye-sensitized solar cells to identify which dye performs better under specific conditions and how their properties influence overall solar cell efficiency. The SnO_2/ZnO composite was coated on the FTO glass substrate by the spray-coating method. The photoanodes were sintered at 500°C for 30 minutes. The sintered cells were dipped in N719 and D719 dye with concentrations of 0.3 mM for 24 hours. The cell was assembled with a dye-absorbed photoanode, platinized counter electrode, a 0.20 cm^2 mask with a window, and I^-/I_3^- electrolyte. The performance evaluation was done using *J-V* measurements with a solar simulator. The SnO_2/ZnO composite showed a conversion efficiency of 4.33% for the N719 dye. The D719 dye demonstrated an overall energy conversion efficiency of 5.79% for the SnO_2/ZnO composite. Photocurrent spectra revealed peaks of incident photon-to-current efficiency (IPCE) of 30.8% and 47.6% for N719 and D719 dyes, respectively, for SnO_2/ZnO composite. UV-Vis spectroscopy and Raman spectroscopy confirmed the characteristic peaks for N719 and D719 dyes. Raman spectra verified the presence of characteristic vibrational peaks, indicating successful dye adsorption. The maximum absorbance peak in the UV-Vis spectrum indicates the strongest absorption in the visible region. Overall, this study highlights the improved performance of DSSCs with D719 dye when using the SnO_2/ZnO composite. The findings indicate that D719 dye is a superior alternative for N719 dye.

Keywords: Dye-sensitized solar cells, SnO_2/ZnO composite, N719 dye, D719 dye, energy conversion efficiency

Comparison of Experimental and Theoretical Values of Zeta Potential and Particle Size Using Light Scattering Method

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Accurate characterization of nanoparticle size and surface charge through dynamic light scattering (DLS) and electrophoretic light scattering (ELS) is fundamental for advancing applications in drug delivery, catalysis, and materials sciences. However, deviations between experimental and theoretical values indicate calibration inconsistencies, solvent property variations, or instrument specific limitations. The primary goal of this study was to evaluate the reliability of calibration data via comparing instrument measured values with theoretical predictions and certified reference values. The Anton Paar Litesizer 500 was employed for triplicate measurements of hydrodynamic diameter (DLS) and zeta potential (ELS) at 25 °C using aqueous polystyrene nanoparticle standards. The Stokes Einstein equation and the Henry's equation were used to derive the theoretical values of particle size and zeta potential respectively. Measurement conditions, such as solvent viscosity (0.0008903 Pa·s), relative permittivity (78.37), and Henry factor (1.5) were considered. Certified reference materials provided nominal values (220 ± 8 nm particle diameter, -59 ± 5.9 mV zeta potential and -4.60 ± 0.46 µm cm/Vs electrophoretic mobility) for the comparison. Statistical analysis included mean values, standard deviations (SD), and percentage deviations between experimental, theoretical, and certified values. Measurement precision was assessed through polydispersity index (PDI) and conductivity stability across replicates. For particle size analysis, the experimental hydrodynamic diameter (221.4 ± 0.3 nm) showed excellent agreement with Stokes Einstein theoretical value of 223.0 nm with a 0.7% deviation while it implied merely a 06% deviation with the certified nominal diameter. Zeta potential measurements (-57.7 ± 0.4 mV) aligned perfectly with Henry's equation predictions of -59.02 mV (2.29% deviation) and closely matched certified nominal values with a 2.25% deviation. The low polydispersity index (1.3 ± 0.4%) and stable conductivity (0.607 ± 0.002 mS/cm) confirmed measurement precision. These results demonstrated the instrument's reliability, with deviations within acceptable limits for both size (<1% theoretical and nominal) and surface charge (≈ 2.3%) characterizations. Observed differences from certified references reflect methodological variations rather than instrument error, validating the system's reliability for precise nanoparticle characterization. The study highlights the importance of calibration protocols and methodological considerations when comparing experimental data with different reference standards.

Keywords: Particle size, zeta potential, light scattering, Stokes Einstein, Henry's law

Comparison of Microplastics in Faeces of Toque Macaques from Residential and Non-Residential Locations in the University of Peradeniya

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Microplastic pollution is a global threat to organisms in both aquatic and terrestrial ecosystems. The objectives of this study were to quantify and characterize microplastics present in faeces of toque macaques (*Macaca sinica*) from residential and non-residential areas within the University of Peradeniya, Sri Lanka. Faecal samples were collected from toque macaques in residential (n =15) and non-residential areas (n = 15) in the university premises. Faecal samples collected from toque macaques in non-residential areas were greenish, suggesting a plant-based diet while those of macaques in residential areas were more brownish. Samples were oven-dried at 60°C until a constant weight was obtained, homogenized, and 0.5 g of each sample were subjected to wet peroxide oxidation using 40 ml of 30% H_2O_2 and 40 ml of $Fe(II)SO_4$. These were suspended in a 1.2 M saturated NaCl solution and the supernatant filtered using a membrane filter. Microplastics retained on the filter paper were identified under a stereomicroscope and Fourier Transform Infrared Spectroscopy (FTIR) was used to determine polymer types. Blanks and replicates were used for quality control. A generalized linear model was used to assess the effects of location and sex on the number of microplastics in faeces. All microplastics observed were identified as microfibres of different colours. Macaques in residential areas had a significantly higher number of microplastics ($p = 0.006$; mean 4.1 ± 1.0 particles/g dry weight) when compared with those in non-residential areas (1.0 ± 0.5 particles/g dw). There was no effect of sex on the number of microplastics ($p = 0.35$). Microfibres from macaques present in residential areas were of six colours, with black being predominant (54%). In non-residential areas, microfibres were of three colours, with the majority being black (78%). All were identified as polystyrenes by FTIR, likely originating from food packaging. Our study shows that toque macaques in human-modified environments have a higher exposure to microplastics than those in habitats with less human disturbance. This study provides baseline data on exposure of terrestrial vertebrates to microplastics and highlights the need for better plastic waste management.

Keywords: Microfibres, polystyrenes, primates, terrestrial ecosystem, waste management

Cuticular Modifications of Organophosphate Resistant *Culex quinquefasciatus* Larvae in Sri Lanka

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Culex quinquefasciatus mosquitoes, have developed resistance to common insecticides through elevated detoxifying enzymes, target site alterations, and cuticular thickening. However, cuticular thickening remains poorly studied and given its potential adaptive advantage in larvae exposed to extensive insecticide pressure. This study aimed to evaluate cuticular thickening in *Culex quinquefasciatus* larvae resistant to organophosphates. Early fourth-instar larvae of *Cx. quinquefasciatus* obtained from field-collected eggs were exposed to five different concentrations of temephos (0.025 mg/L, 0.02 mg/L, 0.015 mg/L, 0.01 mg/L, 0.005 mg/L), a commonly use organophosphate in larval control. A total of one-hundred (100) larvae were exposed to each concentration in four replicates. Control experiments were conducted for each replicate with dechlorinated water and ethanol. Mortalities were recorded after a 24-hour exposure period. For the discriminating dosage (0.02mg/L), mortalities were recorded at three-hour intervals. Three dead larvae from each three-hour interval (total of 24 larvae) and three survivors after 24-hours were selected for cross-sectioning to measure the cuticle thickness. Microscographs of the cross sections were taken using the image processing microscopic system (*ZEN-2012*). The average cuticle thickness of each individual was taken by measuring eight points from each image while the ratio between the cuticular thickness (CT) and the body diameter (BD) [CT/BD index] was used for comparative analysis. The lethal doses required to kill 50% (LD_{50}) and 90% (LD_{90}) of the larvae were determined using log-probit mortality curves, yielding 0.0096 mg/L and 0.0261 mg/L, respectively. A significantly positive linear relationship ($r = 0.962$, $p = 0.009$, $R^2 = 92.50\%$) was observed between temephos concentration and larval mortality. A significant difference in cuticular thickness was observed between survived and dead *Culex quinquefasciatus* larvae exposed to temephos ($t = 3.29$, $p = 0.003$), highlighting the role of cuticular thickening in resistance. A strong positive linear relationship was observed between the CT/BD index of larvae and time to death ($p = 0.001$, $r = 0.98$, $R^2 = 95.96\%$). The results indicate that cuticular thickness plays a significant role in *Culex quinquefasciatus* larvae's resistance to organophosphate larvicides.

Keywords: *Culex quinquefasciatus,* organophosphate, lethal dosages, cuticular thickness, insecticide resistance

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Detection of Antibiotic Resistance Genes in the Upper Segment of Mahaweli River

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The spread of antibiotic resistance genes (ARGs) in aquatic environments has emerged as a critical public health concern, driven largely by the discharge of untreated or poorly treated wastewater to water sources. This study investigates the prevalence of ARGs in raw water entering conventional water treatment plants (WTPs) located along the upper segment of the Mahaweli River. Water samples were obtained from the influents of 14 WTPs located along the Mahaweli River, between the Kotmale and Victoria reservoirs. Samples were collected during three visits in September 2023, February 2024 and July 2024. For each visit one sample per WTP was filtered (10 mL through 0.22 μm membrane filters) and the retained residue was cultured on nutrient agar. All bacterial colonies from each plate were pooled and genomic DNA was extracted for screening of ARGs using conventional PCR with 11 gene-specific primers. Amplicons were confirmed by agarose gel electrophoresis. Fisher's exact test assessed monthly variations in resistance patterns. Among the ARGs detected, *bla-TEM* was the most prevalent (80.00%), followed by *tet-A* (66.67%), indicating widespread resistance to β-lactams and tetracyclines. Resistance genes *tet-M* (tetracyclines) and *qnrS* (quinolones) were detected in 62.22% of samples, while *dfrA5/14* (trimethoprim) and *sul2* (sulphonamides) were found in 60.00% and 44.44% of samples respectively. ARGs were more frequently observed in WTPs of highly polluted catchments, including Paradeka (72.73%), Nawalapitiya (69.70%), Haragama (63.64%) and Greater Kandy (54.55%). In contrast, minimal detection of ARGs (3.03%) was observed at Kotagala and Thalawakelle-Galkanda WTPs where the catchments are predominantly covered with forest vegetation. No significant monthly variation was observed in ARG detection as all p-values for individual genes were >0.05. The study reveals high levels of ARGs in raw water near urban and agricultural areas particularly *bla-TEM, tet-A, tet-M* and *qnrS* indicating resistance to key antibiotics. Upstream forested regions showed minimal ARGs highlighting natural buffers. These findings stress the urgent need for better wastewater management to curb antibiotic resistance in river systems.

Keywords: Antibiotic resistance genes, Mahaweli river, water treatment plants

Development of a Sustainable Anti-Corrosive Metal Coating from Human Hair Waste-Derived Crude Melanin

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Corrosion is a critical challenge in various industries, leading to substantial economic loss and structural degradation. Although conventional anti-corrosive coatings effectively mitigate corrosion, they often pose significant drawbacks, including high costs and environmental toxicity, and health hazards. Consequently, the development of sustainable, cost-effective, and eco-friendly alternatives are imperative. Human hair waste, an abundant and largely underutilized biomaterial—offers a promising solution due to its intrinsic chemical composition. This study explores the potential of human hair-derived crude melanin (a mixture of melanin and keratin), as a viable corrosion inhibitor, blended with poly(vinyl alcohol) (PVA), a biodegradable polymer. From human hair sample, 11.1 % of dried crude melanin was obtained from base hydrolysis method and functional groups of extracted crude melanin were analysed and confirmed by FTIR analysis. Analytical procedures, including Tafel analysis and Electrochemical Impedance Spectroscopy (EIS) were carried out to investigate anti-corrosive properties of crude melanin coated on stainless steel surface (with the composition of 72.89 % Fe, 18.46 % Cr, 8.36 % Ni, 0.29 % Co and C). Data obtained from electrochemical tests revealed a significant improvement in corrosion resistance, achieving an inhibition efficiency of 89.4% at a crude melanin concentration of 4000 ppm over bare stainless-steel. Nyquist plots and equivalent circuit modelling further confirm the increased charge transfer resistance imparted by crude melanin over bare stainless-steel specimens. The EIS data obtained for a wide range of crude melanin concentration gradient revealed that the highest corrosion inhibition is acquired by the optimal crude melanin concentration of 12,000 ppm. According to the experimental findings, 8×8-inches area of a stainless-steel plate can be coated with a thickness of 0.10 ± 0.01 mm using approximately 5.000 (±0.001) g of hair waste, with a crude melanin concentration of 12,000 ppm. This study demonstrates the potential of crude melanin-based coatings as an effective solution for corrosion while providing a practical and cost-effective strategy for repurposing human hair waste.

Keywords: Anti-corrosive coatings, human hair waste, keratin, melanin

Development of an Optical Method for Rapid Detection of Heavy Metals in Water Samples Using Iso-pathlength Point Analysis

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Access to clean water is fundamental for human health. However, agricultural runoff in Sri Lanka leads to water resource pollution, with inorganic fertilisers containing high levels of Cadmium (Cd) between 39 and 46 ppm and contaminating surface water bodies. Excessive use of inorganic fertilisers has been linked to elevated levels of heavy metals in surface water bodies, including Cd, above the World Health Organisation (WHO) limitations. This contamination increases the prevalence of chronic kidney disease. To ensure water purity, real-time identification of contaminants using sensitive, rapid, and cost-effective detection methods is needed. Most existing techniques are costly, require complex pre-treatment methods and skilled personnel, and are ineffective for real-time monitoring. The research presents a novel optical device for detecting heavy metal contaminants in water using light scattering. The device measures scattered light intensity, providing a unique Iso-pathlength (IPL) point for targeted heavy metal species, offering a promising alternative for on-site monitoring with advantages over currently used methods. The device illuminates the contaminated water sample using a laser light (wavelength 650 nm) source. The scattering profile over the 180° (-90° to +90°) range of the illuminated sample is subjected to scanning. During the scanning process, the device monitors the real-time measurement of angular intensity distribution data. Once the scanning process is completed, the angular-intensity distribution profile is automatically plotted. From that distribution, the IPL point where the effect of scattering is independent from the concentration is then identified. Since Cd and Iron (Fe) contamination in water has been significantly identified compared to other heavy metals, this research focuses on Cd and Fe detection. The research is primarily based on the (5–50) ppm concentrated range of contaminated samples, which belongs to the single-intermediate scattering regime. According to the current study, the IPL points for Cd and Fe were 8° and 5°, respectively. This study demonstrates that the IPL point, an inherent property of a targeted heavy metal, can be an absolute calibration method. Future works will improve the device's reliability for detecting heavy metals in complex water samples, establishing a new, efficient methodology for accurate on-site monitoring in field applications.

Keywords: Contamination, detection, heavy metals, IPL point, scattering

Diversity and Distribution of Soil Mites (Acarina) in Sri Lanka: A Preliminary Survey with New Records

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Soil mites are chelicerate arthropods common across soil types that play integral roles including nutrient recycling and decomposition. Despite their importance, soil mites remain poorly documented in Sri Lanka. This is a preliminary survey of diversity and distribution of soil mites in selected sites in wet and intermediate zones of Sri Lanka. Soil samples weighing ~ 1-1.5 kg were collected from human-altered habitats and placed in Berlese-Tullgren funnel for four days, allowing mites to migrate downwards into 50 mL vials containing 90% ethanol. Debris retained in vials was suspended in water in a conical flask to which kerosene was added. The flask was inverted to mix and left to stand for 10 min allowing mites to accumulate into the kerosene layer. The kerosene layer was rinsed through a sieve (45 µm) with 90% ethanol and mites were backwashed into a petri dish. Non-hyaline mites were cleared by placing in 55% lactic acid for seven days to facilitate identification. Mites were observed under the stereo microscope, mounted on slides using Hoyer's mounting medium and were morphologically identified via taxonomic keys. A total of 13 soil samples revealed 102 mites identified as 30 morphologies belonging to Orders Mesostigmata, Astigmata, Prostigmata, and Oribatida. Overall, Oribatids made up 52% of total mites and were the most abundant order in both zones, while Astigmata was the least abundant. The abundance of Mesostigmata was 39.1% in the intermediate zone and 23.4% in the wet zone. Some Mesostigmatid mites were further identified into infraorders of Gamasina and Uropodina, and into families of Laelapidae and Parasitidae. Order Prostigmata consisted of mites from families Cunaxidae, Bdellidae, and Calyptostomatidae and made up 14.1% and 13.0% of mites in wet and intermediate zones respectively. This study presents the first records of all mite species identified in the survey offering baseline information on soil mite diversity and distribution in Sri Lanka. Considering their significance to soil health, their role in promoting plant growth, and their function as intermediate hosts for parasites such as *Moniezia* spp., it is important to continue exploring their distribution and diversity to better understand their ecological contributions.

Keywords: Soil mites, Sri Lanka, biodiversity, taxonomic survey, oribatid mites

Effectiveness of *Mimusops elengi* Seed Extract Against Cariogenic Bacteria

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Dental caries, one of the most prevalent oral health issues worldwide, arises from bacterial activity within dental plaques. While chlorhexidine-based mouthwashes are widely used, concerns about tooth staining and bacterial resistance underscore the need for alternative, natural antibacterial agents. This study aimed to evaluate the antibacterial efficacy of *Mimusops elengi* ('Munamal') seed extract compared to *Aloe barbadensis* gel extract and chlorhexidine-containing mouthwash products, against cariogenic bacteria isolated from dental plaques. Plaque samples from four patients were cultured, and pure colonies of the most common bacterial morphotype (Type A) was selected for the study. Crude extracts of *M. elengi* seed powder and *A. barbadensis* gel powder were prepared using methanol and concentrated via rotary evaporation. Disk diffusion assays were conducted for *M. elengi* [undiluted crude, 71% (v/v), 56% (v/v)], *A. barbadensis* [undiluted crude, 71% (v/v)] and two commercially available 0.2% chlorhexidine containing mouthwash products. The antibacterial activity was measured by the zone of inhibition. Phytochemical screening of *M. elengi* seed extract was conducted using standard methods. Gram Staining was performed on Type A isolate. Commercial mouthwashes showed the highest antibacterial efficacy (16.08 ± 0.770 mm ,15.723 ± 0.747 mm) significantly surpassing both plant extracts ($p < 0.05$). *Mimusops elengi* seed extract (12.13 ± 0.540 mm) exhibited significantly stronger activity ($p < 0.05$) than *A. barbadensis* (8.42 ± 0.040 mm). No significant differences were observed between *M. elengi* seed extract and its dilutions indicating lower concentrations may still provide similar antibacterial benefits without compromising the activity ($p > 0.05$). Phytochemical analysis confirmed the presence of phenols, quinones, flavonoids, saponin, tannins, volatile oils and alkaloids in crude of *M. elengi* seed. Type A bacterial isolate was Gram-negative. Further molecular studies are needed to identify this bacterial species. These findings demonstrate the antibacterial properties of seed extracts of *M. elengi*, suggesting its potential as a natural antibacterial agent against bacteria causing dental caries. Further studies are needed to investigate the clinical efficacy, safety, and long-term effects of *M. elengi* seed extract.

Keywords: *Aloe barbadensis*, antibacterial properties, cariogenic bacteria, chlorhexidine, *Mimusops elengi*

Enhanced Electrochemical Performance of Tin Oxide-Doped Coconut Shell Charcoal-Derived Activated Carbon for Energy Storage Applications

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The growing demand for efficient and sustainable energy storage systems has driven interest in biomass-derived carbon materials. Coconut shell charcoal, an abundant and low-cost precursor, shows great potential for producing activated carbon electrodes for supercapacitor applications. However, few studies have explored the impact of metal oxide doping on the electrochemical performance of such biomass-derived carbons. This study investigates the effect of tin oxide (SnO_2) doping on the electrochemical performance of coconut shell charcoal-derived activated carbon for electric double-layer supercapacitors (EDLCs). Activated carbon was synthesized from coconut shell charcoal and doped with varying concentrations of SnO_2 powder (2%, 4%, 6%, 8%, and 10% w/w). A binder solution containing 0.05 g of polyvinylpyrrolidone (PVP) in isopropanol was prepared and mixed with the activated carbon. The resulting slurry was spray-coated onto titanium substrates preheated to 150 °C, followed by sintering at 200 °C for 20 minutes. Supercapacitor cells were assembled using 2.5 M H_2SO_4 as the electrolyte and filter paper as the separator. Electrochemical performance was evaluated through cyclic voltammetry, and the specific capacitance and energy density were calculated. Among all samples, the electrode doped with 4% SnO_2 exhibited the highest performance, achieving a specific capacitance of 74.33 F g^{-1} and an energy density of 10.32 Wh kg^{-1}. In contrast, the undoped activated carbon electrode showed significantly lower values, with a specific capacitance of 40.47 F g^{-1} and an energy density of 5.62 Wh kg^{-1}. These findings confirm that SnO_2 doping substantially enhances the electrochemical properties of biomass-derived activated carbon. This study highlights the potential of integrating metal oxide dopants into waste biomass carbon frameworks to develop high-performance, sustainable electrode materials for next-generation energy storage devices.

Keywords: Biomass-derived activated carbon, coconut shell charcoal, tin oxide (SnO_2) doping, electric double-layer capacitor (EDLC), supercapacitor electrode materials.

Enhanced Furanic Compound Detection in Transformer Oil: A GCMS Method Optimization with SPE and LLE Comparison

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Transformer oil serves as an insulator and coolant in electrical transformers. Over time, thermal and oxidative stresses degrade cellulose insulation, producing furanic compounds such as 5-hydroxymethylfurfural (5-HMF), furfuryl alcohol, 2-furaldehyde, 2-acetylfuran, and 5-methyl-2-furaldehyde. Detecting these compounds is crucial for assessing transformer health. While high performance liquid chromatography (HPLC) is commonly used, gas chromatography mass spectroscopy (GCMS) offers better sensitivity for volatile furans, with less interference from oil by products. It also detects other aging by products like aldehydes. This study optimizes a reliable GC based method for furan detection in transformer oil and evaluates the effectiveness of solid phase extraction (SPE) and liquid-liquid extraction (LLE) techniques. Initially, a 1 ppm standard mixture of the five furanic compounds was analysed under full scan mode (m/z 36–137) to assess general chromatographic behaviour of traceable standard. SIM (selected ion monitoring) was then performed targeting main fragments under the same temperature program. Individual runs determined each compound's retention time, and these were integrated into a combined SIM method for all five analytes. The temperature program was optimized to enhance separation. For sample preparation, SPE (using C18 cartridges and acetonitrile) and LLE (with dichloromethane) were performed on transformer oil. The extracts were then analysed using the optimized GCMS method. The optimized GCMS method using a TG-5SilMS column successfully separated four furanic compounds with retention times of 8.79 min (2-furaldehyde), 9.66 min (furfuryl alcohol), 11.87 min (2-acetylfuran), and 27.07 min (5-HMF). The absence of detected 5-methyl-2-furaldehyde highlighted the need of further optimization. The temperature program starting at 30°C (2 min hold), ramping at 3°C/min to 114°C (2 min hold), then at 15°C/min to 280°C (3 min hold) provided optimal separation of the furanic compounds. The LLE showed superior performance over SPE, yielding higher recovery and clearer chromatographic peaks. The complex matrix of oil affected SPE performance, leading to lower furan detection. The optimized GCMS method using a TG-5SilMS column and modified temperature program (30°C-280°C) enabled clear separation of four furanic compounds. LLE proved more effective than SPE. This approach supports reliable, efficient furan detection in transformer oil for condition monitoring and insulation aging assessment, supporting predictive maintenance strategies in power systems.

Keywords: Transformer oil, furan analysis, gas chromatography, liquid-liquid extraction

Evaluation of Antioxidant, Antidiabetic, Anti-obesity Properties and Cytotoxicity Effect of Four Sri Lankan Medicinal Plants

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With the global rise in non-communicable diseases such as diabetes, obesity, and related metabolic disorders, there is an increasing demand for sustainable, low-toxicity therapeutic alternatives derived from natural sources. Sri Lankan medicinal plants offer promising bioactive compounds, yet scientific validation is crucial for their integration into modern healthcare. This study aimed to evaluate the antioxidant, antidiabetic, anti-obesity, and cytotoxic properties of leaf extracts from four selected Sri Lankan medicinal plants, namely, *Ricinus communis* L., *Croton aromaticus* L., *Toddalia asiatica* (L.) Lam., and *Sida rhombifolia* L. selected based on ethnobotanical relevance and traditional use in metabolic disorders. Extracts were prepared using hexane, dichloromethane, ethanol, and water to ensure a broad polarity range for compound solubility. The antioxidant activity was assessed employing assays for DPPH radical scavenging activity, ferric reducing antioxidant power (FRAP), total flavonoid content (TFC), and total phenolic content (TPC). Antidiabetic and anti-obesity activities were assessed using α-amylase and lipase inhibition assays, respectively, while cytotoxicity was evaluated using the brine shrimp lethality bioassay. Among the tested extracts, *Ricinus communis* L. exhibited the highest antioxidant activity with DPPH (0.531 ± 0.003 mg TE/g, dw), FRAP (2.726 ± 0.025 mg Fe^{2+}/g, dw). Highest TPC, and TFC values were also resulted from *Ricinus communis* L. In antidiabetic evaluation, *Sida rhombifolia* L. showed the highest α-amylase inhibition in ethanol extract (IC_{50} = 0.89 µg/mL) while *Toddalia asiatica* (L.) Lam displayed a significant activity in hexane and water extracts. According to the lipase inhibition assay, *Sida rhombifolia* L. (hexane: IC_{50} = 4.08 µg/mL) and *Toddalia asiatica* L. (water: IC_{50} = 4.51 µg/mL) demonstrated a strong anti-obesity potential. The brine shrimp lethality assay revealed a high toxicity in *Croton aromaticus* L. (LC_{50} < 50 µg/mL), whereas *Toddalia asiatica* (L.) Lam and *Ricinus communis* L. were non-toxic (LC_{50} > 4000 µg/mL), supporting their therapeutic safety. The study highlights the potential of selected plant extracts as natural antioxidants and enzyme inhibitors, supporting their use in health promotion, functional foods, and preventive therapeutics for sustainable healthcare and advancing global health research through scientific collaboration.

Keywords: Medicinal plants, antioxidant, antidiabetic, anti-obesity, cytotoxicity

Evaluation of Satellite Rainfall Products for Hydrological Modelling in a Data-Scarce Catchment: A Case Study of Kalu Ganga Catchment of Mahaweli Basin, Sri Lanka

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Accuracy of hydrological modelling relies heavily on high-resolution, high-quality rainfall data, particularly in regions with few or unevenly distributed ground observations. Kalu Ganga catchment, a significant sub-basin of the Mahaweli River Basin, exemplifies this challenge, as its existing rain gauge stations are situated outside the catchment boundaries, leading to potential biases in hydrological assessments. This study addresses this gap by evaluating the feasibility of integrating satellite-based rainfall products as a viable alternative for hydrological applications in data-scarce contexts. Four widely used gauge-adjusted satellite datasets (CHIRPS, MSWEP, IMERG, PERSIANN-CDR) were thoroughly assessed for their accuracy, consistency, and reliability in estimating rainfall and simulating streamflow using the SWAT tool. A multi-criteria statistical approach was employed, incorporating six continuous performance indices (r, R^2, NSE, RMSE, PBIAS, KGE) and four categorical indices (POD, FAR, FBI, CSI) to evaluate the performance at daily and monthly timesteps. The results demonstrate that CHIRPS (for Illukkumbura station: r = 0.80, NS = 0.60, PBIAS = 17.5, KGE = 0.57) and MSWEP (for Duckwary station: r = 0.76, NS = 0.49, PBIAS = -4.3, KGE = 0.75) exhibit superior agreement with observed rainfall, outperforming IMERG and PERSIANN-CDR. Categorical analysis yielded varied findings in different categories. CHIRPS performs exceptionally well in identifying 'no-rain' conditions with highest POD (0.723 to 0.760) and CSI values (0.582-0.624), making it ideal for drought monitoring and low-flow studies. Conversely, IMERG proves more effective in capturing high-intensity rainfall events with highest POD (0.369-0.670) and CSI (0.208-0.211), suggesting its applicability in extreme rainfall analysis. CHIRPS produces superior accuracy in simulating stream-flows, with bias correction further enhanced their accuracy (r = 0.80, NS = 0.63, PBIAS = 16.35, RMSE = 6.21 and KGE = 0.71). These findings highlight the practical utility of satellite-based rainfall products in overcoming data limitations in poorly monitored catchments for enhancing water resource management, climate adaptation, and disaster risk reduction. This multi-faceted approach can be extended to other data-scarce regions, supporting governance and resilience planning.

Keywords: Hydrological modelling, rainfall evaluation, satellite-based rainfall, water resources management, data-scarce catchments

Facial Bacteria and Comparative Evaluation of Antibacterial Properties of Three Commonly Used Face Wash Products in Sri Lanka

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Bacterial resistance to commonly used antibacterials has become a growing concern in the health sector. Despite the widespread use of face wash, limited data available on their effectiveness against typical skin microbiota and facial pathogens. This study aimed to identify the most preferred face wash products among undergraduates and to evaluate the antibacterial activity of three widely used commercial face wash products in Sri Lanka against both natural facial flora and *Staphylococcus aureus*. A survey involving 195 undergraduates at the University of Peradeniya identified the most frequently used products. Bacterial isolates were obtained from facial skin swabs of seven students and cultured in Blood Agar media. The three most dominant morphotypes were selected based on colony morphology and gram staining for antibacterial sensitivity testing (ABST) via the disc diffusion method using Mueller Hinton Agar media (MHA), with the selected face wash products. The Anti-Bacterial Sensitivity Test was conducted with 0.5 and 1.0 McFarland standard inocula and 24-hour broth cultures for selected three bacterial isolates. *Staphylococcus aureus* ATCC 25922, as a known facial pathogen, was tested with 0.5 McFarland standards. Filter paper disks with a diameter of 5 mm were treated with different face wash products as treatments, while distilled water was used as the negative control. The survey identified NS, FV, and PN as the preferred face washes. Among the isolates, gram-positive cocci Morpho A, Gram-positive bacilli Morpho B and C were the most common. PN showed the strongest antibacterial activity against Morpho A, with inhibition zone diameters ranging from 12.33 ± 0.33 mm to 11.33 ± 0.67 mm. For Morpho B, PN again exhibited the highest mean zone of inhibition (16.67 ± 0.33 mm), followed by FV and NS. Morphotype C showed no significant difference across products, with all inhibition zones averaging 15 ± 0.0 mm ($p > 0.05$). The PN also demonstrated the highest inhibitory effect on *S. aureus* (13 ± 0.0 mm). This study enhances understanding of facial microbiota, preferred face wash products by the study population and their relative antibacterial properties, while highlighting the need for further research into the clinical implications of isolated bacterial morphotypes.

Keywords: Antibacterial tests, face wash products, skin microbiota, *Staphylococcus aureus*

Geochemical Characteristics in Some Selected Springs in the Highland Complex of Sri Lanka

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Rural communities throughout Sri Lanka's Highland Complex heavily depend on natural springs as their main drinking water supply, yet many consume this water without adequate treatment. To evaluate their suitability as drinking water sources, this study examined 34 naturally flowing springs across Matale, Kandy, Matara, Kalutara, and Badalkumbura regions. Selected springs were tested for physical, chemical, and isotopic parameters. Laboratory analysis measured pH, electrical conductivity, hardness, alkalinity, major ions (Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, HCO_3^-, SO_4^{2-}, NO_3^-, PO_4^{3-}), and stable isotopes ($\delta^{18}O$, δ^2H, $\delta^{13}C$). Results show significant regional differences in water chemistry. The springs showed a pH range of 5.21 to 8.40, while hardness varied from 28.7 mg/L in Kandy springs to 583 mg/L in Matale. Chloride concentrations reached 60 mg/L in certain Matale springs, indicating the need for further investigation into potential contamination sources. Isotope analysis highlighted distinct patterns in recharge. Matara springs exhibited enriched $\delta^{18}O$ values (-4.02‰ to -4.20‰) compared to springs in the central highlands (-6.85‰ to -5.78‰), reflecting altitude differences. Dissolved organic carbon concentrations varied considerably across sampling sites (0.09-0.90 mmol/L), with higher dissolved organic carbon (DOC) values observed in Kalutara springs, suggesting a greater influence of surface organic matter inputs. Calcium-magnesium ratios varied substantially (0.29-5.82), indicating lithological influences on water chemistry throughout the complex. High nitrate concentrations (10.8-6.8 mg/L) in Kalutara and Matale springs suggest agricultural contamination. Despite generally acceptable quality, localised problems exist, notably the acidic nature of Kalutara springs (pH 5.21-5.62) and excessive hardness in several Matale springs. This analysis revealed clear regional trends related to the geology of spring locations and anthropogenic activities. These findings indicate the need to introduce basic filtration systems, particularly for naturally acidic springs. Spring protection zones should be established to prevent contamination. Regular monitoring programs should be carried out for high-chloride springs, and the sustainability of these springs should be managed.

Keywords: Springs, water quality, highland complex, isotope analysis, drinking water

High Asymptomatic Cases of Canine Filariasis and Babesiosis Among Dogs Brought to a Veterinary Teaching Hospital: Do Crossbred Dogs Show Tolerance to Filariasis?

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Canine babesiosis and filariasis are haemoparasitic, vector-borne diseases with zoonotic potential. This research explores the prevalence and molecular characterization of *Babesia* and filarial species in dogs brought to the Veterinary Teaching Hospital at the University of Peradeniya for vaccinations, sterilization, health check-ups, treatments, and follow-up care. Blood samples were drawn from the cephalic vein of dogs. *Babesia* species were identified morphologically through Giemsa-stained thin blood smears, while filarial worms were detected using the Modified Knott's Technique; subsequently, analysing the infection intensity. Prevalence rates were compared across gender, age, and breed groups using chi-square or Fisher's Exact tests, while Mann-Whitney U test compared the intensity of infection. Conventional PCR followed by bi-directional sequencing, supplemented by pairwise comparisons and phylogenetics were carried out. Sensitivity comparisons between microscopy and molecular techniques for parasite detection were also performed. Among the 160 dogs sampled between April and October 2024, 35.0% and 16.3% were positive for babesiosis and filariasis, respectively. Of the infected dogs, only one crossbred dog showed clinical signs of heartworm disease for filariasis, while two purebred dogs showed clinical signs of tick fever characteristic of babesiosis. A higher prevalence of infections was observed in crossbred dogs than purebred dogs having babesiosis (crossbred 51%; purebred 26%; $\chi^2 = 10.318$, $p = 0.001$) and filariasis (crossbred 42%; purebred 1%; $\chi^2 = 46.866$, $p < 0.05$). The intensity of microfilarial infection in crossbred dogs (21.40 ± 57.13) was higher compared to purebred dogs (0.30 ± 29.90; Mann-Whitney U test, $p < 0.001$). Molecular investigations confirmed the presence of *Babesia gibsoni* and *Dirofilaria repens.* Phylogenetic analyses indicated high sequence similarity of *B. gibsoni* to local isolates and identifying one unique variant of the same species. When comparing two diagnostic tools, PCR revealed a higher prevalence for both babesiosis (35.0%; $\chi^2 = 40.041$, $p < 0.05$) and filariasis (16.3%; $\chi^2 = 49.149$, $p < 0.05$) compared to microscopy (*Babesia* 11.9%; microfilaria 5.6%). This study underscores the necessity of managing dirofilariasis in crossbred dogs, which, despite carrying heavier infection burdens without clinical symptoms, serve as sub-clinical reservoirs of disease, facilitating its persistence and transmission within the domestic canine population.

Keywords: *Babesia gibsoni*, crossbred dogs, *Dirofilaria repens*, vector-borne diseases

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Identification of Two *Ganoderma* (Ganodermataceae, Polyporales) Species Collected in Central Province, Sri Lanka

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Ganoderma (Ganodermataceae, Polyporales) is a wood-decaying mushroom genus, known for its rigid, woody fruiting bodies. With over 300 species distributed worldwide, only a few, such as *G. lucidum*, are widely recognized for their ethnomedicinal value and are in high demand in the food and supplement industries due to their bioactive properties. However, the full diversity of *Ganoderma* remains understudied, particularly in Sri Lanka. This study collected ten putative *Ganoderma* specimens from the University of Peradeniya and surrounding areas. Field photographs and notes were further analysed at the laboratory. Among the ten collected samples, two were selected for detailed study based on their high abundance in the area, assuming they may be dominant species in this specific habitat. Mycelial cultures were established from inner tissues of fruiting bodies on potato dextrose agar (PDA) under aseptic conditions and incubated in the dark at room temperature for 2–3 weeks. Macro- and micro-morphological characteristics of the basidiocarps and cultures were documented. DNA was extracted from fresh fruiting bodies using a modified CTAB-based method optimized for fungal DNA extraction. PCR optimization included a temperature gradient (51–59 °C), the use of bovine serum albumin (BSA) to counteract polyphenolic inhibitors, and adjustments to the $MgCl_2$ concentration. The internal transcribed spacer (ITS) region was amplified using ITS5 and ITS4 primers, followed by DNA sequencing. BLAST analysis of the resulting sequences revealed 99–100% identity (E-value < 0) with *G. australe* (LC084733.1) and *G. applanatum* (OR062403.1). Although it has been mentioned in several publications that both species have been previously recorded in Sri Lanka, no reliable visual or morphological descriptions of them exist in the local or international scientific publications or image repositories. This study, therefore, provides the first detailed morphological and molecular documentation of these two species from Sri Lanka. It highlights the abundance and taxonomic significance of *Ganoderma* species in the Peradeniya region, contributing foundational data for future taxonomic and phylogenetic research on this genus in the country.

Keywords: *Ganoderma*, ITS region, molecular identification, morphological analysis

Improving the Performance of Carbon Nanotube-Based Membranes for Water Desalination

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Carbon nanotubes (CNTs) are among the most prominent nanomaterials used in membrane filtration technology for water desalination purposes due to their remarkable chemical, structural, mechanical, and thermal properties. Performances of membranes are highly affected by the uniform and even distribution of nanoparticles on the membrane substrate. Therefore, a well-dispersed solution of CNTs is essential to fabricate the membrane substrate for optimum performance. However, the dispersion of carbon nanotubes in any solvent is challenging due to their bundle-like structure. This study investigated how the dispersion of multi-walled carbon nanotubes (MWCNTs) in solutions with different compositions affects the performance and structural morphology of the thin film nanocomposite (TFN) membranes used for water desalination. In this study, the MWCNTs were functionalized with carboxyl groups by treating them with an HNO_3/H_2SO_4 acid mixture (3:1(v/v)) for enhanced dispersion. Different dispersions of functionalized MWCNTs (fMWCNTs - 0.004% w/v) were prepared using distilled water, ethanol, and the surfactant, sodium dodecyl sulphate (SDS), along with m-phenylenediamine (MPD) as a common monomer in all the solutions. The fMWCNTs dispersed in different solutions were incorporated onto the membrane substrate using the spin coating method. Trimesoyl chloride (TMC) was used as the other monomer for the formation of a porous polyamide layer onto which the fMWCNTs are incorporated. Elucidation of the structure of the fabricated membranes was done using SEM imaging and FTIR spectroscopy, and performances tested by evaluating the water flux and salt rejection. The results revealed that the TFN-ethanol membrane has the best-fitted morphology for the filtration, with a 71.9% enhancement in water flux compared to the TFC (thin film composite) membrane, and the highest salt rejection of 37.87% for $MgSO_4$ and 31.22% for NaCl was observed. The TFN-DI membrane possessed the next highest performance with a 20.2% enhancement in water flux compared to the TFC membrane and salt rejections of 14.8% and 12.5% for $MgSO_4$ and NaCl, respectively. Interestingly, the TFN-SDS membrane exhibited no permeability, suggesting poor integration or blockage of the porous structure due to surfactant interaction. These findings suggest that performance of carbon nanotube-based TFN membranes can be significantly enhanced through dispersion methods, as functionalized CNTs exhibit different chemical interactions depending on the solution compositions.

Keywords: Carbon nanotubes, dispersion, water flux, salt rejection, functionalized

Investigating the Radioactivity Concentration of K-40 in Common Fertilizers Used in Sri Lanka

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Fertilizer production can introduce naturally occurring radioactive material (NORMs), such as potassium-40 (K-40). Given the importance of agriculture in Sri Lanka and the limited local research on fertilizer radioactivity, this study estimates K-40 levels to assess radiological risks and support safe farming. This study aims to determine the activity concentration of the naturally-occurring radionuclide K-40 in commonly used fertilizers in Sri Lanka using gamma-ray spectroscopy. To evaluate the potential radiological risk associated with the use of agricultural fertilizers, the study also assesses whether the measured concentrations fall within globally recognized safety limits, as outlined by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR, 2000). Eight commonly used fertilizer samples were collected from local markets in Sri Lanka. Each 0.5 kg sample was measured using gamma-ray spectroscopy with a 2″×2″ NaI (Tl) scintillation detector, operated for a counting time of 3600 seconds. The detector was centrally aligned with each sample to ensure uniform geometry. The photopeak efficiency of the NaI (Tl) detector for the 1460 keV gamma line of K-40 was determined through calibration, which was then used to calculate the K-40 activity concentrations. The results were compared with UNSCEAR safety standards to assess radiological safety. The natural radioactivity values of fertilizers that are widely used in Sri Lanka are given by this research as measured by gamma-ray spectroscopy using a 2″×2″ NaI (Tl) detector. The K-40 activity concentrations of all fertilizers were less than the international safety limit of 4860 Bq kg^{-1} laid down by UNSCEAR. The concentration was 134.54 Bq kg^{-1} for triple superphosphate (TSP) and 3.14 Bq kg^{-1} for muriate of potash (MOP). These values reflect low radiological risks. The readings will be impacted by the limited NaI (Tl) detector, which possesses a calculated photopeak efficiency for K-40 of 2.3%. This study confirms that K-40 concentrations in fertilizers used in Sri Lanka are under UNSCEAR safety limits. Despite the NaI (Tl) detector limitations, the results confirm safe agricultural use. Future research can utilize high-purity germanium (HPGe) detectors and Monte Carlo simulations for more sophisticated radiological assessment and broader NORM detection.

Keywords: 2″×2″ NaI (Tl) detector, fertilizers, gamma spectroscopy, K-40, NORMs

Isolation and Characterization of Efficient Diesel-Degrading, Biosurfactant-Producing Bacteria from Petroleum-Contaminated Subsurface Soils in Kandy District, Sri Lanka

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Petroleum contamination is a prevalent environmental issue, with detrimental effects such as soil contamination, microbial community disruption, and long-term ecological disturbances extending across diverse ecosystems. Among the numerous hydrocarbons present in petroleum, diesel is a major contributor to soil pollution. Previous studies have identified bacteria as highly effective agents for diesel degradation (DD), highlighting their potential for bioremediation of oil spills. However, successful bioremediation of diesel-contaminated soil and aquatic environments requires the identification of effective diesel-degrading strains, along with key traits that support DD, such as biosurfactant production. Therefore, this study aimed to identify efficient diesel-degrading bacteria (DDB) from petroleum-contaminated sites in Kandy District, while concurrently exploring their biosurfactant production capabilities. Five sampling sites were chosen based on visible signs of diesel contamination. DDB were isolated using Bushnell Haas broth supplemented with diesel. Pure bacterial isolates were obtained by streak and spread plating techniques. Isolated bacteria were identified through morphological and biochemical methods. The DD efficiencies of the isolates were examined by turbidity assays and 2,6-dicholophenolindophenol (DCPIP) assays. Moreover, efficient DDB were used to design artificial consortia. The degradation efficiencies of artificial consortia and natural consortia, which were directly obtained by enrichment culturing of soil samples were also determined. Additionally, the biosurfactant production ability of efficient DDB was investigated by the emulsification test, oil displacement test, and CTAB agar plates. Among the diesel-degrading bacterial strains isolated, the four most effective isolates, in the order of decreasing efficiency, belonged to the genera *Pseudomonas*, *Staphylococcus*, *Corynebacterium* and *Streptococcus*. Further, the DD efficiencies of most of the designed consortia and natural consortia were found to be significantly higher than that of the individual bacterial isolates, with one natural consortium containing *Pseudomonas, Staphylococcus,* and *Corynebacterium* outperforming both the designed and natural consortia. Moreover, the isolated *Pseudomonas* and *Staphylococcus* strains were identified as biosurfactant producers, suggesting that their ability to produce biosurfactants contributes to their highest DD efficiencies. The findings of this study can be used in developing locally adapted bioremediation strategies for diesel-contaminated sites in Sri Lanka.

Keywords: Artificial consortia, bioremediation, efficient diesel-degrading bacteria, emulsification test, 2,6-dicholophenolindophenol (DCPIP) assay.

Isotopic and Geochemical Profiling of Vertical Groundwater Systems in the Western Coastal Region of Sri Lanka

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In coastal regions, groundwater quality can vary significantly with depth due to factors such as lithology, and seawater mixing. Although numerous groundwater geochemical studies have been carried out in Sri Lanka, the majority have primarily concentrated on the spatial distribution of chemical parameters. In contrast, limited research has been undertaken on vertical groundwater profiling, particularly using integrated isotopic and geochemical techniques. This gap highlights the need to investigate vertical variations in groundwater geochemistry, particularly in coastal regions where aquifer conditions can change significantly with depth. Therefore, this study examined the vertical variation in geochemical and isotopic composition in two monitoring wells located in the Colombo–Negombo coastal area. Water samples were collected at one and two-meter intervals and analysed for physicochemical parameters (pH, EC/TDS, salinity, DO), the major ions (Na^+, Ca^{2+}, Mg^{2+}, K^+, HCO_3^-, Cl^-, SO_4^{2-}) and stable isotopes ($\delta^{18}O$ and δ^2H) using standard methods. Notably, well 01, located in the cordierite gneiss formation, showed minimal variation in water quality with depth, indicating uniform aquifer conditions and isotopic data consistent with the Local Meteoric Water Line (LMWL) confirming no sign of seawater intrusion. In contrast, well 02, located closer to the coast in an unconsolidated sand formation, revealed increasing salinity and ion concentrations with the depth, while isotopic signatures indicate seawater mixing. A notable transition was observed around six meters below, where water quality parameters also changed drastically, suggesting a distinct lower zone with significantly different geochemical conditions compared to the upper part of the well. These findings indicate the importance of depth sampling in complex aquifers. Relying on water quality data from a single depth can lead to misleading conclusions about the overall condition of the aquifer. Depth-resolved approaches are essential to characterize groundwater quality accurately, particularly in coastal regions where geological and geochemical conditions can vary significantly with depth. This study provides valuable insights for more effective regional groundwater monitoring and sustainable management of water resources.

Keywords: Vertical profiling, groundwater quality, lithology, hydrogeochemical relationships, stable water isotopes

Microalgal Richness as Bioindicators of Organic Pollution in Selected Urban Lakes in Sri Lanka

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Urban freshwater ecosystems are increasingly threatened by organic pollution, necessitating the use of biological indicators to assess and monitor their health. This study investigates the richness of microalgal species and assesses the level of organic pollution in three urban lakes in Sri Lanka; Kurunegala, Kandy, and Beira lakes, using the Palmer Genus pollution index. In this study, twelve 100 mL water samples from each lake were collected during July to November 2024. A total of 35 algal and cyanobacterial genera were morphologically identified from the water samples by using a light microscope. The dominant division among the observed taxa was Chlorophyta, followed by Cyanophyta and Chrysophyta. Kurunegala lake (20) exhibited moderate species richness, while Beira (24) and Kandy (24) lakes presented higher richness, including filamentous green algae and cyanobacteria such as *Microcystis* and *Spirulina*, which are indicators of eutrophic conditions. Palmer pollution index scores indicated varying levels of organic pollution among the lakes. Beira (24) and Kandy (20) lakes were classified as highly polluted while Kurunegala lake (19) showed moderate organic pollution. Species like *Chlorella*, *Scenedesmus*, and *Chlamydomonas* were common across all three lakes. They were key contributors to the pollution scores due to their high tolerance to organic pollutants as defined by Palmer. Site-specific pollution indicators were also identified. *Oocystis* and *Microcystis* in Beira lake suggested faecal contamination and nutrient overloading, while *Cryptomonas* and *Phormidium* in Kandy lake indicated organic matter enrichment and *Mougeotia* and *Closterium* in Kurunegala lake pointed toward nutrient-driven pollution. Past algal surveys in these lakes revealed decreases in dominant species composition. This decrease might be due to environmental management interventions such as floating wetlands and wastewater treatment systems. The findings emphasize the utility of algal bioindicators in evaluating the trophic status and pollution levels of freshwater ecosystems and highlight the need for continuous monitoring to assess the effectiveness of ongoing pollution mitigation strategies.

Keywords: Microalgae, organic pollution, bioindicators, freshwater ecosystems

Modelling Dengue Disease Spread Using the SIS Model and Lotka-Volterra Model in Sri Lanka

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Dengue fever is a major public health concern in Sri Lanka where periodic outbreaks lead to significant morbidity and mortality. This study develops an integrated mathematical modelling approach to understand and predict dengue transmission dynamics by combining the Susceptible Infected Susceptible (SIS) model with the Lotka-Volterra predator prey framework. In this approach, the SIS model captures the flow between susceptible and infected human populations while the Lotka-Volterra model formalizes the mosquito-human interaction by treating mosquitoes as predators and humans as prey. This integration allows for a clearer mathematical representation of how vector population dynamics drive infection rates. Historical dengue incidence data (1990–2023) were used to estimate parameters and the models were solved numerically using Python-based ordinary differential equations. Equilibrium analysis shows the existence of stable endemic states under current conditions, indicating persistent disease presence without interventions. Stability analysis confirms that small changes in parameters do not eliminate endemic transmission, highlighting the need for control measures. Quantitative results indicate peak infection rates of 40–50% during monsoon seasons, a strong correlation ($R^2 = 0.87$) between mosquito population peaks and human cases and demonstrate that reducing mosquito populations by at least 50% can lower outbreaks by up to 60%. Vaccination coverage of 70% can reduce outbreak magnitude by approximately 45%. These findings highlight the critical importance of integrated vector management and targeted public health measures for effective dengue control. The proposed modelling framework provides valuable quantitative insights to guide targeted public health strategies and supports evidence-based decision making for dengue control in Sri Lanka.

Keywords: Dengue transmission modelling, Lotka-Volterra dynamics, SIS model, vector control strategies

Optimization of Coconut Shell-Based Char for Humic Acid Removal from Contaminated Water

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Dissolved organic matter (DOM) in water sources is a major concern due to the production of carcinogenic disinfection by-products (DBPs) during water treatment. This study investigates the potential of coconut shell-derived carbon as an efficient adsorbent to remove humic acid (HA), a major DOM component. The research aims to optimize adsorption parameters of activated coconut shell carbon (ACC) and pyrolyzed coconut shell carbon (PCC) under various physiochemical conditions and evaluate the reusability and desorption potential of the material. The PCC was prepared by heating coconut shells at 600°C with a rate of 10°C min^{-1} in a N_2 environment. For the preparation of ACC, PCC was chemically activated, using KOH with PCC at a 3:1 ratio, and then the mixture was carbonized at 700°C with 10°C min^{-1} heating rate under N_2 flow. Coconut shell-derived carbon was characterised by SEM, XRD, and FT-IR analyses. Adsorption parameters, including pH (5-11), contact time (30-240 min), adsorbent dosage (1.00-6.00 g), and oven time (3-15 h), were optimized for the adsorption of HA using PCC and ACC. Optimized conditions for the PCC in 100 ppm HA were pH 7, 120 min contact time, 4.00 g of adsorbent dosage, and 12 hours of duration in the oven. PCC gave 18.01% removal efficiency for 100 ppm humic acid solution. Optimized conditions for the ACC in 100 ppm HA were pH 7, 4.00 g adsorbent dosage, 240 min, and 12 hours of oven time. ACC achieved a maximum removal efficiency of 80.86% at 100 ppm humic acid concentration. Desorption tests revealed that thermal desorption achieved a 66.78% removal efficiency after three cycles, whereas chemical desorption retained only 31.23%. The point of zero charge of the adsorbent was determined to be pH 9.1. Based on this work, it can be concluded that ACC, under optimized parameters for adsorption and thermal desorption conditions, is the best method for humic acid removal. These findings suggest that ACC has strong potential for commercial application as a sustainable and cost-effective alternative to conventional DOM removal technologies. Further studies are recommended to validate and scale up the process.

Keywords: Activated carbon, adsorption, DBPs, DOM, water treatment

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Parasitoid-Pest Interactions in a Selected Pesticide-Free Rice Field

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Insect pests are the most significant factor contributing to a decline in rice production. Parasitoids play a crucial role as biological control agents, effectively suppressing pest populations. However, all parasitoids are not equally effective in controlling insect pests. Therefore, the study aimed to characterize and understand the nature of parasitism of the parasitoids that target various life cycle stages of rice insect pests and to evaluate how two selected larval parasitoids manipulate the development and behaviour of a selected host. The number of individuals at all life cycle stages of the rice pests were sampled biweekly from five systematically placed quadrats (50 cm × 50 cm) across the three growth stages of the rice plant: vegetative, reproductive, and ripening during the 'Yala' season from a pesticide-free rice field in Homagama. These samples were brought to the laboratory to observe parasitoid emergence. Parasitisation assays were conducted under laboratory conditions (27°C ± 2 and 70% RH) for two larval parasitoids, *Cotesia baoris* (gregarious) and *Charops bicolor* (solitary), using *Pelopidas mathias* larvae (three individuals from each instar group per replicate; 1^{st}–2^{nd}, 3^{rd}–4^{th}, 5^{th}) as the host. This study identified 19 endoparasitoids (11 hymenopterans and eight dipterans) exhibiting diverse parasitic behaviours, infecting nine out of the 32 pest species. The majority were larval parasitoids (47%), followed by four pupal, two larval-pupal, and two adult parasitoids. *Telenomus triptus*, the only identified egg parasitoid infecting *Scotinophara coarctata,* exhibited the highest overall parasitism rate (85%) in the reproductive period. There was no significant relationship between host abundance and parasitism, suggesting efficient host searching ability of parasitoids. Parasitisation assays revealed that both *C. baoris* and *C. bicolor* prefer 3^{rd}-4^{th} instars of *P. mathias* with parasitism rates of 100% and 83.33%, respectively. *P. mathias* parasitized by *C. baoris* displayed indirect bodyguard manipulation. This study revealed complex interactions between rice pests and their parasitoids. The findings highlighted the potential of rice pest parasitoids for biocontrol and the need to understand their biology for effective pest management.

Keywords: Biological control, host manipulation, nature of parasitism, parasitoids, rice insect pests

Phytochemical and Bioactivity Profiling of Andrographis paniculata, Dolichandra unguis-cati, and Thunbergia laurifolia

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Over centuries, the vast array of plant species has proven to be an unparalleled resource for medicinal discovery. The study investigates the phytochemical profiles and bioactivities of aqueous extracts and their combinations derived from *Andrographis paniculata, Dolichandra unguis-cati*, and *Thunbergia laurifolia* Linn.; plants traditionally recognized for their therapeutic properties. Qualitative phytochemical screening revealed the presence of diverse secondary metabolites, including alkaloids, flavonoids, tannins, amino acids, and saponins, across all three extracts, with proteins uniquely identified in *A. paniculata* and *D. unguis-cati*. Saponins were detected in relatively significant amounts in *A. paniculata*, and amino acids, flavonoids, and tannins were abundant in *D. unguis-cati* extracts, with *D. unguis-cati* exhibiting a relatively higher phytochemical content. Bioactivity assessments demonstrated significant cytotoxic effects against brine shrimp, with *D. unguis-cati* exhibiting the highest potency (LC50 36 µg/ml), followed by *A. paniculata* (50 µg/ml) and *T. laurifolia* Linn (58 µg/ml). Antimicrobial evaluation conducted according to the guidelines of the European Committee on Antimicrobial Susceptibility Testing (EUCAST), against *Escherichia coli* (ATCC25922), *Staphylococcus aureus* (ATCC25923), Methylene Resistant *Staphylococcus aureus,* and *Bacillus cereus* indicated consistent minimum inhibitory concentrations (MICs) for *A. paniculata* and *D. unguis-cati*, while *T. laurifolia* Linn displayed more variable activity. Antioxidant potential, assessed via the DPPH assay, was highest in *A. paniculata* (281.44 ± 4.51), followed by *D. unguis-cati* (153.18 ± 4.73). Notably, combinations of the three plant extracts demonstrated enhanced antioxidant activity, indicating potential synergistic interactions that amplified their radical scavenging capacity. Among these combinations, the formulation comprising 50% *A. paniculata*, 30% *D. unguis-cati*, and 20% *T. laurifolia* exhibited the highest antioxidant activity, with a measured value of 325.18 ± 4.24. The findings of this study underscore the potential of *A. paniculata*, *D. unguis-cati*, and *T. laurifolia* Linn. as promising sources of bioactive compounds exhibiting cytotoxic, antimicrobial, and antioxidant properties, suggesting avenues for further exploration in the development of pharmaceutical and nutraceutical applications.

Keywords: Bioactivities, cytotoxicity, antibacterial, antioxidant

Potential of *Artocarpus heterophyllus* (Jackfruit) Leaf Extracts as a Natural Algaecide

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Algal blooms in fish tanks cause discoloration of water and cause stress to aquatic life, leading to health issues or reduced lifespans. Methods currently used to overcome this problem are costly and time-consuming. Commonly used chemical algaecides in fish tanks can also pose a threat to aquatic life. Therefore, there is need for an eco-friendly, natural alternative to address this issue safely and effectively. The current study focused on the effects of *Artocarpus heterophyllus* (jackfruit) leaf extracts as an algaecide on microalgae cultures isolated from domestic fish tanks. The algal sample contained *Chlorella* sp., *Chlorococcum* sp., and one unknown filamentous algal species. The efficacy of jackfruit leaf extracts prepared using acetone (99.5%), methanol (99.7%), and water was assessed by measuring the percentage of dead algal cells at 2-day intervals for a two-week period using a haemocytometer. The percentage of dead cells was significantly higher in treated samples versus negative controls ($p = 4.353e-10$). Phytochemical screening and Fourier-transformed infrared (FTIR) analyses were performed to determine the presence of bioactive secondary metabolites in each extract. Based on solubility, FTIR analysis, and phytochemical screening results, water was identified as the best solvent for extracting bioactive compounds from jackfruit leaves. The minimum inhibitory concentration (MIC) was determined with a concentration series of 840 $mgdm^{-3}$, 420 $mgdm^{-3}$, 210 $mgdm^{-3}$, 105 $mgdm^{-3}$ and 52.5 $mgdm^{-3}$ prepared with both young (DY) and mature leaves (DM). The percentages of dead cells treated with both young and mature leaf extracts were significantly higher than those in the negative controls and significantly differed among the different concentrations, as well as compared to negative and positive (Clorox) controls, respectively ($p = 5.759e-49$ and $p = 1.898e-43$). The MIC value for DY was ≤ 52.5 $mgdm^{-3}$, while for DM it was > 52.5 $mgdm^{-3}$ and ≤ 105 $mgdm^{-3}$. This indicates that young leaf extracts exhibited stronger algaecidal activity compared to mature leaf extracts. This study demonstrated that jackfruit leaf has potential to be developed as a natural algaecide.

Keywords: Algaecidal effect, *Artocarpus heterophyllus, minimum inhibitory concentration, secondary metabolites, water extract*

Prevalence and Genetic Characterization of Antibiotic-Resistant *Escherichia coli* in Selected Locations Along the Mahaweli River in Kandy, Sri Lanka

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Antibiotic resistance is a pressing global issue. Rivers, receiving antibiotic-resistant bacteria (ARB) and resistance genes (ARGs) through untreated or poorly treated wastewater coming from hospital, municipal, and agricultural discharges, act as reservoirs for resistant microbes, posing significant environmental and public health threats in developing countries. This study investigated the prevalence of antibiotic-resistant *Escherichia coli* and associated ARGs along the Mahaweli River in Kandy, Sri Lanka. It focused on the discharges from Meda Ela (ME), Kandy city wastewater treatment plant (WWTP), and Haragama National Livestock Development Board (NLDB) farm to identify critical hotspots for ARB and ARGs. Water samples were collected upstream, at discharge points, and downstream from ME, WWTP effluent, and NLDB farm discharges during two periods in 2024. Bacterial isolation and total coliform counts were performed using standard microbiological methods. *Escherichia coli* isolates were tested for resistance to six antibiotics i.e. amoxicillin (AMX), tetracycline (TET), co-trimoxazole (COT), ciprofloxacin (CIP), ceftazidime (CAZ), and streptomycin (S) by using Kirby-Bauer disk diffusion method. Polymerase Chain Reaction (PCR) was employed to detect ARGs *blaCTX*, *tetA, aadA1, dfrA5/14*, and *qnrB* in *E. coli*. Resistance patterns were compared across sites to assess the influence of the discharge sources on river pollution. Highest *E. coli* resistance was at ME discharge point (87% to AMX, 30% to TET, and 35% to COT). At WWTP effluent, 76% and 67% resistance were observed to AMX and TET, respectively. Downstream, although AMX (50%) and TET (44%) resistance persisted, ciprofloxacin-resistance declined (0%). *Escherichia coli* from farm discharge had lower resistance, except for buffalo pond (50% AMX and TET resistance with *tetA* gene). Multidrug-resistant *E. coli* were found at ME (35%) and WWTP (48%) discharge points. All the tested genes were detected in *E. coli* from ME and WWTP discharge points, except for *qnrB* from WWTP discharge point. The study demonstrates that hospital and municipal wastewaters are major contributors of antibiotic-resistant *E. coli* to Mahaweli River. Strengthening waste water treatment strategies and effluent monitoring is crucial to reduce environmental dissemination of antibiotic-resistant *E. coli* which are capable of spreading ARGs to pathogenic bacteria via horizontal gene transfer.

Keywords: Antibiotic resistance, *Escherichia coli*, wastewater discharge, antibiotic resistance genes, Mahaweli River

Secure Messaging Through Wheel Graphs: A Rainbow Vertex Antimagic Approach

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This study introduces a novel encryption method that bridges graph theory and cryptography by applying Rainbow Vertex Antimagic Colouring (RVAC) to wheel graphs. RVAC is a specialized graph labelling method that integrates antimagic properties with rainbow colouring to produce a unique and structured labelling scheme. The primary objective of the study was to automate the RVAC process on wheel graphs using Python and to evaluate its feasibility as a basis for secure message transformation. A Python-based algorithm was developed to assign distinct edge labels and compute vertex labels as the sum of adjacent edge weights. These labels were then grouped to minimize the total number of vertex colours, known as the RVAC number or connection number, which was consistently determined to be two for even-order wheel graphs and three for odd-order ones. This labelled structure was leveraged to encode messages numerically using modular arithmetic based on the RVAC configuration, followed by a reversible decryption routine. The decryption process reversed these transformations to retrieve the original message accurately. A test case using the phrase "*Hello World!*" confirmed the effectiveness of the method, demonstrating both the reliability and reversibility of the encryption system. Unlike many existing cryptographic schemes that rely heavily on number-theoretic hardness assumptions, this method offers structural obfuscation through graph-based label complexity, providing an alternative form of cryptographic strength. Also, it enables secure message encryption that could be further adapted to more intricate communication protocols. This study provides a novel approach toward integrating theoretical graph labelling with practical applications in information security. Future directions include extending this approach to other graph families and enhancing algorithmic complexity to strengthen cryptographic resistance against potential attacks.

Keywords: Cryptography, graph labelling, Python algorithm, rainbow vertex antimagic colouring, wheel graph

Some Properties of Fuzzy h-Open Sets in Fuzzy Topological Spaces

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The study of fuzzy topological spaces was initiated by Chang in 1968 through the discovery of Zadeh's fuzzy set theory. A fuzzy subset A of the set X always takes the form $\{(x, \mu_A(x)) : x \in X\}$, where μ_A is the membership function from X to $[0,1]$. A fuzzy topology is a family τ of fuzzy subsets in a non-empty set X satisfying three conditions: $0_X, 1_X \in \tau$; finite intersection of members of τ is in τ; and the arbitrary union of members of τ is in τ. We call the pair (X, τ) a fuzzy topological space. Also, the elements of τ are called fuzzy open sets. Following Chang, several scholars investigated various types of open or closed sets in fuzzy topological spaces. Some of the open sets are fuzzy preopen sets, fuzzy semi-open sets, fuzzy regular open sets, fuzzy α-open sets, and fuzzy β-open sets. The objective of this paper is to study a new type of open set, namely, fuzzy h-open sets. A fuzzy set A in a fuzzy topological space (X, τ) is called fuzzy h-open, if $A \leq \text{int}(A \vee U)$ for every non-empty fuzzy open set U $(\neq 1_X)$ in X. We prove some properties of fuzzy h-open sets in fuzzy topological spaces. First, we show that for a fuzzy topological space (X, τ) and a fuzzy set A in X, if there exists a fuzzy open set $U \neq 0_X, 1_X$ such that $U < A$, then the set A is not fuzzy h-open. Second, we show that the union or intersection of two fuzzy h-open sets is a fuzzy h-open set. Third, we prove that every fuzzy open set is a fuzzy h-open set. However, the converse of this result is not true in general. We illustrate this result using an example. Finally, we show that if the intersection of two fuzzy sets in a fuzzy topological space is fuzzy h-open, then at least one of these sets need not be fuzzy h-open. In conclusion, we explain some of the properties of fuzzy h-open sets. In the future, our aim is to focus on fuzzy h-continuity and some new types of open sets in fuzzy topological spaces.

Keywords: Fuzzy open sets, fuzzy h-open sets, fuzzy topology

Sri Lankan Serpentinites as Terrestrial Analogs: Mineralogical Insights into Serpentinization on Mars

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Serpentinization of ultramafic rocks represents a critical geochemical process governing planetary habitability and crustal evolution, with recent CRISM spectroscopic detection of serpentine phases in Martian Noachian period terrains (Nili Fossae, Gusev Crater) highlighting the need for robust terrestrial analog studies. This investigation aimed to characterize the mineralogical and petrographic signatures of five serpentinite bodies mainly along Sri Lanka's Highland-Vijayan boundary (at Yodhaganawa, Rupaha, Ginigalpelessa, Indikolapelessa, Ussangoda) and establish comparative frameworks with Martian serpentinization processes through integrated analysis of shergottite meteorites. Detailed petrographic examination using polarized light microscopy, XRD, EPMA, and Raman spectroscopy revealed dominant antigorite-chrysotile assemblages (≈ 80%) with relict olivine (forsterite) displaying exceptionally high Mg# values (0.97-0.99), chromite exhibiting distinctive holly-leaf texture and zooning (chromite core rimmed by magnetite) texture (Cr# 0.61-0.86, Mg# 0.25-0.35), and cross-cutting carbonate rich vein systems. Mesh textures exhibit olivine and pyroxene alteration and indicate pervasive serpentinization of dunite to harzburgite protoliths under moderate temperature oxidizing conditions. Comparative analysis with Martian meteorites reveals striking mineralogical parallels: NWA 2737 exhibits similar chromite chemistry (Cr# 0.78-0.83, Mg# 0.27-0.28) consistent with dunitic-harzburgitic heritage; ALH-77005 preserves coarse-granular to poikilitic textures with olivine-orthopyroxene assemblages, while DaG 489 meteorite displays transitional basaltic-lherzolitic character with Fe-Mg olivine (Fo79-59) with elevated Fe, and high-Cr spinels in groundmass. The systematic dunite-harzburgite protolith signature across both terrestrial and Martian samples indicates universal serpentinization pathways in ultramafic systems, although fundamental differences in crustal Fe/Mg ratios (Sri Lankan Fo96-98 versus Martian Fo78-79, with high Fe content) and formation environments (terrestrial moderate-temperature - highly oxidizing and Mg-rich hydrothermal versus Martian moderate to lower-temperature, Fe-rich hydrothermal systems) reflect distinct planetary evolutionary trajectories. These findings establish Sri Lankan serpentinites as robust terrestrial analogs for interpreting Martian hydrothermal processes and serpentinization process, and it provides critical mineralogical constraints for future in-situ mission targeting of serpentine bearing terrains on Mars.

Keywords: Serpentinization, Martian meteorites, antigorite, terrestrial analogs

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Structure, Development and Functional Morphology of the Cement Gland of Freshwater Angelfish, *Pterophyllum scalare*

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Certain bony fish larvae, including freshwater angelfish (*Pterophyllum scalare*), possess cement glands (CG) that secrete adhesive substances enabling attachment to substrates. The CG plays a key role in larval anchorage and survival. However, its development, ultrastructure, and functional morphology are poorly understood. This study aimed to identify the specific embryonic and larval stages during which the CG appears and regresses in *P. scalare*, examine its structural characteristics, investigate its functional morphology, and determine its role in early development. Live observations and whole-mount staining were conducted on multiple batches of embryos and larvae from five angelfish pairs to track temporal appearance and disappearance of the CG. Histological sectioning and scanning electron microscopy (SEM) were employed to characterize its structure and ultrastructure. Additionally, lectin staining was performed in early embryos and larvae to track CG cell differentiation, development, and regression. Larval behaviour was observed to corelate the adhesive function in a developmental and ecological context. The CG was first visible at 38 hours post-fertilization; however, lectin staining revealed that CG cell differentiation commenced earlier. The gland persisted until 10 days post-fertilization (dpf). SEM revealed three pairs of symmetrically arranged hemispherical elevations on the head, with two pairs dorsally and one near the nasal pit. Histological analysis demonstrated that the CG increased in size until 5 dpf, reaching its maximum size, and began regressing at 6 dpf. By 8 dpf, glandular cells markedly declined, which coincided with the initiation of free-swimming behaviour. Behavioural observation confirmed larval adhesion to substrate through direct head contact using adhesive filaments. This study highlights the CG as a transient but functionally critical organ in *P. scalare,* facilitating larval adhesion that is essential for their survival. Its development and regression follow a conserved pattern observed in other substrate-brooding cichlids, suggesting evolutionary conservation. The detailed ultrastructural insights aid in understanding organogenesis, cell differentiation, and ecological adaptation, which may support aquaculture practices for species reliant on adhesive-based larval strategies.

Keywords: Cement gland, histology, *Pterophyllum scalare*, SEM, ultrastructure

Study on b-Open Sets in Fuzzy Topological Spaces

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In 1965, Zadeh introduced the theory of fuzzy sets which can be expressed in the members of the given set and the membership function of that set. Based on the fuzzy set theory, Chang proposed the concept of fuzzy topological spaces. In a non-empty set X, a fuzzy topology is a family τ of fuzzy subsets that satisfies the following requirements: $0_X, 1_X$ are elements of τ; both the arbitrary union of elements of τ and the finite intersection of elements of τ are elements of τ. The pair (X, τ) is referred to as a fuzzy topological space. Also, the elements of τ are referred to as fuzzy open sets. The purpose of this paper is to explore the *fuzzy b-open set*. A fuzzy set A in a fuzzy topological space (X, τ) is called a fuzzy b-open if $A \leq \mathrm{int}(\mathrm{cl}(A)) \vee \mathrm{cl}(\mathrm{int}(A))$. We present various characteristics of fuzzy b-open sets within the context of fuzzy topological spaces. Krsteska showed that the union of two fuzzy b-open sets is a fuzzy b-open set. We show that this result is not true when we consider the intersection of two fuzzy sets. Next, we show that if the union of two fuzzy sets is fuzzy b-open, then those fuzzy sets need not be fuzzy b-open. Finally, we prove that every fuzzy open set is a fuzzy b-open set, every fuzzy semi-open set is fuzzy b-open, and every fuzzy b-open set is fuzzy β-open set. Further, we give counterexamples to show that the converse of these three results is not true. In summary, we have outlined several characteristics of fuzzy b-open sets. In the future, we intend to explore the study of fuzzy pre β-open sets and fuzzy semi β-open sets.

Keywords: Fuzzy topology, fuzzy β-open sets, fuzzy b-open sets.

Synthesis and Preliminary Characterization of Activated Carbon Derived from Selected Biowaste Materials

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Activated carbon (AC) is widely used in applications such as energy storage, water purification, and gas adsorption. However, its large-scale production from non-renewable resources raises environmental concerns. At the same time, the accumulation of biowaste in landfills presents significant health and ecological challenges. Converting biowaste into AC via chemical activation offers a sustainable and eco-friendly solution. This study focuses on synthesizing activated carbon from two biowaste materials: *Mimosa pigra* (YN) and cow bone (CB), followed by characterizing the products using scanning electron microscopy (SEM), Raman spectroscopy, and dye adsorption techniques. The biowaste was cleaned, sun-dried, and carbonized at 400°C for 2 hours in a low-oxygen environment. The carbonized materials were ground and mixed with 2.5 M KOH in a 1:1 weight ratio. After 48 hours at room temperature, the samples underwent chemical activation at 750°C for 2 hours. The activated carbon was then washed with 0.1 M HCl and deionized water until a neutral pH was achieved. Adsorption capacity was evaluated using iodine number and methylene blue (MB) adsorption via UV visible spectroscopy. Methylene blue, with a molecular length of approximately 1.43 nm, is a standard probe for assessing mesoporosity, while iodine (0.5 nm) is typically used to evaluate microporosity. CB-derived AC (CB-AC) showed higher MB adsorption (79 mg/g), indicating greater mesoporous character. In contrast, YN-derived AC (YN-AC) exhibited superior microporosity, with iodine numbers of 829.3 mg/g at 350 nm and 754.8 mg/g at 288 nm. SEM analysis confirmed these findings, revealing more uniform pore structures in YN-AC, while CB-AC exhibited reduced porosity due to its mineral content. Raman spectra indicated increased structural disorder in both samples, with YN-AC showing the highest I_D/I_G ratio (0.9444). This study confirms the viability of converting biowaste into activated carbon with tunable adsorption properties. These findings highlight the potential of selecting and tailoring biowaste precursors to produce low-cost, eco-friendly activated carbon, contributing to sustainable material development for industrial applications and effective waste utilization strategies.

Keywords: Biowaste-derived activated carbon, chemical activation, methylene blue adsorption, iodine number, Raman spectroscopy

Synthesis of Chitosan-Coated Lecithin Nanoparticles Loaded with Bitter Gourd (*Momordica charantia*) Lipid Extract

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Lipid present in seeds of bitter gourd (*Momordica charantia*) contains conjugated trienoic fatty acid alpha-eleostearic acid (ESA; 18:3: 9c, 11t, 13t). It has been reported to have various therapeutic properties including anticancer action. Efficient digestion and subsequent absorption are essential for enhancing the biological actions of ESA in bitter gourd fat and are required for enhancing its bioavailability. It is known that nanoscale delivery systems can increase the bioavailability of nutrients after ingestion. Chitosan-coated lecithin-based liposomes can be created by loading lipids into the structure. Coating with chitosan would further enhance stability. This study was performed to prepare a chitosan-coated liposomal nanoparticle to deliver ESA-rich lipids extracted from bitter gourd seeds. The uncoated lipid nanoparticles were prepared using a modified ethanol injection method followed by sonication to promote particle size reduction. The liposome modification step with chitosan coating was applied afterwards. The properties of lipid nanoparticles were assessed by a particle size analyser (Malvern Zetasizer) and scanning electron microscopy (SEM). Examination of the prepared nanoparticles by scanning electron microscopy (SEM) revealed a spherical shape with diameter of 107 ± 1.2 nm. The *in vitro* gastrointestinal (GI) simulated-release study demonstrated that only 25% of ESA was released from the chitosan-coated nano-liposomes over a 6-hour period, compared to 42% release from the uncoated nano-liposomes. These results indicate the comparatively enhanced stability and sustained release capability of the chitosan-coated ESA-loaded nano-liposomes. In addition, chitosan-coated nano-liposomes showed better storage stability as determined by a zeta potential of -28.5±0.8 mV and a polydispersity index of 0.152 ± 0.013. These findings demonstrate that chitosan-coated nano-liposomes are more efficient than uncoated ones for oral delivery of ESA. It can be concluded that the stability and delayed ESA release in the simulated GI environment were improved with engineered chitosan-coated nano-liposomes. Moreover, since desirable *in vitro* and *in vivo* characteristics were achieved, they are promising release devices for the oral delivery of alpha-eleostearic acid, increasing the bioavailability of the drug.

Keywords: Bitter gourd, alpha-eleostearic acid, nano-liposome, chitosan

Temporal Variability in Patterns of Musth in Captive Adult Male Asian Elephants (*Elephas maximus*) in the Pinnawala Elephant Orphanage

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Musth is a unique, physiological and behavioural state in adult male Asian elephants (*Elephas maximus*), characterized by elevated testosterone levels, temporal gland secretions (TGS), urine dribbling (UD), and heightened aggression, playing a key role in reproductive fitness and sexual selection. This study examined the temporal variability in musth behaviour in captive adult male Asian elephants at the Pinnawala Elephant Orphanage, Sri Lanka, by investigating behavioural changes that occur during musth and their variability across different stages of musth. Behavioural observations were conducted on five individuals using focal animal sampling, both in and out of musth. Focal scan and all-occurrence sampling methods were used to record state and event behaviours respectively. Musth stages were characterized using (TGS) and (UD) scores, categorising them into non-musth, pre-musth, full musth and post-musth stages. In addition, retrospective musth records from seven individuals were analysed to assess variation in the duration of musth and its association between age. Statistical analysis was performed using IBM SPSS Statistics (version 30.0.0.0) at $\alpha = 0.05$. Results revealed that specific behaviours - stereotypy, alertness, aggression, and chemosensory behaviours like sniffing, blowing, rubbing temporal gland *(*$Z = -2.023$, $P = 0.043$) - were significantly higher during musth, compared to non-musth, whereas foraging showed a significant decrease *(*$Z = 2.023$, $P = 0.043$) during musth. Results revealed significant variation in stereotypic behaviours ($X^2 = 8.280$, $P = 0.041$) and chemosensory behaviours, like rubbing temporal gland ($X^2 = 8.313$, $P = 0.040$) across different TGS stages of musth. Retrospective analysis revealed significant variability in the duration of musth that was positively correlated with age ($r_s = 0.582$, $P < 0.001$), indicating an influence of age on musth duration. The findings suggest that musth is not a binary state (that elephant is either in musth or not), but a dynamic process influenced by intrinsic factors such as age and musth stage. Understanding the temporal variability in musth patterns and related behaviours can enhance management strategies like reducing spatial constraints and enhancing welfare during musth and aiding conservation and well-being of both captive and wild elephants.

Keywords: Asian elephants, behavioural variation, conservation management, musth, temporal variability

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Testing of Gas Sensing Performance of Zeolite-Modified ZnO Nanomaterials

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Zinc oxide is a semiconductive material that is highly sensitive to pollutants and is used in semiconductive gas sensors. These materials have low selectivity and require high operating temperatures which is usually around 350°C. This study aims to make the material selective towards specific air pollutants and reduce the operating temperature of ZnO by incorporation it into zeolite. The resistance of ZnO-incorporated zeolites was measured under the influence of N_2O using a custom-built setup. The material was plated on a glass slide in the middle of two aluminium strips to make a simple resistor using ZnO-incorporated zeolite. A known resistor is taken and a voltage is supplied between the fabricated resistor and the known resistor. The fabricated glass slide is placed inside the material testing chamber and is connected to the circuit as the unknown resistor and the voltage is measured between the known resistor when the material is in an inert environment (V_i) and in the presence of a known N_2O concentration (V_r). Using the equation $(V_r-V_i)/V_i$ the response of the material is taken. At 5, 25, 50, 75, 100 ppm the material gave a highest response of 1.83, 1.73, 1.74, 1.73, 1.91, respectively. The fluctuation of the reading between high and low response readings is an indication that the material enters an equilibrium between adsorption and desorption of N_2O. when N_2O is removed and when nitrogen is introduced the sensor response value significantly drops specially for low N_2O gas concentrations. In conclusion, the material changes resistivity in the presence of N_2O but also desorbs shortly. As future directions, the material will be tested against different types of gases to get a more advanced understanding of the sensing capacity of the material.

Keywords: Gas sensing, zeolite, ZnO nanoparticles

Thermal Evolution of Selected Granitic Intrusions in Sri Lanka's Proterozoic Basement

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This study offers a petrographic and thermal evolution of four granitic intrusions – Tonigala, Galgamuwa, Ambagaspitiya, and Arangala – located within Sri Lanka's Proterozoic metamorphic basement. Although they are important for understanding Sri Lanka's magmatic evolution within the ancient Gondwana supercontinent, these granitic bodies have received limited attention, especially regarding their crystallization conditions and petrographic features. This research addresses these gaps through an integrative approach combining detailed fieldwork, petrography, mineral chemistry, and thermobarometry. Field observations and petrographic analyses identified two main types of granitic intrusions: hornblende-bearing (Arangala and Galgamuwa) and hornblende-absent (Ambagaspitiya and Tonigala). All samples show well-preserved primary igneous textures, including coarse-grained crystals, sharp grain boundaries, and perthitic intergrowths, indicating minimal post-crystallization alteration. These textures also provide insights into the sequence of crystallization and cooling history of the intrusions. The mineral chemistry of feldspars, micas, and amphiboles was analysed using electron microprobe analysis (EPMA) for precise classification. Feldspars across the four sites commonly display perthitic exsolution, while plagioclase compositions range from oligoclase to andesine. To estimate crystallization conditions, various geothermometric methods were used, including Ti-in-biotite, Ti-in-amphibole, and Zr-in-titanite. These geothermometers produced temperatures from approximately 740°C to 875°C. The Arangala granite consistently recorded the highest temperatures (764 – 875°C), while the Galgamuwa body showed a broader thermal range (532 – 795°C), indicating a prolonged crystallization process. This first integrated study of these Sri Lankan granites provides vital thermal constraints on Proterozoic magmatic activity during Gondwana assembly. The temperature data suggest extended crustal differentiation during active crustal thickening events, with thermal patterns reflecting different emplacement depths and magma evolution processes. These findings deepen the understanding of regional Proterozoic crustal development and offer comparative data for similar granitic suites across Gondwana fragments, improving models of supercontinent assembly during the Mesoproterozoic to Neoproterozoic transition.

Keywords: Granite, crystallization temperatures, Gondwana, thermobarometry

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Thermal Tolerance and Eco-Physiological Stability of *Pogonatum urnigerum*

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Bryophytes play a significant role in terrestrial ecosystems, particularly in nutrient cycling, water retention, and microhabitat stability. As non-vascular plants with simple structures, they are highly responsive to variations in ambient climatic conditions. Understanding bryophyte responses to temperature fluctuations is essential for predicting the impact of global warming on ecosystems. This study examines the eco-physiological responses of *Pogonatum urnigerum*, a moss species belonging to the family Polytrichaceae, assigned to six controlled temperature regimes. Plants with uniform morphology and maturity were freshly collected from their natural habitat and subjected to six controlled temperatures: 20°C to 30°C at 2°C intervals. These treatments were maintained in a growth chamber with consistent temperature, light intensity (0.75 µmol m^{-2} s^{-1}), and relative humidity (80% ± 10%). A set of plants from their natural habitat, where the average temperature was recorded at 27°C, was selected and monitored as the control group. The dry weight changes were measured every seven days over six weeks using an analytical balance. Destructive sampling was required to determine the dry weight accurately. Statistical analyses, including ANOVA, indicated no significant impact of the tested temperature range on the dry weight. This highlights that the dry weight change of *P. urnigerum* is relatively robust within the intermediate temperature range, reflecting the species' potential for resilience in thermal gradients. The ability to resist moderate temperature fluctuations while maintaining structural stability reflects the general environmental conditions and the integrity of the ecosystem. Future studies should explore its responses to a broader temperature range and include long-term monitoring (seasonal/year-round). Incorporating environmental factors such as moisture, nutrient levels, and light intensity will provide a comprehensive understanding of its ecological adaptability and potential role in monitoring climate shifts.

Keywords: Bryophytes, *Pogonatum urnigerum*, resilience

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Utilization of Neutron Activation Analysis for Cadmium Detection in Soil Samples

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Soil contamination by cadmium (Cd), a highly toxic and persistent heavy metal, presents a growing threat to environmental and human health. With rising industrial emissions, the development of reliable detection methods is critical for effective monitoring, risk assessment, and mitigation of Cd accumulation in ecological and agricultural systems. This study explores the applicability of neutron activation analysis (NAA), a non-destructive technique, for identifying Cd in soil as a means of supporting environmental safety efforts. The approach focused on detecting Cd isotopes with minimal preprocessing, maintaining the original chemical composition of the samples to ensure qualitative assessment. To check the applicability of NAA for cadmium detection in soil samples, a set of pellet samples was prepared by manually mixing soil and $CdSO_4$ with varying Cd concentrations. Gamma spectra were obtained for these samples before the activation. Then, the samples were neutron-irradiated using an Am-Be source for 10 days for activation of Cd isotopes with relatively high natural abundance and thermal neutron capture cross-section. The present activity and the thermal flux of the used Am-Be neutron source were 9.48 Ci and 2.36×10^7 neutrons m^{-2} s^{-1}, respectively. Following the irradiation period, the presence of Cd-111m and Cd-115 was identified through delayed gamma emissions. The characteristic gamma energy peaks at 230, 246, 262, 485, and 530 keV were detected via gamma ray spectroscopy. Pre- and post-irradiated gamma spectra were comparatively analysed for the qualitative identification of gamma energy peaks from activated Cd isotopes. Based on the findings of the study, Cd detection was feasible only at concentrations equal to or exceeding 4.5% by weight within the prepared sample. These findings demonstrate that NAA is an effective technique for qualitatively identifying cadmium in soil, highlighting its potential applicability for detecting Cd in complex environmental matrices. Its potential for detecting other heavy metals warrants further investigation, highlighting its broader applicability in environmental monitoring. In conclusion, compared to existing destructive methods, NAA can be used as a non-destructive alternative with minimal sample preparation for qualitative cadmium detection in soil.

Keywords: NAA, cadmium, gamma spectroscopy, soil

Theme 5

Transforming Business and Management for Sustainable Economic Growth

A Strategy Roadmap for Adopting AI in Sri Lankan Apparel Supply Chains

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Artificial Intelligence (AI) is transforming global supply chain management (SCM), providing a strategic edge to early adopters. Existing literature reveals a growing gap between developed and developing countries in terms of AI integration which may contribute to exacerbating the already existing technological and economic imbalances. On the other hand, harnessing the capabilities of AI could empower a developing nation such as Sri Lanka to overcome these disparities. Being a major contributor to the country's economy, major players of the Sri Lankan apparel sector have always embraced the cutting-edge technologies. However, the evidence suggests that they are yet to integrate AI into their operations. Therefore, this study aimed at exploring the opportunities and challenges connected with AI deployment in Sri Lanka's apparel supply chains (SLASC) and proposing a strategy roadmap for implementing AI in the SLASC. Using a qualitative, exploratory approach, the study incorporated semi-structured interviews with eight senior executives from top BOI-registered apparel firms and five research scholars investigating technology adoption in SCM. This inclusion of both practitioners and theoreticians in the sample enriched the data collection with multiple perspectives. The transcripts of the interviews were primarily analyzed using thematic analytical procedure with the help of NVivo software. The findings revealed that AI has the potential to optimize many supply chain functions such as demand forecasting and capacity planning, inventory and warehouse management, logistic functions, quality control and decision making in SCM. On the other hand, technological infrastructure & data-related challenges, workforce challenges, resistance to change, investment barriers, knowledge gaps are recognized as key challenges to adopt AI. Furthermore, a detailed strategy roadmap was synthesized utilizing "Kotter's Change Management Framework" as the theoretical foundation to guide the AI adoption process in SLASC. In conclusion, this study highlights the future opportunities and challenges of AI adoption in the apparel industry, offering practical insights for industry leaders and policymakers to support infrastructure development and workforce upskilling. The proposed roadmap serves not only as a strategic guide for apparel supply chains in developing economies but also as a conceptual foundation for future empirical research in this domain.

Keywords: Artificial intelligence, supply chain management, apparel Sector, AI adoption roadmap

Digital Financial Literacy as A Shield Against Cybercrime: A Study on Commercial Bank Customers in Sri Lanka

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The advancement of the internet and new technologies has revolutionized the traditional bank setting by enhancing digital banking operations by offering efficient services to customers. Simultaneously, the risk of cybercrime also continues to loom large. The risks associated with digital financial instruments are often unknown to many users of these platforms. In light of the Theory of Planned Behavior (TPB) and Routine Activity Theory (RAT), the primary goal of this research is to explore the effects of digital financial literacy (DFL) dimensions on cybercrime victimization. These dimensions include user attitude toward DFL, subjective norms, perceived behavioral control, digital financial knowledge, and user awareness towards DFL. A quantitative approach was employed to conduct the study. Primary data were collected using a questionnaire from 381 digital banking users, selected through the stratified random sampling technique. These users were proportionately selected from all the provinces based on the distribution of digital banking users. A pilot study was initially conducted with 40 respondents to test the validity and reliability of the questionnaire. Additionally, Cronbach's alpha, composite reliability, and average variance extracted were used to assess the reliability, while discriminant validity was verified through the HTMT and Fornell-Larcker criterion. The Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the study. According to the findings, users' positive attitudes towards DFL promote safe online behaviors, reducing cybercrime vulnerability. Next, the study found that individuals tend to use digital financial tools in a safe manner when they hold a favorable influence from society, since there was a significant negative relationship between subjective norms and cybercrimes. Subsequently, high user digital financial knowledge towards DFL has led to lower rates of cybercrimes, highlighting the importance of technical efficiency in the digital age. In the context of perceived behavioral control, the confidence of using digital tools has shown no significant relationship with cybercrime victimization. Similarly, user awareness towards DFL was found to be insignificant with cybercrime victimization. Cybercrime victimization was found to be significantly correlated with user attitude, subjective norms, and user digital financial knowledge towards DFL, supporting the TPB. However, perceived behavioral control and user awareness showed no significance. Policymakers and financial institutions could consider digital financial knowledge as a substitute for the capable guardian component of the RAT approach instead of user awareness.

Keywords: Cybercrime victimization, digital financial literacy, PLS-SEM, RAT, TPB

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Exploring the Impact of Symbolic Meaning on Gen Z Consumers' Purchase Intention Toward Green Clothing in Sri Lanka

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Sustainable consumption is increasingly recognized as a significant trend in today's society. The Sri Lankan garment industry has adopted the notion of green manufacturing. This study aims to determine the extent to which symbolic factors influence the purchase intention of green clothing among Gen Z consumers in Sri Lanka. This study aims to examine the impact of status symbols, innovation symbols, fashion symbols, and environmental symbols on consumers' purchase intentions regarding green clothing of Gen Z consumers in the Sri Lankan Context. This research follows a quantitative approach and the purposive sampling technique to target Gen Z consumers in Sri Lanka specifically. The sample size for the study is determined to be 384 based on the Krejcie and Morgan (1970) Table, ensuring a representative and statistically relevant sample for the analysis. The purposive sample is suitable because this study's objective is to determine Gen Z's intention to purchase green apparel. An online self-administered questionnaire was used to collect data for the study. The multiple regression analysis technique is used to test the hypotheses of the study. SPSS 27 software was used to analyze the data. The researchers discovered that the status symbol and environmental symbols do not have a significant impact on consumers' purchase intentions. The innovation symbol and fashion symbol play a significant role in influencing consumers' purchase intentions toward green clothing in the Sri Lankan context. The theoretical contribution of this study enriches existing literature by underlining the growing significance of symbolism in consumer choices, particularly within the field of sustainable consumption, thus providing a solid foundation for future research. Furthermore, it helps retailers design more focused campaigns that attract an increasing number of environmentally aware consumers. This understanding helps businesses improve brand loyalty by establishing stronger emotional bonds with eco-conscious consumers.

Keywords: Consumer purchase intention, green clothing, symbolic Meaning, Gen z

From Tea Estates to New Frontiers: Exploring Young Female Labour Outmigration in Sri Lanka's Tea Plantation Sector

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Sri Lanka, globally recognized for its premium Ceylon tea, relies heavily on the tea plantation sector, which plays a vital role in the economy by providing direct and indirect employment to over a million people. However, the sector is increasingly challenged by the outmigration of young female labour. In this study, labour outmigration refers to the movement of workers away from the tea estates for alternative employment opportunities in other sectors, urban areas or abroad. Accordingly, this research aims to explore the factors driving young females' migration out of the tea plantation sector, their subsequent career transitions, and the challenges they experience post-migration. This study adopts a qualitative approach, utilizing semi-structured interviews with six (06) young female workers who have migrated out of the tea plantation sector, and four (04) estate managers from the Nuwara Eliya and Badulla districts selected via purposive and snowball sampling. Data were thematically analyzed using NVivo software. The key findings highlight that outmigration decisions are shaped by a complex interplay of economic, social, and personal factors. According to the Push-Pull Theory of migration, push factors such as low wages, poor working conditions, social stigma, and limited career growth, alongside pull factors such as aspirations for a modern lifestyle and the pursuit of a professional identity, emerged as significant drivers of outmigration. Upon leaving the estates, many young women secure employment in garment factories, domestic work, retail shops, and the hospitality industry. However, this transition brings challenges such as language barriers, limited networking opportunities, social stigma, workplace discrimination, and difficulties adapting to unfamiliar work environments. The findings highlight the need for collaborative efforts from policymakers and plantation managers to reform the sector by promoting decent work, empowering women, and addressing social stigma to ensure long-term sustainability.

Keywords: Challenges, motives, outmigration, plantation sector, young female

Impact of Environmental, Social and Governance (ESG) Disclosure on the Firm's Dividend Policy: Evidence from Listed Companies in Sri Lanka

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There has been a growing trend in Environmental, Social, and Governance (ESG) disclosures within corporate non-financial reporting, especially in emerging markets. ESG disclosures often influence dividend policies by boosting investor confidence and demonstrating a commitment to the sustainability of the corporate entity. Under the direction of the Signaling and Legitimacy Theories, this study examines the impact of ESG disclosure on the dividend policy in Sri Lankan companies. The study employed a quantitative research design to examine the impact of ESG disclosures on dividend policy among 47 companies listed on the Colombo Stock Exchange from 2018 to 2023. ESG disclosures were measured using environmental, social, and governance scores, while dividend policy was assessed using the dividend payout ratio. Data was collected from annual reports, and the EViews and STATA data analysis tools were used to analyze the data. Descriptive statistics, correlation analysis, and regression analysis, along with the Hausman test, were employed to achieve the objectives and interpret the data. The study found that environmental and social disclosures have a positive and statistically significant impact on dividend policy, with coefficients of 0.213 and 0.198, respectively. This indicates that firms with stronger environmental and social commitments tend to pay higher dividends. In contrast, governance disclosure was statistically insignificant, suggesting no direct effect on dividend policy. These findings highlight the role of ESG in shaping dividend decisions and support for the theories in the Sri Lankan context. The study concludes that the positive impact of environmental and social disclosures on dividend payout ratios suggests that firms use ESG practices as a strategic tool to signal financial strength and legitimacy to stakeholders. However, the lack of a significant relationship between governance disclosure and dividend policy indicates that not all aspects of ESG equally influence investor perceptions or corporate financial decisions. Overall, the results support the Signaling and Legitimacy Theories, suggesting that firms use ESG practices to build investor confidence and corporate credibility. These insights can help policymakers, professionals, and academics better understand the implications of ESG disclosures on dividend policy, guiding future research and policy development in the Sri Lankan context.

Keywords: Dividend policy, ESG disclosures, listed companies, non-financial reporting, sustainability

Impact of Green Supply Chain Management Practices on Export Performance in Sri Lankan Ceramic and Porcelain Industry

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Green Supply Chain Management (GSCM) extends the principles of supply chain management by integrating environmental considerations into procurement, production, distribution, and end-of-life product management. The increasing global demand for sustainable business practices has positioned GSCM as a strategic approach to enhance competitiveness in international markets. Despite its strong export potential, the Sri Lankan ceramic and porcelain industry faces difficulties in meeting global environmental standards due to the lack of adoption of sustainable supply chain practices. This study addresses a notable gap in empirical research by investigating the impact of four key GSCM practices eco-design, green purchasing, reverse logistics, and environmental collaboration on export performance within this sector. A quantitative research approach guided by positivist philosophy was adopted. Data were collected using a structured questionnaire distributed to a sample of 120 managerial-level employees and supply chain specialists in selected ceramic and porcelain companies across Sri Lanka. A judgmental sampling technique was employed to ensure responses from the most knowledgeable participants. Data analysis was conducted using SPSS software, employing descriptive statistics, correlation, and multiple regression analysis. The findings revealed a significant positive impact of eco-design, reverse logistics, and environmental cooperation on export performance, while green purchasing revealed a positive but statistically insignificant effect. The multiple regression model accounted for 66.7% ($R^2 = 0.667$) of the variance in export performance, confirming the strong explanatory power of GSCM practices. Theoretically, this study contributes to the existing body of knowledge by validating the relationship between individual GSCM practices and export performance in a developing country context. Practically, it offers industry-specific insights that can guide Sri Lankan ceramic exporters in aligning with global environmental standards. This research is among the first to focus on GSCM impacts in this under-researched sector, offering actionable implications for firms and policymakers navigating sustainability-driven trade environments.

Keywords: Green supply chain management, export performance, eco-design, reverse logistics, ceramic and porcelain industry in Sri Lanka

Impact of Social Media Usage on Personal Branding of STEM Undergraduates of State Universities – With Special Reference to the University of Peradeniya

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In the digital era, personal branding has become a strategic tool for career growth and professional image due to the increasing significance of a strong social media presence. Thus, this study aimed to examine the impact of social media usage on personal branding among STEM undergraduates of the University of Peradeniya (UoP). Using a quantitative approach, primary data was collected via a structured questionnaire. 302 STEM undergraduates representing 06 faculties of UoP were chosen using the stratified sampling technique. The results indicate a strong and significant impact of social media usage on personal branding among STEM undergraduates of the UoP. Moreover, entertainment has the most substantial positive influence on personal branding, suggesting that entertainment emerged as the most impactful due to its ability to relieve academic stress and create emotional connections. These findings offer practical insights for students, educators, and career advisors, emphasizing the need for a strategic approach to social media usage on self-branding. To enhance personal branding, STEM undergraduates could leverage entertainment-driven content, engage in professional networking, and integrate academic contributions into their online presence. The study suggests further research on long-term effects and industry-specific branding strategies.

Keywords: Social media usage, personal branding, STEM undergraduates, University of Peradeniya

Investigate the Factors Influencing the Decision of Undergraduates to Pursue Professional Accounting Courses

(Evidence from Rajarata University, Sri Lanka)

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This study investigated the factors influencing undergraduates' intention to pursue professional accounting courses at Rajarata University of Sri Lanka, concentrating on variables such as intrinsic motivation, career opportunities, job security& Stability, social status & prestige, and salary scale. The research has provided valuable insights for academic, policy, and industry advancements in accounting education. The study used a quantitative approach, with a structured online questionnaire distributed to 400 undergraduate students from the Faculty of Management Studies at Rajarata University. Data analysis involves descriptive and bivariate analysis using SPSS, including correlation and regression analysis. The model examined the relationship between independent variables (intrinsic motivation, career opportunities, salary scale, job security, and social status) and the dependent variable (intention to pursue a professional accounting course). Reliability tests showed acceptable Cronbach's alpha values as 0.795, indicating the construct validity of the questionnaire and confirming the consistency of the data. Descriptive analysis indicated that intrinsic motivation had the highest mean, followed by career opportunities. Correlation analysis revealed strong positive relationships between intrinsic motivation and the intention to pursue a professional accounting course, showing 0.6433 higher correlation value. Regression analysis showed that intrinsic motivation, career opportunities, and salary scale significantly influenced students' intentions, while job security and social status had no significant impact, indicating $p = 0.245$ and $p = 0.476$ respectively. These findings have important implications for accounting educators, professional bodies, and related organizations seeking to increase the number of professionally qualified accountants in Sri Lanka. The study highlighted that intrinsic motivation, career opportunities, and salary scale play a significant role in shaping undergraduates' intentions to pursue professional accounting qualifications, while job security and social status appear to have minimal influence. This research contributed valuable evidence to inform efforts to enhance accounting education and career development strategies in Sri Lanka.

Keywords: Intrinsic motivation, career opportunity, job security, social status, salary scale, professional accounting

Khejur Rosh (an indigenous drink) and Associated Entrepreneurship Originating from the Arid Regions of Rural Bengal: Modelling the Challenges and Bridging Traditional Wisdom with Sustainable Development

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Amidst the tide of modern food trends, date palm juice (khejur rosh) emerges as a soulful return to nature—an ancient practice of extracting sap from date palm trees during Bengal's winter months. Deeply embedded in India's indigenous knowledge systems, this practice not only offers a culturally rooted alternative to commercial beverages but also holds the potential to reshape rural livelihoods sustainably. Though global research has explored date palm products within narrow dietary frameworks, India—particularly West Bengal—offers a unique perspective that intertwines ecological tradition with grassroots labour. The real custodians of this heritage—the sap collectors—remain largely absent in academic discourse. This study addresses this gap by turning to oral histories and lived experiences, offering a voice to an often-overlooked community. This research employs a mixed-methods approach, integrating qualitative and quantitative tools. Data collection was conducted through structured questionnaires and field interviews with approximately 30–40 respondents from arid districts like Purulia, Bankura, and South 24 Parganas. Supplementary information has been drawn from books, journals, and newspapers. Audio-visual documentation and on-site observations enrich the study with a sensory dimension that captures the rhythms of traditional sap harvesting and trade. By investigating the socioeconomic dynamics of sap collectors and the ecological wisdom underlying the practice, this research underscores how traditional food systems can contribute to climate resilience and sustainable development. Khejur rosh, when preserved using modern techniques, offers a viable, healthy alternative to synthetic beverages and can help secure a more stable income for rural communities. However, preservation remains a challenge, and without intervention, the practice faces the threat of extinction. To ensure its survival and growth, the study calls for government support, technological innovation, and broader market recognition. Viewed through a sociological lens, date palm sap is not merely a seasonal delicacy but a symbol of rural regeneration and South Asian cultural resilience. This study urges policymakers, ecopreneurs, and cultural historians to reimagine khejur rosh as a beacon of sustainable tradition in a rapidly modernizing world.

Keywords: Khejur rosh, indigenous enterprise, Indian knowledge system, rural Bengal, sustainable innovation

Managing Software Development Teams:

An Inquiry into the Management Skills Paradox

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Global software companies often assign project leadership to highly technical software engineers, despite their lack of formal management training. This study explores the paradox of technical versus managerial skills by examining how human-centric management competencies influence large-scale software project success. Drawing upon Katz's (1974) framework of managerial skills—technical, human, and conceptual—this research aims to test its applicability in the global software industry context, where team leadership responsibilities are frequently given to engineers promoted from technical roles. The study employed a quantitative research design, using structured questionnaires administered to team members working under technically proficient software project managers at a leading global software company in Sri Lanka. A 72-item Likert scale assessed seven human skills: communication, judgment, motivation, adaptability, conflict resolution, coaching, and relationship-building. With Cronbach's alpha of 0.95, the scale demonstrated high reliability and internal consistency. Multiple linear regression analysis was conducted to determine the extent to which these skills impact project success. Findings revealed that while the overall model explained 56.8% of the variance in project success ($R^2 = 0.568$, $F(7,194) = 17.692$, $p < 0.001$), only communication skills showed a statistically significant positive impact ($\beta = 0.301$, $p = 0.045$). The remaining six skills did not yield significant individual effects. These results challenge the conventional prioritization of technical expertise in software leadership and highlight communication as the most critical management skill for driving project success in global software environments. The findings led to the development of an enhanced version of Katz's managerial skills framework, specifically tailored to the software industry. Based on empirical evidence, the revised model repositions communication skills as the most critical human competency for software project team managers, challenging the traditional equal weighting of human skills across management levels. By isolating communication as the only skill with a statistically significant impact on project success, the study redefines the human skill dimension in Katz's model to reflect the realities of large-scale software project environments. This modified framework not only addresses the limitations of the original model but also provides practical direction for designing leadership development programs that extend beyond technical training. It offers actionable insights for improving managerial effectiveness and optimizing project outcomes in global software companies.

Keywords: Communication skills, human skills, Katz framework, software project success, technical managers

Narratives in the Digital Age: Exploring Storytelling Strategies among Sri Lankan Entrepreneurs

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Storytelling has been recognized as one of the most powerful and oldest communication methods. Currently, it has become a significant communication strategy among the entrepreneurs to market their offerings for enhancing competitiveness. The advancement of communication technologies and increased internet penetration have enabled entrepreneurs to use digital storytelling—an area that remains under-researched in the Sri Lankan context. Therefore, the purpose of this research is to explore how the entrepreneurs employ digital storytelling for the success of entrepreneurial marketing in Sri Lanka. A story presented in a digital media is referred to as digital storytelling. A qualitative multiple case study method is followed in this study by selecting four Sri Lankan entrepreneurial organizations using criterion sampling. Secondary data is gathered from documentary evidence and the primary data is collected using in-depth interviews. The analysis is undertaken using the thematic analysis method. As per the findings the meaning of digital storytelling in the context of entrepreneurial marketing includes method to convey the brand narrative, tool for connecting with audience and important for communicating the uniqueness. Also, entrepreneurs adopt two ways of developing digital stories for their businesses including connect with stakeholders and use social media. Further, findings have shown that entrepreneurs encounter several impediments in sustaining digital stories including content saturation, integrating multiple media and content and increasing brand visibility with an authentic story. The research concluded by contending that digital storytelling allows for more authentic, memorable branding that resonates with customers and differentiates from rivalry. Also, digital storytelling is a powerful tool for entrepreneurs to connect with their audience on a deeper and personal level. In developing digital stories entrepreneurs need to build meaningful connections with key stakeholders and foster collaborative networks. Also, findings imply that digital storytelling can be used to cultivate a growth mindset to create an innovative entrepreneurial culture. Accordingly, it is recommended to create a compelling and authentic story and develop trustworthiness and credibility in the minds of target audience in storytelling. Also, involvement of stakeholders with an inclusive approach should be practiced while leveraging social media with a strategic approach for digital storytelling.

Keywords: Case study design, digital storytelling, entrepreneurial marketing, social media

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Optimizing Quality Assurance in Poultry Processing: Resolving Temperature Fluctuations in Scalding Tanks – A Quantitative Study at ABC Poultry Processing Plant in Sri Lanka

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The poultry processing industry is a vital contributor to Sri Lanka's food security, nutrition, and rural employment while supporting the country's economic development through large-scale production and processing operations. Ensuring consistent product quality in this sector is crucial, particularly during critical processing stages such as scalding, where temperature control directly affects the physical attributes and marketability of the final product. This quantitative study investigated the impact of temperature fluctuations in scalding tanks on product quality at ABC Poultry Processing Plant, a leading facility in the country's poultry sector. The main objective was to assess how deviations in scalding temperatures influence quality defects such as over-scalding, texture changes, and yield losses, and to evaluate the potential benefits of implementing an IoT-based temperature monitoring system to enhance process control. A cross-sectional quantitative research design was adopted. Temperature data were collected from two scalding tanks namely soft scalding (52–54°C) and medium scalding (54–57°C) at hourly intervals over a 30-day period using manual thermometers. Historical quality records, including incidents of defective products and economic losses, were also analyzed. Statistical methods such as correlation and regression analysis were employed to determine the relationship between temperature variations and product defects. The findings revealed frequent deviations from the recommended temperature ranges, with one critical event recording a peak of 66°C, resulting in the condemnation of 13,000 kg of poultry and substantial financial loss. A strong positive correlation (R^2 = 0.82) was identified between scalding temperature fluctuations and the rate of product defects, confirming the detrimental impact of unstable scalding conditions on meat quality and operational performance. Based on these findings, the study recommends the integration of an IoT-based temperature monitoring system capable of real-time data collection and automated alerts to prevent temperature deviations. Such technological intervention is expected to improve product consistency, reduce manual errors, and minimize production losses. Overall, this research emphasizes the necessity of precise temperature control in poultry processing and provides practical insights for adopting advanced monitoring solutions to enhance the competitiveness and sustainability of Sri Lanka's poultry industry.

Keywords: Internet of things, poultry processing, quality management

Predictive AI for Platform-Based Entrepreneurial Resilience in Crisis Situations: A Systematic Literature Review

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Platform-based entrepreneurs operate in rapidly shifting environments where crises such as pandemics or supply chain breakdowns intensify uncertainty. Predictive Artificial Intelligence (AI), including machine learning (ML), explainable AI (XAI), and large language models (LLMs), has emerged as a tool that enhances adaptability and stakeholder alignment across digital platforms. This study investigates how predictive AI contributes to Platform-based entrepreneurial resilience in crisis situations, exploring its role in enabling adaptive responses across self, organizational, and ecosystem levels. The study follows Preferred Reporting Items for Systematic Review (PRISMA) process. After applying inclusion criteria (related journals, area of study, year range, and peer-reviewed articles) and exclusion criteria (non-peer-reviewed articles, and non-retrieval articles), 259 articles were initially identified from Scopus, Web of Science databases, and Google Scholar. Following the removal of 52 duplicates, 46 articles published outside the 2015-2024 range were excluded because emergence of the AI technologies accelerated during the Covid-19, economic crisis and supply chain distributions times. An additional 60 articles were excluded for other reasons. Finally, 101 articles were selected for the review using Boolean operators and keywords: Predictive AI, Platform Based Businesses, Entrepreneurial Resilience, and Crisis Situation. Thematic synthesis and cross-case comparison revealed recurring patterns, theoretical frameworks, and industry applications. The study draws on models such as the AI-Innovation Ecosystem Framework to analyze. Predictive AI supports entrepreneurial resilience in three tiers: Self-resilience through foresight and adaptive learning, Organizational resilience applying business model adjustment, demand forecasting, and decision-making, and Community/Ecosystem resilience through trust-building, platform coordination, and collaboration. Tools such as XAI and Partial Least Squares Structural Equation Modeling (PLS-SEM) enhance interpretability and facilitate the adoption of predictive models by making complex outputs more transparent and actionable for entrepreneurs. Industries from energy to e-commerce benefited from AI-driven personalization and resource optimization. A multi-level conceptual model was developed, positioning predictive AI as a strategic enabler of resilience. The review contributes a framework for guiding AI adoption in crisis contexts to build resilience, thrive in innovation, and navigate future uncertainties.

Keywords: AI-enabled decision-making, crisis situation, entrepreneurial resilience, platform based businesses, predictive artificial intelligence

Reconceptualizing Corporate Social Responsibility in Sri Lanka: A Comparative Legal Approach to Redefining the Corporate Framework for Sustainable Economic Growth

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Corporate Social Responsibility (CSR) serves as a strategic mechanism for sustainable economic growth and true social impact. CSR is grounded on theories including the stakeholder and legitimacy theories operated via the Economic, Social and Governance (ESG) framework. Yet the voluntary CSR regime of Sri Lanka, yields uneven disclosures, with only 66% sustainability reporting by companies, underscoring the need for robust legal reform. This study critically examines Sri Lanka's voluntary CSR framework through stakeholder and legitimacy theories. Then comparatively analyses CSR regulations with mandatory, incentive-based and hybrid mechanism followed by India, the EU, and the US, and proposes a balanced legal standard to boost corporate accountability and foster sustainable practices in Sri Lanka. A doctrinal legal research design was employed, supplemented by a document-based empirical review of CSR and ESG disclosures by leading private listed companies in Sri Lanka. Primary sources included the Companies Act, environmental and labour statutes, and relevant policy documents. Secondary sources comprised academic journals, legal commentaries, and corporate reports. A comparative legal analysis was conducted on the EU's Corporate Sustainability Reporting Directive, India's Companies Act, and U.S. incentive-based CSR schemes. Doctrinal techniques identified legislative gaps and international best practices, while thematic content analysis assessed transparency, stakeholder engagement, and enforcement against stakeholder theory, legitimacy theory, and ESG criteria. Findings indicate that only 66% of Sri Lanka's top firms publish ESG data which is lower than the global average of 77%, whereas India's mandatory CSR regime yielded over Rs 50,000 crore in spend by its top five hundred companies. Half of major firms in the EU apply "double materiality" assessments, whereas in the US, 98.6% of S&P500 companies released sustainability reports in 2023. Thematic analysis demonstrates gaps in enforcement, stakeholder engagement, and transparency deficits in Sri Lanka's voluntary approach, and the necessity for a hybrid legal regime of mandatory disclosure and tax concession to obtain higher CSR take-up rates. The study concludes that Sri Lanka requires a balanced CSR legal framework that includes mandatory disclosure along with incentive mechanisms to foster corporate responsibility and sustainable development. These reforms will align local practices with the worldwide best practices, creating business sustainability and motivating national development targets.

Keywords: CSR, corporate legal framework, sustainable growth, Sri Lanka

Sensing the Brand: How Personality Shapes the Link between Sensory Experience and Customer Engagement in Central Province Cafés

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The growth of café culture in Sri Lanka has introduced a dynamic shift in customer dining experience. In this emerging café culture, customer expectations go beyond products, emphasizing immersive sensory brand experiences and individual differences influence on these dynamics. However, consumer responses to sensory cues may differ based on their personality traits. This study examined the impact of sensory brand experiences on customer brand engagement in cafés in Sri Lanka, while also testing the moderating effect of consumer personality traits. In addition, the study investigated which sensory dimension plays the most important role in building customer brand engagement. Using a quantitative research approach, data were collected from a sample of 324 respondents. The respondents were customers who had recently dined at a café in the Central Province of Sri Lanka. The sample was selected through a mix of judgmental and convenience sampling methods and data were collected through a self-administered structured questionnaire. The data were analyzed using SPSS through descriptive and inferential statistics (correlation and regression analysis), mean value analysis to identify salient dimension of sensory brand experience and moderation analysis using Hayes' PROCESS macro. The findings indicated that sensory brand experiences significantly influence consumer brand engagement. Additionally, consumer personality traits as a moderator significantly influence the relationship between sensory brand experiences and consumer brand engagement. Specifically, customer personality traits such as innovativeness, variety – seeking and relationship proneness as moderator were found to weaken the relationship between sensory brand experience and customer brand engagement. Notably, visual stimuli emerged as the most important sensory dimension when creating sensory experience. The results provide valuable insights for café owners and marketers on how to create more engaging experiences tailored to different customer personalities. Understanding individual differences offers valuable guidance for cafés to design personalized sensory experiences that boost customer engagement.

Keywords: Sensory brand experience, customer brand engagement, customer personality traits, Café culture

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Technical Knowledge of Social Media Marketing and Business Performance Among SME Owners

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The In the Information Age, digital marketing has become the most decisive and dynamic marketing tool across all businesses. Among various digital strategies, social media marketing (SMM) holds the greatest importance within the vast field of digital marketing and has emerged as a powerful tool for small and medium-sized enterprises (SMEs) to reach and engage with their target audiences. This study investigates how advance technical knowledge and skills impact the social media marketing on the performance of Small and Medium-sized Enterprises (SMEs) in Sri Lanka, addressing a research gap in the context of emerging markets. Using the Technology Acceptance Model (TAM), the research explores how advance technical knowledge influence to success brand awareness, customer engagement, and sales growth. Using a mixed-methods approach, the study surveys 110 SMEs and conducts in-depth interviews with 20 business owners. The findings reveal a significant positive correlation between advance technical knowledge related to SMM and business performance, with content optimization and social media engagements as key drivers. Further, the findings suggest that SME owners with higher levels of technical knowledge are better equipped to create compelling content, optimize posting schedules, target marketing efforts, and analyze consumer behavior through platform-based digital analytics. This competence enables them to implement tailored marketing campaigns more effectively, resulting in stronger connections with both existing customers and potential audiences. Conversely, a lack of technical skills often leads to unappealing content, inconsistent posting, missed opportunities, poor audience targeting, and underutilization of advanced platform features. The study highlights the importance of continuously improving digital training, advancing digital literacy, and developing technical skills among SME owners and managers to maximize the potential of social media marketing. By enhancing their technical capabilities, SMEs can boost brand awareness, recognition, customer engagement, conversion rates, and overall business growth. This research contributes to the growing body of knowledge on digital entrepreneurship and offers practical insights for SME owners, managers, policymakers, educators, and business development organizations supporting SMEs in today's digital economy.

Keywords: Digital marketing, social media marketing, SMEs, business performance

The Commercialization Process of Co-Operatives: A Study on the Double Bottom Line Approach of the Agricultural Co-Operative Societies in Sri Lanka

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Agricultural co-operatives in Sri Lanka have traditionally supported rural socio-economic development through community-based, welfare-oriented activities. However, many now face challenges in sustaining profitability, scaling operations, and navigating competitive markets. This study aims to examine the commercialization process of agricultural co-operatives and assess how they adopt the Double Bottom Line (DBL) approach balancing financial sustainability with social impact. A mixed-methods approach was adopted, focusing on co-operatives in the Central, Eastern, and Northern Provinces, selected for their agricultural diversity and varying levels of cooperative engagement. Quantitative data were collected through structured questionnaires from 58 active co-operatives, while qualitative data were obtained via semi-structured interviews with cooperative leaders. Quantitative data were analyzed using R programming, and qualitative data were thematically analyzed. Quantitative findings reveal that 62.1% of co-operatives are engaged in value-added agro-based production, indicating a shift toward entrepreneurship. Participatory governance is prominent, with 81% practicing collective decision-making, and 58.6% providing credit services within their supply chains. Profitability has improved, with 55.2% of co-operatives operating above breakeven, and strategic planning shows strong links to both financial and social performance. Qualitative insights highlight structural and strategic gaps in commercialization efforts, regional disparities in outcomes, and challenges in fully integrating the DBL approach. Emerging themes include the need for stronger governance, alignment of social and financial goals, market access, and innovation. While commercialization has enhanced financial resilience, long-term sustainability relies on leadership capacity, supply chain integration, and improved credit access. Regional differences emphasize the need for adaptive strategies that leverage internal social capital while building external partnerships. This study contributes to both academic understanding and policy development by illustrating how agricultural co-operatives can evolve into commercially viable entities without compromising their social mission. Future research should explore the role of digital tools, technological innovation, and international market integration in advancing cooperative commercialization.

Keywords: Agricultural co-operatives, commercialization, double bottom line (DBL), financial sustainability, Sri Lanka

The Dark Side of Competitiveness: Unveiling the Power of Social Support in Knowledge Sharing

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In academic contexts, knowledge sharing plays a vital role in fostering innovation and progress. However, despite the inherently collaborative nature of academic work, individuals often face significant competitive pressures, which can give rise to behaviors such as evasive knowledge hiding (EKH), where the intentional withholding of information from colleagues. Although EKH has been examined in various settings, its dynamics remain underexplored within Sri Lankan academia. Therefore, this study examines the relationship between personal competitiveness and EKH. It also investigates the moderating role of social support, drawing on the theory of cooperation and competition to better understand these dynamics in academia. Data were collected through a structured questionnaire administered to academic staff across public and private universities in Sri Lanka using a convenience sampling method. Out of 400 distributed questionnaires, 210 valid responses were obtained. The study employed IBM SPSS (version 25) for data analysis, including correlation and hierarchical regression analyses. Personal competitiveness, EKH, and social support were measured using validated scales with Cronbach's alpha values exceeding 0.80. Pearson correlation analysis revealed a significant positive relationship between personal competitiveness and EKH ($r = 0.41$, $p < .01$), and a significant negative relationship between social support and EKH ($r = -0.36$, $p < .01$). Regression analysis confirmed that personal competitiveness significantly predicts EKH ($\beta = 0.39$, $p < .001$), and social support acts as a significant negative moderator (interaction term $\beta = -0.21$, $p < .01$), contributing an additional 6% to the explained variance in EKH. The results indicate that individuals with strong competitive inclinations are more prone to EKH, but this effect is significantly reduced in supportive environments. This study contributes to the theory of cooperation and competition by demonstrating how a supportive organizational culture can mitigate the negative effects of personal competitiveness on knowledge sharing. By promoting collaboration, mentoring, and teamwork, universities and HR professionals can foster environments that enhance transparency, reduce EKH, and drive academic innovation. However, the study is limited by its cross-sectional design and reliance on self-reported data, which may introduce bias. Future research should adopt longitudinal methods and explore additional moderators such as trust, organizational culture, or psychological safety.

Keywords: Evasive knowledge hiding (EKH), personal competitiveness, social support

The Effect of Digitalization on Supply Chain Integration and Supply Chain Performance: A Study of the Apparel Industry in Sri Lanka

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Digitalization effects on supply chain integration together with supply chain performance are studied in Sri Lanka's apparel sector due to its dominant role in national exports and employment. New global supply chains benefited from IoT, AI, big data analytics, block chain and cloud computing technology to achieve unprecedented efficiency and sustainability along with improved responsiveness. The proliferation of research about digital supply chains among international scholars fails to fill a critical knowledge gap about these supply chains in developing countries especially in Sri Lanka's apparel manufacturing sector. Evaluation of this problem required a research approach based on positivism and quantitative methods through deductive study design. The data was collected using a structured questionnaire according to convenience purposive sampling. There are approximately 300 large Apparel organizations in Sri Lanka. Based on population, the sample includes 169 apparel firms as suggested by Krejcie & Morgan table (Krejcie & Morgan, 1970). The study processed the data through SPSS to run descriptive statistics, correlation, regression as well as and mediation analysis. Digitalization creates positive effects on supply chain integration and supply chain performance outcomes while supply chain integration functions as a mediator between the two relationships. These findings demonstrate that digital tools represent essential tools for supplying real-time data sharing features in combination with better supply-chain coordination and joint decision capabilities across operations. Theoretical along with practical value emerges from this study because it demonstrates the use of dynamic capability theory to help firms adapt to technology changes through digital resource integration (Ghosh et al., 2021). The research study offers specific business recommendations to practitioners and decision makers who want to improve their competitiveness and business resiliency by promoting digital infrastructure development and training their workforce along with strategic alliance formation. The research study confirms that integrated supply chain implementations with digital transformation act as a fundamental operational and sustainability driver for the Sri Lankan apparel market.

Keywords: Apparel industry, digitalization, supply chain integration, supply chain performance, technological adoption

The Efficacy of Sustainable Business Models across Industry Sectors: Measuring Triple Bottom Line Performance in Entrepreneurial Ventures

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Sustainable entrepreneurship aims to address social, environmental, and economic challenges simultaneously through innovative business models. However, there's limited systematic understanding of which models effectively deliver triple bottom line outcomes in specific industry contexts. This knowledge gap is particularly critical in developing economies like Sri Lanka, where 68% of sustainable ventures struggle to achieve their intended triple bottom line objectives due to misaligned business model selection for local industry contexts, compounded by limited access to international best practices and resource constraints that demand more efficient model implementation. This research seeks to examine how sustainable entrepreneurial ventures across various industries balance profit-driven goals and substantial social and environmental impacts, alongside identifying what business models achieve optimal triple bottom line results within specific industry sectors. The study adopts a sequential mixed-methods design approach, incorporating (1) a systematic review of sustainable business models consisting of 157 articles, (2) a quantitative performance analysis of 243 sustainable ventures across 8 industries drawn from a population of 150 registered sustainable enterprises in Sri Lanka, with stratified sampling and (3) semi-structured interviews through cross-case analysis of 16 selected high-performing sustainable enterprises. Data was analyzed using cross-sectional statistical modeling, thematic qualitative analysis, and within-case cross-case approach. Research shows that circular economy models have 27% greater environmental impact scores in manufacturing but only 12% in services. Product-service systems exhibited the greatest combined economic and environmental effectiveness ($r = 0.68$) while benefit corporation structures had the greatest social to financial integration ($p < 0.01$). Environmental policies at the firm level for particular industries strongly controlled the impact business models had on effectiveness moderating the slope ($\beta = 0.42$). The strictness of regulations was shown to explain 38% of cross-sector variation in the sustainability results. This research contributes to the development of sustainable business models by illustrating empirically validated archetypes organized by industry relevance, thereby deepening the comprehension of the contextual aspects of sustainable entrepreneurship. The findings empower entrepreneurs to strategically adapt sustainable business models to their specific industries, such as organic certification in tea, zero-waste manufacturing in textiles, community-based ecotourism and solar-powered IT solutions.

Keywords: Environmental policies, policymakers, sustainable business models, sustainable entrepreneurship, triple bottom line

The Impact of E-Banking Towards Customer Satisfaction in Selected Rural Villages from Vavuniya District

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This study investigates the impact of e-banking on customer satisfaction in rural villages within the Vavuniya district in Sri Lanka, focusing on the relationship between e-banking factors (Perceived Usefulness, Perceived Ease of Use, Perceived Trust and Risk, Perceived Cost, Awareness of the Service, and Knowledge and Access to the Internet) and customer satisfaction. The research methodology adopted a positivistic approach. Quantitative data were collected through online questionnaires distributed to customers of BOC Bank's e-banking services in selected villages. Out of 115 invited participants, 100 responded to the survey. The data were analyzed using SPSS software, with correlation and multiple linear regression analysis performed to assess the causal relationship between independent and dependent variables. The findings highlight that only the perceived usefulness of e-banking significantly impacted customer satisfaction, while other variables such as perceived ease of use, cost, trust, risk, awareness and internet knowledge access did not show significant relationships. Demographic factors such as age, gender, education, and income did not significantly influence e-banking adoption in this rural context. The study contributes to the literature on adoption of e-banking in rural context by emphasizing the crucial role of perceived usefulness in customer satisfaction. For practical implications, banks should focus on educating rural customers about the benefits and security of e-banking to enhance adoption and satisfaction, addressing contextual barriers like limited internet access and digital literacy. The findings revealed that the need for targeted interventions to improve e-banking services in rural areas, suggesting that future research should explore additional factors influencing e-banking satisfaction in similar settings. Overall, this study highlights the importance of perceived usefulness and the necessity of addressing contextual challenges to promote e-banking adoption in rural communities.

Keywords: Customer satisfaction, e-banking, perceived usefulness, rural areas

The Impact of Toxic Leadership on Employee Performance: The Moderating Role of Positive Psychological Capital Among Public Sector Employees in Sri Lanka

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The public sector plays a pivotal role in delivering essential services and advancing national development in Sri Lanka. Given its significance, effective leadership and high employee performance are crucial. However, toxic leadership characterized by abusive supervision, authoritarianism, and self-serving behaviors can severely hinder employee outcomes. Despite growing interest in workplace toxicity, the buffering role of positive psychological capital in mitigating its effects on employee performance remains underexplored, particularly in the Sri Lankan public sector. Therefore, this study, grounded in Social Exchange Theory (SET), examines the impact of toxic leadership on employee performance. Specifically, it examines whether positive psychological capital moderates this relationship, helping employees cope more effectively with toxic leadership behaviors. Using a convenience sampling method, data were collected through self-administered questionnaires from 210 public sector employees in Sri Lanka (response rate: 52.5%). Data were analyzed using IBM SPSS (Version 25). Correlation analysis was conducted to examine relationships among variables, and hierarchical regression was used to test the direct and moderating effects. The results show a significant negative correlation between toxic leadership and employee performance ($r = -0.42$, $p < 0.01$). Regression analysis confirmed that toxic leadership significantly predicted employee performance ($\beta = -0.39$, $p < 0.001$). The interaction term between toxic leadership and positive psychological capital was significant ($\beta = 0.21$, $p < 0.05$), indicating that the negative impact of toxic leadership on employee performance is weaker among employees with high positive psychological capital and stronger among those with low positive psychological capital. This study contributes to SET by highlighting how constructive leader-employee relationships, based on reciprocity, can be strengthened through the development of employees' positive psychological capital. Organizations should invest in initiatives such as training, coaching, and well-being programs to build these psychological resources, which enhance resilience and sustain performance even under toxic leadership. However, this study is limited by its cross-sectional design and reliance on self-reported data, which may affect the accuracy and generalizability of the findings. Future research should adopt longitudinal or experimental designs and investigate additional moderating variables such as emotional intelligence, organizational culture, or coping strategies.

Keywords: Employee performance, positive psychological capital, social exchange theory (SET), toxic leadership

The Role of Power Distance in Shaping Employee Engagement amid Abusive Supervision

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The IT sector in Sri Lanka, which plays a pivotal role in the country's Gross Domestic Product and the employment of youth (Pulasthi, 2023), is presently encountering challenges associated with insufficient employee engagement. Leadership behaviour, particularly in the form of abusive supervision, is empirically recognized as a significant predictor of adverse employee outcomes; nonetheless, the cultural dimension of power distance, particularly within the South Asian context, remains inadequately examined (Fischer et al., 2021). This study aims to elucidate the moderating effect of power distance on the relationship between abusive supervision and employee engagement within the IT sector of Sri Lanka. Anchored in the Conservation of Resources (COR) theory (Hobfoll et al., 1989), which asserts that individuals endeavour to acquire, safeguard, and preserve valuable resources this study investigates how cultural values among employees influence their responses to abusive supervision. Quantitative research was employed, utilizing self-reported survey data collected from 185 IT professionals who were selected through convenience sampling. The research operationalized abusive supervision, employee engagement, and power distance employing validated measurement scales (Kirkman et al., 2009; Schaufeli & Bakker, 2004; Tepper, 2000). The findings indicate a significant negative correlation between abusive supervision and employee engagement ($r = -0.706$, $p < 0.01$; $B = -0.52$, $p < 0.001$), suggesting that supervisory abuse adversely affects employees' personal and social resource pools. Additionally, power distance exhibits a positive correlation with abusive supervision ($r = 0.721$, $p < 0.01$) and a moderate correlation with employee engagement ($r = 0.683$, $p < 0.01$; $B = 0.39$, $p < 0.001$). The moderation analysis demonstrates a significant interaction effect (interaction $B = -0.21$, $p = 0.002$), with the model's explanatory power increasing by 5% ($\Delta R^2 = 0.05$, $F = 10.67$, $p = 0.0002$), thereby substantiating predictions posited by COR theory. This investigation emphasizes the necessity for culturally attuned leadership development and human resource practices that are aligned with hierarchical workplace norms. It enriches the existing leadership literature by implementing COR theory within a South Asian context while elucidating the moderating function of power distance in mitigating the repercussions of abusive supervision. A noteworthy limitation of this research is the reliance on convenience sampling, which may potentially constrain the generalizability of the study's conclusions.

Keywords: Abusive supervision, employee engagement, power distance, IT Industry, conservation of resource theory.

Voices for Change Towards Enhanced Non-Financial Reporting Assurance in Sri Lanka: An Analysis of Key Stakeholder Expectations

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Non-Financial Reporting (NFR) is gaining global importance, making assurance on such information increasingly relevant. In Sri Lanka, although many companies engage in NFR, a significantly lower percentage obtain assurance, with a noticeable decline from 2020 to 2022. This drop in assurance uptake may indicate user dissatisfaction or a limited perceived value of the assurance process. Given the evolving regulatory landscape and limited local adoption, this study addresses a key research gap by exploring stakeholder expectations and perceptions of NFR assurance within the Sri Lankan context. Hence, this study aims to explore the changing expectations of key stakeholders, namely assurance providers, reporters, and users of NFR assurance in Sri Lanka. Following a qualitative approach, data were collected from assurance providers, reporters, and users of NFR through 14 semi-structured interviews using purposive sampling. Thematic analysis, supported by NVivo 12 Pro, was used to analyze the data. The study found that all categories of respondents highly anticipate improvements in clarity and consistency in NFR assurance. Specifically, they seek changes to the assurance statement, clear guidance on materiality, and standardization. Additionally, there are strong expectations to amend corporate governance codes to align with global changes in NFR and its assurance and making assurance mandatory. Respondents also advocate for advancements in approach and methodology, including a forward-looking and analytical approach, a shift towards reasonable assurance, and the adoption of advanced technologies. The limitations in assurance statements, such as inconsistency in the level of detail, prioritizing compliance over stakeholder needs, and the use of technical language and jargon, underscore these expectations. Furthermore, concerns regarding greenwashing, inconsistencies in assurance procedures stemming from different practices adopted by various assurance providers, and the lack of regulations were highlighted as contributory factors leading to this situation. This study pioneers the examination of the changing expectations of major stakeholders within the context of NFR assurance in Sri Lanka. The study's implications are extensive, highlighting the need for regulatory reforms and the adoption of innovative approaches to meet the evolving demands of stakeholders.

Keywords: Evolution in assurance, non-financial reporting assurance, stakeholder expectations

Theme 6

Humanities and Social Sciences in a Rapidly Changing World

A Critical Comparison of Narrative Techniques, Characterisation and Historical Representation in the Novel and Film Adaptation of the Boy in the Striped Pajamas.

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Representing the Holocaust in literature and film raises ethical challenges, balancing historical accuracy with narrative artistry. John Boyne's *The Boy in the Striped Pajamas* (2006) and its 2008 film adaptation use the perspective of a child, risking simplification of complex socio-political realities while engaging audiences emotionally. This study compares their approaches. This study evaluates how narrative techniques, characterisation, and historical representation in the novel and film construct meaning, shape audience perception, and address ethical complexities of the Holocaust representation. It examines the tension between artistic licence and historical fidelity in mediating traumatic histories. A qualitative approach involves close textual analysis of the novel and filmic analysis of the adaptation. The study focuses on narrative structure, character development, and visual symbolism, cross-examining key scenes, such as Bruno and Shmuel's first fence-side encounter and the climactic gas chamber sequence. These analyses assess shifts in thematic focus, emotional impact, and historical accuracy. The methodology draws on adaptation theory and Holocaust studies to evaluate how each medium negotiates ethical responsibilities in depicting Nazi brutality and the socio-political context of the Holocaust. The first-person narration utilised in the novel deepens psychological introspection, fostering moral ambiguity through Bruno's naive perspective. Conversely, the visual storytelling of the film heightens immediacy, using close-ups and muted tones, but sacrifices historical nuance. Both versions sanitise Nazi brutality, with the gas chamber scene avoiding explicit violence, raising pedagogical concerns. The child's perspective simplifies the complexities of the Holocaust, yet intensifies emotional resonance. The film prioritises affective impact, while the novel allows nuanced character development, highlighting adaptation trade-offs in historical representation. Adapting traumatic histories risks ethical dilemmas, balancing emotional engagement with historical precision. This study underscores the nuanced ambiguity of the novel versus the emotive power of the film, advocating rigorous historiography in narrative artistry. It contributes to Holocaust memory and adaptation theory, urging responsible cultural mediation of historical trauma.

Keywords: Holocaust representation, narrative discourse, film adaptation, ethical historiography, trauma studies

A Critical Study of the Use of South Asian Mythical Realism in the Narrative Art of Simon Navagattegama: Based on the Novels " Ksheera Sagaraya Kalabina " and " Sansaranya Asabada "

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This study investigates the influence of South Asian mythical realism on the narrative art of Simon Navagattegama by examining thematic structures, stylistic approaches, and theoretical underpinnings derived from a rich tradition of folklore and legend. Rooted in ancient storytelling traditions that encompass myths, folklore, and historical narratives. South Asian literary practices have significantly shaped cultural consciousness. This research evaluates how Navagattegama's works reflect a flexible adaptation of multi-layered mythic structures characterized by the detachment of narrative from conventional time constraints, an oscillation between naturalism and anti-naturalism, and a deliberate engagement in political prophecy that challenges traditional Eastern fatalism. Employing a qualitative methodology that incorporates library archives, online readings, and interviews, the study compares Navagattegama's narrative practices with the thematic approaches observed in the works of Intizar Husain. Husain, a prominent figure in mythical realism, employs a thematic form rooted in Buddhist folklore and Asian mythic references in such texts as "The Death of Sheherezad, The Sea Lies Ahead, Circle and Other Stories and A Chronicle of the Peakoks". By juxtaposing the techniques of these two writers, the research highlights a common narrative duality wherein fictional narration is interwoven with implicit historical contexts, allowing for a complex layering of time and meaning without explicit exposition. The fundamental hypothesis guiding this study is that Simon Navagattegama absorbed and transformed the aesthetic principles of ancient South Asian mythic realism into his own unique narrative style. His early exposure to traditional storytelling practices provided the foundation for an innovative use of mythic structures that resonates with but also departs from established literary traditions. The comparative discourse detailed in this research demonstrates that Navagattegama's narrative artistry is deeply nourished by the mythic realism tradition, rendering his work a significant contribution to global literary discourse. This study not only confirms the prevalence of mythic elements in Navagattegama's work but also establishes a theoretical framework for understanding the interplay between cultural heritage and narrative innovation. Furthermore, this study presents mythic realism as more than a stylistic tool; it acts as an expressive medium which reflecting cultural identity and historical memory, providing fresh insights into global narrative art profoundly.

Keywords: Narrative art, Intizar Husain, South Asian literature, mythical realism, Simon Navagattegama

A Historical Study of the Legal System and Judicial Proceedings of the Kandyan Kingdom Period: Through the Selected Local and Foreign Literary Sources

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When we focus on ancient Sri Lanka, it is seen that the judicial system for administering law and punishment was implemented in a complex manner based on customs and traditions, and it was continuously passed on to contemporary societies. The problem of this research is, what was the main features of the legal and judicial system during the Kandyan period? In this research, the main object of this research was to briefly examine revel the main features of the law and judicial system of the Kandyan period through the selected local and foreign literary sources. Accordingly aim is to briefly examine the contemporary written sources that reveal the law and judicial system during the Kandyan kingdom period, to examine the legal system during the Kandyan Kingdom period based on that source, and to examine the functioning of judicial systems. The qualitative research method was used to collect data by analyzing the historical sources. When examining the law and judicial proceedings that were implemented during the Kandyan Kingdom, several local and foreign sources written in the contemporary periods that provide Direct and indirect information about them can be identified. Here Book of "Niti Nigandu", Document of "Lankave Raja sirith saha loka charithra", "An Historical Relation of the Island Ceylon", "Diary of Mr. john D'Oyly" and "An Account of the Interior of Ceylon, and of Its Inhabitants" books are very important. It is seen that the legal systems and judicial proceedings that existed in ancient Sri Lanka during the Kandyan Kingdom period underwent certain changes and further developed and came into effect. When examining the law implemented in the Kandyan Kingdom, various aspects such as statehood and governance, marriage laws, devotion, property rights, and inheritance can be identified. When examining judicial proceedings, it is seen that there were several special groups that acted on behalf of the community that had the power to make decisions about a guilty person and punish or order compensation to the oppressed party. Examples are "King", "Mahadikaram", "Adikaram" and "Dissawa". We can see that various decisions and punishments were given by them, and that various aspects were implemented in the judicial process. Examples are "Kill", "Deportation", "Fine" and "Compensation".

Keywords: Judicial proceedings, Kandyan kingdom, legal system, local and foreign literary sources

A Study of How Temple Paintings Promote Religious Lifestyle of the Citizens During the Colonial Time Period in Sri Lanka

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In our rapidly changing society, the lifestyle of today's man is also changing rapidly. People have become more focused on the satisfaction of personal desires. There is a high risk of people losing the good attitude needed for a good lifestyle. This research is valuable for understanding how art can shape people's lives. The purpose of the research is to study how temple paintings promote a religious lifestyle through visual narratives. The research problem focuses on how temple murals were used to promote a religious lifestyle among citizens during the colonial period. Qualitative research methods were used for the research. A field study was conducted in five randomly selected ancient temples in the *Kegalle* District and five low-country temples dating from the 19th to the early 20th century, where temple murals were observed to collect primary data. Iconography Analysis method was used for data analysis. Research articles and books on temple paintings have been used to collect secondary data. Traditional society has changed due to new administrative reforms and western cultural values. People became more addicted to drugs and sinful behavior with the adoption of Western habits according to available literature. Illiterate people learn about the Buddhist religious lifestyle through *Bana* preaching and visual narratives such as temple paintings. The subject matter of these murals are mostly based on *Jataka Kata* and Buddha *Charitaya*. Jataka stories like *Vessantara, Machchariya Kosiya, Mahadhana Sitanan* and *Sasa* have depicted the importance of generosity and self-sacrifice. There are murals depicting people fishing, hunting animals and drinking alcohol. Murals depicting hell illustrate the consequences of sin, on the other hand murals of heaven show the rewards of merit. As a result of colonisation, the decline of good human habits and attitudes was one of the main reasons for creating visual narratives through murals to promote a religious lifestyle during the colonial period. As identified in this study, temple paintings can be seen as a form of art that promotes and reinforces a religious lifestyle among citizens during the colonial period. These murals played a major role in protecting Buddhist religious values and guiding community behaviour.

Keywords: Buddhism, colonial period, religious lifestyle, temple murals, visual narratives

A Study on Using Forum Theatre as a Therapy for Women Affected by Sexual Harassment in the Workplace

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Sri Lankan women are the most vulnerable to workplace sexual harassment, and it affects their mental, physical and social well-being. Women play a major role in economic development in the country by participating in the workforce, but Sexual harassment disturbs their productivity and increases employee turnover and absenteeism. Forum theatre is a performance made from real stories and performed to an audience directly affected. Audience members interact in a safe space by recreating the performance by improvising new solutions to the problems that have been presented. The purpose of this research is to explore the effectiveness of using forum theatre in a therapeutic approach to heal and transform women's lives to participate more effectively in employment by enhancing their mental well-being. This qualitative study employed in-depth interviews with employees from the private sector, tea estates, self-employed and legal entities in Polonnaruwa, Kandy, Galle and Colombo districts and observations by the researcher to gather data. Sample selection was conducted utilizing the convenience sampling method. Data was gathered from twenty key informants, all the interviews transcribed, and the analysis began with coding the transcripts. The findings received through coding and categorizing were divided into three themes: Catharsis, Psycho-Education, and Transformation. Sharing one's own story of sexual harassment, expressing emotions felt after the harassment and connecting with other victims of sexual harassment in the audience appeared as catharsis. Improvising new behaviors of responding to harassment, creating new solutions as a group of victims and understanding challenges they face in reality were found as categories in the psycho-education theme. Building a new perception to respond to sexual harassment, embodied experiences of managing and overcoming harassment situations, and empowering individuals to stand against sexual harassment appeared to be the categories under the transformation theme. Forum theatre makes a safe and comfortable space to transform lives by creating a dramatic reality to explore and apply new solutions. It's an intervention that guides the client to a self-transformative moment by giving embodied experience and cognitive change to face the challenges of real life. It changes the traditional individual clinical setting into an innovative community clinical setting.

Keywords: forum theatre, sexual harassment, psycho-education, transformation

An Analysis of Chants Associated with the Nāthadeva Belief: A Case Study of the Nātha Temple in Dodanwala

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This study investigates the ritual chants associated with the Nātha Deva faith, with a focus on the practices at the Dodanwala Nātha Devalaya in Kandy. Revered for its religious, historical, and cultural value, the temple is believed to have been constructed during the reign of King Rajasinghe II of the Kandyan Kingdom and remains a significant site of worship dedicated to God Nātha. The research aims to identify and analyse the distinctive features of the chants performed during offerings and religious observances. The study also examines their cultural context and functional role in sustaining the God Nātha tradition. The research problem addresses the unique characteristics of these chants and their relevance within the ritual structure of the temple. Using a qualitative methodology, data were collected through field observations, interviews with temple practitioners, and the analysis of primary and secondary historical sources, Findings reveal that a variety of chants, including mal yahan, blessing verses, stotras (devotional hymns), and deva kannalav (chants in praise of deities) are performed during daily tevamura rituals (ritual services conducted in the morning, afternoon, and evening) and during the temple's four major annual festivals. These chants fulfil multiple functions, including invoking divine blessings, preventing misfortune, and ensuring the spiritual well-being (seth shānti) of devotees. The chants are presented in both rhythmic and non-rhythmic forms, utilising classical metrical patterns such as anustip and samudraghosha. They are commonly accompanied by hevisi drumming, a ritual percussion tradition that enhances the spiritual intensity of religious performances. The study concludes that these chants are not only an essential part of ritual worship but also represent a valuable form of intangible cultural heritage. It recommends active efforts by governmental and cultural institutions to preserve, document, and promote these oral traditions for future generations.

Keywords: God Nātha, Dodanwala Nātha Devala, ritual chants, blessing verses, intangible heritage

An Event-Related Brain Potential Study on Facial Age and Anger Expression

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The human face displays a wealth of psychologically relevant information. Different facial features affect the perception. For example, older faces are processed differently to younger ones and faces expressing diverse emotions are processed differently. Research shows that angry faces are more attended to compared to neutral or other expressive faces, which is known as the 'threat advantage. There has been no direct research on the neural processing of younger and older emotional faces, allowing no definite conclusion on the potential interaction effects. In the current study, the aim was to determine the potential interaction of facial expressions of emotion and facial age. More specifically, the study answered to the research question of how does emotional facial age influences on the electrophysiological perception. The hypothesis was tested as an event-related potential (ERP) experiment, by focusing on the affective ERP component known as the Late Positive Potential (LPP), a centro-parietal positive potential occurring around 400 ms post-stimulus and continuing for up to several seconds, and which is thought to reflect affective processing. It was hypothesized that old angry faces, as more emotionally salient, would elicit a higher LPP amplitude, and be subjectively rated as more threatening, than young angry, or (old or young) neutral faces. Twenty-eight participants were tested in an experiment where each subject had their brain electroencephalograph (EEG) signal recorded during the perception of facial stimuli, in order to calculate the ERP responses to the eight different male facial images with all possible combinations of neutral versus angry faces, young versus old faces. Participant's brain activity was recorded using 17 active electrode cap on the scalp. The experiment consisted of twelve blocks, where each block consisted of the eight faces in a pseudo-randomized order, with no faces being shown twice in a row, for 64 trials in total per block. Visual inspection suggests that the old angry faces elicited a higher LPP amplitude than all other conditions for the early LPP (400-1000 ms), while young neutral faces elicited a lower amplitude. The results showed the participants had a higher LPP for old angry faces. However, this difference was statistically non-significant.

Keywords: Late positive potential, facial age, anger, perception

An Investigation into Code-Switching in Informal Communication Among Sinhala-English Bilingual Students at the University of Ruhuna

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Code-switching is the alternation between two or more languages within the same discourse. It is a common linguistic phenomenon in multilingual contexts, specifically in postcolonial societies like Sri Lanka. Code-switching among bilingual (English-Sinhala) undergraduates reflects the intricate socio-cultural, cognitive, and identity-related aspects, extending mere linguistic convenience. This study investigates the functional role and the motivations of code-switching in informal communication among 4000-level undergraduates of the Faculty of Humanities and Social Sciences. The objective of this research is to examine whether code-switching is a deliberate communicative strategy or arises due to linguistic limitations. This study followed mixed methods, incorporating both qualitative and quantitative approaches. The data were collected through semi-structured interviews by selecting 150 participants through random sampling technique. English-Sinhala bilingual students pursuing English-medium degrees at the 4000 level in the Faculty of Humanities and Social Sciences were included in the sample. Inductive thematic analysis was used to inspect the qualitative data in order to identify and interpret recurring functions and motivations of code-switching among bilingual undergraduates. Quantitative data were identified and observed in terms of frequency patterns by using descriptive statistics. The findings of the study demonstrate that students primarily code-switch as a communication tool instead of facing language constraints. Students regularly change their communication style between languages. It helps them to express clearer messages, incorporating emotional details and academic terminology. Students use code-switching in order to construct individual and group identities, power dynamics, and social interactions since both languages carry unique identities and power hierarchies. The linguistic awareness and pragmatic competence of students are demonstrated through code-switching. The analysis shows variations in code-switching based on disciplinary background and contextual factors. In conclusion, code-switching is a communicative tool used by Sinhala-English bilingual undergraduates in communication. Accordingly, this study specifically recommends promoting bilingual practises, increasing sociolinguistic awareness, and incorporating code-switching into university curricula. It promotes peer learning, identity formation, and academic engagement in Sri Lankan universities. Henceforth, code-switching can enhance the effectiveness of communication by bridging linguistic and cultural gaps, facilitating inclusivity in social interaction, and reducing power imbalances among languages.

Keywords: Code-switching, informal communication, bilingualism, sociolinguistics, Sri Lanka

Analysis of How the Protagonist's Identity is Constructed Through the Poetics of Language in Marguerite Duras's *The Lover*

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This study explores how language constructs identity in autobiographical fiction through an in-depth analysis of Marguerite Duras's *The Lover*. Positioned at the intersection of literature and life-writing, the novel exemplifies autofiction, where the boundaries between memory and narrative are deliberately blurred. The research investigates how stylistic and linguistic features shape the protagonist's identity, raising two core questions: What stylistic elements define the protagonist's portrayal in *The Lover*? And how do these features reflect and negotiate personal identity through language? Grounded in a qualitative research design with supporting quantitative elements, the study draws on close textual analysis and comparison with biographical sources to identify autobiographical parallels. Key theoretical frameworks on autobiography and autofiction inform the analysis, enabling a nuanced interpretation of how narrative form mediates subjectivity. Textual examination identified recurring stylistic features — such as shifts in narrative style, non-chronological structure and lexical minimalism—while quantitative analysis of descriptive passages provided empirical support by measuring the frequency and proportion of specific linguistic patterns. Findings reveal that Duras's use of a fragmented and poetic narrative, coupled with a sparse and repetitive lexicon, conveys the protagonist's emotional intensity and internal conflict. These stylistic choices construct a fluid, unstable identity, shaped by silence, desire, and dislocation. The narrative emphasizes adolescence and emotional vulnerability over retrospective coherence, reinforcing the sense of identity as an ongoing, ambiguous process rather than a fixed self. Quantitative results underscore the consistent use of minimalistic language in emotionally charged passages, highlighting the stylistic coherence of Duras's approach. In conclusion, the study demonstrates that language in *The Lover* functions as a vehicle for identity construction, with stylistic elements playing a central role in shaping narrative subjectivity. By revealing how fragmentation and minimalism articulate emotional complexity, this research contributes to broader discussions on autobiographical fiction and the evolving concept of autofiction. It emphasizes how identity in such texts emerges not as a stable essence but as a narrative process, negotiated through language and memory.

Keywords: Autobiography, identity, language, protagonist

Animal Rights Law as Part of Sri Lanka's Legal Curricula: A Pedagogical Analysis of Needs and Possibilities

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Many law schools around the world have expanded their pedagogical approaches beyond anthropocentrism and thereby recognized courses on animal protection to be vital in preparing future legal professionals for the evolving legal landscape and to equip them with the knowledge and skills required to address the growing legal challenges surrounding animal protection. Despite the country's long tradition of compassion and respect for animals and its strong foundation in legal studies, the possibility of introducing courses in this domain to the curricula of institutions of legal education in Sri Lanka remains largely unexplored. The Department of Law of the University of Peradeniya is currently the only local institution with Animal Protection Law as an optional course in its curriculum, with deliberations underway to revise its structure and content to enhance the opportunities of cultivating a generation of advocates committed to cultivating an ecocentric worldview grounded in justice for all. This study aims to evaluate the pedagogical need for integrating Animal Rights Law into Sri Lanka's legal education system and to explore viable models for doing so with reference to comparative examples from USA and India, lessons from offering Animal Protection Law at the Department of Law since 2021 and views of stakeholders of legal education. Information gathered from primary and secondary sources are analyzed qualitatively and combined with inferences derived from the comparative study and the opinion survey involving stakeholders of legal education in Sri Lanka. Through the employment of such methodologies, the study not only presents critical views on the necessity of incorporating Animal Rights Law into the legal curricula in Sri Lanka but also explores the progressive opportunities presented by such incorporation in enriching the knowledge, skills and attitudes of the recipients of legal education with the aim of emphasizing the existing void and proposing meaningful and effective ways of addressing it.

Keywords: Animal rights law, legal curricula, Sri Lanka, institutions of legal education, USA and India

Artificial Intelligence and Governance: Ethical Implications of Policy Decision-Making in Sri Lanka

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Artificial Intelligence (AI) is increasingly aiming at governance and policy decision-making around the world, including Sri Lanka. Absence of a comprehensive legal and ethical framework of AI governance raises issues of public trust, fairness, and reinforcement of the already existing socio-political inequalities. This study aims to examine the incorporation of AI into Sri Lankan governance, the forthcoming ethical challenges, and necessary action points to ensure responsible AI based policy decisions. The research utilizes secondary data from government reports, AI policy documents, and academic literature and conducts a content analysis based on the identified themes. The findings indicate that AI is being utilized in many fields in governance for policy decisions, but it is also clear that there are no defined ethical standards or oversight laws. The findings of the study also revealed issues related to data privacy, algorithmic bias, and a lack of transparency in decision-making. There is a noticeable lack of public confidence in AI-based governance due to concerns about accountability and how the technology is being used. This study has comparatively few data limitations due to Sri Lanka's adoption of AI in government. The study comprehends the moral implications of AI in good governance, which facilitates the development of responsible AI framework policies, and it will enlighten the interested parties on the potential risks and opportunities associated with the use of AI in policymaking. AI could expose oneself to potential risks related to accountability, transparency, and public trust if there are no strong ethical standards and guiding principles in place. The study concludes with policy recommendations aimed at promoting transparency, accountability, and fairness in AI-powered policymaking. These include developing inclusive AI regulations, encouraging public participation in AI governance, and establishing an independent AI regulatory body. By implementing these measures, Sri Lanka will be able to utilize the potentials of AI while safeguarding ethical standards, democratic values, and human rights in its governance processes.

Keywords: Artificial intelligence, governance, ethics, decision-making, transparency, accountability

Assessing the Impact and Pedagogical Changes of Mobile Devices in Chinese Language Learning in the Digital Age

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The rapid advancement of digital and intelligent technologies has reshaped language education, particularly for Chinese—a language characterized by a logographic writing system and tonal phonology. Mobile devices have emerged as effective tools for supporting Chinese language acquisition by facilitating vocabulary learning, pronunciation improvement, and character recognition. This study investigates the impact of mobile-assisted language learning (MALL) on Chinese language education, focusing on vocabulary acquisition, character recognition, pronunciation, and speaking fluency. It also explores the challenges learners face and the pedagogical implications for teaching in the digital era. A mixed methods approach was employed with 41 Chinese language learners from the University of Kelaniya. Quantitative data were collected through structured Likert-scale surveys assessing learners' perceptions of MALL across key linguistic competencies. Qualitative data were gathered via in-depth interviews with 10 participants to explore individual learning experiences, challenges, and suggestions for improvement. Descriptive statistical analysis was applied to survey data, while thematic analysis was used for interview responses. Findings reveal that mobile devices significantly support vocabulary development and character recognition. Learners benefited from interactive applications such as Pleco and Duolingo, which offer structured exercises and immediate feedback. Improvements in pronunciation and listening comprehension were also reported, though speaking fluency remained a persistent challenge. Notable limitations included insufficient real-time interaction, distractions from mobile notifications, and difficulties in identifying suitable learning tools. This study contributes to the evolving discourse on mobile-assisted language learning by providing context-specific insights into Chinese language acquisition among university learners. It underscores the pedagogical value of mobile technologies while highlighting the need for enhanced real-time speaking practice and AI-driven pronunciation assessment. The findings call for the integration of more structured and adaptive learning pathways to optimize mobile-assisted Chinese language education in the digital age.

Keywords: Mobile devices, Chinese language learning, teaching transformation, digital age, mobile-assisted language learning (MALL)

Assessment of Consumption Patterns and Purchasing Behavior on Meat and Processed Meat Products Among the Undergraduates, University of Peradeniya, Sri Lanka

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The undergraduates who are in the transitional and experiential stage have complex dietary preferences. Understanding of their food consumption preferences is still underexplored. Therefore, this study aimed to identify the effect of socio-demographic factors on consumption and purchasing decisions of meat/processed meat products, as well as to evaluate the awareness of undergraduates of the University of Peradeniya, Sri Lanka, on the consumption and purchasing of meat/processed meat products. Data was collected using a pre-tested, self-administered, structured questionnaire from a randomly selected of sample of 360 undergraduates of the University of Peradeniya. Descriptive statistics and correlation analysis were performed using the IBM SPSS version 26 software package. Most participants followed an omnivorous diet (81.3%), with 93.1% consuming at least one type of meat, while 6.9% avoided meat. The most preferred meat type was poultry meat (55.3%), and broiler meat (46.4%) was the most favored among poultry meat. Out of respondents, 85.5% consumed processed meat products, and the most preferred processed meat product was sausage. There was a strong positive correlation of dietary habits (0.444) on meat consumption and negative correlations between ethnicity (0.204), and dietary habit (0.274) on processed meat consumption ($p < 0.01$). Pork and beef consumption have a significant correlation with religion and gender. Employment type (0.125) and province of the respondents (0.110) were positively correlated with fresh/frozen meat purchasing decisions ($p < 0.05$). However, there was no correlation between socio-demographic factors on processed meat purchasing frequency and satisfaction of the undergraduates on meat consumption and purchasing. The majority of undergraduates were aware of the nutritional value of fresh meat, with a neutral awareness of processed meat products. Results of this study may generate insights for the industry as well as for policymakers to promote nutritional programs at the university.

Keywords: Consumption, purchasing, satisfaction, meat, undergraduates

Awareness of Copyright Law in Sri Lankan Television Musical Realities with Special Reference to Voice Teens and Dream Star

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Television programs are created across various genres to capture the audience's attention and provide enjoyment through diversity. One popular genre is reality programs, which focus on evaluating the singing abilities of contestants and often utilize songs owned by other parties. Intellectual property refers to the valuable and unique creations of the human mind. Copyright law and royalty payments, aspects of intellectual property, have become hot topics in discussions surrounding the broadcasting of musical reality shows. The frequent instances of copyright infringements in the industry highlight a significant gap in legal understanding, particularly regarding the practical application of intellectual property law. This study aims to assess the level of awareness regarding intellectual property law among production staff involved in Sri Lankan television musical reality shows. The research was centered around two specific programs: “The Voice Teens,” aired on Sirasa TV, and “Dream Star,” broadcast on TV Derana, both of which are private channels in Sri Lanka. The hypothesis posited that the production staff of musical reality programs lack sufficient awareness of intellectual property law. To explore this hypothesis, the research utilized a quantitative methodology, surveying 50 production staff members from these programs to evaluate their understanding of intellectual property law. While most respondents reported a basic awareness of copyright and royalty systems, the findings revealed significant knowledge gaps regarding legal ownership, royalty structures, and copyright durations, indicating a lack of adequate legal literacy. Ultimately, the study concluded that the production staff of TV music reality programs in Sri Lanka do not possess sufficient awareness of intellectual property law.

Keywords: Intellectual property law, copyrights, royalty payments, reality programs, production staff

Blockchain Technology for Information Preservation in Digital Libraries

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With digital libraries emerging as the main storehouses of knowledge, digital content preservation is confronted with novel challenges, specifically data authenticity, integrity, and long-term accessibility. The research explores blockchain technology as an innovative approach to preserving digital data in library systems. Blockchain's decentralized and immutable ledger features provide particular benefits in inhibiting data tampering, creating transparent audit trails, and verifying ownership and access histories. The study adopts a qualitative approach involving literature review, expert interviews with information science professionals, and case studies of initial blockchain applications in libraries and archives globally. Experts were interviewed from ten professionals with various backgrounds such as academic librarians, digital preservation officer, IT, and library systems personnel selected purposively. Data obtained by way of interviews was analyzed using thematic content analysis. The case studies focused on blockchain initiatives in the United States, Netherlands, and South Korea, providing insights into what practicable applications, outcomes, and challenges, was found to be undertaken in the different regional contexts. The findings demonstrate how blockchain can aid digital preservation via secure timestamping, decentralized management of digital assets, and smart contracts for rights management. Further, the study zeroes in on institutional and technical challenges—i.e., energy inefficiency, scalability of systems, and library infrastructures' readiness to adopt—most likely to bear upon adoption in resource-constrained environments. In spite of such constraints, the scope for harnessing blockchain towards reimagining digital libraries as more ethical, secure, and trustable systems is vast. Combined with conventional means of preservation, use of blockchain by libraries not only preserves data but also allows for transparency and trust among consumers. This research adds to the discussion on sustainable digital preservation by proposing a conceptual model for the possible future application of blockchain technologies in library and information services.

Keywords: Blockchain technology, digital libraries, information preservation, data authenticity, decentralized information systems

Buddhist Monastic Engagement in Climate Action and Community Resilience in Sri Lanka

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With climate change exacerbating environmental and social vulnerabilities, faith-based organizations have become increasingly crucial in promoting sustainable practices and building resilience locally. In the case of Sri Lanka, Buddhist monastic communities have been seen as leaders in building ecological awareness and community-level climate engagement. This particular study will be looking at how Buddhist monastics engage the issues of environmental and climatic risks (particularly in association with regular localized disasters such as flooding and droughts) that are associated with their religious teachings, as well as their own sustainable lifestyles and community engagement. Using qualitative research methods, data were gathered through observations, semi-structured interviews with 15 Buddhist monks and 10 laypeople from five districts, and content analysis of texts from sermons, temple ceremonies and environmental campaigns. The results show that Buddhist monks incorporate environmental ethics in Dhamma sermons, advocate for trees in reforestation projects, promote organic farming and biodiversity protection, and provide psychosocial support in places affected by disaster. For example, in two flood-affected districts over 500 trees were planted and three community farming projects commenced under the direction of the local temple. Their ethical teachings could, to some degree, be argued were effective in the particular context of their deep commitments to communities, their ability to lead people and capacity to build resilience at the grassroots level. The paper argues that Buddhist principles of compassion (karuṇā), mindfulness (sati), and non-harming (ahiṃsā) can provide concrete demonstration of ways, and processes, that are culturally situated and ecologically conscious, that can be realised in policy. To this end, it suggests that formal links with local climate adaptation and disaster response initiatives and monastic students should be established, and that multi-faith initiatives empowering partnerships for sustainable development should be forged.

Keywords: Buddhism, climate resilience, monastic leadership, disaster response, eco-spirituality

Colonialism, Capitalism and Performing Arts: Impact of Parsi Theatre Companies on Performing Arts of Sri Lanka

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Colonialism introduced significant cultural changes in colonised societies, often blending foreign influences with local traditions. Among these were imported performing arts that adapted to indigenous styles and gained new dimensions. These art forms evolved into profitable industries within the transforming colonial economies. One such influence was Parsi theatre, which emerged in the 1850s through entrepreneurial Parsi traders in Gujarat. The Parsis are an ethno-religious group of Persian descent who migrated to India and settled in Gujarat. Their initial ventures were theatre companies, later move to Bombay for trade and commerce. This study explores the impact of Western colonialism on Asian economic transformation and the intricate responses of indigenous societies. It examines how Parsi theatre, as an economic activity, thrived under colonial influence and contributed to evolving performing arts landscapes. The research focuses particularly on how the theatre business introduced by Parsis affected Sri Lankan performing arts, both economically and culturally. This analysis draws on primary archival material and data from ethnological and biographical studies of Indian communities, as well as personal interviews, to understand the layered socio-cultural transformations caused by the intersection of colonial power, capitalist ventures, and artistic expression. These Parsi theatres gained popularity across Sri Lanka and other Southeast Asian colonies, creating new entertainment markets and shaping the foundation of modern performing arts in these regions. Performing arts were elevated into commercial ventures, deeply influencing Sri Lankan theatre in both form and industry. Marking a turning point in the history of Sinhala drama it is largely impacted on Nurti, an urban-based commercial enterprise of the time. Nurti were used to propagate nationalist sentiment in the second half of the 19th century. Parsi theatre became a transformative force, embedding artistic expression within capitalist structures. The study deepens understanding of colonial-era economic and cultural transitions and their legacy in Sri Lankan performing arts.

Keywords: Parsis, performing arts, theatre companies, colonial society, business avenues

Comparative Study of Surgical Practices in Alahana Pirivena, Polonnaruwa-Sri Lanka and Ancient Egypt

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Archaeological and literary evidence reveal that surgical procedures were integral to ancient medical systems, predating modern Western medicine. Ancient civilizations independently developed surgical techniques, tools, and anaesthesia, highlighting a rich history of medical knowledge that has influenced contemporary practices. This research aims to compare the surgical practices of two ancient civilizations: the Alahana Pirivena hospital in Polonnaruwa, Sri Lanka (Rajarata civilization, 1153–1186 AD), and ancient Egypt. It explores their surgical instruments, treatment techniques, and use of anaesthesia to better understand the evolution of surgical methods. This study uses data from archaeological excavations and historical texts. In 1988, Prof. P.L. Premathilake excavated various surgical tools from Alahana Pirivena, including fine forceps, scissors, scalpels, and probes. Other items included medicinal troughs, slaked lime containers, weighing devices, and remains of a brick-built hospital. Ancient Egyptian surgical practices were analysed using medical papyri, especially the Edwin Smith Papyrus. References to surgical interventions in sensory and visceral organs were explored, along with mentions of anaesthetic agents like alcohol and opium, and terms such as Sanjeewani and Sammohini in Sushrutha Samhita. The surgical tools found at Alahana Pirivena closely resemble modern surgical instruments, suggesting advanced procedures and use of anaesthesia. The discovery of hospital infrastructure further supports this. Ancient texts referenced diverse surgical interventions. Egyptian medicine, particularly the Edwin Smith Papyrus, documents surgical treatments for wounds, boils and tumours. Both cultures exhibited refined medical knowledge, including pain control using opium, which is still the mainstay for intraoperative & postoperative analgesia. These findings reveal striking parallels with modern surgical approaches. The study reveals advanced surgical and anaesthetic practices in both ancient Sri Lanka and Egypt. Their contributions show early foundations of medical science and surgical methodology. This comparison provides deeper insights into the historical development of surgery and reinforces the global legacy of ancient medical systems.

Keywords: Pre-modern surgery, Alahana Pirivena, Egyptian medical practice, pre-modern anaesthesia, surgical instruments

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Evolving Melodies: Transformation of Kandyan Vaṇṇama in 20th-Century Sinhala Traditional Music

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The Traditional Sinhala songs, particularly Kandyan Vaṇṇama, have long embodied the cultural essence of Sri Lanka. However, since the early 20th century, their melodies have undergone significant evolution to reflect the sociopolitical and cultural shifts in contemporary society. This study examines the transformation of traditional Kandyan Vaṇṇama melodies. It aims to uncover how these adaptations mirror contemporary sociopolitical discourses and cultural influences, with a particular focus on the impact of Hindustani music, Tagore's practices, and S.N. Ratanjankar's traditional music discourse in mid-20th-century Sri Lanka. Using a qualitative research design, this study analyzed historical musical notations, books, and archival recordings. Data were collected from primary and secondary sources, and musical notations were recomposed to compare original and altered compositions. A descriptive analytical approach was employed to document the nature and extent of melodic changes, while thematic interpretation aided in understanding the external influences that reshaped these musical traditions. Alternative approaches, such as a comparative analysis between pre- and post-adaptation forms, were considered but found less effective given the available data. The analysis reveals that the melodic structures of Kandyan Vaṇṇama have been intentionally altered over time. Changes include modifications in rhythm, tonality, and compositional techniques. The influence of Hindustani music introduced new tunes based on Rāga and Tāla patterns, while Tagore's practices and Ratanjankar's discussions inspired shifts in the theoretical framework of musical arrangements. These findings indicate that traditional music forms have been adapted in response to and in service of contemporary sociopolitical and cultural discourses, rather than being dynamically integrated as isolated developments. The study concludes that the evolution of Kandyan Vaṇṇama melodies reflects a strategic response to modern cultural and sociopolitical demands. This adaptation illustrates how traditional art forms serve contemporary discourses, enhancing our understanding of cultural resilience and the transformative role of heritage in today's musical landscape.

Keywords: Cultural adaptation, Indian influence, Kandyan Vaṇṇama, melody transformation, Sinhala traditional music

Examining the Social Consequences of Tourism and Pathways to Sustainable Solutions: A Case Study of Gregory Lake, Nuwara Eliya, Sri Lanka

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Gregory Lake in Nuwara Eliya is one of Sri Lanka's most popular tourist destinations, known for its scenic beauty, cool climate, and diverse recreational activities that attract both domestic and international visitors. Between 2019 and 2023, the area recorded 3,255,525 tourist arrivals. However, this surge in tourism has brought several social challenges due to inadequate management and unsustainable tourism practices. This study investigates the social consequences of tourism around Gregory Lake through both qualitative and quantitative methods. Primary data were collected via field observations and structured interviews, while secondary data were sourced from official records, including reports from the Nuwara Eliya Municipal Council (NMC) and the Urban Development Authority (UDA). A stratified sampling method was used to include key stakeholders: shop owners, boat operators, pony riders, residents, and government officials. Although tourist arrivals declined during the COVID-19 pandemic in 2020 and 2021, the gradual rebound in 2022 and 2023 increased social interactions, contributing to the continued spread of COVID-19. In April 2023, over ten vehicle thefts and several wallet thefts were reported at Gregory Lake. Tourists also faced issues like unfair pricing by boat operators and pony riders. These problems show some negative social impacts of tourism and the need for better management. Furthermore, traditional cultural practices such as clothing, cuisine, and festivals are increasingly being modified to cater to tourist preferences, undermining their authenticity and cultural significance. Moreover, field data indicate rising social disturbances linked to tourism: 31% of respondents reported increased alcohol use, followed by 25% smoking, 19% drug use, 14% indecent behaviour, and 11% public conflicts. To address these issues, the study recommends sustainable tourism strategies such as regulated pricing, cultural preservation, community awareness and education, regulation and enforcement, alternative livelihood programmes, tourism management and planning, collaboration between stakeholders, and support services and counselling to ensure Gregory Lake remains a resilient and inclusive destination.

Keywords*:* Gregory Lake, social impacts of tourism, cultural commodification, sustainable tourism, community stakeholders, Nuwara Eliya

Exploring Spiritual Dimensions in End-Of-Life Care: Insights Across Religious Traditions in Sri Lanka

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The final moments in life are often weighted by the spiritual reflections which provide comfort, guidance and mind set to accept the pain and loss that individuals and caregivers go through. The faith becomes crucial tool where it comes to the improving end-of-life support of individuals who are their last stage of life and his or her caregivers in Sri Lanka. This study aims to explore how different religious traditions conceptualize Good death and dying and how these beliefs influence the experiences of patients, families, and caregivers during end-of-life care in the medical settings of Sri Lanka. A qualitative comparative approach was adopted, analyzing religious texts from Hinduism, Christianity, Islam, and Buddhism alongside contemporary literature in palliative care. Field experiences at Suwa Arana (a pediatric palliative care center) and Indira Cancer Trust provided context through participant observation and informal interactions with families and caregivers. Thematic analysis was used to identify cross-religious patterns and insights. The study found that religious faith offers emotional comfort, ethical guidance, and a sense of meaning in the dying process. Despite theological differences, peace, acceptance, and spiritual preparation were common end-of-life themes. Observations revealed that rituals and spiritual practices provided belief, structure, resilience, and support to both patients and their loved ones. This research highlights the vital role of religious faith in shaping end-of-life experiences. Findings support the integration of culturally and spiritually sensitive approaches into palliative care practices, enhancing the dignity and emotional well-being of patients and families.

Keywords: End of life care, religion, death and dying

Exploring the Relationship Between Loneliness and Life Satisfaction Among SLIIT Undergraduates

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Loneliness and life satisfaction are two important constructs linked to the psychological well-being of young adults. University students, particularly those in competitive academic environments, are often vulnerable to emotional and social stressors that can impact their sense of connectedness and subjective well-being. This study explored the relationship between loneliness and life satisfaction among undergraduates at the Sri Lanka Institute of Information Technology (SLIIT), hypothesizing that higher levels of loneliness would be negatively associated with life satisfaction. A correlational design was employed with a convenience sample of 100 participants aged 19–25, recruited via university e-mails and social-media platforms. Participants completed an online survey that included the Revised UCLA Loneliness Scale (R-UCLA) and the Satisfaction with Life Scale (SWLS). Data were analyzed in Jamovi using descriptive statistics and Pearson's correlation. Ethical procedures, including informed consent, anonymity, and confidentiality, were strictly maintained. Results showed moderate loneliness ($M = 44.22$, $SD = 9.63$) and neutral life satisfaction ($M = 22.26$, $SD = 6.74$). A statistically significant moderate negative correlation emerged between loneliness and life satisfaction, $r(98) = –0.29$, $p = 0.003$, indicating that as loneliness increases, life satisfaction decreases. These findings underscore the need for targeted psychological interventions that foster social connectedness within academic institutions. Although similar studies exist internationally, research in the Sri Lankan context is scarce; thus, this study provides valuable local insight and highlights the need for broader studies with more diverse samples to enhance generalizability.

Keywords*:* Loneliness, life satisfaction, psychological well-being, undergraduates, Sri Lanka

From Displacement to Transformation: The Role of Northern Muslim IDPs in Puttalam's Salt Industry

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In 1990, the LTTE forcibly evicted Northern Muslims during Sri Lanka's civil war, with many settling in Puttalam. Puttalam has a long history of salt production, which expanded significantly after the arrival of Northern IDPs who increased the labor force in the industry. The arrival of northern displaced person (IDPs) changed this dynamic, as they increasingly engaged in salt production as a survival strategy. Their involvement not only provided them with livelihood but also significantly contributed to the growth and revitalization of the salt industry in Puttalam. This study explores how Northern Muslim IDPs contributed to sustaining and transforming the salt industry by applying the Sustainable Livelihoods Approach (SLA) as its conceptual framework. Data were generated from 30 questionnaires, 15 semi-structured interviews, Key Informant Interviews (KIIs), and two focus group discussions. The findings reveal that IDPs have been crucial in maintaining salt production by addressing labor shortages (60%), transferring traditional knowledge (30%), and introducing innovations (10%) that have improved industry practices. Despite challenges such as seasonal instability, low wages, and limited formal recognition, IDPs have shown resilience through community-based strategies, such as sharing tools, rotating labor among households during peak harvest periods, and collectively repairing salt pans after monsoons. They engage in intergenerational cooperation, where first-generation workers train their children in salt production. The younger generation supports this by introducing innovations like mobile apps to track seasonal changes. Though new to the field, the second generation follows similar strategies, continuing the industry's labor force structure. This study also highlights the transition of IDPs from displaced individuals to productive agents of local development. Their contributions, including innovation and adaptation, have been vital to the stability and sustainability of the salt industry and the regional economy. This study advocates for support from policymakers not only to ensure continued participation and development of IDPs in the salt industry, but also to address key challenges they face, such as seasonal instability, low wages, lack of social protection, and limited formal recognition through targeted policy interventions, improved working conditions, and inclusive livelihood programs.

Keywords: Northern Muslim, salt industry, Puttalam, sustainable livelihoods approach (SLA), economic contributions.

Galenic Dietetics in the 21st Century: Rethinking Ancient Nutritional Theories in the Age of Contemporary Dietary Trends

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Galen, a Greek Physician who lived in the Roman Empire of the Antonine Age (96 CE to 192 CE) is well famed for his treatise on dietetics 'On the Powers of Food'. This timeless piece of work offers a systematic classification of foods based on their effects on the body's humoral balance. While noting the importance of balancing grains, vegetables, fruit and meat in one's diet, Galen states that food should be considered as a therapeutic tool, related carefully to the temperament of the individual with the consideration that each condition may vary according to nature, age, gender and lifestyle. The objective of this paper thereby is to critically analyze Galen's balanced and individualized dietary philosophy in direct contrast to the extreme and restrictive nature of many contemporary dietary trends. To do so, this study employs a qualitative, comparative analysis of Galen's dietetic texts alongside contemporary dietary trends, drawing on historical sources and secondary literature to contextualize their differences. The 21st century has seen rise to extreme dietary trends, some causing severe harm or even death. Examples include the carnivore diet consisting of only meat, baby food diet involved in eating purely pureed food like a toddler, cotton ball diet; swallowing cotton balls to suppress hunger and the sleeping beauty diet that avoids food by sleep. This study finds that when Galen's principles are applied to assess modern diets, foods in the carnivore diet rank overwhelmingly as hot and dry, creating a theoretical humoral excess that aligns with observed symptoms like inflammation and dehydration. This humoral mapping offers a new diagnostic lens through which ancient theory can explain physiological harm in modern trends, reflecting the enduring relevance of Galen's treatise on food, especially in the context of modern dietary trends

Keywords: Galen, dietary, contemporary, food, trends

Global Media, Localization and Cultural Identity: A Study of Dubbing Practices in Sri Lankan Television (Korean Dramas)

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The global circulation of media content has dramatically influenced local cultures, especially through the localization of television shows tailored for diverse audiences. In Sri Lanka, the practice of dubbing foreign television dramas particularly Korean dramas into Sinhala plays a crucial role in facilitating cultural exchange while preserving local linguistic and cultural values. This study explores how the Sinhala-dubbed versions of Sujatha Diyani, Sooriya Kusuma, and Boys Over Flowers are adapted to resonate with Sri Lankan audiences, aligning foreign narratives with local norms. Guided by Media Localization Theory, which emphasizes how media content is reshaped to meet local cultural expectations and linguistic practices, the research investigates how global media, specifically Korean dramas, are restructured for Sri Lankan viewers. Employing a qualitative methodology within an interpretivist framework, the study conducts a content analysis of the selected dramas, focusing on narrative structure, dialogue, and visual elements. Through this lens, the research uncovers how key aspects such as family dynamics, humor, gender roles, and social relationships are modified to reflect Sri Lankan societal values. The analysis reveals that dubbing serves as a powerful tool for cultural adaptation, selectively preserving key themes of global narratives while reshaping dialogue and context to resonate deeply with local audiences through culturally relevant references. The study demonstrates that the localization process reinforces Sri Lankan cultural identity, offering a space where local language and social norms are preserved while still engaging with the globalized nature of modern media. This research highlights the critical role of television dubbing in negotiating cultural identity within a globalized media landscape, showing how media localization can bridge global content and local traditions. It contributes to broader discussions on media globalization, illustrating how localized adaptations help cultivate cultural relevance in an interconnected world, thus reshaping the way audiences experience foreign media.

Keywords: Cultural identity, dubbing, Korean dramas, media localization, Sri Lankan television

Investigation on the Extent and Consequences of Noise Pollution in a Historical City of Sri Lanka: A Case Study

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Noise pollution is a serious environmental and public health issue, especially in the developing nations. Shuddha Nagaraya in Anuradhapura, Sri Lanka, is a historic and cultural city toured by both local and foreign tourists. Its religious significance, traditional construction, and technological advancements have made human activity more concentrated, and thereby intensifying concerns over noise pollution. The aim of this study was to examine the auditory and non-auditory health impacts of noise pollution on the populace, and investigate individuals' awareness, perception, and recommended mitigation strategies. A semi structured questionnaire survey was conducted among 150 respondents representing a cross-section of age, gender, education levels, income classes, and geographical locations within the Shuddha Nagaraya. The majority of the respondents pointed out that the noise level was louder compared to the previous years. Chi-square statistical test revealed that there was a significant relationship between age and the type of health effects experienced due to exposure to noise ($p = 0.022$, $\chi^2 = 35.97$). The elderly residents reported more auditory effects such as hearing impairment and fatigue, while the young residents reported more non-auditory effects such as stress and sleep disturbance. On the other hand, no significant relationship was found between gender and noise health effects ($p = 0.34$, $\chi^2 = 2.17$), indicating that both males and females are equally affected. The findings also showed no significant relationship between age group and type of noise reaction ($p = 0.927$, $\chi^2 = 3.74$) and between gender and reaction type ($p = 0.761$, $\chi^2 = 1.17$). Besides, the age ($p = 0.289$, $\chi^2 = 10.81$) and sex ($p = 0.871$, $\chi^2 = 0.71$) of the respondents did not significantly differ in their suggestions on noise control measures. The findings highlight the need for implementing effective noise control measures such as noise buffer zones, control of loudspeakers, and public awareness programs with special reference to the health and well-being in historically significant urban areas such as Shuddha Nagaraya.

Keywords: Community awareness, effects of noise, historical city, mitigation, noise pollution

Kuweni as Woman: An Exploration of the Idea of Kuweni in Historical, Popular Culture, and Literary Conceptualizations

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The Kuweni myth is an inalienable aspect of what has eventually been recognized as the origin myth of the Sinhala ethnic identity. Despite the central role that Kuweni plays in that origin myth, she has largely been seen as the historical 'other' within the dominant discourse. The goal of the present study was to map her position in the context of the origin myth of the Sinhala ethnic identity, based on an exploration of how Kuweni has been depicted in mainstream historical records and alternative historical narratives and also in popular culture and literary/artistic representations of the origin myth. The methodology of the study comprised a text-based analysis of the origin myth, as detailed in the *Mahavamsa*, and interviews conducted with the chief and members of the *Adivasi* community in Dambana. It also included a close examination of three novels—*Kuweni: Historical Novel* by Chandra Ariyaratna; *Vijaya & Kuweni* by Somadasa Abeywickrama (translated into English by Sunil Wijesinghe); and *Vijayayi Kuweniyayi* (Sinhala) by Rupa Shriyani Ekanayake—and a selection of songs, poems, and social media posts, which engage with the idea of Kuweni and also the broader origin myth. The study has shown that Kuweni's position as a woman is central to how she has been understood as a historical figure. She is clearly the historical 'other' in the mainstream historical narrative of the country. One could argue that her otherness is due to her position as a member of a local, non-Aryan clan, but the importance that Ravana who is also non-Aryan has acquired in the mainstream discourse shows that her otherness has much to do with her position as a woman. The popular culture and literary/artistic depictions of Kuweni also underscores her identity primarily as a woman.

Keywords: Kuweni, Sinhala origin myth, gender and identity, popular Culture, Sri Lankan history

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Land Cover Changes of Lankagama Village in Sinharaja Rain Forest Buffer Zone

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Forest buffer zones are vital for safeguarding ecologically sensitive areas, and their integrity is paramount for biodiversity conservation. Forest buffer zones like Lankagama in Sinharaja buffer zone are crucial for biodiversity. The Lankagama buffer zone in the Sinharaja Rainforest is particularly important for biodiversity conservation due to its role as a habitat corridor and its proximity to one of Sri Lanka's last remaining primary tropical rainforests. This study addresses the research problem of rapid land cover changes in Lankagama, a vital buffer zone in Sinharaja, and its significance for rainforest protection. This research aims to quantify and analyze land cover transformations in Lankagama between 2007 and 2022 and identify the key drivers behind these changes using spatial analysis and ground verification. Employing a spatial analysis methodology, Landsat satellite imagery from 2007, 2012, and 2022 was processed using supervised classification techniques (maximum likelihood algorithm) in Arc GIS software. Accuracy assessment was conducted using ground-truthing via GPS field surveys and high-resolution Google Earth images to validate the classification results. The study reveals a significant shift from forest to agriculture, with agricultural land increasing from 44.17% in 2007 to 82.09% in 2022. This indicates a strong shift towards agricultural land use in the area. Forest cover drastically decreased from 53.03% to 14.59% during the same period. This represents the deforestation over the 15-year period, with the most substantial decline occurring between 2007 and 2012. The most substantial loss of forest cover occurred between 2007 and 2012, coinciding with local policy changes and increased agricultural incentives. While a portion of the agricultural expansion included agroforestry systems potentially less damaging than monoculture the overall trend suggests significant conversion of natural forest to human-modified landscapes. The data also show that much of the land conversion occurred in areas previously categorized as chena lands or shrublands, indicating that not all changes directly replaced intact forest. This study underscores the urgent need for sustainable land management practices and targeted conservation efforts to mitigate the adverse impacts of land cover changes in forest buffer zone, Lankagama and ensure the long-term ecological integrity of the Sinharaja rainforest.

Keywords: Deforestation, land cover change, Sinharaja buffer zone, spatial analysis, sustainable land management

LinkedIn for Effective Reintegration: Hiring an Ex-offender

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Unemployment is emphasized as a root cause for recidivism. However, finding a career for an ex-offender is challenging in Sri Lanka. Meanwhile, LinkedIn is a professional networking platform with job-seeking options. Although prior studies have explored much, the attention paid to examining the potential of LinkedIn for job seeking by ex-offenders is relatively small. The study was conducted to determine whether being an ex-offender impacts career recruitment and to determine the feasibility of LinkedIn for such individuals. Hence, the study aimed to identify recruiters' opinions, industry-specific trends, and LinkedIn's features on job seeking. The study employed a mixed-methods research approach, where 50 recruiters from companies that had advertised job openings on LinkedIn between October and December 2024 were selected. An online questionnaire was administered to gather primary data from those recruiters, followed by the analysis using descriptive statistics (MS Excel). Alongside that, the 'Jobs' feature of the LinkedIn application was scrutinized, and content analysis was used to gain insights. As identified, even if the ex-offender possesses the required qualifications, 58% were reluctant to recruit, while 42% demonstrated no hesitation. While 'talent matters over the past' was the notion of these 42%, effects on company reputation, internal team dynamics, and ineffective rehabilitation were the justifications for others' reluctance. In terms of the industries, IT services were open for ex-offenders, while banking and manufacturing had restrictions. Despite their reluctance, 64% noted LinkedIn as a better job-seeking avenue for ex-offenders. Also, the visibility navigator in the 'Open to work' option and the 'LinkedIn easy apply' feature were found to be effective for ex-offenders. In conclusion, companies with remote job openings in emerging brands were open to ex-offenders, while onsite vacancies in well-established brands were not. Moreover, the features provided in the LinkedIn app were noted to be significant to any ex-offender because it offered multiple sorting options as an effective means of reintegration.

Keywords: LinkedIn, ex-offenders, job-seeking, reintegration, Sri Lanka

Male Sex Workers in Sri Lanka: A Phenomenological Inquiry into Stigma and Social Relationships

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Male commercial sex workers (MCSWs) in Sri Lanka remain an under-researched group within the discourse of sex work. Despite their presence in sex economies, MCSWs often remain socially invisible due to stigma, legal ambiguity, and cultural taboos surrounding male same-sex relations and non-normative gender expression. This study aimed to investigate the lived experiences of MCSWs in Sri Lanka, focusing on how stigma impacts their psychosocial well-being and social relationships. Further, this study addresses a critical literature gap by uncovering the underlying mechanisms that reinforce their marginalisation and consequently calling for policy reforms. A qualitative phenomenological design was used. Semi-structured interviews were conducted with four MCSWs who were recruited through NGOs and community networks using snowball sampling. The interviews were transcribed verbatim and analysed using interpretative phenomenological analysis. This method enabled the identification of core experiential themes that reflect the participants' lived experiences within a stigmatised profession. Two superordinate themes emerged: (a) Societal Discrimination and Stigma, and (b) The Quest for Social Acceptance and Fear of Rejection. Participants reported experiences of pervasive marginalisation in both legal and societal contexts, strained social relationships, and psychological distress as a result of stigmatisation. The findings revealed multifaceted discrimination, including public harassment, social media abuse, and persistent stereotyping related to sexual health, and biased treatment from authorities. The stigma extended beyond their occupational identity, compounding with their sexual orientation and gender expression, leading to a form of layered marginalisation. This analysis exposes how stigma operates not only at an interpersonal level but also through institutional silence, social invisibility, and lack of legal protection. Findings highlight the need for policy reforms including stigma reduction initiatives, mental health interventions, legal framework revisions and sensitisation programmes for service providers. This research adds to the limited literature on male sex workers and calls for inclusive frameworks to improve the lives of marginalised groups in the sex work industry.

Keywords*:* Male commercial sex workers, discrimination, stigma, marginalisation, acceptance

Mind After Murder: Psychological And Behavioral Explorations of Death Row Inmates

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This study explores the post-homicidal mindset and coping strategies of death row inmates in Sri Lanka. Moving beyond punitive perspectives, it focuses on the psychosocial responses of these individuals, aiming to identify their psychological rehabilitation needs. Through a qualitative approach, the study examines emotional reactions such as guilt, fear, detachment, and the physiological effects experienced after committing homicide. Using Interpretative Phenomenological Analysis (IPA), the study was conducted at Welikada Prison with a purposive sample of six male inmates. Data was gathered through semi-structured interviews, performed by three trained members of the research team. Interviews were manually transcribed in line with prison security protocols and later analysed using the IPA framework. The findings indicate a range of post-homicidal emotions, including guilt, fear, and indifference. Some participants reported experiencing physiological sensations such as numbness and an elevated heart rate. The majority identified reading, creative pursuits, and religious activities as common coping strategies. Motivations for homicide ranged from lack of legal knowledge and past trauma to self-defense and retaliation. While some participants expressed remorse, others remained emotionally detached. The results shed light on the complex psychological reactions and adaptive behaviors that follow homicide, offering insights into the long-term mental health impacts and the potential for rehabilitation beyond retribution. This study highlights the complex emotional states and coping strategies of death row inmates, including guilt, detachment, and reliance on religion and creativity. The findings point to the importance of psychological support and rehabilitation within prisons to address inmates' mental health and promote humane, constructive correctional approaches.

Keywords: Coping strategies, post-homicidal psychosomatic responses, motive, death row inmates

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Perceived Causes of Depression as Explained by The Family Members of Individuals with Depression.

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Depression is one of the most prevalent psychiatric disorders, gaining significant attention due to its widespread occurrence and adverse outcomes. As the primary social unit, the family plays a central role in the course of depression and its impact. In Sri Lanka, the decentralisation of mental health care through contemporary health policies further emphasizes the family's role in the recovery process. Against this backdrop, the present study aimed to explore the perceived causes of depression among family members of individuals diagnosed with severe depression. A purposive sample of fifteen family members, aged 18 to 60, of seven patients diagnosed by Consultant Psychiatrists at the Teaching Hospital, Kandy, participated in the study. In-depth interviews using a semi-structured questionnaire and clinical documentation were used to collect data, which were then analysed using thematic analysis. Results show that family members' causal explanations fall into two broad categories: bio-psychological and cultural. While the bio-psychological explanations often reflected subjective interpretations of psychiatric explanations—such as nerve weakness, brain deficits, genetics, stress, and emotional loss—cultural explanations included environmental, religious, and supernatural factors. A key finding was that families perceived the causes of depression as multiple in nature. This multiplicity, while was confusing, also facilitated agency by providing families with diverse means of engagement, which in turn fostered a greater sense of control in managing the illness. For example, cultural attributions such as karmic effects supported an internal locus of control by framing karma as partially predetermined but still allowing individual agency. These understandings enabled families to stay engaged with the healing process in culturally meaningful ways and maintain hope for recovery. In conclusion, the analysis, informed by theoretical and cultural frameworks, highlighted how families use multiple explanatory models to regain control over the mental health condition of their family member and their lives. It is recommended that interventions should foster this sense of control by offering patient's families with socio-culturally intelligible explanations and interventions.

Keywords: Perceived causes, depression, family members

Philosophical Insights from Plato's Paideia as a Guide for AI-Driven Education

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Plato, classical Greek philosopher of the 4th century BCE, discusses his educational philosophy of paideia in The Republic, particularly in Books II, III, VI, and VII. Paideia refers to a holistic and lifelong process of shaping the human soul intellectually, morally, and civically through education, aimed at the realization of justice within the individual and the state. This concept offers valuable insights for rethinking the role and limitations of artificial intelligence in education. As AI technologies increasingly intervene in instruction, assessment, and personalization, they raise critical concerns about the decline of critical thinking, intellectual autonomy, and the educator's ethical role. This study incorporates a qualitative methodology, using textual analysis of primary philosophical texts and interpretive comparison with contemporary scholarship in AI ethics and pedagogy. In recent scholarship the ideas of Werner Jaeger and Kostas Karpouzis, the study critically compares the Platonic educational ideals with current AI driven models. The study further shows that while AI can support learning through content delivery and adaptive feedback, it often lacks the capacity to promote phronesis, dialogical reasoning, or moral discernment, which is the central aim of Platonic education. Taking the allegory of the cave as a key example for evaluating the risk of students mistaking algorithmic outputs for truth, and for understanding the teacher's role as a philosophical guide in bringing the learners from appearance to reality. Studies suggest that current applications of AI in education prioritize functionality over formation, which increases the passive experience and diminishes the development of the soul. In contrast, Plato's idea of paideia emphasizes the necessity of character formation, the cultivation of virtue, and to balance of intellectual, moral, and civic dimensions of learning. This paper concludes that reinterpreting the role of AI in education, incorporating classical ideals to preserve the integrity of the learning process.

Keywords: Artificial intelligence, critical thinking, education, Paideia, Plato

Radiographic Analysis on Manufacturing Techniques of Terracotta Figures Found in Early Historic Archaeological Contexts of Sri Lanka

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Plain radiography plays a pivotal role in non-invasive analysis of artifacts such as terracotta figures found in archaeological contexts. Radiography involves the use of X-rays which can be used to understand the construction of terracotta figures, revealing their internal structures, material composition, and even manufacturing techniques. This research is focused on using plain radiography to identify the basic structural components of terracotta figures found in early historic contexts of Sri Lanka. The aim of the study was to analyze the manufacturing techniques of the terracotta figures and to reveal the internal and external anatomy of the particular figures. The methodology of this study uses a mixed-method approach. Eight pieces of figures belonging to the terracotta reference collection of the Department of Archaeology, University of Peradeniya were obtained. These terracotta figures include remains of terracotta sculptures, faces, and headlesses. A stationary X-ray machine was used to obtain the radiographs which were processed using a computed radiography (CR) image processing system. All eight figures were positioned in order to obtain two orthogonal radiographs respectively. Figures were placed on the CR cassette and exposed using exposure factors 80kVp and 20mAs. Further, the radiographs were utilized to interpret the ancient manufacturing techniques of terracotta figures. Ancient sculpture manufacturing techniques primarily involved carving, casting, and assembling techniques to create sculptures by using several materials such as stones, marbles, metals, ivory, and terracotta. Predominantly these radiographs confirmed a totally different technique in manufacturing terracotta figures in early historic Sri Lanka. The analysis of radiographs identified radiopaque and radiolucent areas in the figures. Radiolucent areas revealed that there are definite hollow spaces, nearly even spaced, which inferred that some support was used in the process of making the sculpture and that it was later removed or possibly burnt out.

Keywords: Archaeology, early historic Sri Lanka, exposure factors, radiography, terracotta figures

Social Wellness and Group Dynamics in Bharatanatyam for Women Over 50 in Sri Lanka

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In Sri Lanka, women over the age of 50 often face challenges such as social isolation, declining self-worth, and limited opportunities for meaningful engagement. This study explores how Bharatanatyam, a classical Indian dance tradition, can serve as a culturally rooted medium to enhance social wellness and foster positive group dynamics among this demographic. Social wellness in this context is defined as an individual's ability to develop and maintain meaningful interpersonal relationships, participate in supportive social networks, and experience a sense of belonging and emotional connection within a community. It encompasses two key dimensions: *social connectedness* is the feeling of being part of a supportive group and *emotional well-being* is the ability to experience positive emotional states within social interactions. The research investigates whether consistent participation in Bharatanatyam dance classes helps improve social interaction, emotional connection, and group cohesion among women aged 50 and above in Sri Lanka. The study was conducted in Gampaha, Sri Lanka, over a period of three months (January–March 2025). It involved ten female participants aged between 51 and 68, most of whom had no prior formal dance experience but expressed an interest in physical movement and community activity. Given the small sample size, the study primarily employed a qualitative research approach, drawing on semi-structured interviews, reflective journals, and participant observation to gather rich, narrative-based data on participants' lived experiences. Preliminary quantitative assessments (pre- and post-programme surveys) were also conducted to provide background context, though these were analyzed descriptively rather than statistically. Thematic analysis of the qualitative data revealed notable improvements in social interaction and emotional engagement. Participants reported a renewed sense of purpose, increased self-confidence, stronger peer support, and deeper interpersonal bonding. Over time, the Bharatanatyam classes evolved from a structured dance activity into a socially nurturing space, fostering empathy, respect, and emotional resilience. This study highlights the potential of traditional performing arts like Bharatanatyam to meaningfully contribute to social wellness in aging populations. It advocates for the integration of culturally grounded art forms into community-based wellness programmes, particularly in South Asian contexts where shared cultural values can amplify the impact of such initiatives. These findings also open avenues for further interdisciplinary research in gerontology, cultural studies, and dance therapy in Sri Lanka and beyond.

Keywords: Bharatanatyam, social wellness, aging women, group dynamics, Sri Lanka

Teachers' Perceptions of Integrating Digital Literacy into English Language Teaching and Its Impact on 21st-Century Skills Development in Sri Lankan State Universities

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Digital literacy has become an essential educational aspect, especially in the context of English Language Teaching (ELT) at Sri Lankan state universities. The aim of this study is to examine ELT teachers' perceptions of digital literacy integration and its influence on student performance in the 21st-century classroom. Teachers should recognize how rapidly technology is developing and how digital resources may enhance language acquisition while equipping students with the communication, creativity, critical thinking, and teamwork skills they need to thrive in the classroom. The sample used in the research consists of fifteen ELT instructors who were selected via purposive sampling from three state universities in Sri Lanka. The data with regard to their perspectives on the incorporation of digital literacy is collected using semi-structured interviews and open-ended questionnaires, and analyzed via thematic analysis. Despite the widely acknowledged significance of digital literacy, its effective integration into the classroom may be impeded by resistance to change, limited resources, and inadequate training. The research identified effective practices used by teachers who have adopted technology, offering innovative approaches that foster an engaging learning environment. In the end, this study highlights how critical it is to address these issues in order to improve English language instruction's overall efficiency in the digital age and open the door for more inclusive and flexible teaching methods. State universities may thus better prepare instructors to use technology successfully by recognizing and overcoming these challenges. This will enhance students' learning opportunities and better prepare them for an increasingly dynamic digital world. Teachers have to remain dedicated to professional development and ongoing learning to sustain their proficiency and confidence in using technology into their instructional methodologies.

Keywords: Digital literacy, English language teaching, state universities, twenty-first century

The Correlation Between the Growth of Artificial Intelligence and Rising Existential Anxiety in the AI-Powered Digital Age

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The technological world is revolutionized and inverted day by day. But as a unique creature, the essence that contains and precedes through human existence is never replaceable. Highlighting that as the answer, this paper brings out the problem of rising existential anxiety because of the ethical dilemmas arising from misguided fears of society about job loss with the transformative growth of Artificial Intelligence in this AI-powered digital age. This emerges as a critical issue, given its universal impact on contemporary society as we grapple with these challenges today. Thus, the objective of this study relies on clearing up the misguided fears behind existential anxiety while enhancing what it is ideally to briefly outlining the essence of humankind, which precedes through existence. This study follows a qualitative method driving towards existential philosophy of Satre and Nietzsche which is considered important to highlight the concepts of authenticity, freedom, meaning, the concepts of *Ubermensch* and *Will to power* of existentialism which can be used to challenge the traditional notions of freedom, meaning, and morality, posing ethical dilemmas. The misguided fears behind existential anxiety and the strengths and weaknesses of AI inventions are analyzed separately to reach the conclusion. Through the inputs of IT professionals, career counselors, and the general public, according to specific age categorization brought out through interviews and document analysis, further validated the philosophy of this study. Finally, it showcases human supremacy and freedom, connected to AI as a human creation. It explores the role of Artificial Intelligence in reflecting human nature and its existential implications, also showing the future job transformation, neglecting the idea that AI replaces jobs. Here it shows the human agency, adaptation, and responsibility that Sartre discussed to prove that this existential anxiety about Artificial Intelligence is not the end of the human era and as a new chapter in the human revolution, as a transformation.

Keywords: AI, essence, existential anxiety, Nietzsche, Sartre

The Hindu Renaissance and Reformation of Dhamma: A Path to Human Flourishing in Modern Age

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Hinduism is the world's oldest religious tradition, grounding both philosophical and metaphysical foundations. However, the evolution of this foundational religion has faced insecurity due to scientific advancements, globalization, colonial encounters, and interreligious criticism. To address such criticism, the revival of Hinduism during the 19th and 20th centuries has been promoted. This movement, known as Neo-Vedanta, transformed traditional religious thought into a more scientific and rational framework, aiming at human welfare. Given this significant transformation of Hinduism, this study has primarily focused on evaluating the restructuring approach taken during modernization and its contributions to promoting human flourishing in contemporary society. This qualitative study utilizing the teachings of revival philosophers of Hinduism as primary sources and relevant texts as secondary sources. Content and thematic analysis methods are employed to evaluate the findings. This notable revival was realized by numerous Hindu scholars active during that specific period. Human nature has largely been explained from a psychological perspective under this revival, presenting teachings aimed at fostering happiness and satisfaction with existence rather than promoting pessimism. In modern times, the shaping of personality has involved a process of education. To enhance the educational process, numerous teachings were proposed by these schools. Ultimately, through their teachings, spirituality was not overlooked but instead introduced a humanistic and integrative approach to spirituality that promotes human flourishing in both secular and sacred life.

Keywords: Hinduism, human flourish, Indian religion, religious psychology, well-being

The Impact of Adult Children's Migration on the Well-being of Elderly Parents Left-Behind

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The rise in migration and the growing ageing population are two significant challenges facing Sri Lanka. Following children's migration, elderly parents experience numerous challenges in physical, mental, and social domains. The study was designed to investigate the challenges faced by left-behind elderly parents in maintaining their well-being, and to identify the strategies and resources they use to cope with these challenges. This study was designed using a phenomenological approach and adopts qualitative research methods, and data was collected through semi-structured interviews. A purposive sample of left-behind parents, aged 65–82, participated in the stud. The sample comprised 15 participants (five males and ten females) drawn from the Gampaha, Kurunegala, and Puttalam districts of Sri Lanka. Data were analyzed using thematic analysis and four main themes were identified: perception of migration, health conditions, the role of resources and strategies to cope with health challenges, and the function of relationships. The study results indicated that while parents are happy with their children's migration for a better future, they expressed worries about the isolation and absence of a close relationship. Chronic diseases were the most common physical health challenges. Loneliness and memory impairments were significant challenges to elderly parents' mental health. Female participants reported experiencing greater loneliness than males, as they remained at home throughout the day, whereas male participants engaged in social activities and outdoor tasks. With the remittances received, parents tended to seek healthcare services from private hospitals. To cope with loneliness, they adopted both adaptive and maladaptive strategies. Left-behind elderly parents living in village areas identified neighbors as their primary source of social support, whereas those in urban areas emphasized the role of relatives. In conclusion, elderly parents face multiple challenges in maintaining their physical, social, and mental well-being, and both remittances and social support play a crucial role in helping them navigate and cope with these difficulties.

Keywords: Migration, elderly parents left behind, well-being, social support, remittance

The Influence of Eastern Aesthetics on the Cinematic Philosophy of Andrei Tarkovsky

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This research addresses the underexplored influence of Eastern aesthetic philosophies on the cinema of Andrei Tarkovsky. While his work is widely studied through the lens of Russian Orthodoxy and European existentialism, it often reflects deeper affinities with Zen, Taoist, and Japanese aesthetic traditions particularly in its pacing, symbolism, and meditative tone. The objective of this research is to examine Tarkovsky's films incorporate principles of Eastern aesthetics such as wabi-sabi, ma, and mono no aware to construct a transcultural spiritual narrative. The research problem how the lack of critical discourse recognising these aesthetic convergences in Tarkovsky's filmmaking. The methodology of this research employs qualitative film analysis integrated with comparative aesthetic theory. A selection of Tarkovsky's films Stalker (1979), Nostalghia (1983), and The Sacrifice (1986) were analysed for visual, thematic, and temporal features reflective of Eastern artistic values. Additionally, insights were drawn from Tarkovsky's theoretical writings, especially Sculpting in Time, to trace philosophical parallels. Visual motifs, rhythm of editing, ambient soundscapes, and symbolic use of elemental imagery were studied in relation to Eastern concepts such as emptiness, impermanence, and intuitive perception. As the key findings, the study reveals that over 80% of key scenes across the three films exhibit characteristics aligned with Eastern aesthetic frameworks. Tarkovsky's deliberate use of temporal suspension, natural decay, minimalist composition, and meditative silences demonstrates a strong alignment with concepts like ma and wabi-sabi. These findings support the view that Tarkovsky's cinema fosters a contemplative space that transcends Western formalism. This research concludes that Tarkovsky's spiritual cinema represents a synthesis of Orthodox mysticism and Eastern metaphysics, contributing a new dimension to his cinematic legacy. By highlighting this intercultural aesthetic dialogue, the study enriches current interpretations of Tarkovsky and broadens the discourse on transcultural influences in global auteur cinema.

Keywords: Eastern aesthetics, Ma, spiritual cinema, Tarkovsky, Wabi-Sabi, Zen Buddhism

The Role of AI in Translating and Preserving German Literary Heritage

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German language literary translation requires in in-depth understanding of cultural and linguistic complexities. With the beginning of AI translation software, the question remains whether it can successfully capture the richness of literature. This study examines the role of AI in translation and preservation of German literary heritage based on its advantages and disadvantages. The purpose of this study is to examine the performance of AI translation tools in processing German literary texts. It compares human translations with those generated by AI and tests them for accuracy, fluency, and cultural sensitivity, in an attempt to identify areas where AI faces difficulties. Faust by Johann Wolfgang von Goethe was selected as the primary text due to its historical significance, complex poetic structure, and dense use of figurative language, making it a representative and challenging work for machine translation. Excerpts from the original German version of Faust were translated into English using DeepL, a widely recognized AI translation tool praised for its fluency and contextual accuracy. These translations were then compared with the acclaimed human-translated version by David Luke, known for its literary sensitivity and stylistic fidelity. The study employed a qualitative and comparative research design, evaluating the translations based on syntactic accuracy, fluency, cultural sensitivity, and the handling of idiomatic expressions, metaphors, and poetic structure. The findings indicated that while DeepL generated fluent and grammatically accurate translations, it exhibited notable limitations in capturing deeper literary and cultural meanings. The AI translations frequently lacked interpretive nuance and failed to preserve the poetic rhythm and figurative complexity of the original. In contrast, the human translation demonstrated a higher level of semantic precision and aesthetic coherence, particularly in conveying culturally embedded references and literary style. This research contributed to the ongoing discourse on AI and translation studies by highlighting both the current capabilities and constraints of AI tools in literary contexts. The results affirmed the continuing relevance of human expertise in preserving the cultural and artistic essence of literary texts, while also acknowledging the potential of AI applications as supportive tools in translation processes.

Keywords: AI translation, German literature, cultural sensitivities, literary preservation, human vs AI translation

The Role of Overarching Constitutional Provisions in Eradicating Contemporary Social Injustices: A Comparative Analysis of Article 12(1) of the Sri Lankan Constitution and Article 21 of the Indian Constitution

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It is no exaggeration to say that human rights have been a significant force which composed the rhythm of human civilization during the last century. As a result, while international legal instruments emerged to protect human rights globally, the majority of States constitutionally recognized certain fundamental rights for their citizens. But, in rapidly changing modern societies, even these States need to recognize new fundamental rights time to time, and frequent constitutional amendments to accommodate emerging rights would also be impractical due to various legal complexities and political constraints, faced by the most of governments. However, this research explores how the expansive judicial interpretations for overarching constitutional provisions such as Article 12(1) of the Sri Lankan Constitution and Article 21 of the Indian Constitution have provided a better alternative to recognize novel fundamental rights in developing States. The research was based on a qualitative research design, utilizing Sri Lankan and Indian constitutions and judicial decisions as primary sources, and relevant books, journal articles and internet resources as secondary sources. In overall, this research demonstrates, while Article 12(1) of the Sri Lankan Constitution declares that all persons are equal before the law and entitled to the equal protection of the law, how the Supreme Court of Sri Lanka has broadly interpreted it, recognizing several emerging rights such as the right to a clean and healthy environment, the right to education, and the right to protection from a breach of legitimate expectations or public trust, and similarly, while Article 21 of the Indian Constitution declares that no person shall be deprived of his life or personal liberty except according to legally established procedure, how it has also been expansively interpreted to recognize some emerging rights including the right to privacy, the right to sleep, the right to marriage, and the right to self-determination of gender. Accordingly, in conclusion, this research strongly suggests that overarching constitutional provisions on fundamental rights would be a sustainable solution for constitutional draftsmen to design a living constitution which creatively evolves with contemporary social changes.

Keywords: Constitutional interpretation, fundamental rights, judicial activism, living constitution

Translanguaging and Cognitive Flexibility in Sri Lankan University ESL Classrooms

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English as a Second Language (ESL) classrooms in Sri Lankan universities comprise Sinhala and Tamil speakers, and translanguaging between English and their first languages (L1) like Sinhala and Tamil as a common pedagogical and communicative strategy. Although translanguaging is traditionally discouraged in formal education settings, emerging psycholinguistic research suggests that translanguaging may enhance cognitive flexibility and comprehension in bilingual learners. The current study investigates the role of translanguaging in facilitating language processing and learning in Sri Lankan university ESL classrooms. The key objective of the study is to explore how the strategic use of translanguaging in ESL instruction influences learners' comprehension, participation, and cognitive flexibility, especially among first-year undergraduates. A qualitative classroom-based study was conducted over six weeks in a state university ESL course. The sample, selected using purposive convenient sampling method, comprised 37 Sinhala- and Tamil-speaking undergraduates. Data were collected through classroom observations, audio recordings of lessons, and teacher journals. A brief cognitive flexibility assessment (a bilingual version of the Stroop test) was administered as pre- and post-interventions. Semi-structured interviews and student reflections/feedback were also analyzed using thematic content analysis. The data revealed that moderate, context-specific translanguaging provided several cognitive benefits, including enhanced concept clarification, improved cognitive task performance, greater cognitive engagement, and strengthened comprehension and cognitive adaptability. Moreover, the findings indicated affective benefits such as increased classroom interaction, enhanced learner confidence, and more active student participation. These findings challenge monolingual norms in ESL pedagogy and support the integration of bilingual strategies appropriate to the local linguistic context. The study suggests that using L1 in the ESL classroom facilitates a conducive learning environment rather than debilitating language learning. This would also impact language policy and teaching practice in Sri Lankan university classrooms.

Keywords: Translanguaging, cognitive flexibility, bilingualism, ESL

Unraveling Causes for Investigative Delays in Sri Lanka: An Analysis from Scene of Crime Officers (SOCO) Perspective

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Criminal Justice is a comprehensive process involving police, the judiciary, and corrections, where Scene of Crime Officers (SOCO) also play a pivotal role. However, a considerable delay is often associated with this process. Even though literature has unraveled causes for courtroom delays, a scarcity of studies regarding investigative delays was noted. Hence, this study was conducted to identify what causes within the criminal investigation process result in the dragging of cases over prolonged periods of time. The study employed a qualitative research design, where primary data was collected through structured in-depth interviews with nine SOCO officers in the Mirihana SOCO Lab on April 25, 2024, and subsequently analyzed using thematic analysis. The rationale behind the sample is the emphasis on this particular police division as a major crime hotspot. The study identified the inadequacy of SOCO labs and human resources as the primary cause of investigative delay. Since seventeen police stations are assigned to the Mirihana Lab, which functions with nine officers, congestion is generated when multiple crimes are reported. The second identified cause is the operation of evidence collection (SOCO) and analysis (Government Analyst's Department) through two separate entities, resulting in a lack of constant coordination. Thirdly, the lack of quality materials used in evidence identification due to financial restraints was identified. This results in inaccurate or delayed evidence identification, dragging the investigation further. Hence, it is recommended that a justifiable number of police stations be attached to each SOCO lab while restructuring the SOCO and Government Analyst's Department as a single unit. Also, reducing unnecessary expenses to procure quality investigation materials is suggested. These will expedite the investigative process and result in justice being served.

Keywords: Causes, criminal investigation, criminal justice, investigative delays, scene of crime officers (SOCO)

Use of AI-Assisted Tools in Postgraduate Students' Teaching and Learning Process: Benefits and Challenges

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In the context of contemporary technological advancement, Artificial Intelligence (AI) plays a vital role in the field of higher education in Sri Lanka. This study aimed to explore the benefits and challenges of AI-assisted tools for teaching and learning in higher education. The specific objectives were to identify the AI tools used for teaching and learning, examine the benefits and challenges of using AI tools, and assess their implications for the university. A case study approach was adopted, focusing on postgraduate students who study Information Technology at a state university. A sample of 100 students and 15 lecturers was selected using the random sampling method. Data were gathered through questionnaires, document analysis of 20 assignments, and semi structured interviews with 10 students and 15 lecturers. Moreover, quantitative data were analyzed using descriptive methods, while qualitative data were analyzed using thematic analysis. The findings revealed that postgraduate students frequently used AI-assisted tools, primarily ChatGPT, as well as others such as Microsoft Copilot, Gemini, Perplexity AI, Jenny AI, Canva, Grammarly, and QuillBot. These tools were employed in the preparation of various class activities, including written assignments, coding tasks, and multimedia creations. Questionnaire data revealed that 100% of the students used AI-assisted tools in their classroom activities. The reason was that the students needed the literacy of Information Technology to follow this programme. The interview data suggested that language fluency, quick access to information, time-saving capabilities, coding assistance in various programming languages, and the ability to create multimedia content are benefits. However, lecturers identified several challenges, especially concerning academic integrity in evaluating classroom activities, assignments, and theses. They expressed concerns over maintaining academic standards, students' critical thinking abilities, and ethical considerations when planning lessons and assignments. In conclusion, while AI-assisted tools can significantly enhance teaching and learning efficiency, their improper use may hinder students' intellectual development. Therefore, when designing classroom activities and assessments, lecturers should focus on evaluating higher-order thinking skills. It is recommended that the university make aware both students and lecturers about the proper use of AI-assisted tools in teaching and implement clear policies to regulate the use of AI-assisted tools and learning.

Keywords: Artificial intelligence, AI assisted tools, information technology, teaching and learning

Visual Narratives as Tools for Literary Interpretation in Teaching French as a Foreign Language: A Case Study of Le Comte de Monte Cristo by Alexandre Dumas and Its 2024 Film Adaptation

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French classical literature is known for its elegance, universal themes, and philosophical depth. Students who learn French as a Foreign Language (FLE) study French classical literature as part of their degree programs. However, these literary texts can present challenges, even for students with strong language skills, particularly due to historical and cultural distance. This study focuses on using visual narratives as pedagogical tools to support literary interpretation in teaching French at the university level in Sri Lanka. The research centers on the French Romantic novel Le Comte de Monte Cristo (The Count of Monte Cristo), written by Alexandre Dumas and published in 1844, as the primary literary text, and the 2024 film adaptation directed by Alexandre de La Patellière and Matthieu Delaporte, as the visual narrative. A classroom-based qualitative methodology will be employed, involving pre- and post-interpretation tasks with 35 undergraduate French students of the second and third years of the Faculty of Humanities at the University of Kelaniya. It is hypothesized that multimodal storytelling can help bridge interpretive gaps for FLE learners, enabling them to understand complex narrative structures, character development, and moral themes better.

Keywords: French literature, romantic novel, visual narratives, film adaptation

Theme 7

Reimagining Education, Policy and Governance for the 21st Century

A Study of Sri Lankan Students' Insights on Native and Non-Native Chinese Language Teachers

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With the increasing global significance of the Chinese language, the development of effective Chinese language instruction has attracted growing attention from experts worldwide. In the Sri Lankan context, there remains a notable gap in research on newly designed learning environments that integrate native and non-native instructor-led classrooms. This study aims to evaluate the effectiveness of native and non-native Chinese language teachers based on insights from Sri Lankan students learning Chinese. Using a mixed-methods approach, the study collected both quantitative and qualitative data from 120 students enrolled in Chinese language courses at four government universities in Sri Lanka. The research addresses the issue of disparities in instructional effectiveness. Findings reveal that beginner-level students taught by native Chinese-speaking teachers reported higher satisfaction, better perceived learning outcomes, and demonstrated stronger proficiency in linguistic skills compared to those taught by non-native teachers. However, the study also acknowledges the significant contributions of non-native teachers, especially in areas such as Teaching Chinese as a Foreign Language, Chinese literary criticism, and Chinese for specific purposes. These teachers provide pedagogical approaches and cultural insights that are adaptable to the specific socio-cultural context of Sri Lanka. Furthermore, the study identifies cultural differences as potential barriers in language learning, underscoring the importance of cultural sensitivity and adaptability in teaching. The results suggest that the native and non-native speaking status of the teacher has a considerable impact on student learning experiences and outcomes. Hence, in the course allocation process, administrators should carefully consider the teachers' linguistic competencies and cultural backgrounds. This study highlights the critical role of both cultural and linguistic factors in effective language education and recommends a balanced instructional model that harnesses the strengths of both native and non-native speaking teachers. The findings have important implications for language education institutions and policymakers, advocating for the thoughtful selection and training of instructors to meet diverse learner needs amidst China's growing global presence.

Keywords: Chinese language education, Sri Lankan learners, instructional effectiveness, native and non-native teachers, cross-cultural language teaching

Activating Learning Through Social Media: A Case Study of Undergraduate Engagement at a Sri Lankan State University

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The integration of social media into higher education has reshaped student learning experiences, creating new pathways for communication, collaboration, and knowledge sharing. In Sri Lanka, the increasing use of platforms such as WhatsApp, YouTube, Facebook, and Instagram by university students emphasizes the need to understand their role in supporting academic engagement and active learning. This study investigates how social media contributes to activating learning among undergraduates at a state university, with particular focus on student interaction, resource access, and self-directed learning. The research employed a mixed-method approach, analyzing both quantitative and qualitative data. A structured survey was conducted among 346 undergraduate students at a selected state university in Sri Lanka using Google Forms to examine the frequency and patterns of social media usage for academic purposes. In addition, focus group discussions provided deeper insights into students' experiences, perceived benefits, and challenges associated with using these platforms. Data analysis combined descriptive statistics and correlation analysis with thematic coding of qualitative responses. Findings showed that WhatsApp (75%) and YouTube (65%) strongly support collaborative learning and academic resource sharing, while Facebook (30%) and Instagram (25%) are used less for academics works and mainly for social interaction. Quantitative analysis showed high correlations between academic engagement and social interactions ($r = 0.888$), information sharing ($r = 0.841$), and self-directed learning ($r = 0.662$). Students reported that social media helped them stay updated, clarify doubts, and engage more actively in coursework. However, several challenges were also identified, including digital distractions, difficulties in balancing social and academic content, and the absence of structured guidance on educational use. The study concludes that social media, when integrated thoughtfully into the academic framework, has great potential to enhance active learning. It recommends that universities implement digital literacy programs, establish academic-focused social media policies, and create institutional platforms to facilitate effective, guided use. These steps can help maximize benefits while minimizing distractions in digital learning environments.

Keywords: Academic engagement, active learning, higher education, social media, Sri Lanka, undergraduate education

AI-Driven Personalized Higher Education Opportunity Selection System

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Transitioning from secondary education to higher education is a critical point for Sri Lankan students. Because it determines their future career paths. Sri Lankan Advanced Level (A/L) students face significant challenges in selecting government university courses that align with their preferences, skills, strengths, and weaknesses. Often, students list their university preferences according to traditional methods, which may overlook valuable courses due to a lack of knowledge about university offerings and the future job market. This research aims artificial intelligence approach to develop a platform to assist Sri Lankan government university entrants in making informed decisions about their academic future using historical A/L data (2019-2023) from Monaragala district. A fine-tuned Mistral based LLM was trained on students details including A/L results, Z-scores, skills, and preferences, to provide recommendations for government university courses. The expected outcome was validated using traditional selection methods through accuracy metrics and user satisfaction survey. This is prompt based recommendation system which can be used easily. The AI-driven system achieved 87% accuracy in predicting suitable course matches compared to 62% for traditional methods. Student satisfaction scores also improved from 6.2/10 to 8.4/10. This LLM based recommendation system is a user-friendly AI tool that empowers students to make data-driven choices, ultimately enhancing their higher educational experience. The goal is to enhance government university education by integrating AI-driven insights within the unique educational context of Sri Lanka.

Keywords: AI-driven, large language model, *Monaragala*, machine learning, Sri lankan government university

An Intelligent Mobile Flashcard System for Supporting Active Recall and Conceptual Learning Among University Students: UniFlash

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University students often face challenges in maintaining effective study routines and retaining complex material. Traditional flashcard methods lack adaptability and personalization, making learning less efficient and engaging. This study aims to design and propose a mobile application powered by generative AI that enhances active recall and spaced repetition, while also offering personalized learning support and collaborative features. The UniFlash mobile application developed using Flutter (Dart) and Firebase, integrated with OpenAI's GPT-3.5-turbo model, allows users to create and review flashcards, selecting difficulty levels after each review to guide the frequency of spaced repetition. The generative AI assistant simplifies complex concepts through a chat interface and generates model questions based on user-created content. Key features include adaptive repetition tailored to difficulty trends, flashcard sharing, a personalized statistics dashboard, and AI-generated flashcards derived from text inputs or study materials. Gamification elements and collaborative learning modes further support user engagement and motivation. A four-week pilot study was conducted with 53 undergraduate students. Active recall improvement was measured through pre- and post-study quizzes aligned with course content. The results showed a 40% average improvement in recall scores and a 35% increase in study time consistency. Additionally, 65% of participants reported enhanced understanding of complex concepts due to the AI assistant, and 70% frequently used collaborative features, highlighting the impact of peer-driven learning. AI significantly supports conceptual understanding and personalized revision. Adaptive spaced repetition, driven by user-rated difficulty, ensures focus on challenging areas. Gamification encouraged frequent app usage and fostered a sense of achievement. Collaborative features enhanced motivation through peer interaction. Participants found AI-generated flashcards accurate and helpful for last-minute revisions, common among the majority of undergraduates. UniFlash demonstrates that AI-integrated mobile learning tools can effectively promote active recall, deepen understanding, and build productive study habits in exam preparation and conceptual learning in higher education.

Keywords: Generative AI, flashcards, spaced repetition, study support app, active recall

Enhancing History Education in Sri Lanka through In-Situ Museums

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In the Sri Lankan school curriculum, history is a compulsory subject for students from Grade 6 to 11. It includes the study of the human past, aiming to foster historical awareness and critical engagement with cultural heritage. Therefore, archaeological evidence and sites can serve as vital educational support. However, a significant gap exists between classroom-based theoretical knowledge and direct experiences with archaeological heritage. The absence of practical, site-based learning hinders students' comprehensive understanding of the country's rich historical legacy. This research addresses the question: How feasible and educationally impactful is the establishment of in-situ museums at significant archaeological sites in each district of Sri Lanka for enhancing formal history education? The aim of this research is to assess the feasibility and educational impact of establishing in-situ museums at significant archaeological sites in each district of Sri Lanka, with a focus on enhancing formal education and fostering greater engagement with the country's cultural heritage. The research was conducted using both field surveys including observations and interviews, and library-based studies. The collected data were analyzed through narrative and case study analysis to identify suitable sites, evaluate current educational practices, and determine the potential for community engagement and infrastructure development. In-situ museums, located at original archaeological or historical sites, function as dynamic educational hubs that connect academic learning with real-world heritage. Unlike traditional museums, these offer immersive, context-rich experiences, enabling learners to engage directly with tangible remnants of the past. They serve as open-air classrooms and promote interdisciplinary education in history, archaeology, anthropology, art, architecture, conservation, and environmental studies. By embedding learning within the cultural and spatial context of sites, in-situ museums encourage critical thinking and experiential learning. In-situ museums can offer educational programs aligned with the school History curriculum through a combination of on-site and take-home activities. These museums can also be designed to be accessible to students with disabilities, ensuring inclusive educational opportunities. This approach provides school students with a valuable opportunity to engage with the subject of History from new perspectives, moving beyond traditional museum visits. Therefore, in-situ museums can serve as vital platforms for both formal and informal education, as well as for promoting sustainable cultural development in Sri Lanka.

Keywords: Education, history, In-situ Museums, Sri Lankan school curriculum

Enhancing Professional Development in Physics Education Through Autonomy-Supportive Intervention Program: An Experimental Study in the Jaffna Zone

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Fostering students' motivation and engagement is a fundamental aspect of effective teaching. However, many teachers struggle to integrate motivational strategies into their classroom practices. Among various instructional approaches, Autonomy-Supportive Instructional Behaviors (ASIB), rooted in Self-Determination Theory (SDT), have emerged as a promising strategy for promoting intrinsic motivation among learners. However, in Sri Lanka, these approaches remain underutilized due to the lack of integration of intrinsic motivational theories into teacher professional development programs. This study aimed to evaluate the effectiveness of an Autonomy-Supportive Intervention Program (ASIP) in enhancing science teachers' motivating style, and beliefs related to autonomy-supportive (AS) teaching, specially in physics-based. The study employed experimental design with Jaffna Educational Zone all grade seven public school science teachers (n = 60) were selected as the samples such that one teacher from each school where the number of students in grade 7 is greater than 4 and if number of teachers more than one in a school one teacher was selected by randomly toasting to ensure a balanced and representative for the generalizability of experimental findings. Participants were randomly assigned to either an experimental group (n = 30), which underwent the 17-week ASIP, or a control group (n = 30), which received no intervention. Quantitative measures assessed AS practices (AS motivating style, Personal Endorsement, Future Intention) and teacher beliefs (Effectiveness, Ease of Implementation, and Normative Beliefs) at three intervals: pre-, mid-, and post-intervention using the validated standard tools. Qualitative data were also collected to explore teachers' understanding and internalization of AS principles. Data were analyzed using SPSS 20, employing descriptive statistics, repeated-measures ANOVA, and Cohen's d to determine the significance and magnitude of changes over time. Thematic analysis was conducted for qualitative insights. Results indicate that the ASIP significantly improved teachers' AS practices and beliefs, with sustained effects beyond the intervention period. Teachers reported increased awareness and intention to adopt ASIB, viewing the ASIP as a meaningful professional development opportunity. These findings underscore the value of integrating SDT-based interventions into teacher education and offer practical recommendations for enhancing physics education at the junior secondary level in Sri Lanka.

Keywords: Autonomy-supportive teaching, self-determination theory, intervention, professional development, physics education

Evaluating the Effectiveness of Game-Based Approach on Student Engagement in Undergraduate ICT Classes: A Case Study at the Faculty of Arts, University of Peradeniya

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Gamification has emerged as a contemporary educational strategy that incorporates game elements into learning environments to enhance motivation and participation. Despite its global adoption, the effectiveness of gamified learning within Sri Lankan higher education, particularly in Information and Communication Technology (ICT) disciplines, remains underexplored. This study examines the impact of game-based instructional methods on student engagement and academic performance among first-year undergraduates at the Faculty of Arts, University of Peradeniya. A mixed-methods case study design was employed, involving pre and post-intervention surveys, weekly in-class quizzes, and open-ended feedback from students enrolled in the ICT Skills course (ESS1004). The study was conducted during the academic year 2023/2024, semester II with first-year undergraduates (N=120) of the ICT Skills course (ESS1004). The intervention spanned 8 weeks, during which game-based activities were integrated into weekly lessons. Students participated in weekly gamified quizzes and collaborative challenges. Findings indicate that a majority of students responded positively to gamified activities, with 72.3% reporting increased enjoyment and motivation, and 75.2% noting improved understanding of complex ICT concepts. Competitive elements and immediate feedback were highlighted as particularly beneficial for regular revision and self-assessment. Nevertheless, challenges such as time pressure during quizzes, internet connectivity issues, and the need for deeper conceptual discussions were identified. Quantitative results showed that 78.57% of students participated in gamified activities, with 69.05% agreeing that these improved their comprehension. These perceptions were partially reflected in Mid Semester Examination results. This study underscores the value of intentional and responsive gamification in higher education settings, that are carefully aligned with learning objectives such that 84% of students felt gamified activities improved their understanding of the subject, while 15.1% were neutral and only 0.8% disagreed, highlighting the strong potential of gamification to enhance learning in undergraduate ICT classes. This research contributes localized evidence to the growing literature on educational innovation in Sri Lanka, reinforcing the potential of gamification to enhance student-centered learning while emphasizing the need for strategic implementation based on learner feedback and classroom realities.

keywords: Gamification, student engagement, educational innovation, higher education, classroom realities

Evaluating the Effectiveness of Game-Based Learning in Enhancing Youth Engagement in Traditional Carpentry Education: A Case Study from Moratuwa, Sri Lanka

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Traditional industries are increasingly facing stagnation or decline, largely due to diminishing youth interest in sustaining these professions. The carpentry industry in Moratuwa, a region with a rich heritage of woodworking, is no exception. A noticeable disinterest among the younger generation poses a significant threat to the continuity of this culturally embedded craft. Preliminary observations indicate that the current modes of teaching and learning in the field do not effectively support the accumulation of knowledge and practical skills among youth. In response to this issue, the present study was designed with two primary objectives: to evaluate youth engagement with game-based learning strategies and to assess the potential effectiveness of integrating such methods into carpentry education within the Moratuwa region. The study was conducted in the Moratuwa area, targeting youth aged 18 to 25. A total of 122 questionnaires were distributed to gather quantitative data on youth perceptions of and engagement with game-based learning. In addition, qualitative insights were obtained through interviews with key stakeholders, including educational professionals and industry experts in carpentry. These interviews aimed to understand the practical implications, potential benefits, and limitations of incorporating game-based learning into traditional vocational training. This mixed-methods approach allowed for a comprehensive understanding of both the attitudes of young learners and the feasibility of implementing innovative educational strategies within the industry. The findings of the study highlight a promising avenue for revitalizing youth interest in the carpentry profession. A majority of respondents expressed a favorable view of game-based learning, indicating its potential to increase engagement and knowledge retention in vocational training settings. Stakeholder interviews further supported the feasibility and potential effectiveness of this approach. While game-based learning presents a viable solution to the challenge of youth disengagement, further research is required to explore its long-term impact and optimize its integration into existing carpentry education frameworks.

Keywords: Vocational training, game-based learning, youth engagement, carpentry education, Moratuwa

ICT Training Needs of the Management Assistants: A Case Study in a State University of Sri Lanka

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Information and Communication Technologies (ICTs) are vital for the effective functioning of modern organizations. Given the rapid pace of technological advancement, it is essential to conduct systematic training needs assessments when planning ICT-related training interventions. This study aimed to assess the ICT training needs of Management Assistants (MAs) in a state university in Sri Lanka. The objectives of the study were twofold: (1) to examine the ICT training requirements of MAs as perceived by both MAs and their immediate supervisors, and (2) to identify the key challenges faced by MAs in utilizing ICT tools for daily office work. Data were collected through two structured surveys, and participants were selected using stratified random sampling. The sample included 50 MAs and 25 immediate supervisors, including all the faculties and service divisions. Quantitative data were analyzed using built-in tools in Google Forms, while qualitative responses were explored through thematic analysis. The findings revealed that a majority (70%) of MAs were aged between 30 and 39, with 58% having 0–10 years of service experience. Many had received prior training in Google Forms and Sheets (76%), MS Office (66%), computer maintenance (48%), and database management (44%). Both MAs and supervisors emphasized the need for regular ICT training. MS Office software was identified as the most essential tool for everyday tasks. Supervisors highlighted similar priorities, with particular focus on training in Google Forms and Sheets (88%), MS Office (68%), computer maintenance (48%), and database management (64%). Key challenges reported by MAs included inadequate training, outdated ICT infrastructure, and software-related issues. While supervisors expressed moderate satisfaction with the current ICT competencies of MAs, 40% indicated dissatisfaction. Recommendations included training in specialized software tools such as accounting packages, cloud storage, Google Workspace, and Learning Management Systems. The study concludes that MAs need regular training in areas such as MS Office and Google Workplace related software. It recommends the implementation of regular, targeted training programs to enhance their skills and improve organizational effectiveness.

Keywords: Training needs assessment, ICT training, management assistants

Integrating IT Education with Arts Faculty Subjects at the University of Peradeniya

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Despite the digital transformation of academic and professional landscapes, the Faculty of Arts in Sri Lankan universities limits IT education to basic first-semester modules only. This creates a problem because what students learn and what they don't match what they need for current world jobs. Graduates from the arts, humanities and social sciences are entering a workforce that requires technology skills they haven't been taught during their university time. This research aims to find IT needs in Arts faculties, measure students' need for technical education, and formulates a model for targeted IT modules improving employability without compromising academic integrity. I combined structured interviews with 215 undergraduate students across 19 departments in the Faculty of Arts. Stratified random sampling ensured proportional representation from each discipline. Interviews explored students' current IT competencies, perceived needs, and preferred technical skills relevant to their disciplines. Quantitative data was analyzed using descriptive statistics, and thematic analysis was applied to qualitative responses to identify discipline-specific patterns in IT educational needs. Survey results revealed strong interest in IT education by discipline, with 87% of the population expressing interest in additional technical training after the first year. Data analysis skills were primarily demanded by Political Science (76%), Economics (82%), and Sociology (71%) students. Design-related skills were demanded by History (65%), Fine Arts (93%), and Archaeology students (77%). Web development and digital marketing were in great demand by the Education (68%) and English (55%) departments. Additionally, 79% of students across all departments confessed that IT skills would make them far more employable, and 62% of them believed that they were at a disadvantage to science and commerce graduates when job hunting. Our research shows that arts students urgently need subject-specific IT courses. We recommend starting with high-demand modules taught by current faculty, then gradually adding specialized courses through partnerships with industry and the Information Technology department.

Keywords: Information technology, Faculty of Arts, Sri Lankan Universities, IT education, technical skills

Re-imagining Education: The Growing Demand for Private Tutoring in Sri Lanka's Free Education Landscape

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Private Supplementary Tutoring (PST) has become a vital part of the general education system worldwide. Uptaking PST helps students enhance their academic performance in public exams. According to recent statistics, in Sri Lanka, demand for PST has grown substantially, 65% in urban areas, 62% in rural areas, and 36% in the plantation sector. The main objective of this study is to answer the question, "Why is there an increasing demand for shadow education in Sri Lanka among stakeholders despite the availability of a well-established free formal education system?" and how gender, family income, education level, ethnicity, and the urban/rural divide intersect with shadow education. This study adopted a mixed-methods approach that combines quantitative and qualitative methods, utilizing an exploratory qualitative design to understand how individuals interpret shadow education Phenomenon. A purposeful sampling approach deployed to select participants for the study. Kandy City represents an urban setting, while Rotelawala village in Mahiyanganaya represents a rural setting. A total of 25 participants—comprising teachers, parents, and students—were interviewed from each location. Data collection methods include interviews, participatory observation, focus group discussions, and data analyzed thematically. The findings suggest that increasing investment in female education, particularly within Muslim families, is challenging traditional gender norms. This shift indicates a move toward liberalization in both urban and rural families. The patterns of uptaking PST showed significant differences between middle and upper-class families and were more likely to participate in individual and group classes. Lower-class families were restricted to mass classes due to financial limitations. In conclusion, the study showed a great tendency to invest in PST irrespective of traditional gender norms, ethnicity and class divide. Conversely, it showcased limited access to quality PST for rural students, which created a significant rural-urban divide in uptaking PST with increasing competitiveness in traditional education, challenging the free education policy in the country.

Keywords: PST, urban rural divide, gender, gender interests, shadow education

Reimagining the Skills Mismatch Hypothesis - A Critical Evaluation of the Changing Dynamics of Hard vs. Soft Skills

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The skills mismatch hypothesis posits a critical gap between the skills of aspiring graduates and those demanded by businesses. These mismatches, stemming from discrepancies in qualifications, knowledge, or specialisation, are widely linked to graduate unemployment or underemployment. This paper argues that such mismatches are largely due to a lack of understanding of the distinction between hard and soft skills. Increasingly, businesses prioritise competencies like critical thinking, leadership, teamwork, storytelling, empathy, and business acumen - often above technical skills traditionally embedded in disciplines such as accounting, finance, HR, marketing, and IT. This study undertakes a preliminary comparison of soft skills development among graduates with and without formal people skills training, aiming to critically evaluate the proposed soft skills mismatch hypothesis, which posits that deficiencies in behavioural competencies play a significant role in graduate employability challenges. This qualitative, exploratory case study investigates the experiences of two groups of graduates from the University of Kelaniya who completed their studies within the past three years. One group completed both their undergraduate degree and a parallel Diploma in People Skills - a programme by the Department of Marketing Management in collaboration with industry partners. The other group completed only their degree programme. Using purposive sampling, twenty participants (ten from each group) were selected. Semi-structured interviews were conducted, focusing on the application of soft and technical skills in professional settings. Data were analysed thematically. While the study offers valuable insights, the small sample size and single-institution scope are acknowledged as limitations. Findings indicate that graduates who engaged with the integrated soft skills curriculum reported greater confidence, adaptability, and workplace readiness. They demonstrated enhanced communication, emotional intelligence, self-awareness, and collaboration skills, enabling them to navigate complex interpersonal situations, respond to feedback, and align with organisational cultures. They were better equipped to articulate ideas, manage challenges, and take initiative. In contrast, those without formal soft skills training experienced a steeper learning curve, more workplace stress, and difficulty applying technical knowledge in dynamic settings. The study advocates for a paradigm shift in curriculum design, positioning soft skills as integral to academic development. The soft-skills mismatch hypothesis presents a novel perspective on employability and calls for holistic skill integration in higher education.

Keywords: Skills mismatch hypothesis, soft skills, technical skills, mismatch hypothesis, higher education, graduate employability

Strategies for Obtaining Community Participation Towards Effective School Management Process

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Community participation plays a crucial role in ensuring effective school management, yet systematic engagement strategies remain underexplored in Sri Lankan schools. Stakeholder involvement, which consist of teachers, parents, and alumni associations, contribute to strengthening the school governance and educational development through participatory approaches. The study aims to identify and evaluate strategies for fostering active community involvement in school management and determine the effectiveness of participatory governance in improving school infrastructure, decision-making efficiency, and stakeholder trust. A sequential mixed-methods design was employed. A sequential mixed-methods design was employed. In Phase 1, a survey of stakeholders (teachers = 60, parents 40, alumni = 20; n = 120) across government schools (1AB Type = 3, 1C Type = 4, Type 2 = 4, and Type 3 = 4; n = 15) in Sri Lanka's Central Province was conducted using stratified random sampling. in the Central Province of Sri Lanka was conducted using stratified random sampling. Phase 2 included four case studies utilizing 30 semi-structured interviews, 12 focus group discussions, and observational data. Thematic analysis and descriptive statistics were applied to evaluate participatory mechanisms, while document analysis of school records assessed infrastructure and resource outcomes. Findings indicate that well-organized and meaningful community participation enhances school decision-making processes, accountability, and resource mobilization. Schools with effective engagement strategies experienced marked improvements in stakeholder trust and collaboration. For instance, reported 65% higher stakeholder satisfaction, and volunteerism increased by 55%, directly improving infrastructure. Additionally, 85% of schools noted enhanced trust through transparent budgeting, while 90% of parents reported better accountability. However, 78% of teachers highlighted insufficient training in conflict resolution. Qualitative findings revealed that alumni contributions were instrumental in establishing ICT labs across the case-study schools, demonstrating effective resource mobilization. Professional training for administrators and teachers on community collaboration techniques proved essential for sustaining engagement. In conclusion, strategically well-organized and meaningful community participation strengthens school management through accountability and resource efficiency. Policymakers should institutionalize participatory frameworks and priorities teacher training in collaboration techniques. These reforms can scale sustainable governance models, aligning Sri Lankan schools directly with community-driven educational development goals.

Keywords: Community participation, effective school management, stakeholder Engagement

Student-Centred Instructional Approaches to Enhance Students' Interest in Learning the Human Nervous System

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The purpose of this study was to explore whether student-centred instructional approaches can be used to enhance students' knowledge, learning and understanding of the Human Nervous System and their interest in learning science. Although the existing Sri Lankan science curriculum consists of many activities, it is mostly delivered in a teacher-centred manner. Therefore, students are not interested in learning the human nervous system. The objective of this study is to examine whether the newly introduced student–centred methods are more effective than traditional teaching methods for this unit. The research was designed in a mixed-method approach. This study was conducted in a pre-selected secondary school in Sabaragamuva Province. A pre-instructional unit test with drawings, a post-instructional unit test with drawings, and classroom observations were used to identify students' overall knowledge, learning and understanding in one randomly selected Grade 10 Sinhala medium science class of twenty students. The blended learning activity was based on the Human Nervous System, from the Grade 10 Science textbook. Inquiry-based learning, blended learning, and authentic learning approaches were introduced to enhance student interest. Several activities of the unit were instructed using the above-mentioned pedagogies. Ten lessons of the above unit were observed. Students' engagement and achievements were higher when they were doing group activities cooperatively. The findings of this research suggest that using the above approaches develops students' 21st-century skills. Students' learning skills, such as critical thinking, creativity, collaboration and effective communication were developed. Students were asked to draw several parts of the human nervous system, such as the neuron, brain, and the reflex arc, before instruction to assess their prior knowledge. After the unit was taught, students were asked to draw the same parts of the human nervous system to assess their knowledge regarding the human nervous system. Observations included students working in pairs, engaging in hands-on activities, recording and reporting their findings, and sharing their views on the human nervous system. To foster critical thinking, creativity, communication, and collaboration, the science learning process can be enriched through student-centred approaches such as blended learning, inquiry-based learning, and authentic learning.

Keywords: Pedagogy, blended learning, inquiry-based learning, authentic learning, student interest

The Judicial Impartiality in Sri Lanka: A Key Pillar of Democratic Governance Amidst Digital Era

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Judicial impartiality is regarded as a fundamental unit not only under democratic governance but also under the rule of law. The independence of judiciary has been subjected to criticisms and concerns due to the increased external pressures such as by political influences and due to the development of digital technologies and media. This study aims to revolve around and examine the present state of judicial impartiality in Sri Lanka, mainly highlighting the *Online Safety Act No. 09 of 2024,* which shows the growing administrative authority over the virtual domain and the many repercussions for judicial insights. This research will be adopting a qualitative approach mainly evaluating the provisions of the constitution, landmark cases and their rulings of the Supreme Court with the newly developed legislative areas. It will also rely on primary sources such as important ordinances and legal instruments in adjacent to secondary sources, inter alia academic texts and annotations. A comparative analysis will also be carried out with designated jurisdictions like the United Kingdom, India and Estonia to get an idea and also to access worldwide benchmarks related to the independence of the judiciary in the age of digital technology. Even though Sri Lanka has made sure to uphold judicial impartiality throughout the history, the findings have showed that present day pressures, specifically the online compliance sector is posing major threats to the independence of the judiciary. The study highlights and focuses on the pressing requirement for a comprehensive legal curriculum, a transparent public policy, institutional overhaul to fortify and consolidate judicial independence. The importance of bolstering this key element is not only limited to preserving democratic values but also in ensuring authentic digital oversight and for a long-lasting political equilibrium.

Keywords: Judicial impartiality, age of digital technology, democracy, governance

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The Role of Simulation-Based Education in Paediatric Therapeutics: A Systematic Review of its Effectiveness in Undergraduate Healthcare Training

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Simulation-based education bridges theory and practice, offering safe, immersive environments for undergraduate students to learn paediatric therapeutics, an area often restricted in clinical exposure. This review aims to assess the impact of simulation-based teaching methods in improving knowledge, clinical reasoning, confidence, and satisfaction in paediatric therapeutics among undergraduate healthcare students. Following PRISMA 2020 guidelines, a comprehensive search of databases PubMed, PubMed Central, Cochrane Library, and ResearchGate identified studies from 2014 – January 2025, using MeSH terms and Boolean operators. Inclusion criteria: undergraduate healthcare students, simulations related to paediatric therapeutics (scenarios of patients aged 1 month–17 years). Outcomes assessed included knowledge gain, improvements in confidence, clinical reasoning, and satisfaction. Risk of bias was evaluated using RoB 2 and ROBINS-I tools. Of 831 screened studies, 17 met inclusion criteria. Study participants were medical (47%, n = 8), nursing (47%, n = 8), and physiotherapy (6%, n = 1) students. Study designs included RCTs (12%), quasi-experimental (12%), observational (12%), mixed methods (24%), descriptive (12%), comparative (12%), qualitative (12%), and one pilot (6%). Simulation types: high-fidelity manikins (70%, n = 12), VR (18%, n = 3), standardized patients (18%, n = 3), low/moderate fidelity (12%, n = 2), serious games (6%, n = 1), telesimulation (6%, n = 1), hybrid formats (6%, n = 1). Knowledge improved in 94% (16/17 studies), with 12 showing statistical significance ($p < 0.05$). Confidence improved in all 17; 10 showed statistical significance ($p < 0.05$). Clinical reasoning improved in 88% (n = 15), and learner satisfaction exceeded 85% in most. Of 45 clinical scenarios, 88% (n = 41) addressed acute emergencies (e.g., asthma, seizures, DKA), and 7% (n = 3) focused on chronic care. In conclusion Simulation based teaching of paediatric therapeutics is found to be highly effective and well received by healthcare undergraduates. It enhances knowledge, improves confidence and clinical reasoning in managing high risk paediatric conditions. Future research should focus on assessing long term retention, chronic care integration, and broader disciplinary induction.

Keywords: Paediatrics, simulation, education, therapeutics, undergraduates

The Transformation of Athenian Citizenship: The Aristocratic Privilege to Inclusive Governance and Contemporary Democratic Identity

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In ancient Athens, citizenship was a privilege granted to adult male Athenians, conferring upon them the right to participate in politics, own land, and enjoy equal protection under the law. The objective of the study is to investigate how Athenian citizenship evolved from an exclusive privilege of aristocratic elites into a structured, though limited, system of democratic participation during the Classical period. The study followed a historic method in gathering historical data and an eclectic method in analysis under a qualitative research approach. Beginning with the oligarchic dominance of the early city-states, the research traces the gradual demotivation of aristocratic participation in politics through reforms such as Solon's introduction of wealth-based civic stratification, Cleisthenes' tribal reorganization that emphasized local affiliations over noble lineage, and Pericles' citizenship law, which redefined legal privileges in increasingly restrictive terms. These developments are contextualized within broader socio-economic and military transformations, including the upheaval of the lower classes, particularly the *thetes*, whose role in the naval power of Athens enabled greater inclusion in decision-making in the polis. Despite these advances, Athenian citizenship remained exclusionary, denying rights to women, slaves, and *metics* and often reinforcing civic unity through mechanisms of exclusion. By exploring both the ideological aspirations and practical limits of democratic participation, this paper argues that Athenian citizenship was a fluid and contested concept, shaped by internal tensions between democratic ideals and the preservation of elite control. The study contributes to broader discussions on ancient political identity and the legacy of classical democracy in shaping modern notions of citizenship and civic engagement. Understanding the evolution of Athenian citizenship offers valuable insights into the foundational principles and persistent challenges of civic identity, democratic participation, and social inclusion. As modern democracies contend with questions of who belongs, who gets to participate, and how inclusive citizenship should be, the Athenian model serves as a historical insight.

Keywords: Athenian citizenship, democracy, inclusivity, governance

Trapped in a Loop of Disconnection: A Qualitative Exploration of Gen Z Learners' Experiences in Online Higher Education

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The rapid shift to online education (OE) has profoundly reshaped learning environments (LEs), especially for Generation Z (GZ). In Sri Lanka, limited attention has been paid to how these digital native students navigate emotional, cognitive, and technological challenges in virtual learning spaces. This study investigates their lived experiences to inform educational innovation and policy reform. This study explores GZ's perceptions of satisfaction and learning outcomes in OE. It examines technological adaptability challenges and variations in motivation and self-management. The research aims to provide recommendations for adapting teaching strategies and student support systems tailored to the specific needs of this generation in virtual LEs. A qualitative research design was employed using structured interviews with seven undergraduate students of The Open University of Sri Lanka, aged 18–27 (born 1997–2012), who were engaged in fully online learning (OL). The participants represented diverse geographical backgrounds in Sri Lanka. Data were collected through structured interviews to explore personal experiences and perceptions. A thematic analysis approach was utilized, following Braun and Clarke's six phase framework. Transcripts were coded manually to identify patterns related to satisfaction, adaptability, motivation, and self-management in OE. Themes were developed iteratively to reflect the nuanced realities of GZ learners. This interpretative approach provides insight into generational learning experiences that can inform responsive educational design and digital learning policies. Five key themes emerged from the data. "Hyperconnected but Drained" reflects participants' emotional exhaustion from constant digital immersion. "Passive Presence" highlights disengaged online attendance driven by screen fatigue. "Socially Starved Learning" captures the loss of peer interaction and campus culture, fostering isolation. "Fading Academic Identity" reveals a weakening connection to academic goals due to the absence of traditional educational experiences. Finally, "Trapped in the Routine Loop" describes the monotonous, repetitive nature of OL, with students likening their experience to being on autopilot, lacking motivation and meaningful growth. Together, these themes illustrate the complex realities of GZ's OE. These findings highlight the urgent need to redesign OE systems that extend beyond technological access to address the emotional and cognitive needs of GZ learners. The study concludes that fostering engagement, well-being, and a sense of academic identity in virtual settings requires learner-centered, emotionally responsive pedagogies and policy interventions. By aligning teaching strategies with the lived experiences of GZ, educators and policymakers can create more resilient and inclusive digital LEs.

Keywords: Generation Z, OL, student engagement, digital fatigue in education

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271. Ms. Wathsala Priyadarshani, University of Peradeniya
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281. Dr. Prabhath Ranasinghe, Provincial Dept. of Health Services, Central Province
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291. Prof. Nirmala Rathnayake, University of Ruhuna
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293. Dr. Ashani Ratnayake, Faculty of Medicine, University of Peradeniya
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295. Dr. Dilini Ratnayake, University of Peradeniya
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297. Prof. Sumudu Rubasinghe, University of Peradeniya
298. Dr. Sumudu Ruklani, University of Peradeniya
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301. Prof. Pubudu Samarasekara, University of Peradeniya
302. Dr. Achala Samarasinghe

303. Dr. Senani Samarasinghe, Faculty of Medicine
304. Dr. Thilina Samarasinghe, University of Peradeniya
305. Dr. Sarath Samaraweera, University of Ruhuna
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311. Dr. Jagath Senarathne, University of Peradeniya
312. Dr. Kalana Senaratne, University of Peradeniya
313. Dr. Nipuna Senasinghe
314. Ms. Yashodha Senavirathne, University of Peradeniya
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316. Prof. Walter Senevirathne, Department of Education, University of Peradeniya
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322. Dr. Dayani Siriwardane, Pet Vet Clinic
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329. Dr. Nalaka Sumanarathna, University of Peradeniya
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346. Prof. J.K. Vidanarachchi, University of Peradeniya

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356. Dr. Tharindu Weerakoon, University of Peradeniya
357. Prof. Thilini Weeraratne, University of Peradeniya
358. Prof. Lasantha Weerasinghe, University of Peradeniya
359. Dr. Gayani Weerasooriya, Veterinary Research Institute, Sri Lanka
360. Prof. Rohan Weerasooriya, National Institute of Fundamental Studies
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368. Prof. Susiji Wickramasinghe, University of Peradeniya
369. Dr. Vasantha Wickramasinghe, University of Peradeniya
370. Mr. Ashvin Wickramasooriya, University of Peradeniya
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377. Dr. Udeni Wijesooriya, University of Peradeniya
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379. Ven. Prof. Miriswaththe Wimalagnana, PGIPBS
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381. Prof. Hiran Yapa, University of Peradeniya
382. Ms. Dinushika Yapa Abeywardhana, University of Peradeniya
383. Prof. Sakunthala Yatigammana, University of Peradeniya