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2024

ANNUAL RESEARCH SYMPOSIUM 2024

UNIVERSITY OF COLOMBO

BUILDING A SUSTAINABLE FUTURE THROUGH IMPACTFUL RESEARCH

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PROCEEDINGS OF THE ANNUAL RESEARCH SYMPOSIUM 2024 UNIVERSITY OF COLOMBO, SRI LANKA

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UNIVERSITY OF COLOMBO, SRI LANKA

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"Buddhi Sarvathra Bhrajate"
Wisdom Enlightens

OUR VISION

To be a centre of global excellence in education, research, and stakeholder engagement to enrich human potential for the betterment of society

OUR MISSION

To discover and disseminate knowledge; enhance innovation; and promote a culture of broad inquiry throughout and beyond the university through engagement and collaboration with industry and community

PROCEEDINGS OF THE ANNUAL RESEARCH SYMPOSIUM 2024

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PROGRAMME OF THE INAUGURATION CEREMONY

Prof. Lakshman Dissanayake Auditorium, FGS, University of Colombo
On Monday, 04th November 2024 at 1.30 pm

Time	Programme
01.15 pm – 01.30 pm	**Arrival of the Guests**
01.30 pm – 01.40 pm	**National Anthem** **Lighting of the Oil Lamp**
01.40 pm – 01.45 pm	**Welcome Dance – Cultural Performance**
01.45 pm – 01.50 pm	**Welcome Address** Professor Dilshani Dissanayake Chairperson, Annual Research Symposium 2024
01.50 pm – 02.00 pm	**Address by the Vice Chancellor** Senior Professor (Chair), H. D. Karunarathne The Vice Chancellor, University of Colombo
02.00 pm – 02.15 pm	**Video Showcasing Impactful Research of the University of Colombo**
02.15 pm – 02.20 pm	**Launch of the Electronic Proceedings and Presentation of Symposium Proceedings to the Chief Guest, Keynote Speakers, and the Vice Chancellor**
02.20 pm – 02.35 pm	**Address by the Chief Guest** Ms. Azusa Kubota UNDP Resident Representative in Sri Lanka
02.35 pm – 03.10 pm	**Keynote Address I** **'*Transdisciplinary Research for Sustainability, Balanced Inclusive Green Growth (BIGG), and Climate Justice*'** Professor Mohan Munasinghe Founder and Chairman, Munasinghe Institute of Development (MIND) and MIND Group, Colombo, Sri Lanka
03.10 pm – 03.20 pm	**Cultural Performance** Students from the Department of Performing Arts Sri Palee Campus
03.20 pm – 03.55 pm	**Keynote Address II** **'*Sustainable Development of Global Supply Chains*'** Professor Yasuyuki Todo Graduate School of Economics, Waseda University, Japan

03.55 pm – 04.30 pm	**Keynote Address III** **'*Building a Sustainable Future through Impactful Research: Role of the Community and Civil Society*'** Dr. Vinya S. Ariyaratne President, Sarvodaya Shramadana Movement of Sri Lanka
04.30 pm – 04.40 pm	**Felicitation of University of Colombo Researchers Ranked among the World's Top 2% Scientists 2023**
04.40 pm – 05.00 pm	**Presentation of Senate Awards for Research Excellence**
05.00 pm – 05.10 pm	**Vote of Thanks** Professor Nimal Punayasiri Co-Chair, Inauguration Committee Annual Research Symposium 2024
05.10 pm – 05.30 pm	**Group Photographs** UOC Researchers Ranked among the World's Top 2% Scientists 2023 Senate Awardees for Research Excellence Senate Commendation Awardees for Research Excellence ARS 2024 Organizing Committee
05.30 pm onwards	**Refreshments**

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MESSAGE FROM THE VICE CHANCELLOR

Senior Professor (Chair) H. D. Karunarathne

Vice Chancellor, University of Colombo, Sri Lanka

It is my privilege to present this message for the Annual Research Symposium 2024, a flagship event in the University of Colombo's academic calendar. As Sri Lanka's highest-ranked university, with over 150 years of proud history, we continue to uphold our role as a center of academic excellence, innovation, and research. Each year, we build on this legacy while advancing in global rankings, further enhancing our reputation as a premier institution of higher learning.

Since its inception in 2008, the University's Annual Research Symposium has grown into a prominent platform for sharing knowledge. Each year, following the inauguration ceremony, our faculties and institutes organize a variety of academic activities, including symposiums, conferences, doctoral colloquiums, industry dialogues, and panel discussions, all aimed at fostering scholarly exchange. These events provide opportunities for both local and international researchers to present their findings, further strengthening our commitment to advancing intellectual inquiry and practical solutions in their respective fields.

The theme for this year, '*Building a Sustainable Future through Impactful Research*', underscores the University of Colombo's commitment to tackling global challenges with innovative, sustainable solutions. Our research is dedicated to developing evidence-based strategies that enhance environmental stewardship, resource efficiency, and social equity. By embedding sustainability into our research, we strive to create practices with a lasting positive impact, supporting resilient and balanced futures for both local and global communities.

I extend my heartfelt gratitude to the Chairperson of the Annual Research Symposium 2024, chairs and members of the sub-committees, the Academic Publication Branch, and the entire team whose dedication and hard work have made this event a reality. Their collective efforts have been instrumental in ensuring the success of this prestigious gathering. I am confident that the proceedings of this year's symposium will provide valuable insights and significantly contribute to shaping a sustainable future through impactful and pioneering research.

MESSAGE FROM THE SYMPOSIUM CHAIRPERSON

Professor Dilshani Dissanayake

Chairperson of the Annual Research Symposium 2024
Faculty of Medicine, University of Colombo, Sri Lanka

It is with great pleasure that I send this message to the Book of Proceedings of the Annual Research Symposium of the University of Colombo for 2024. The symposium, centered on the theme '*Building a Sustainable Future through Impactful Research,*' marks a significant milestone in the collective efforts of University of Colombo (UoC) researchers to address pressing global challenges through innovation and impactful research. This year, the entities of the UoC bring together a diverse community of scholars, industry experts, and policymakers, each contributing valuable insights into creating a future where sustainability is at the core of our developmental strategies.

The Book of Proceedings captures the essence of our deliberations, innovative ideas, and plans of each entity of the University. We have included a special document to guide our thinking process towards policy development for sustainability through impactful research. We hope that this collection of research and the policy document will inspire further inquiry and drive actionable solutions that can be implemented across sectors and communities of the UoC and beyond.

On behalf of the organizing committee, I would like to extend my sincere gratitude to our Vice-Chancellor, Senior Professor (Chair) H.D. Karunaratne who is our tower of strength and guiding light in organizing the symposia of this caliber. We wish to express our sincere appreciation to the chief guest and keynote speakers of the inauguration ceremony for accepting our invitations to share their expert insights.

I am grateful to the organizing team for their tireless efforts in ensuring the seamless execution of the inauguration ceremony of the Annual Research Symposium and the publication of the book of proceedings.

Let us continue to build on the momentum generated here and work together towards a more sustainable, equitable, and prosperous future.

INTRODUCTION TO THE CHIEF GUEST

Ms. Azusa Kubota

Resident Representative, United Nations Development Programme (UNDP), Sri Lanka

Azusa Kubota joined UNDP in Sri Lanka as the Resident Representative in January 2023. Prior to her appointment in Sri Lanka, Ms. Kubota served as the Resident Representative for UNDP in Bhutan from 2019-2022, where she led overall operations, programme implementation, strategic vision setting, and representation of the office in the country. Prior to her tenure in Bhutan, she served UNDP in multiple leadership capacities as the Manager and Head of Office of UNDP in the Solomon Islands and the UN Joint Presence Manager for UNDP, UNICEF, UNFPA, and UNWOMEN (2016 – 2019), Deputy Resident Representative, Programme and Operations for UNDP Lao PDR (2014 – 2016), and UNDP Maldives (2011-2014). She led UNDP's independent country programme evaluations in multiple countries across regions, as well as thematic evaluations while working for UNDP's independent evaluation office from 2008 to 2011. Her career with UNDP began as the Programme Analyst, Sustainable Economic Empowerment Unit, UNDP Malawi in 2002.

Previously, she worked in NGOs in Boston, San Francisco, Senegal and Lesotho. At the International Law Institute in Washington D.C., she was responsible for designing and executing training programmes for senior government officials in the areas of international law and economic development.

A national of Japan, Ms. Kubota holds a Master's Degree in International Affairs in Economic and Political Development from the School of International and Public Affairs, Columbia University, New York, USA and a Bachelor's Degree from Smith College, Northampton, USA. She has spent a semester at Université Cheikh Anta Diop de Dakar, Dakar, Senegal.

ABSTRACT OF THE ADDRESS BY THE CHIEF GUEST

Building a Sustainable Future through Impactful Research

Ms. Azusa Kubota

Resident Representative, United Nations Development Programme (UNDP), Sri Lanka

I would like to congratulate the University of Colombo on hosting the 16th Annual Research Symposium. The longstanding success of this annual event is a testament to the University's dedication to advancing knowledge and fostering impactful research for sustainable development. The theme, '*Building a Sustainable Future through Impactful Research,*' is timely, highlighting the essential role that research plays in addressing global challenges.

We, as the global community, are at a critical juncture. The series of cascading crises we have experienced since the COVID-19 pandemic – the growing cost of living, raging wars, and growing energy demands – have resulted in the first-ever regression of the Human Development Index since UNDP conceived it in the 80s. While many countries bounced back since, the growing gap between the rich and poor countries undermines sustainable development. At the same time, the impact of the Triple Planetary crisis – pollution, biodiversity loss, and climate change – is adding further complexity to the global landscape. In the context of fast-shrinking fiscal space to address these ever more complex and interconnected challenges, the focused and efficient use of available resources is essential. Academic research provides a valuable evidence base and insights into these complexities, playing an integral role in optimizing our chances to accelerate the attainment of Sustainable Development Goals, even with limited resources.

At UNDP, we have long advocated for incorporating research into making policy choices and programmatic decisions. We firmly believe in the crucial role played by academic institutions in providing that foundation for data-driven evidence. In this regard, I would like to sincerely commend the University of Colombo for hosting the Annual Research Symposium on 'Building a Sustainable Future through Impactful Research'. Your efforts are a commendable step toward strengthening the contribution of research to sustainable development.

The COVID-19 pandemic globally created a fast-evolving situation where decisions had to be made with suboptimal information. Here in Sri Lanka, to fill the knowledge gap to understand the impact of the cascading crisis at the household level, we commissioned the National Citizen Survey 2022-3 and the Multidimensional Vulnerability Index 2023. These data sets complemented regional and global data exercises such as the Human Development Index, and the needs assessments and mapping exercises we jointly conduct with national stakeholders. Building on the evidence generated, we ensured that our programmatic efforts would be more finely tuned toward evidence-based programming. Such research also aids in identifying potential collaborators, and gaps in the sector, ensuring that interventions are contextually relevant, culturally sensitive, and strategically aligned with the broader ecosystem we are operating in. Data also provides a useful tool to help generate a shared vision between

partners within the development space, helping to strengthen trust and foster relationships with our key stakeholders.

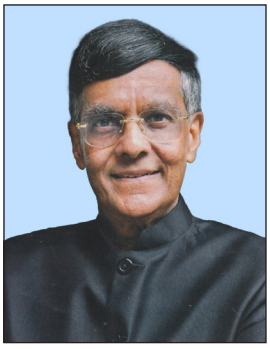
By bringing together esteemed researchers from diverse disciplines, the symposium promotes the kind of interdisciplinary collaboration that is key to driving meaningful change. Your efforts to create a platform for both leading and emerging voices underscore the University's role as a hub of academic excellence and a driver of positive societal impact. I hope, learning from these experiences, UNDP will help bridge research with practitioners to enhance the overall development impact and attainment of SDGs.

At UNDP, policy research, ideas, and robust evidence-based processes are the pillars in advancing sustainable development. By fostering knowledge and utilizing evidence, UNDP supports governments, civil society, and stakeholders in developing impactful laws, policies, and strategies. This strengthens their capacity to implement sustainable solutions that bring tangible change in line with global development goals. And in this journey, academics and research institutions at large play an indispensable role.

We applaud the University of Colombo's continued dedication to shaping a sustainable future and creating solutions that benefit a range of stakeholders and finally communities in Sri Lanka. And we in UNDP are deeply humbled to be a partner in your journey.

We wish you all successful deliberations at the symposium.

INTRODUCTION TO THE KEYNOTE SPEAKER – I



Professor Mohan Munasinghe

Founder and Chairman,
Munasinghe Institute of Development (MIND) and MIND Group, Colombo, Sri Lanka

Professor Mohan Munasinghe, the Founder Chairman of the Munasinghe Institute of Development (MIND) and MIND Group in Colombo, is a globally recognized scholar and practitioner in sustainable development. He was awarded the prestigious 2021 Blue Planet Prize, often regarded as the "Environmental Nobel Prize," for his contributions to environmental and development policy. He served as the Vice Chair of the United Nations Intergovernmental Panel on Climate Change (IPCC-AR4), which shared the 2007 Nobel Prize for Peace. In recognition of his international influence, Professor Munasinghe has received the highest national honors from the Heads of five countries. He currently serves as the Chairperson of the Presidential Expert Commission on Sustainable Sri Lanka 2030 Vision, a key national initiative aimed at steering the country towards a sustainable future. Additionally, he is a distinguished Guest Professor at Peking University in China and serves as an Honorary Senior Advisor to the Government of Sri Lanka.

His academic background is distinguished by post-graduate degrees in engineering, physics, and development economics from prestigious institutions such as Cambridge University (UK), MIT (USA), and McGill and Concordia Universities (Canada). In recognition of his scholarly contributions, he has also been awarded several honorary doctorates. With over 50 years of distinguished public service, Professor Munasinghe has held prominent roles, including Senior Energy Advisor to the President of Sri Lanka, Advisor to the US President's Council on Environmental Quality (PCEQ), and Senior Advisor/Manager at the World Bank.

Prof. Munasinghe has been a Visiting Professor at leading universities worldwide and has won numerous international awards for his research and practical applications. He is world-renowned for developing the integrated, trans-disciplinary 'Sustainomics' methodology, and has authored over 120 books and 400 technical papers covering areas such as economics, sustainable development, climate change, power, energy, water resources, transport, environment, disasters, and information technology. He is a Fellow of several prestigious, internationally recognized science academies and serves on the editorial boards of 14 professional journals.

INTRODUCTION TO THE KEYNOTE SPEAKER – II

Professor Yasuyuki Todo

Graduate School of Economics
Waseda University, Japan

Yasuyuki Todo, who holds a Ph.D. in Economics from Stanford University, has been a Professor at the Graduate School of Economics, Waseda University since 2014. Prior to this, he served as the Head of the Department of International Studies at the University of Tokyo. He is also a Program Director and Faculty Fellow at the Research Institute of Economy, Trade, and Industry. His research fields are international economics, development economics, and applied micro-econometrics, with a current focus on the role of social and economic networks in fostering economic growth and resilience based on firm- and household-level data from various countries.

He has published nearly 70 academic papers in refereed journals including *Nature Sustainability*, the *Journal of Industrial Economics*, the *Journal of Regional Science*, *Research Policy*, *World Development*, and *Ecological Economics*. According to ScholarGPS, he ranks in the top 0.39% of economists in the world and in the top 0.67% of supply chain researchers, based on academic publications over the past 5 years. He is a board member of the Japanese Association for Development Economics and the Japanese Society of International Economics. He has also served on numerous policy-advising committees for the national and local governments, including the Committee for Japan's Future under the Council on Economic and Fiscal Policy of the Cabinet Office, the Industrial Structure Council of the Ministry of Economy, Industry and Trade, and T20 Japan 2019 under G20.

ABSTRACT OF THE KEYNOTE ADDRESS – II

Sustainable Development of Global Supply Chains

Professor Yasuyuki Todo

Graduate School of Economics, Waseda University, Japan

In recent years, global supply chains have been significantly restructured due to geopolitical tensions, particularly the decoupling between the United States and China, thereby posing substantial risks to the sustainability of these supply networks. This keynote speech will explore the construction of sustainable, resilient, and innovative global supply chains, drawing on recent academic research, including the speaker's own contributions. Four key issues will be examined. First, while diversification of supply chains across countries is crucial for enhancing resilience, it has become evident that market failures necessitate policy interventions to facilitate such diversification. Second, despite the importance of diversification, supply chain connections between Western countries, including Japan, and the Global South, including Sri Lanka, remain fragile. A potential solution to this gap lies in the provision of greater infrastructure development and technical assistance by Western nations, which would in turn bolster foreign direct investment (FDI) from the West to the Global South. Third, onshoring – relocating supply chain operations to domestic markets – presents an additional strategy to reinforce supply chain resilience. In this regard, many countries, including the United States, China, Japan, and the European Union members, have implemented industrial policies aimed at promoting onshoring. However, caution must be exercised as such policies may risk inefficiency and may have adverse effects on the global economy. Lastly, the expansion of international knowledge networks, including those between Western nations and the Global South, is emphasized as a critical factor in fostering innovation.

For more information, please visit his official website:
https://sites.google.com/view/yastodo/

INTRODUCTION TO THE KEYNOTE SPEAKER – III

Dr. Vinya S. Ariyaratne

President, Sarvodaya Shramadana Movement of Sri Lanka
Chairman, Sarvodaya Institute of Higher Learning, Sri Lanka

Vinya Ariyaratne is a Board-Certified Specialist in Community Medicine and the Immediate Past President (2023) of the Sri Lanka Medical Association (SLMA). He is a Past President and Fellow of the College of Community Physicians of Sri Lanka (CCPSL). Dr. Ariyaratne obtained his Doctor of Medicine (M.D.) degree from De La Salle University in the Philippines and a Master of Public Health (M.P.H.) degree from Johns Hopkins University, U.S.A. He also holds a Master of Science (M.Sc.) and Doctor of Medicine (M.D.) in Community Medicine from the Postgraduate Institute of Medicine, University of Colombo, Sri Lanka.

He was a Visiting Fellow at the Liverpool School of Tropical Medicine, U.K., and a Chevening Fellow at the Nuffield Institute, Faculty of Medicine and Health, University of Leeds, U.K., where he obtained a Postgraduate Certificate in Health Management, Planning, and Policy with Distinction. In 2007, he was awarded the degree of Doctor of Civil Law (DCL) honoris causa by the University of Durham, U.K., for his outstanding contribution to tsunami recovery in Sri Lanka.

Dr. Ariyaratne possesses extensive experience in public health, community-based research and development, disaster management, nutrition, and child health.

ABSTRACT OF THE KEYNOTE ADDRESS – III

Building a Sustainable Future through Impactful Research: Role of the Community and Civil Society

Dr. Vinya S. Ariyaratne

President, Sarvodaya Shramadana Movement of Sri Lanka
Chairman, Sarvodaya Institute of Higher Learning, Sri Lanka

The keynote will emphasize the role of impactful research in driving sustainable development, with a focus on community involvement and civil society. It will draw from the experiences of the Sarvodaya Shramadana Movement and the Sarvodaya Institute of Higher Learning (SIHL) in Sri Lanka. Founded on principles of self-reliance, community empowerment, and non-violence, Sarvodaya has demonstrated for over six decades how grassroots participation can converge with institutional knowledge to foster sustainable development. The SIHL's research initiatives underscore the importance of co-creating solutions with communities, ensuring inclusivity, equity, and shared knowledge.

The address will underscore the need for research to address the unique challenges of marginalized communities while promoting environmental sustainability. Case studies from the SIHL will showcase successful research projects that have led to tangible improvements in community well-being. The keynote will also advocate for civil society's involvement in supporting research-driven solutions.

By sharing Sarvodaya's best practices, the keynote aims to inspire researchers, policymakers, and community leaders to collaborate toward a sustainable future. The collective power of community engagement and the transformative impact of research, when aligned with the needs and aspirations of the people, will be key themes. Attendees will gain insights into how impactful research, rooted in community engagement, can shape a sustainable and equitable future.

Building a Sustainable Future through Impactful Research

Dilshani Dissanayke[1], Siyath Gunawardene[2], Ruwan Gamage[3], K.V. Dhanapala[4]

[1]Department of Physiology, Faculty of Medicine, University of Colombo, Sri Lanka
[2]Department of Physics, Faculty of Science, University of Colombo, Sri Lanka
[3]National Institute of Library and Information Sciences (NILIS), University of Colombo, Sri Lanka
[4] Sri Palee Campus, University of Colombo, Sri Lanka

1. Achieving Global Sustainability: Navigating Challenges and Opportunities for the Future

Sustainability is a broad, multidimensional concept shaped by socio-cultural, economic, and political contexts within global realities. Climate change, geopolitical conflicts, and economic stagflation collectively threaten the goal of achieving global sustainability by 2030. These challenges undermine access to health, nutrition, education, and justice, deepening socio-economic disparities and often leading to civil unrest. By the end of this decade, it is estimated that 575 million people will be living in extreme poverty, with 600 million facing hunger. Additionally, 84 million children and young people will be out of school, and the global community is expected to surpass the Paris Agreement's 1.5°C 'safe' threshold for average global temperature rise (Malekpour et. al, 2023). In response to these multiple risks, the United Nations introduced 17 Sustainable Development Goals (SDGs) in 2015 (United Nations, 2015), aimed at supporting member states in achieving significant outcomes at the national level by 2030. The SDGs are deeply interconnected, as progress in one area often requires advancements in others.

The SDGs serve as a universal call for action aimed at eradicating poverty, protecting the planet, and ensuring prosperity for all. Compassion in the pursuit of equity, justice to safeguard equality, and global cooperation to agree upon core values will become the guiding principles of global leadership in achieving these SDGs. However, citizens in economies with constrained fiscal space and capital inflows are most likely to face the greatest challenges in achieving the SDGs by 2030. Global SDG Index 2023 ranked Sri Lanka at 93rd place among its member nations (Sachs, Lafortune, & Fuller, 2024). Thus, Sri Lanka faces distinct challenges, intensified by economic adversity, climate change, and environmental degradation. Significant improvements across various sectors will be necessary for Sri Lanka to meet its SDG targets by 2030.

Forward-looking policies and regulatory frameworks that prioritize sustainability across institutions are essential for fostering fiscal prudence, creating opportunities for innovation, and promoting multilateralism - all of which are crucial for expanding both public and private capital. In the long-term, equitable education that empowers citizens to embrace innovation with access to markets will become a key driver of sustainability. Integrating sustainability within the green and blue economies, driven by advancements in Artificial Intelligence (AI), will undoubtedly create new opportunities, markets, business models, and improved relationships with stakeholders (Fan, Yan, & Wen, 2023). Over the next decade, leadership from both advanced economies and emerging markets, particularly those led by India (Das & Das, 2019) and China

(Liu et. al, 2021) will play a decisive role in shaping the socio-economic transformation of the world. Therefore, working hard to institutionalize and uphold integrity, professionalism, and respect for diversity will be essential for achieving sustainable development.

2. Pivotal Role of Higher Education in Achieving Sustainability through Impactful Research

Sustainable development requires addressing complex challenges that ensure the well-being of society, the economy, and the environment. Developing nations, in particular, face pressing issues such as climate change, biodiversity loss, and social inequality, which necessitate the adoption of innovative technologies. In this context, Higher Education Institutions (HEIs) play a critical role with Research and Innovation serving as key drivers in enhancing the quality of education they provide.

Promoting a culture that values Research and Innovation is further advanced through Teaching and Outreach, creating a community of learners engaged in transformative practices. Thus, the future must adopt an interdisciplinary approach that fosters transformative learning experiences (Thomas, 2009), empowering students with the skills necessary to tackle complex problems using fact-based systems thinking rather than maintaining the status quo through rigid procedures. This shift is essential for developing adaptive and innovative problem solvers capable of addressing multifaceted issues of sustainability. The UNESCO-initiated Education for Sustainable Development (ESD) framework identifies five priority action areas: Policy, learning environments, capacity building for educators, youth engagement, and local-level action (UNESCO, 2024). These areas are crucial for embedding sustainability into the fabric of educational institutions. Recognizing human capital as an institution's most valuable asset enables the development of policies that effectively support and enhance these priority areas. Through such comprehensive efforts, higher education can significantly contribute to the realization of sustainable development goals (Leal Filho, Salvia, & Eustachio, 2023).

3. Contribution of the University of Colombo

The University of Colombo (UoC), as a higher education institute (HEI) in Sri Lanka, has significant potential to serve as a transformative force in addressing sustainability challenges. Aligning UoC's research strategy with both global and national sustainability priorities would enhance its impact and relevance, contributing in meaningful ways to addressing sustainability challenges. Its strategic location in Colombo, a city undergoing rapid urbanization, uniquely positions the University of Colombo to engage with sustainable development initiatives. Researchers at the UoC are well-positioned to actively contribute to Sri Lanka's effort to achieve the SDGs. An analysis of the research accepted for the Annual Research Symposium (ARS) – 2024, reveals that UoC's research is making significant strides towards advancing the UN-SDGs, and the potential for faculties, institutions, and research centers to further contribute to the SDGs is remarkable. It is also observed that the academic disciplines of UoC are collectively contributing to the SDGs across six key themes: Education, Health and Well-being, Economic Growth and Sustainability, Science and Technological Innovation, Strengthening Legal and Ethical Foundations, and Engaging Communities and Enhancing Visibility. This

multidisciplinary approach positions the UoC as a vital institution in the pursuit of sustainable development both locally and globally.

The Faculty of Education at the University of Colombo promotes research in key areas such as educational psychology, humanities education, and science and technology education. The Faculty of Medicine, the Faculty of Indigenous Medicine, the Postgraduate Institute of Indigenous Medicine, and the Postgraduate Institute of Medicine primarily focus on the SDG of 'Good Health and Well-Being' showcasing impactful research that enhances healthcare outcomes. They promote SDG-driven medical research, fostering collaborative approaches with local and international health organizations to address pressing local and global health challenges and contributing to sustainable healthcare practices. Complementing these efforts, the Faculty of Nursing highlights the essential role of nursing in improving patient care and advocating for sustainable healthcare systems.

The Faculty of Management and Finance promotes research that advances sustainable business practices, responsible for economic growth, and innovation. The Faculty of Technology contributes by showcasing advancements in Agricultural Technology, Environmental Technology, and Information and Communication Technology driving sustainable solutions to contemporary challenges. Together with the Institute for Agro-Technology and Rural Sciences (IARS), these entities emphasize innovations that support economic resilience, environmental sustainability, and agricultural development, ultimately ensuring food security and promoting responsible resource management. The Faculty of Science plays a crucial role in addressing local and global environmental challenges through research focused on biodiversity conservation, renewable energy, and sustainable environmental practices. Additionally, the Institute of Biochemistry, Molecular Biology, and Biotechnology (IBMBB) and the University of Colombo School of Computing (UCSC) will advance research in cutting-edge fields such as molecular life sciences and intelligent systems, furthering innovation towards achieving SDGs. The Faculty of Law explores the legal frameworks that support sustainable development, promoting research in areas such as climate change law, human rights, and effective governance. This legal expertise is instrumental in ensuring the ethical and regulatory aspects of sustainability, which leads to a more just and equitable society. The Faculty of Arts explores the social, economic, cultural, and political aspects of sustainability through impactful research aimed at building resilient societies. They also address local and global challenges such as poverty, inequality, and cultural dynamics. Complementing these efforts, the Sri Palee Campus emphasizes the importance of educating the public on sustainability issues through media and the performing arts. It highlights the role of communication in nurturing a more informed and engaged society. The Institute of Human Resource Advancement (IHRA) further supports these initiatives by promoting lifelong learning and human resource development, while the Faculty of Graduate Studies (FGS) fosters collaborative research across multiple disciplines to enhance research capacity in sustainability. Similarly, the National Institute of Library and Information Sciences (NILIS) and the Library Network further emphasize the importance of data management, evidence-based practices, and the ethical dissemination of knowledge, all of which support transparency and accountability in research and policy-making. Collectively, these efforts inspire holistic societal development through R&D, positioning the UoC as a central player in

advancing sustainable development.

At the University of Colombo, the Center for Internal Quality Assurance (CQA) and the International Office (IO) have been instrumental in establishing a framework for SDGs to enhance the university's visibility in advancing these goals. This framework aims to integrate UoC's sustainability performance with its strategic objectives by creating clear communication channels and processes. Furthermore, the university has adopted ranking criteria to map and assess its sustainability efforts, ensuring that core standards and practices are consistently implemented while identifying and addressing any gaps within the institution. A key component of this framework involves forging national and international collaborations focused on SDG-related initiatives.

4. Recommendations for 'Building a Sustainable Future through Impactful Research'

The ARS 2024 Organizing Committee made a collective effort to propose initiating a system within the UoC centered on the theme of '*Building a Sustainable Future through Impactful Research*'. The objective is to harness the efforts of the SDG platform and other research-oriented forums and to move towards developing a policy and monitoring mechanism aimed at achieving the university's sustainability goals. By aligning institutional research practices with the SDGs, UoC is making a concerted effort to solidify its role as a leader in sustainability-focused research and education. The event aims to engage all university stakeholders in embracing multidisciplinary research, innovation, and community engagement to promote sustainability across diverse disciplines through impactful research. By developing a comprehensive policy that promotes impactful research aligned with sustainability goals, the UoC has the potential to emerge as a leader in shaping a sustainable future for both local and international communities. Enhancing the participation of all stakeholders in such impactful research initiatives will significantly elevate the university's global visibility and its standing in international benchmarks. This policy can be grounded in the principles of United Nations SDGs ensuring a strategic and cohesive approach to sustainability-driven research and innovation.

5. Key Elements (KE) of a University Policy on Sustainability Research

Key elements of a university policy should be aligned with the Education for Sustainable Development (ESD) framework promoted by UNESCO which incorporates five priority action areas: Policy, learning environments, capacity building for educators, youth engagement, and local-level action. In light of this framework, we recommend the following five key elements for a pragmatic policy document aimed at achieving sustainability through impactful research. These elements could be integrated into the university's strategic and action plans and monitored by a designated platform, such as the Center for Internal Quality Assurance (CQA) or a purpose-designed establishment. By establishing these key elements within a structured policy framework, the university can effectively promote sustainability and ensure that its research initiatives contribute meaningfully to global sustainability goals.

5.1. KE–01: Incorporating SDGs to University of Colombo Research Policy Framework

To effectively embed the SDGs into the university research policy framework, proactive measures are essential. Aligning research initiatives with the SDGs will ensure that research undertaken at UoC directly contributes to addressing pressing real-world sustainability challenges. Establishing dedicated research clusters and centers focused on national priority areas – such as total well-being, climate adaptation, sustainable agriculture, and green technology innovation – will leverage the existing expertise within the university faculties, institutions, centers, and schools. By encouraging interdisciplinary collaborations, the university will also enrich the undergraduate curriculum with a more holistic approach to education. This integration will promote problem-solving skills that have a tangible societal impact, equipping students to engage meaningfully with sustainability challenges.

5.2. KE–02: Dedicated Funding and Research Support

Robust financial backing is crucial for effective research, and a sustainability-focused research policy at the UoC should prioritize the availability of funding for projects addressing sustainability challenges. To enhance research capacity, the university should actively seek external funding from international organizations such as the United Nations, the World Bank, and regional bodies. One initiative could be the establishment of a 'Sustainable Futures Fund' dedicated to supporting sustainability-focused research projects. This fund will not only facilitate impactful research but also enrich the undergraduate curriculum by integrating practical, research-driven experiences into academic programs. Additionally, forging partnerships with the private sector – particularly in industries such as renewable energy, eco-tourism, and agriculture – can provide further financial support for research initiatives that align with Sri Lanka's national development priorities. Implementing a business incubator program designed to drive interdisciplinary innovation and entrepreneurship would further enhance the university's research ecosystem, fostering an environment where sustainable solutions can thrive and contribute to both academic and societal progress.

5.3. KE–03: Promoting Interdisciplinary and Cross-Sectoral Research

Addressing complex challenges such as promoting renewable energy, managing water resources, developing smart cities, empowering well-being, ensuring sustainable governance, achieving climate justice, and implementing environmental policy requires transdisciplinary solutions. At the UoC, the integration of STEM (Science, Technology, Engineering, and Medicine) disciplines with Humanities, Education, Management, and Social Sciences (HEMS) will be crucial for addressing these multifaceted issues. The entities at UoC can serve as key drivers in establishing private, public, and multilateral international partnerships focused on sustainability-related initiatives. By fostering collaboration across diverse fields, these partnerships can enhance the university's capacity to generate impactful research outcomes. Such research can then be translated into practical applications, including businesses, policies, and social practices that drive innovation, foster economic growth, and yield significant real-world impact on both local and global scales.

5.4 KE–04: Sustainability of In-house Operations

To enhance the sustainability of in-house operations, key focus areas include transitioning to renewable energy, reducing plastic waste, and promoting biodiversity conservation in urban environments. Research into optimized management practices is essential for significantly improving the efficiency of infrastructure maintenance, administrative decision-making processes, investment, and financial sustainability. Specific initiatives could include exploring zero-waste strategies, developing green laboratories, and implementing virtual meetings to minimize resource consumption. Additionally, research on sustainable agriculture, biodiversity, and alternative energy sources can further contribute to the university's commitment to sustainability while providing valuable insights that can be applied in various operational contexts. By prioritizing these research areas, the university can not only strengthen its sustainability practices but also serve as a model for similar institutions to follow.

5.5. KE–05: Engaging Staff, Students, and Relevant Communities in Sustainable Research

UoC's sustainability policy should include efforts to engage staff (academic, administrative, and non-academic), students (postgraduate, undergraduate, and extension), and relevant communities outside the University in meaningful sustainable research projects. This engagement can be achieved by integrating sustainability topics into the curriculum, establishing student-led research initiatives, and supporting sustainability-themed theses and dissertations. By offering students opportunities to work on real-world projects, the university can provide valuable experiential learning while advancing its sustainability goals. Furthermore, incorporating sustainability into faculty research performance evaluations and offering incentives for sustainability-focused research will promote a culture that values sustainability within the university. Potential incentives could include research fellowships, recognition programs, and sustainability research awards to acknowledge faculty contributions to global and local sustainability efforts. Entities such as the Center for Environmental Initiatives have demonstrated leadership in involving multiple stakeholders in sustainability-centered activities across the university. Further supporting such entities will enhance the university's sustainability initiatives, fostering a collaborative and impactful approach to sustainability that engages the entire university community and beyond.

6. A Monitoring Mechanism in Place for the Sustainability of the Proposed Actions

To ensure that UoC's sustainability-focused research policy is impactful, a strong monitoring and evaluation framework is essential. Assessing research outcomes concerning the SDGs and Sri Lanka's national sustainability targets is crucial for measuring effectiveness. Additionally, publishing annual reports on sustainability research at the UoC would enhance transparency and demonstrate the university's commitment to fostering a sustainable future. Establishing an independent Sustainability Committee through the Center for Quality Assurance or the SDG platform can facilitate the evaluation of policy effectiveness, and ensure implementation of accountability practices. This committee would play a vital role in overseeing the monitoring process, providing recommendations for improvements, and reinforcing the university's dedication to sustainability. We further recommend that a dedicated division be established

to disseminate research outcomes to the public and relevant communities who would benefit from these findings. This initiative aligns with the Sri Lankan government's economic recovery strategy (Wickramarachchi, 2024, p.11). By prioritizing these strategies, UoC can strengthen its research initiatives and contribute meaningfully to sustainable development.

7. Conclusion

Sustainable development is vital for the well-being of global citizens. However, challenges such as climate change, geopolitical conflicts, and global economic stagflation create uncertainties for sustainability efforts. Nations in the Global South are particularly vulnerable in their pursuit of the UN SDGs by 2030 due to limited financial and human resources. Higher education can play a pivotal role in nurturing leadership capable of addressing these sustainability challenges. Promoting transformative learning and systems thinking is essential for effective problem-solving, which requires transdisciplinary collaboration.

The University of Colombo, as a premier academic institution in Sri Lanka, is well-positioned to become a regional leader in sustainability research. By developing a policy that aligns with the SDGs, the UoC can promote interdisciplinary collaboration, and position itself as a sustainability testing ground. This approach will enable the UoC to conduct impactful research that addresses both local and global sustainability challenges. To better align with the UN SDGs, five key elements have been identified: Incorporating SDGs into UoC's research framework, providing dedicated funding and research support, promoting interdisciplinary and cross-sectoral collaborations, ensuring the sustainability of in-house operations, and engaging students and staff in sustainability efforts. Encouraging and incentivizing interdisciplinary research and curriculum development will be central to this transformation. Institutional governance and accountability can be monitored through an independent sustainability committee under the Center for Quality Assurance (CQA). Capacity building for researchers and students through collaborative research with global reach and local engagement should also be prioritized. Prudent investment in human capital, infrastructure, and impactful research is essential for advancing the overall quality of education at UoC. Such investments will enhance institutional impact, increase international visibility, and ensure the sustainability of the university in the years to come.

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FACULTY OF ARTS

Building a Sustainable and Resilient Future through Humanities and Social Sciences

21st of November 2024

MESSAGE FROM THE DEAN

Senior Professor Lasantha Manawadu

Dean
Faculty of Arts
University of Colombo, Sri Lanka

It is with great pleasure that I pen this message for the annual International Conference of the Faculty of Arts (IConArts 2024), the flagship event in the academic calendar of the faculty. Held under the theme 'Building a Sustainable and Resilient Future through Humanities and Social Sciences,' presentations at this year's conference highlight how impactful research done in humanities and social sciences helps create a sustainable and resilient future for everyone. This year's conference intends to reinvigorate the quest for sustainability to provoke innovative responses to challenges that confront us today. The tumultuous present demands, more than ever, that we think anew and fortify ourselves with the tools necessary to navigate the unchartered and murkier waters that lie ahead of us. Hence, this year's emphasis is on sustainability and resilience. Accordingly, the conference provides a platform for researchers to come together and share their insights on sustainable solutions for the plethora of socioeconomic and political challenges that confront us today, locally and globally in order to build a more resilient future. I hope the research presentations at IConArts 2024 will guide our responses to the challenges we face today.

This conference is the result of the contribution and commitment of numerous individuals. First, I would like to thank the Vice Chancellor of the University of Colombo, Senior Professor H. D. Karunaratne for his support and guidance in making this event a success. I would also like to express my sincere gratitude to the keynote speaker for graciously accepting our invitation to speak at this event. I take this opportunity to thank the organizing committee and the sub-committees of IConArts 2024, competently led by the co-chairpersons of the conference. I also extend my gratitude to the administrative, technical, and support staff of the Faculty of Arts for their assistance in numerous ways. Finally, I wish to express my appreciation to all the presenters, without whose contributions this event would not have been possible.

I extend my best wishes to the presenters and participants and wish IConArts 2024 great success.

MESSAGE FROM THE SYMPOSIUM CO-CHAIRS

Dr. Ananda Y. Karunarathne

Department of Geography
Faculty of Arts
University of Colombo, Sri Lanka

Ms. Nethra Senadhi

Department of Demography
Faculty of Arts
University of Colombo, Sri Lanka

Welcome to the annual International Conference of the Faculty of Arts, University of Colombo (IConArts 2024). This year's conference theme, 'Building a Sustainable and Resilient Future through Humanities and Social Sciences,' invites us to explore how these fields can provide vital solutions for today's pressing issues. In an age where challenges are increasingly interconnected, understanding the role of humanities and social sciences in fostering sustainability and resilience is more important than ever. Traditional academic boundaries often hinder comprehensive solutions that are both sustainable and resilient; thus, embracing a holistic approach is essential. The world's challenges cannot be overcome through isolated efforts. We must recognize the interconnectedness of various factors influencing the survival of our species. In particular, the world has been increasingly experiencing the adverse consequences of climate change and the collapse of ecosystems over the last few decades. Notably, critical climate tipping points (CTPs) such as significant global warming, polar ice cap melting, Gulf Stream disruption, and escalating trends in hydro meteorological disasters have become the biggest problems that confront humanity today. In this context, this conference seeks to bridge vital gaps in the existing body of literature and the discourse on extending the longevity and resilience of our planet.

This conference is a call to break free from conventional boundaries and to rise up to the occasion to seek solutions to the pressing problems of the day. It is an opportunity to leverage diverse perspectives and methods, bringing together scholars and practitioners to address local and global challenges effectively. This year, IConArts 2024 provides an opportunity not only for academics and postgraduate students but also for undergraduates to showcase their knowledge and insights gathered through research. Our goal is to inspire fresh thinking and foster a collaborative spirit that transcends traditional academic confines. IConArts 2024 aims to illuminate the significant impact that humanities and social sciences can have on creating a sustainable and resilient future. By engaging with these fields, we can unlock new pathways for addressing the complex problems of our time, ensuring a better world for future generations.

The Abstract Review Coordinating Committee of IConArts 2024 received a substantial number of abstracts from national and international researchers, covering a wide array of topics relevant to the conference sub-themes. These submissions underwent a rigorous double-blind peer review process, conducted by experts in their respective disciplines. Thereafter, the best abstracts were selected for oral presentations at the conference. These authors will have the unique opportunity to share their impactful research findings with a diverse audience in person or virtually on the 21st of November 2024, at IconArts 2024.

We wish to express our thanks to Professor Nihal Perera for accepting our invitation to be the Keynote Speaker at the event. Given the interdisciplinarity of his research, the proceedings of IConArts 2024 are enriched by his participation. For the support extended to the organizing IConArts 2024, we express our sincere gratitude to the Vice Chancellor of the University of Colombo, Senior Professor H. D. Karunaratne and the Dean of the Faculty of Arts, Senior Professor Lasantha Manawadu for their encouragement and guidance. We also thank session chairs and abstract reviewers for lending us their expertise. Members of the organizing committee deserve special thanks for their untiring effort in putting the conference together. We thank all the participants and contributors including non-academic staff and volunteers for their support in making IConArts 2024 a success.

As we exchange ideas, share insights, and forge new intellectual connections at this conference, let us embrace the power of synergizing diverse knowledge. Let this be the first step in breaking down the barriers of conventional thinking and paving the way for a brighter and more enlightened future. We hope you find the IConArts 2024 program both stimulating and challenging!

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CONFERENCE PROGRAMME

Time	Programme
08.00 am – 08.30 am	**Registration**
08.30 am – 08.35 am	**National Anthem (instrumental)**
08.35 am – 08.45 am	**Welcome Address** Co-Chairperson, IConArts - 2024
08.45 am – 08.55 am	**Address by the Dean** Professor L. Manawadu Faculty of Arts
08.55 am – 09.05 am	**Address by the Vice Chancellor (Chief Guest)** Senior Professor (Chair) H. D. Karunaratne
09.05 am – 09.10 am	**Launch of Conference Proceedings**
09.10 am – 09.15 am	**Introduction to Keynote Speaker**
09.15 am – 10.10 am	**Keynote Address and Q&A Session** Professor Nihal Perera
10.10 am – 10.20 am	**Presentation of Tokens of Appreciation**
10.20 am – 10.30 am	**Vote of Thanks**

INTRODUCTION TO THE KEYNOTE SPEAKER

Professor Nihal Perera

Professor Emeritus of Urban Planning
Ball State University
USA

Nihal Perera, PhD, is Professor Emeritus of Urban Development at Ball State University, USA. The two-time Fulbright Scholar (China and Myanmar) was a senior research fellow at the National University of Singapore and King Mongkut Institute of Technology at Ladkrabang (Thailand), a Graham Foundation Fellow (USA), a Distinguished Visiting Scholar at the University of Alberta (Canada), and an Erasmus Mundus Scholar (Germany and Italy). He also received three Fulbright-Hays awards for the CapAsia program, an innovative immersive-semester in Asia he founded and directed (1999 – 2021). An original contributor to the field of postcolonial urban studies and a leading scholar of Colombo, his research focuses on how ordinary people produce (lived) spaces for daily activities and cultural practices within the larger field of the social production of space. He has written articles on gender, race, development, Chandigarh, Dharavi, Yangon, and Gary (USA). His books include *Decolonizing Ceylon, Transforming Asian Cities,* and *People's Spaces.*

ABSTRACT OF THE KEYNOTE ADDRESS

Pedagogy of the Illiterates

Emeritus Professor Nihal Perera

Ball State University, USA University Thessaly

Contemporary education is a western product imported to Sri Lanka via colonialism. It aims to produce literate people who can not only read and write but also think and engage in intellectual endeavors. For the most part, education is training and for most subjects, it is a means to get a job. Questioning the connection between education and literacy, Nihal Perera will demonstrate that the illiterates are the products of the modern education system. He will discuss two main types of illiterates produced through education and different pedagogies employed by the 'literates' and the 'illiterates.' He will highlight the significance of learning from people using examples from the CapAsia field study program in Asia he founded and directed for 20 years.

FACULTY OF ARTS
List of Abstracts

Sustainability of Sri Lanka's Economic Recovery

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Sri Lanka faced an unprecedented economic crisis in 2022, exacerbated by a combination of long-standing issues such as a prolonged civil war, political instability, and external debt crises, compounded by the COVID-19 pandemic. The country's economic growth rate plummeted to -7.8%, while inflation soared to 69.8%. Contributing factors included a severe decline in tax revenue—falling to an unprecedented 7.3% of GDP compared to the recommended 20-25% for lower-middle-income countries (Gallagher, 2005; Kaldor, 1963)—and a critical drop in foreign exchange reserves. By mid-2022, reserves had dwindled to just 1.7 billion USD, which severely hampered Sri Lanka's ability to import essential goods, resulting in widespread shortages and inflation (Bhowmick, 2022). High public debt, rising to 113.8% of the GDP, was another significant issue, leading to a vicious cycle of debt accumulation and economic instability (Jiang, 2022; Reinhart & Rogoff, 2010). Despite these severe challenges, Sri Lanka began showing signs of recovery in late 2022, with the rupee stabilising against the USD and inflation decreasing to 6.4% in January 2024. The economy registered a 4.5% growth in the fourth quarter of 2023 (Department of Census and Statistics, 2024). This study investigates the factors influencing the sustainability of Sri Lanka's economic recovery. It aims to understand the contributors to the economic crisis, identify key factors affecting recovery sustainability, assess the impact of economic policies and international assistance, and provide recommendations for enhancing recovery sustainability. Using secondary data from various sources including the Central Bank of Sri Lanka and World Bank indicators, the study employs a multi-step analysis approach, including tabulation, graphical presentation, and Ordinary Least Squares (OLS) regression. Preliminary findings suggest that while international support has stabilised the economy, challenges such as high public debt, dependence on a limited number of export sectors, and political instability remain significant threats to long-term recovery. Addressing these issues through coordinated policy measures and structural reforms is essential for ensuring sustainable recovery and economic growth.

Keywords: *Economic Crisis, Negative Growth, Hyperinflation, External Debt Default, Economic Recovery*

Non-aligned Approach of Sri Lanka towards the Gaza War of 2023-24: Redefining Small State Diplomacy in a Changing World

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This study examines Sri Lanka's foreign policy response to the Gaza War of 2023-24 through the lens of non-aligned diplomacy, addressing the research problem of how small states navigate complex geopolitical conflicts while advocating for their principles. The objective of this study is to analyse Sri Lanka's diplomatic actions and rhetoric during the conflict, particularly its emphasis on humanitarian aid and the protection of civilians, which reflect its historical commitment to sovereign autonomy, anti-imperialism, and disarmament. A review of existing literature on non-aligned movements and small state diplomacy reveals significant gaps in understanding the role of smaller nations in shaping global norms during crises, particularly in contemporary conflicts where larger powers often dominate the narrative. The theoretical framework employed in this study is rooted in constructivist international relations theory, which posits that state behaviour is influenced by identity and normative commitments rather than merely power dynamics. This perspective allows for an exploration of how Sri Lanka's identity as a non-aligned nation informs its foreign policy decisions and actions. Methodologically, this study utilises qualitative analysis of official statements, diplomatic actions, and media reports to assess Sri Lanka's foreign policy trajectory during the Gaza conflict. Findings indicate that Sri Lanka's proactive stance—exemplified by the establishment of the "Children of Gaza Fund" and a significant financial contribution to humanitarian efforts—underscores its commitment to non-alignment while positioning it as a voice for the Global South. Furthermore, Sri Lanka's advocacy for a rules-based international order that respects the sovereignty of small states challenges the prevailing norms that often favour larger powers. This case study highlights the potential for small states to influence international norms and contributes to a more equitable global institutional framework, advocating for peace and justice amidst prevailing power politics. By reaffirming its non-aligned principles, Sri Lanka exemplifies how small countries can assert their agency in global affairs, promoting a vision of international relations that prioritises humanitarian concerns and sovereign rights.

Keywords: *Foreign Policy, Geopolitics, Non-Aligned Foreign Policy, Strategic Autonomy*

The Influence of Generations and the Geographical Locations on the Demand for Green Banking in Sri Lanka

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Green banking, which promotes environmentally sustainable financial practices, is gaining traction globally, and understanding the factors driving its adoption in Sri Lanka provides valuable insights for policymakers and financial institutions. Although green banking is found to be a sustainable and recognized method globally, some Sri Lankans are hesitant to adopt these methods due to their demographic backgrounds. Therefore, this study explores the influence of generational demographics and geographical locations on the demand for green banking in Sri Lanka. A sample of 200 respondents was selected using a random sampling method from two selected Grama Niladhari divisions in the Colombo and Gampaha districts of Sri Lanka. This research utilises a questionnaire to examine how different generations (Baby Boomers, Generation X, Generation Y, and Generation Z) perceive and demand green banking services. Additionally, it investigates geographical variations within Sri Lanka, focusing on urban versus rural regions, to assess how location-specific factors impact green banking preferences. Preliminary findings indicate that Millennials and Generation Z show a higher inclination towards green banking, driven by increased environmental awareness and digital engagement. Generational demand was identified using a binary logistic regression, with the *p*-values for the Y and Z generations reported as 0.047 and 0.005, respectively. The coefficient value for Generation Y is 0.890, while for Generation Z, it is 1.232, indicating a positive demand for green banking. Conversely, Baby Boomers and Generation X demonstrate more cautious adoption, influenced by traditional banking practices. Geographic analysis reveals a pronounced disparity, with urban areas exhibiting a stronger demand for green banking due to better access to information and resources compared to rural regions. These insights highlight the need for targeted strategies that address generational and geographical differences to effectively promote green banking practices across Sri Lanka.

Keywords: *Green Banking, Generational Demand, Geographical Location*

A Sociological Study on the Changes in the Sri Lankan Education System Due to Online Education Popularised during the COVID -19 Pandemic

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The primary aim of this research was to examine the impact of changes in the Sri Lankan education system brought about by the widespread adoption of online education during the COVID-19 pandemic. Specifically, the study sought to assess how these changes affected both the social dynamics and educational outcomes of students. The research was conducted in the Madulla Divisional Secretariat Division of the Monaragala District, Uva Province. The study sample consisted of forty-eight participants selected through a combination of random and non-random sampling methods. The study employed a mixed-methods approach, combining quantitative data collection through structured questionnaires with qualitative insights gained from in-depth interviews with students, teachers, and educational administrators. Key findings highlighted technical challenges as significant barriers to the effective implementation of online education. Issues such as inadequate telephone signal coverage, financial constraints preventing access to necessary technology, and limited technical proficiency among educators and students emerged as critical challenges. Furthermore, the research identified a heightened risk of cyber-crimes affecting students, which contributed to reluctance among students to fully embrace online learning platforms. Moreover, the research underscored a preference prevalent among students for traditional, non-online educational methods despite efforts to integrate online systems. The data also indicated dissatisfaction among students and parents regarding governmental measures aimed at ensuring the success of online education initiatives. To address these challenges and enhance the effectiveness of online education in Sri Lanka, the study proposed several recommendations. These included improving telecommunications infrastructure, providing technical training for educators and students, raising awareness about cybersecurity risks, and formulating policies to support the integration and adoption of online educational tools effectively. Overall, the research underscores the complexities and challenges associated with transitioning to online education in Sri Lanka, emphasising the need for comprehensive strategies to address technical, educational, and social considerations to ensure the successful implementation and acceptance of online learning platforms.

Keywords: *Online Education, COVID-19 Pandemic, Technological Disparity, Economic Disparity, Sri Lanka*

Economic Violence by Intimate Partners against Women in Sri Lanka and Characteristics of Perpetrators

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Any act or behaviour causing economic harm to an individual is referred to as economic violence (EV). For women, EV is usually perpetrated by intimate partners through means such as 'control', 'exploitation' and 'sabotage' (restricting employment). This form of violence often receives less attention because its consequences are not as severe as those of sexual or physical violence, although it has significant implications – such as the female labour-force participation rate, which has oscillated around a low 35% for decades in Sri Lanka. The primary reason for this trend is that women must balance dual roles, often overshadowing other factors like sabotage. Economic barriers further prevent women from standing up to perpetrators. However, financial independence, security, and empowerment are essential for advancing gender equality and achieving the Sustainable Development Goals. Furthermore, in an aging society with a shrinking labor force, it is vital for more women to join the workforce. Identifying women who face economic violence and the men who perpetrate it is crucial to support them in resisting sabotage. The aim, therefore, is to identify women reporting sabotage and the characteristics of perpetrators, using secondary data from the 'Women's Wellbeing Survey' conducted by the Department of Census and Statistics (2020). Sabotage was reported by 239 women, 84.1% of whom were married, indicating that balancing dual roles was not the only reason for non-entry into the labour-force. Most perpetrators were in the age group of 35–50, while their wives were 30-45 corresponding to rearing age, during which husbands may prohibit their wives employment. The majority of perpetrators had education levels ranging from junior secondary to GCE A/L, while lower percentages represented both lower and higher education levels. Ninety percent were employed and five percent were retired. Only about 1% of the perpetrators were unemployed, indicating that women may need to work when their husbands were unemployed; this could be a form of economic exploitation. Lower levels of education were also associated with lower-level occupations and lower income, thereby necessitating the wife's employment. Findings suggest the need to promote economic empowerment by allowing women to enter the labour force and reducing the economic exploitation of women.

Keywords: *Economic Violence, Gender, Sri Lanka, Employment, Intimate Partners*

Community-based Reintegration of Former Combatants into Civilian Life: A Path to Lasting Stability in Post-War Sri Lanka

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Community-based reintegration of former combatants into civilian life is crucial for achieving lasting stability in post-war Sri Lanka. This paper argues for a community-centric approach, drawing on lessons from Burundi, the Democratic Republic of the Congo (DRC), and Liberia, where local initiatives have effectively facilitated the reintegration of ex-combatants. However, it acknowledges that community efforts cannot entirely replace the formal Disarmament, Demobilization, and Reintegration (DDR) programs implemented by the state. The discussion critiques the Sri Lankan state's DDR program, which has been influenced by Sinhala Buddhist nationalist narratives that often marginalise minority grievances and perpetuate the demonization of former combatants associated with the Liberation Tigers of Tamil Eelam (LTTE). This paper posits that the rehabilitation of ex-combatants must be intricately linked to broader reconciliation processes that address these grievances, suggesting that the state has a fundamental role in this task. Moreover, it emphasises the need to critically examine how the state's policies and practices affect the everyday lives of ex-combatants. The ongoing stigmatisation of former LTTE members as terrorists complicates their reintegration and perpetuates cycles of marginalisation and violence. By analysing the experiences of other post-conflict societies, this paper advocates for a more nuanced understanding of community-based reintegration that recognizes the complexities of social dynamics and the importance of inclusive, participatory approaches. In conclusion, while community initiatives hold promise for reintegration, the state must acknowledge its responsibilities and the historical context that shapes the experiences of former combatants. This dual approach is essential for fostering sustainable peace and addressing the underlying issues that contribute to conflict in Sri Lanka.

Keywords: *Community-Based Reintegration, DDR, Ex-Combatants, Post-Conflict Reconstruction, Reintegration*

Long-term Growth Scenarios for Sri Lanka

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In 2022, Sri Lanka's economy witnessed an unprecedented crisis causing severe hardships to people and businesses. The crisis has opened up an opportunity for Sri Lanka to embark on a radical reform process aiming at tapping its growth potential. On the eve of the elections, political leaders promised to make Sri Lanka a developed nation by 2050. In this backdrop, this study aims at examining long-term growth scenarios for Sri Lanka given her past performance and potentials. The study employs the Solow-Swan growth framework in constructing few long-term growth scenarios for Sri Lanka based on targets set in recent policy documents either approved by the parliament and/or proposed by the government. Accordingly, long-run growth scenarios were constructed in quantifying the growth effects of an increase in female labour force participation and FDI inflows as envisaged in the Economic Transformation bill of 2024. Additionally, growth effects due to an increase in TFP and human capital were constructed. Data for the simulation were extracted from national and international organisations. The simulation exercise indicates that growth cannot sustainably be accelerated and maintained at high level through the increase of inputs alone, namely, labour force and physical investment. In addition to the rise of those inputs, according to TFP and human capital scenarios 1 and 2, it is imperative to enhance productivity and human capital in the economy to achieve and maintain a high growth rate in the long-run. As the growth literature highlights economies need to enhance productivity significantly to graduate from middle-income status to high-income status. In other words, a sizable productivity enhancement is the key to avoid the middle-income trap. Radical reforms aiming at inefficient financial markets, poor infrastructure, low levels of innovation, weak institutions, inefficient labour markets and other structural weaknesses are of paramount importance in uncapping growth potentials via productivity improvement in Sri Lanka.

Keywords: *Economic Growth, Solow-Swan Model, Growth Projection, Sri Lanka*

Dance as a Strengths-Based Social Casework Approach: A Systematic Review of Direct Social Work Practice in Sri Lanka

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Integrating creative approaches into social work practice is essential, given its continually evolving nature. The primary objective of this systematic review is to utilise a social psychological framework to explore the significance of dance as a casework approach. The secondary objectives include exploring suitable dance styles for social casework within the Sri Lankan context, examining the integration of dance into various steps of the casework process, and analyse the therapeutic aspect of dance within the casework process. The study employs a qualitative approach, utilising secondary data sources such as peer-reviewed journal articles, research papers, and books. Thematic analysis is used to analyse the data, with all sources cited and acknowledged, emphasising credible and reliable materials from recognized experts and reputable platforms. In Sri Lanka, traditional and modern dance styles, such as contemporary dance and adaptive Bharatanatyam, offer valuable interventions for social work due to their symbolic communicative qualities. Contemporary dance involves improvisation and collaboration, reflecting diverse cultural backgrounds, while adaptive dance fosters inclusivity for individuals with differing abilities. Bharatanatyam, with its use of mudras, abhinaya, and padams, enhances physical health and well-being. Dance Movement Therapy (DMT) integrates a strengths-based perspective, promoting client empowerment through techniques like the Chace approach, Psychodynamic Oriented Dance Therapy, Authentic Movement, and Integrative Dance Therapy. These methods align with social casework principles, emphasising strengths (physical, social, cognitive, and psychological), deconstruction, discourse analysis, and narrative therapy to foster self-expression and holistic healing. In conclusion, the incorporation of dance into social casework not only enhances physical health and well-being but also provides a powerful means of communication and creative expression. By leveraging the therapeutic aspects of dance, social workers can effectively address and transform client situations, promoting holistic healing and growth. Future research should explore problem-specific studies to effectively integrate dance into social work interventions. Establishing 'dance for social work' as a sub-discipline is suggested, enabling social workers to utilise dance both for gathering client information and as an intervention method.

Keywords: *Dancing, Creative Approach, Social Casework, Social Psychology, Social Work*

Assessing the Sustainable Livelihood and Well-Being of Employed People in Sri Lanka

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Individuals need a sufficient income to fulfill their basic needs, including access to essential health services, to be considered as having a sustainable livelihood. The inability to achieve a sustainable level of income, even when employed, indicates a lack of a sustainable livelihood, which adversely affects welfare and economic stability. Using the 2019 poverty line, workers in the Labour Force Survey 2019 can be categorized as either working poor or non-poor. This study employs a cross-sectional regression analysis, including categorical variables, to identify the determinants that contribute to the non-poor group achieving a sustainable livelihood level. Subsequently, by identifying the significant variables in the regression, the study proposes transformations to the employment opportunities of the poor that could help them achieve a sustainable livelihood. Educational attainment, literacy, vocational training, and the sectors and industries in which workers are employed were found to be significant factors in ensuring a sustainable level of earnings. Workers in rural and estate areas fared worse than those employed in urban areas. Therefore, two conclusions may be drawn. Firstly, the state needs to continue focusing on educational development in general while also targeting literacy enhancement and the provision of vocational training opportunities for members of poor households. Secondly, the state should allocate resources and projects towards rural and estate sectors, where poverty is currently more prevalent.

Keywords: *Sustainable Livelihood, Mean Wage, Employed People, Agricultural Sector*

Easy-Attendance: A Smartphone-Based Student Attendance Marker

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Traditionally, student attendance has been taken using paper-based systems in almost all the education institutions in Sri Lanka. This practice has a number of limitations such as falsification, wastage of time, less flexibility, and misplacement of records. This study aims at designing/developing an online platform for attendance taking. A critical review of existing ICT-based solutions and a needs analysis was employed to gather the necessary input parameters. Moreover, limited expert discussions were held in determining output parameters in recognizing the pros and cons of existing systems. Among attendance systems such as RFID, fingerprint, voice recognition, iris recognition, facial recognition, QR code, and embedded systems, smartphone based systems use low resources, consume less time in marking attendance, and are adaptable to different environments. The proposed system captures the GPS location with IP address and confirms the students' presence by taking the displacement between student and lecturer position provided both fall within a radius thereby minimising fraudulent usage. This system works as follows. First, the lecturer creates a session for the lecture and the system will take the lecturer's location and create an OTP (One Time Password), and it is sent to students via SMS. Second, once students enter the OTP, the system will get the student's location and IP address of the smart-phone. Finally, the system confirms the attendance and saves these records in the database. The designed system is a low-cost solution suitable for public sector institutions. The database allows generating recorded information in multiple dimensions. Moreover, the system is user-friendly, quite fast, and efficient despite the class size. This system enhances evidence-based decision making in improving student-based teaching and learning as well as administration. The system is expected to be deployed in the Faculty of Arts, University of Colombo. It is expected to do a critical post-evaluation to introduce necessary modifications in the future.

Keywords: *Smartphone, Attendance Marking System, GPS, IP Address, Low Cost*

Perceptions of the Science-Religion Conflict and Compatibility: A Comparative Study among Religious Groups in Sri Lanka

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The relationship between science and religion remains a complex and multifaceted issue, influenced by individual perspectives and cultural contexts. The main purpose of this study is to examine the perceptions of the conflict and compatibility between science and religion across various religious groups in Sri Lanka. This study investigates the research questions concerning the perceptions of the nexus between science and religion among different religious groups, the influence of scientific identification and religious affiliation on individual religious perceptions, and the ways in which cultural identities impact religious behavior. Since this was a comparative study, a total of four hundred questionnaires were completed for this study using random sampling techniques across four religions (Buddhism, Hinduism, Islam, and Christianity/Catholicism) in Sri Lanka in 2022. In adherence to ethical standards, adults over 18 years or older were recruited to the research sample. It was expected that they would possess understanding and would be able to share regarding their religious behaviour and perceptions. Social Identity Theory was used for this research and the data was analysed using statistical analysis methods. Results reveal that Christians perceive a higher conflict between science and religion compared to other groups, despite a similar level of engagement with science. Islam identifies more strongly with religion than science, indicating a unique view of compatibility. Religion is often seen as a personal belief by Islam and Christians, while Hindus view it more as cultural, and Buddhists see it as both. Buddhists and Hindus slightly favoured scientists over ingroup members, suggesting trust in science, whereas Islam and Christians exhibit an ingroup bias, valuing the intelligence of community members over scientific professionals. These findings reveal diverse perspectives on the conflict and compatibility of science and religion in Sri Lanka, highlighting how religious identity shapes attitudes towards these domains and illustrates broader societal implications.

Keywords: *Science, Religion, Conflict, Compatibility, Perceptions*

Impact of Poverty on Educational Attainment in Sri Lanka

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This research explores the relationship between poverty and educational attainment in Sri Lanka. Despite the country's provision of free education, socioeconomic disparities continue to hinder access to education and the continuation of education. The study focuses on the impact of poverty in both absolute and relative terms, particularly at the General Certificate of Education Advanced Level, a critical stage in post-mandatory education. Using data from the 2019 Household Income and Expenditure Survey, this study analyses the effects of demographic factors, income, and family background across all districts, sectors, and ethnicities on educational attainment in Sri Lanka. The study employs logistic regression analysis to identify how different aspects of poverty influence educational attainment in Sri Lanka. Factors for consideration were chosen based on an in-depth review of the literature and a preliminary analysis of the dataset using descriptive methods and inferential tools such as the t-test and chi-squared test. Findings reveal that poverty-related factors like parental education, household size, income, and multidimensional poverty index scores all impact educational outcomes, highlighting the significant role of poverty in educational attainment at this academic level. Regional and sectoral disparities in the availability and quality of schooling also appear to drive inequalities in attainment. Furthermore, it was observed that many youth abandon their schooling to enter the workforce early. This research underscores the urgency of understanding the implications of poverty for educational outcomes and offers actionable insights for policymakers striving to promote inclusive education systems and socioeconomic development in Sri Lanka.

Keywords: *Free Education, Poverty, Socioeconomic Background*

A Comparison of Syntactic Integration of Borrowings in Spoken and Written Sri Lankan English

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Languages in contact situations over a lengthy period, borrow words from one into another. These borrowed words are transferred from a donor language and integrated morphologically, syntactically, and phonologically into a recipient or main language. In addition, established borrowings show multiple occurrences that denote acceptance by the speech community. There is ongoing debate on nonce borrowings that occur once in the data, indicating new developments in the language. This study investigates spoken data from Sri Lankan English (SLE) to compare the strategies used in it with those used in written data to syntactically integrate borrowings. The data for the study was taken from the spoken corpus of the International Corpus of English (ICE) compiled for research into varieties of Englishes. Syntactic integration and multiple occurrences in more than one text (frequency and dispersion) of transferred words were criteria used to identify borrowings in this study. While the total number of the borrowings was much less in the spoken data, both genres showed that the noun borrowings outnumber other syntactic categories. As such, phrases were analysed revealing that the borrowings were noted in noun, prepositional, and infinitive phrases with articles, demonstrative pronouns and possessive pronouns being used to integrate nouns into the language. Adjectives were noted in both attributive and predicative positions in the two genres. Interjections noted at sentence periphery showed no integration. Although the written data showed neat integration of borrowings into the recipient language according to core English grammar and word order, the spoken data showed constant reformulation and repetition. The spoken genre contained more Sri Lankan features such as the question tag no, missing verbs, and culture-specific expressions. The spoken genre showed the willingness of the speakers to allow SLE features, whereas there was tighter censorship of such features in the written genres, indicating choices made by the language users.

Keywords: *Borrowings, Sri Lankan English, Syntactic Integration, Frequency, Corpus Data*

Exploring the Proliferation of Hate Speech against Women on Social Media

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With the unique nature of social media, the spread of hate speech takes different formations. This has become a considerable issue in silencing women online, creating an obstructive atmosphere in the public cyberspace. The free space on Facebook allows users to comment debate and share their ideas which also results in the acceleration of different forms of hate speech. Thus, this research focuses on how hate speech against women proliferated in various forms on Facebook by giving special attention to how hate speech prevails in different formats and how the content of hate speech is formed. For this purpose, the study incorporated an online questionnaire to collect data from female Facebook users and semi-structured interviews with selected respondents and online observations to explore various forms of hate speech. Special attention was paid to the text of the messages with words, phrases, and emojis attached to the messages. One of the main forms of hate speech identified is gender-trolling where an attempt is made to distract the target from real conversations by provoking intense annoyance. Furthermore, extremely rude, misogynistic ideas were presented in the form of jokes that used humour to ridicule the victim. Additionally, jokes were often presented with emojis to convey more intense sarcasm that extended beyond the text of the messages. Moreover, women who refused to accept the stereotypes of viewing women as reproducers and nurturers were subject to gender-based insults. As such, increased hateful communication on social media constructed the reality of the social world of women. Women's identity is formed in this social process and it is maintained, modified, and reshaped by society. Therefore, hate speech has the power to influence others' views on minorities which leads to unequal treatment towards women.

Keywords: *Gender-Trolling, Jokes, Emojis, Flaming, Reality*

The Role of the Judiciary in Creating Social Justice: A Study of the Jai-Bhim Movie

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"Jai Bhim," a film directed by T.J. Gnanavel, critically examines the systemic injustices and caste-based discrimination prevalent in contemporary South Indian society, spotlighting the entrenched corruption within the judiciary and police force. Set against the backdrop of the real-life struggles of the Irula tribal community, the film narrates the story of Rajakannu, a labourer wrongfully accused of theft, and his subsequent torture and death in police custody. Through a qualitative content analysis, this study explores the film's narrative, character development, and thematic elements, supplemented by secondary sources to provide context on its impact and reception. "Jai Bhim" highlights the persistent societal challenges faced by marginalised communities, particularly the violation of human rights, and the misuse of legal power, emphasising the critical role of legal advocacy in championing social justice. The film not only depicts the harrowing realities of police brutality but also celebrates the efforts of individuals like the character Chandru, a lawyer whose commitment to justice exemplifies the potential of the legal system to effect significant societal change. By drawing parallels to Dr. B.R. Ambedkar's vision and legacy, the film reinforces the ongoing struggle against oppression and the importance of a transparent, accountable legal framework in upholding democratic ideals. This study underscores the film's relevance not just within the Indian context but also as a universal narrative on the importance of legal integrity and human rights, making it a poignant example of how cinema can influence social reform and legal consciousness.

Keywords: *Caste Discrimination, Legal Advocacy, Human Rights*

Critically Analysing the Existing Sri Lankan Air Force Capabilities to Cater to Future Maritime Disasters, Search, and Rescue in Sri Lanka

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This study evaluates the capabilities of the Sri Lankan Air Force (SLAF) to meet the future demand for maritime search and rescue (MSAR) operations in Sri Lanka over the next five years. Using historical data from 2017 to 2023, we conducted a comprehensive analysis incorporating forecasting, risk assessment, probability modelling, and scenario planning. Our findings indicate a steady rise in the number of MSAR incidents, with forecasted values increasing from 340 incidents in 2024 to 440 by 2028. Monthly incident data reveal that December consistently records the highest number of incidents, with a projected value of 59 incidents by 2028. The risk assessment identified technical breakdowns of fishing vessels as the most frequent incident type, averaging 104.33 incidents per year. Other significant incident types include communication failures, medical emergencies, and capsizing. Analysing vessel types, Sri Lankan fishing vessels were found to be the most vulnerable, with an average of 1209 incidents over the study period, followed by merchant vessels with 223 incidents. The study further highlights the distribution of incidents across the year, with August and December showing peak frequencies of 157 and 184 incidents, respectively. These patterns underscore the need for enhanced preparedness during these months. The study advocates for the adoption of advanced surveillance technologies, improved communication systems, and international collaborations to enhance SLAF's MSAR capabilities. Sustained investment in these areas will not only bolster operational readiness but also ensure that SLAF can continue to protect Sri Lanka's maritime assets and manage future MSAR operations effectively. The integration of resource sustainability into long-term planning is crucial for maintaining resilience in the face of increasing maritime risks. Our SWOT analysis reveals that while the SLAF possesses significant strengths in training and technological resources, there are notable weaknesses in areas such as equipment modernization and response time. Opportunities include leveraging international cooperation and technological advancements, while threats encompass increasing maritime traffic and environmental challenges. Although the SLAF is currently positioned to handle the forecasted increase in MSAR demand, strategic improvements are essential to enhance response efficiency and resource allocation. The findings provide a data-driven basis for strengthening SLAF's MSAR capabilities, ensuring maritime safety and security in Sri Lankan waters.

Keywords: *Marine Search and Rescue, Sri Lankan Air Force, Maritime Safety, MSAR Operations, Maritime Trade, Risk Forecasting*

The Gender Wage Gap in Sri Lanka's Logistics and Maritime Industry

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This study investigates the impact of gender in determining the earnings in Sri Lanka's logistics and maritime industry, a crucial sector for the country's economy. The importance of this research is underscored by the logistics and maritime industry's significant role in economic development and the broader context of gender wage disparities. Previous research in Sri Lanka has shown a persistent gender pay gap in the labour force, even though females often have higher educational achievements. However, no specific studies have addressed the logistics and maritime sectors in Sri Lanka, though a few have examined the overall labour force. This study fills that gap by employing Ordinary Least Squares (OLS) regression to identify wage determinants and the Oaxaca-Blinder decomposition method to analyse the wage gap. Data was collected through an online survey of 400 employees with 97.5 percent response rate based in Colombo, selected using snowball sampling. The OLS results reveal that being female is associated with earning approximately 16 percent less per hour than a male counterpart. Decomposition analysis further shows that out of the overall wage difference of 36.24 percent, 53.3 percent can be explained by productive characteristics such as education and experience, while 46.7 percent remains unexplained, suggesting potential gender-based discrimination. The fact that the explained portion of the wage gap is significantly higher indicates that productive characteristics have a more substantial impact on wage disparities. Consequently, recommendations are designed with more weight given to these productive characteristics, while also addressing unexplained factors to reduce the wage gap effectively. These findings highlight the need for targeted policies to address gender wage disparities and promote equitable compensation practices within Sri Lanka's logistics and maritime industries.

Keywords: *Decomposition, Sri Lankan Labour Market, Logistics and Maritime Industry, Wage, Disparities*

Emerging Trends in the Spatio-Temporal Epidemiology of Tuberculosis in Sri Lanka: (2021-2023)

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Tuberculosis (TB) remains a critical global health challenge, affecting a substantial portion of the population worldwide. Despite efforts to control it, TB persists as a leading cause of mortality among infectious diseases, with significant burdens, especially in developing countries. Sri Lanka, historically with a low TB prevalence, faces persistent challenges despite improvements in public health infrastructure. This study aims to explore the spatial-temporal characteristics and epidemiology of TB in Sri Lanka from 2021 to 2023, employing time series analysis and spatial mapping techniques. TB incidence data spanning three years were collected from Sri Lanka's Epidemiology Unit. Statistical analyses included ANOVA to assess temporal variations and choropleth mapping in ArcGIS to visualise spatial patterns. A time series analysis was conducted to forecast future trends in TB incidence across nine provinces. ANOVA revealed significant temporal and provincial differences in TB cases ($F = 42.92$, $p < 0.05$), highlighting varying burdens across Sri Lanka. Spatial analysis identified clusters in the Central and Western provinces, consistently reporting higher incidence rates. Time series analysis indicated a positive trend in TB cases for all provinces, influenced by factors such as rapid urbanisation and environmental conditions. The study underscores the increasing trend of TB in Sri Lanka from 2021 to 2023, with notable geographic clusters and future projections suggesting continued challenges. Addressing TB effectively requires a comprehensive understanding and integration of socioeconomic, climatic, and demographic factors into future research and policy frameworks. Enhanced surveillance and proactive interventions are crucial to mitigate TB's impact and improve public health outcomes in Sri Lanka.

Keywords: *Epidemiology, Public Health, Spatial-Temporal Analysis, Sri Lanka, Time Series Analysis, Tuberculosis*

Vulnerability of Groups that are Traditionally Considered Resilient Living in Flood Prone Areas: Are They "Less Vulnerable"?

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The increased frequency and intensity of rainfall in most parts of the world have increased the flood hazard. Most flood vulnerability research emphasizes that groups such as the socially marginalised, aged, young, or people with low income and disabilities are more vulnerable to flood hazards. Conversely, some research has pointed out that groups such as those who decide to stay in shelter-in-place households (from high-income groups) are more vulnerable to infrastructure-related disruptions caused by hazards. These ideas challenge the traditional view that people who own multi-storied houses (shelter-in-place houses) are less vulnerable to hazards. Therefore, it is important to reconsider whether these groups, traditionally identified as resilient, are less vulnerable to hazards and what makes them vulnerable to these hazards. Taking the Kaduwela urban area in Sri Lanka as a case study, this research aims to examine how communities that are traditionally considered resilient become vulnerable to floods. In-depth interviews were conducted for 13 households that were selected using the purposive sampling method, and data was analysed qualitatively using thematic analysis. This study discovered how less vulnerable communities who were well prepared for the flood event of 2016 became vulnerable during the event of the disaster due to new vulnerabilities created mainly through the exposure of shelter-in-place households to unexpected floodwater levels. These new vulnerabilities that arose during the event resulted in more disastrous impacts. This research argues that the vulnerability of the people who are traditionally considered resilient changes based on the time or situation. Thus, it is a "time/situation-bound vulnerability". The study also emphasises the need for these missing aspects to be considered in emergency management and policy-making. This study further highlights how disaster management activities during the event of a disaster could be less inclusive and misleading if these groups are excluded just because of their socio-economic stability.

Keywords: *Resilience, Vulnerability, Urban, Floods, New Vulnerabilities*

The Digital Panopticon: A Critical Discourse Analysis of the Online Safety Act, No. 9 of 2024

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The rapidly evolving digital landscape in the 21st century has taken on a life of its own, much like a modern-day Frankenstein's monster, driven by the actions and innovations of millions across the globe. While witnessing modern-day technological advancements is exhilarating, their ramifications are equally chilling. Increasing online activity has made the implementation of robust online safety legislation the need of the hour. In light of this, the controversial enactment of the Online Safety Act No. 9, 2024 (OSA) in Sri Lanka merits discussion. This research does not aim to explore the legality of the legislation but rather concentrates on examining the language of the legislative text. Through the lens of Critical Discourse Analysis (CDA), this study investigates how the language of the Act enforces and maintains unequal power dynamics and unveils the broader social and political ramifications of such discourse. The findings of this research reveal that a direct correlation can be drawn between the language of the law and the power of the state. It also demonstrates that the efforts of the state to regulate the activity of netizens through the use of state policy may lead to a potential infringement of individual rights. While emphasising on safety and protection as its key discursive strategy, the OSA implicitly asserts the discretionary power vested in the authorities to set standards and regulate behaviour in digital spaces. Moving away from the political and legal debates surrounding the enactment of this piece of legislation, this study examines the legislative text as discourse in order to shed light on what sits beneath its straitjacket of legal jargon.

Keywords: *Critical Discourse Analysis, Digital, Language, Online Safety Act, Power*

A Study on Utilisation of Technology-Driven Media Tools in Managing Disasters

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Information and media play a crucial role in various stages of disaster management, including the predisaster, disaster, and post-disaster phases. They significantly influence awareness, mitigation, recovery, and reintegration efforts. Providing relevant information at the appropriate time is essential in disaster management and can serve as a powerful tool during the reintegration process. This study aims to investigate the use of technology-driven media tools in managing disasters, with a particular focus on floods, and to examine their roles across these three distinct stages. The primary objective is to investigate how Sri Lanka can leverage communication and technology-driven media tools for disaster management, given that many developed and developing countries have already effectively utilized these tools for similar efforts. The study also explores the communication needs of affected communities throughout the three phases of flooding and assesses the role of media in finding durable solutions for resilience. The main argument of the study is that information and media play an important role in disaster management and can be utilised effectively to enhance communication during the reintegration process of affected communities. This study employs a mixed-method research design, incorporating both qualitative and quantitative approaches. Surveys were conducted to gather data on the importance of information provision, modes of information dissemination, and the use of technology-driven media tools in disaster management in Paraduwa South, Akuressa, and Gampaha town, Sri Lanka. The study identifies an information gap in disaster management and finds that media do not currently play a pivotal role across the three phases of disaster management. Regional differences were also identified in media utilisation with a significantly higher usage of modern technologies in urban areas than in rural areas. It suggests that innovative communication tools and approaches could strengthen all three stages and provides insights into optimising communication strategies to better support affected and vulnerable communities.

Keywords: *Disaster, Disaster Management, Media, Information, Technology-Driven Media Tools*

FACULTY OF EDUCATION

Building a Sustainable Future through Impactful Educational Research

29th of November 2024

MESSAGE FROM THE DEAN

Dr. L. M. K. Bandara

Dean
Faculty of Education
University of Colombo, Sri Lanka

It gives me great pleasure to send this message for the Annual Research Symposium - 2024 of the University of Colombo. The Faculty of Education played an active role in this important annual academic event by hosting its 4th International Research Symposium - EDIRS 2024 on November 29, 2024, under the theme of 'Building a Sustainable Future through Impactful Educational Research'. This year, the keynote address on this theme will be delivered by Prof. Piotr T. Nowakowski, Rzeszow University, Poland.

New scientific knowledge generated and refined through educational research is highly required not only for the field of education but also across other sectors in Sri Lanka to address the unresolved issues pertaining to the sustainable development and to thrive amidst emerging challenges. The findings of more than 55 research studies conducted by researchers from various educational institutes in Sri Lanka, as well as other countries around the world, will be presented at this Symposium. I firmly believe that this Symposium will provide a platform for creating novel discourse on educational research and contribute to bridging gaps in the field of educational research, thereby fostering greater enthusiasm among young researchers in Sri Lanka.

I would like to extend my sincere gratitude to the Chair and Co-Chair of the Annual Research Symposium 2024 of the Faculty of Education, as well as to everyone who contributed to making this event a success and a reality. I congratulate all the presenters and wish them success in their future endeavors. Finally, I convey my best wishes for a successful Annual Research Symposium in 2024.

MESSAGE FROM THE SYMPOSIUM CO-CHAIRS

Dr. Lanka Wedikandage

Department of Social Science Education
Faculty of Education
University of Colombo, Sri Lanka

Ms. R.A.B.U.I. Perera

Department of Educational Psychology
Faculty of Education
University of Colombo, Sri Lanka

We are honored to extend our greetings to the esteemed International Research Symposium (EDIRS) 2024, hosted by the Faculty of Education, University of Colombo. This annual event serves as an invaluable platform for showcasing the research capabilities of our faculty. It is centered on the theme "Building a sustainable future through impactful educational research," aligning with the overarching theme of the University Congress. This symposium offers an opportunity to exchange insights, foster collaborative ideas, and explore pioneering approaches that will propel our field forward.

The conference is scheduled to take place on the 29th of November 2024, with a physical presence at the Education Lecture Theater at the Faculty of Education while offering an online participation option for international attendees. Following a rigorous blind peer review process involving over 65 reviewers and stringent plagiarism checks, we are proud to have accepted 55 full papers. This year, we are introducing poster presentations for MPhil/PhD students of the Faculty of Education, providing a platform for 65 full-time and part-time students to showcase their research prowess at the symposium.

Furthermore, selected papers from EDIRS 2024 will have the opportunity to be published in the *International Journals of Social Science Education* (IJSSE), *Science and Technology Education* (IJSTS), *Humanities Education* (IJHE), *Educational Psychology* (IJEP), and the *Sri Lanka Journal of Education* (SLJE), enabling wider international dissemination after the conference. EDIRS 2024 promises to be a groundbreaking platform for researchers to disseminate their findings and acquire new knowledge, bolstering and enriching their academic endeavors.

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SYMPOSIUM PROGRAMME

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Dean of the Faculty of Education</td></tr>
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INTRODUCTION TO THE KEYNOTE SPEAKER

Professor Piotr Tomasz Nowakowski

College of Social Sciences
Institute of Education
Rzeszów University
Poland

Professor Nowakowski is a highly esteemed Polish scholar affiliated with Rzeszów University. He is widely recognized for his significant and diverse contributions to higher education, educational theory, educational leadership, communication and media, qualitative social research, and urban/rural sociology. He earned his PhD in pedagogy from the Catholic University of Lublin, Poland, in 2003. Professor Nowakowski's research interests encompass a broad spectrum, including public safety, social pathologies, social prevention, social rehabilitation, philosophy of education, and health education. His work is dedicated to addressing pressing societal issues and developing innovative strategies for social progress and educational reform. Professor Nowakowski is a prolific and influential researcher with over ten published books, more than 50 research publications, and numerous conference papers across these domains. In addition, he serves as the chairperson of the ICSA Education Network in Florida, USA. His exemplary academic service has been recognized with several awards, including the prestigious Editor's Reviewer Excellent Award for his contributions to the *Educational Technology Research and Development Journal* in 2022.

ABSTRACT OF THE KEYNOTE ADDRESS

Building a Sustainable Future through Impactful Education Research

Professor Piotr T. Nowakowsk

College of Social Sciences, Institute of Education, Rzeszów University, Poland

Sustainable development is a process that aims to meet the aspirations of the present generation while enabling future generations to achieve them. This does not only mean environmental protection but also the issues of poverty, gender equality, human rights, health, and intercultural dialogue. The history of the concept goes back a long way. The first UNESCO Intergovernmental Conference of Experts in 1968 was devoted to the interconnections between environment and development. It was then that the international programme "Man and the Biosphere" (MAB) was created, which paved the way for global actions for sustainable development. Later, in 1987, the report of the UN World Commission on Environment and Development defined the concept of "Sustainable Development". In this historical context, the need for educational research seems obvious, which will play an important role in shaping the awareness of future generations about sustainable development and their responsibility in this regard. It is, therefore, worth noting the main aspects of educational research that would serve to build a sustainable future: (1) raising awareness – research helps to understand how students perceive sustainable development and what knowledge they have on the subject, enabling curricula to better meet educational needs; (2) developing competences – research identifies key competences that students should develop in the context of sustainable development, such as critical thinking, problem-solving skills, cooperation, and social responsibility; (3) assessing the effectiveness of curricula – research makes it possible to assess which teaching methods are most effective in promoting sustainable development, which allows for continuous improvement of educational programmes; (4) supporting educational policy – research results can be used to shape educational policy at local, national, and international levels, and thus help create educational strategies for sustainable development; (5) promoting innovation – research can inspire the introduction of innovative teaching methods and educational tools that engage students through active learning. It should be added that implementing educational research for sustainable development requires a multi-faceted approach that includes both theoretical and practical aspects.

FACULTY OF EDUCATION
List of Abstracts

Bridging the Gap between Curriculum and Practice: Enhancing Performance in Chemistry and Physics of G.C.E (O/L) Students in Sri Lankan Schools

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The conventional teaching approach in Sri Lankan secondary schools predominantly centers around teacher-directed learning, particularly in the domain of science education. Despite students' proficiency in examination outcomes, there remains a noticeable gap between their theoretical knowledge and practical application, notably discernible in their performance across different branches of science. Notably, students tend to exhibit lower achievement levels in Physics and Chemistry compared to Biology and Environmental Science. This study proposes a framework informed by constructivist theory to enhance student performance. In the constructivist paradigm, students actively engage in setting their own learning goals and objectives, albeit under the guidance and support of their teachers. Under the quantitative paradigm, a quasi-experimental, non-randomized control group pre-test-post-test design was employed in three schools (Type 1 AB, Type 2, and Type C), involving grade 11 students (N = 280). The intervention based on constructivist approaches included detailed lesson plans, worksheets, and questionnaires for both students and teachers. The data were analyzed using the Paired T-test. The results revealed a significant difference in the performance of students in seven classes (calculated t-values for six classes were $t = .000$, $p < 0.001$, while for one class, $t = .002$, $p > 0.05$) after the intervention, while the difference was insignificant in two classes. The results highlighted the potential of constructivist approaches in bridging the gap between theoretical understanding and practical application in science education. This underscores the effectiveness of student-centered approaches in enhancing educational outcomes and advocates for their broader implementation in science education.

Keywords: *Constructivist Theory, Intervention, Performance, Science Education*

Career Guidance Program and Practical Issues Associated with Student Counselling Teachers in Secondary Schools

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This study, conducted using a qualitative research approach, explores the career guidance programs and practical issues associated with student counselling teachers in secondary schools in Sri Lanka. Career guidance, a critical component of student counselling, helps students navigate educational and career pathways but faces several urgent challenges in practical implementation within schools. The study's objectives were to assess how career guidance and counselling programs are implemented at the school level, investigate the role of guidance and counselling teachers in secondary schools, examine the challenges they face, and propose solutions to streamline the school career guidance and counselling process. The study employed a descriptive research method, examining four selected secondary schools. The research identifies significant challenges that student counselling teachers encounter in administering career guidance programs. These include inadequate training, lack of resources, limited institutional support, and insufficient integration of counselling within the school curriculum. The study highlights a general lack of emphasis on student counselling, which further hampers the effectiveness of career guidance efforts. Data analysis reveals that these challenges adversely affect the successful delivery of career guidance programs. The lack of focused attention on student career guidance and counselling undermines the ability of teachers to address students' diverse career interests and educational needs. To address these challenges, the study suggests several urgent measures, including enhanced training for student counselling teachers, better resource allocation, and more robust integration of counselling practices within the school system.

Keywords: *Career Guidance, Student Counselling, Secondary Schools*

Feminization of the Teaching Profession and Student Educational Achievement: A Literature Review

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This research paper is a literature review on the relationship between feminization of the teaching profession and students' academic achievement. Descriptive qualitative methods were used for the literature review of the research paper. According to the results of the literature review, the teaching profession can be described as a feminized profession. Results also revealed that the influential factors such as the nature of the job and social expectations including expectation of motherly characteristics from the teacher had led women to enter the teaching profession more. Although there was no clear relationship between the gender of the teacher and the educational achievements of the students, the role of the teacher as a role model had an impact on the students because the students regarded the teacher as a guide and counsellor. According to the literature review, results also revealed that when male teachers were engaged in teaching, students were more actively engaged in the learning process and that the classroom management skills of female teachers were higher than male teachers.

Keywords: *Teaching Profession, Gender, Feminization, Educational Achievement, Role Model*

The Principal's Role in School-based Management for the Development of Small Schools in Sri Lanka

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School-based management has decentralized the decision-making authority to the school level as an administrative unit, enabling development based on capacity and local needs. This paper aims to investigate the role of the principal in school-based management for the development of small schools in Sri Lanka. Specific objectives are to examine school-based strategies that the principal implements and the issues and challenges involved when implementing school-based strategies. This research was carried out using a qualitative research approach, with three schools having less than one hundred students as the sample. Qualitative data collection methods were utilized including interviews, observations, focus group discussions, and documentary analysis to collect and cross-verify data. The findings indicate that the principal of School A effectively utilized the school-based planning strategies, including SWOC analysis and participatory decision-making, with the support of the School Development Executive Committee. Moreover, several initiatives have been conducted to improve the quality of education, encompassing activities regarding increasing student access, increasing student achievement, promoting horticulture, and strengthening student welfare and nutrition. On the other hand, the School B principal also practices school-level planning with minimal support from the school community, which hinders progress due to their lack of endorsement. School C, declining due to past administrative issues, has now set off on a path towards improvement with the community's backing from the principal. All three principals face obstacles such as limited student enrollment, insufficient government funding, and socio-economic challenges faced by parents, primarily stemming from nearby schools. A positive relationship was observed among the principal, teachers, and the community in the two schools (A and C). In contrast, the lack of a relationship in the remaining school had a negative impact on school development, particularly on the teaching and learning process. The study recommends providing capacity-building programs and experience-sharing opportunities for these principals. Additionally, it is recommended that motivational events be hosted and positive reinforcement offered to teachers in these small schools.

Keywords: *School-Based Management, Small Schools, Principal's Role*

Thirteen–Year Guaranteed Education in Sri Lanka: A Literature Review

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[2]*Department of Social Science Education, Faculty of Education, University of Colombo, Sri Lanka*

Sri Lanka provides free educational opportunities to all children, including welfare facilities. Each year, more than three hundred thousand children are admitted to grade one in the Sri Lankan education system. Of these students, approximately 80,000 students drop out annually because they must pass the Ordinary Level (O/L) examinations to qualify for Advanced Level studies. The majority of these students enter manual labor in various industries with low salaries. The Thirteen Years of Guaranteed Education Programme (13 YGEP), introduced in 2017, is a vocational subject stream added to the school curriculum. It offers a new pathway for students who fail the GCE O/L examinations, allowing them to study vocational subjects at school. This study aims to examine the current working conditions of the Thirteen Years of Guaranteed Education Programme (13 YGEP). This paper presents a literature review focused on vocational education in Sri Lanka. Results revealed that only a limited number of studies have been conducted on vocational education in Sri Lanka. However, the literature review revealed that students who failed the General Certificate of Education (GCE) examination should have opportunities to advance in other fields, as they faced significant challenges in their lives. It was found that unemployment issues could be addressed through more practical and career-oriented educational opportunities, rather than focusing solely on theoretical subjects. Therefore, students should be allowed to choose professional subjects that align with their abilities and interests, preparing them effectively for the future.

Keywords: *Vocational Education, Government Schools, General Certificate Examination Ordinary/ Level*

Unlocking Self-Directed Learning Readiness: A Systematic Exploration of Influential Factors

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Self-Directed Learning Readiness (SDLR) is critical in contemporary education, enabling learners to take ownership of their learning processes. This systematic literature review consolidates insights from 23 studies published between 1986 and 2023 to analyze factors influencing SDLR across diverse educational contexts. The methodology included a rigorous selection process using scholarly databases and search engines. Inclusion criteria ensured relevance and quality, targeting studies on SDLR in educational settings. A standardized extraction form captured study details, while thematic analysis identified recurring themes. Biases were minimized through a systematic approach to both literature selection and data extraction. The review identified 50 factors influencing SDLR, categorized into five themes: Student-related, contextual, teacher-related, sociocultural, and technological. Student-related factors were further divided into personal attributes, psychological, cognitive, and behavioral factors. Contextual factors were grouped into environmental, interpersonal, and institutional subthemes. Teacher-related factors included instructional approaches, support, feedback, sociocultural influences, academic landscape, and technological factors such as access, competencies, and integration. Key findings reveal that student traits, such as motivation and self-efficacy, contextual elements like family support and learning environments, and teacher-related practices significantly influence readiness for self-directed learning (SDLR). Sociocultural influences and technological advancements also play critical roles on shaping learning approaches and providing supportive tools. This study offers a comprehensive framework for identifying and categorizing factors influencing SDLR, highlighting the importance of understanding these dynamics to inform tailored educational strategies and policies. By addressing these factors, educators and policymakers can create environments that foster self-directed learning, equipping students with essential skills for lifelong learning and success in an increasingly complex world.

Keywords: *Self-Directed Learning Readiness, Factors Affecting Online Learning, Student Autonomy, Self-Efficacy*

The Impact of the Teaching Methodology on Learning Geometrical Concepts of Senior Secondary Students

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Geometry is essential in everyday life and plays a significant role in mathematics education. Student performance in geometry is influenced by various factors, including teacher-related, school-related, and student-related factors. This study focuses on teacher-related factors for practical reasons, with teaching methodology identified as the primary factor, categorized into three components: Teaching strategies, teacher knowledge, and learning theory. The purpose of this study was to analyze the impact of teaching methodology on the development of geometric knowledge and skills in secondary schools in the Jaffna district. A mixed-methods design was used to collect data. A sample of 379 students and 50 teachers was drawn from 22 different schools in Jaffna district educational zones using purposive sampling. The sample also included in-service advisors for mathematics, additional directors of mathematics, and subject coordinators of mathematics. Data for the study was collected through questionnaires, interviews, and a geometry achievement test. To assess whether students developed geometric knowledge and skills, a geometry achievement test was administered. The analysis was conducted to examine the impact of the teaching methodology on the development of geometric knowledge and skills. Regression analysis was used to assess the impact of each component, and thematic analysis was employed to analyze qualitative data. By utilizing both techniques, results revealed that teaching methodology significantly impacted the development of geometric knowledge and skills. Moreover, the results indicated that while all three components of the teaching methodology - teaching strategies, teacher knowledge, and learning theory - impacted the development of geometric knowledge and skills, teaching strategies and teacher knowledge had a greater influence than learning theory.

Keywords: *Concepts, Achievement, Geometry, Factors, Impact*

Revitalizing Online Education Systems to Address Challenges during Crises: Perspectives of Pre-Service Teachers in Teacher Education in an E-learning Flipped Classroom Environment

F.N. Wickremasinghe, E. S. Neranjani

Department of Humanities Education, Faculty of Education, University of Colombo, Sri Lanka

The COVID-19 pandemic compelled teachers and students around the world to adapt to new and alternative learning methods. The global outbreak of the COVID-19 served as an effective catalyst for transforming educational institutions to deliver knowledge through web-based technology. This study explores pre-service teachers' perspectives on the effectiveness of the e-learning flipped approach as an instructional strategy in teacher education in the post-pandemic era. Data were collected through focus groups, face-to-face interviews, and lesson observations. The implementation was carried out for 24-week period. Google Classroom and Zoom were used as online instructional platforms, with learning materials structured around Bloom's Taxonomy. A five-step flipped learning strategy referred to as Realize (understand), Reconnoitre (explore), Revelation (experience), Rehearse (practice), and Review (evaluate) was developed in carrying out the course. Thematic analysis highlighted the flipped classroom as an effective instructional strategy, offering benefits such as learning flexibility, a positive psychological state, and improved management of synchronous and asynchronous learning environments. However, challenges related to technology and the pre-preparation process were observed. The study offers valuable insights into the flipped classroom as an effective instructional strategy for scholars and trainers. It demonstrates that this approach can be applied during modern crises, such as school and university closures due to floods or strikes, to ensure uninterrupted learning. Further research is recommended to explore the optimal online learning experience, which represents the future of education and supports continued learning during crises.

Keywords: *Teacher Education, E-Learning Platform, Flipped Classroom, Crisis*

Obstacles in Career Aspirations of Advanced Level Students in Sri Lanka

W. M. C. S. Wijesinghe[1], E. Randeniya[2]

[1] *WP/KV/President's College, Kadawatha, Sri Lanka*
[2]*Department of Education Psychology, Faculty of Education, University of Colombo, Sri Lanka*

There is widespread discussion about the lack of career orientation in the Sri Lankan education system. Career counselors assert that students can make successful career choices by selecting appropriate subject streams in the G.C.E. (Advanced Level) examination according to their interests. However, there is limited existing research on this topic. Thus this study aims to identify students' career interests and the obstacles they face in achieving their career goals. The research sample comprised 240 students from 8 schools within the Kelaniya educational zone of the Gampaha district in the Western Province. The students' career interests were assessed using John Holland's Career Choice Theory and the "Career Key" test developed by Lawrence K. Jones. Data were collected through questionnaires and interviews and analyzed descriptively. The findings indicate that Advanced Level students exhibit a strong preference for realistic careers (40.8%), followed by enterprising (23.8%), investigative (17.9%), social (15%), artistic (1.7%), and conventional (0.8%) career types. The study identified several key obstacles faced by these students, including a lack of self-efficacy in pursuing their preferred careers, insufficient support from educational institutions, challenges in achieving the academic performance required for their chosen Advanced Level subject streams, and financial constraints. Notably, financial barriers (t = .000, p < 0.001) were found to be significantly influential in shaping career choices, despite a substantial level of parental contribution. The data highlights that while students have clear career interests, the systemic and personal challenges they face need to be addressed to facilitate better career planning and support. The high interest in realistic and enterprising careers indicates a need for the education system to better align with these interests and provide targeted support to help students navigate their career paths effectively.

Keywords: *Career Choice, Challenges, Strategies, Random Sampling*

Empowering School Leadership: Unravelling the Implications of School-Based Management on Principals' Managerial Efficacy for School Educational Quality in Sri Lanka

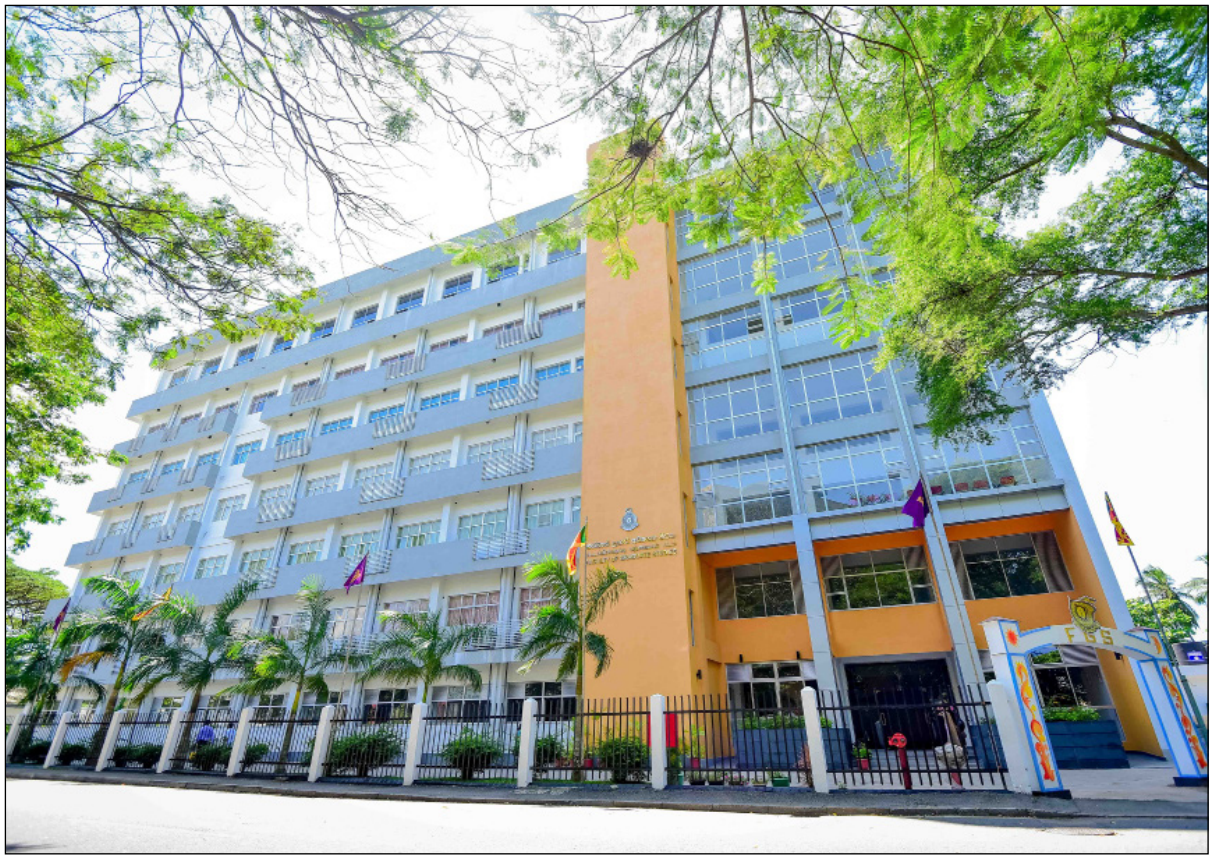
V. Vijayabaskar[1], L.M. K. Bandara[2]

[1]*Department of Education, Faculty of Arts, University of Jaffna, Sri Lanka*
[2]*Department of Humanities Education, Faculty of Education, University of Colombo, Sri Lanka*

This study investigated the impact of School-Based Management (SBM) on principals' managerial efficacy for ensuring overall educational quality in schools in Sri Lanka. With a focus on the Enhanced Programme for School Improvement (EPSI) and the National Competency Framework for School Leadership and Management (NCFSLM), the research examined how decentralization and participatory decision-making influence school governance and educational outcomes. Employing a mixed-methods approach, the study combined quantitative data from a survey of 162 school principals with qualitative insights from semi-structured interviews. The findings revealed that SBM significantly enhanced principals' managerial functions through increased institutional autonomy, administrative capacitation, and facilitation by central authorities. Approximately 60% of the variance in the Principals' Managerial Efficacy was explained (F 4,143 = 53.177, $p < 0.01$, $R^2 = 0.598$) by the participatory decision making and devolution for self–governance of school. However, the efficacy varied across different levels of school educational quality, with external and internal factors influencing the implementation and success of SBM. The study concludes that while SBM holds promise for improving educational quality, its effectiveness depends on context-specific adaptations and ongoing support from central authorities.

Keywords: *School-Based Management, Educational Quality, Principals' Managerial Efficacy*

FACULTY OF GRADUATE STUDIES



Sustainable Future
through Multidisciplinary Research

22nd of November 2024

MESSAGE FROM THE DEAN

Professor A. A. Azeez

Dean
Faculty of Graduate Studies
University of Colombo, Sri Lanka

I am delighted to send this message for the Annual Research Conference 2024 (ARC 2024) of the Faculty of Graduate Studies at the University of Colombo. Reflecting the current economic climate, the conference has been themed around 'Sustainable future through Multi-Disciplinary Research,' with the Keynote speech aligned with this overarching theme. Moreover, ARC 2024 includes a policy dialogue and a doctoral colloquium to be conducted in collaboration with the Bharata Matta Institute of Management, Kochi, India. I am confident that this annual event of the FGS will cultivate the much-needed research culture among academics, researchers, and PhD students, fostering interactions among them to exchange ideas about recent advances in multi-disciplinary research.

The ARC 2024 of FGS features seven diverse tracks, covering Education and Linguistics, STEM, Arts, Humanities, and Social Sciences, Business, Management, and Economics, Environment, Health, and Wellbeing, Policy, Governance, and Human Security, and Multidisciplinary Research Methodd (strengths and challenges). These tracks offer a comprehensive exploration of various academic fields, fostering interdisciplinary collaboration and providing a valuable platform for research students to present and discuss their work. Additionally, the conference incorporates a Policy Discussion event, facilitating participants in addressing policy implications arising from their research.

I extend my sincere gratitude to the conference co-chairs, track coordinators, reviewers, the organizing committee, conference secretariat, and most importantly, the authors for their invaluable contributions to the successful organization and management of this conference.

We eagerly anticipate a rewarding and enlightening conference experience that will contribute to the advancement of knowledge across various multidisciplinary research domains. I wish ARC 2024 a resounding success.

MESSAGE FROM THE SYMPOSIUM CO-CHAIRS

Dr. Sajitha Dishanka

Department of Business Economics
Faculty of Management and Finance
University of Colombo, Sri Lanka

Dr. Pavithra Jayawardena

Department of International Relations
Faculty of Arts
University of Colombo, Sri Lanka

We are delighted to welcome you for the Annual Research Conference 2024 of the Faculty of Graduate Studies (FGS), University of Colombo under the theme of *'Sustainable Future through Multidisciplinary Research'* on 22nd November, 2024 at the faculty premises. We are also proud to remind you that this year, the FGS conference is held in an international collaboration - with Bharata Mata Institute of Management (BMIM) – a renowned higher education institute in India. We are honoured to have the Vice Chancellor of the University of Colombo, Senior Professor (Chair) H. D. Karunaratne as our chief guest. The keynote speaker is Dr. Patrick McNamara, the Executive Director of the United States-Sri Lanka Fulbright Commission who will deliver his keynote speech on 'Sustainable world peace and understanding through interdisciplinary knowledge exchange: Reflections from a Fulbright perspective'. The inauguration of the conference will feature a policy dialogue on multidisciplinary research and policy making.

This year also marks the highest number of submission of abstracts for the conference. As a result, we have decided a number of tracks, giving due attention to a variety of disciplines ranging from Education and Linguistics, Arts, Humanities, and Social Sciences, Business, Management and Economics, Science, Technology, Engineering, Mathematics, Environment Resilience, Health and Wellbeing, Policy, Governance to Human Security. Parallel to the conference, we will also be hosting a doctoral colloquium aiming at improving doctoral candidates' research skills. Senior academicians associated to FGS will be providing consultations for the doctoral candidates through a 'PhD Clinic'.

The Dean of FGS, Professor A. A. Azeez and the conference committee invite you all to join with us for the Annual Research Conference 2024 of the Faculty of Graduate Studies, University of Colombo.

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CONFERENCE PROGRAMME

Time	Programme
09.00 am – 09.30 am	**Registration and Morning Tea**
09.30 am – 10.00 am	**Commencement of the Inaugural Ceremony**
10.00 am – 10.05 am	**Welcome Address** Professor A. A. Azeez Dean, Faculty of Graduate Studies University of Colombo
10.05 am – 10.10 am	**Address by the Chief Guest** Senior Professor (Chair) H. D. Karunaratne Vice Chancellor, University of Colombo
10.10 am - 10.15 am	**Keynote Address** Dr. Patrick McNamara Executive Director United States-Sri Lanka Fulbright Commission
10.15 am – 10.45 am	**Policy Dialogue** '*Making Policies for a Sustainable Future: The Role of Multidisciplinary Research*'
10.45 am – 12.15 pm	**Conference Lunch**
12.15 pm – 01.30 pm	**Parallel Sessions and the Doctoral Colloquium**
01.30 pm – 02.30 pm	**Plenary Session and Awarding Ceremony**
02.30 pm – 05.00 pm	**Evening Tea**
05.00 pm – 05.30 pm	**End of the Conference**

INTRODUCTION TO THE KEYNOTE SPEAKER

Dr. Patrick McNamara

Executive Director
United States-Sri Lanka Fulbright Commission

Patrick McNamara, Ph.D., serves as the Executive Director of the United States-Sri Lanka Fulbright Commission. He has worked with universities, governments, corporations, nonprofits, and foundations for over 35 years. Before joining Fulbright Sri Lanka, Patrick was at the University of Nebraska at Omaha (UNO) where he taught conflict resolution, sustainable development, and social entrepreneurship. At UNO, he also served as Senior International Officer, Director of the International Studies major and minor, Director of the Sustained Dialogue Initiative and Director of the Omaha World Affairs Council. Other past experience includes: Director of Philanthropic Services at Omaha Community Foundation which annually donated over $80 million to nonprofits; Director of the Omaha Hate Crimes Project, a partnership funded by the U.S. Department of Justice to fight hate and discrimination; managing a printing ink manufacturing company; litigation paralegal at a Wall Street law firm; and Capitol Page in the U.S. House of Representatives. He is on the governing board of Initiatives of Change, a global interfaith NGO "building trust across the world's divides." Patrick's TED Talk is *Water Conflict, Water Peace.*

Dr. McNamara earned a Ph.D. from the School of Public Administration at UNO. His dissertation research, funded by a fellowship from the U.S. Department of Housing and Urban Development, focused on public-private partnerships to solve homelessness. He earned an M.Sc. in Conflict Analysis and Resolution from George Mason University with specializations in international and organizational dispute resolution. His B.A. in Religion was from Swarthmore College where he studied comparative religions and ethics.

FACULTY OF GRADUATE STUDIES
List of Abstracts

Exploring Factors Associated with DevOps Usage in the BOI-Registered IT Companies in Sri Lanka

K.P.P. Sandareka[1], R.A.B. Abeygunawardana[2]

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[2]Department of Statistics, Faculty of Science, University of Colombo, Sri Lanka

DevOps is a methodology that has been introduced to speed up the software delivery process while enhancing the quality and reliability of the overall products. DevOps breaks down the traditional silos between development and operations teams by integrating them into one entity and bridging the gap between both teams through enhanced collaboration and communication. While DevOps is widely accepted in a global context, its acceptance and usage in Sri Lankan IT companies remain relatively low compared to global trends. Additionally, there is a scarcity of research on DevOps related to the Sri Lankan context, which prevents organizations from fully understanding the acceptance, usage, and challenges associated with implementing DevOps. The primary aim of this study was to clearly identify the factors that associated with the usage of DevOps in Sri Lankan IT companies and provide actionable insights to enhance DevOps adoption and usage. Based on previous literature, the researcher has identified organizational, technical, market, social, and cultural factors as the main influences on DevOps usage. In this study, engineering professionals in 65 BOI-registered IT companies in Sri Lanka that currently utilize DevOps practices were considered. The average number of DevOps practitioners in these 65 companies was identified as six during the preliminary study. Based on stratified sampling technique, 390 were invited to the survey. Out of the 332 responses collected, 300 valid responses remained after the data cleaning process. Data were analysed using regression analyses and indicate that technical, market, social, and cultural factors were positively associated with DevOps usage, while organizational factors were negatively associated. The study findings, with an adjusted R-squared of 0.758, highlight the model's reliability and provide key recommendations to improve DevOps implementation in Sri Lankan IT organizations. These insights provide strategic guidance for industry stakeholders and policymakers to effectively leverage DevOps practices for organizational growth.

Keywords: *DevOps, Market Factors, Organizational Factors, Social and Cultural Factors Technical Factors, Usage of DevOps*

Impact of Industry 4.0 Technologies on Process Quality in Apparel Manufacturing Sector in Sri Lanka

M. V. T. Kawya[1], S. Dishanka[2]

[1]*Faculty of Graduate Studies, University of Colombo, Sri Lanka*
[2]*Department of Business Economics, Faculty of Management and Finance, University of Colombo, Sri Lanka*

The Industry 4.0 has marked a milestone in the manufacturing sector, enabling the firms to enhance its global competitiveness through quality improvement and process optimization. Although, Sri Lanka is globally renowned for apparel manufacturing, recent industry performance indicators reveal that the industry is facing challenges in competitiveness due to quality related issues. Some industry experts have stressed that the application of latest advanced technology in apparel manufacturing is the core for quality and competitiveness. Accordingly, the primary objective of this research was to identify the impact of Industry 4.0 technologies on process quality in apparel manufacturing sector in Sri Lanka. In order to achieve this objective, the study has made four inquiries with respect to Industry 4.0 technologies, which are robotics and automation, big data analytics and deep learning, cloud manufacturing and additive manufacturing on process quality in apparel manufacturing companies in Sri Lanka. The research adopted the survey strategy within the positivistic research paradigm. Data were gathered through a questionnaire which was distributed among a sample of 110 key personnel which was purposively selected from the apparel industry in Sri Lanka. The four dimensions of Industry 4.0 were pre-processed through Principal Component Analysis for dimensionality reduction and standardization due to the inconsistent variation in contextual factors. The results of the main analysis confirmed a significant impact from robotics and automation, and additive manufacturing on process quality with no adequate evidence to prove the impact of big data analytics and deep learning, and cloud manufacturing on process quality in apparel manufacturing sector in Sri Lanka. Accordingly, these results implied that the application of Industry 4.0 technologies to improve process quality in apparel manufacturing in Sri Lanka is still below global standards, probably due to the lack of financial capabilities and technological competencies.

Keywords: *Additive Manufacturing, Big Data Analytics, Cloud Manufacturing, Process Quality, Robotics and Automation*

Adoption Intention of AI-powered Chatbots in Hospitality Industry: The Case of Classified Tourist Hotels in Sri Lanka

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[1]*Faculty of Graduate Studies, University of Colombo, Sri Lanka*
[2]*Department of Business Economics, Faculty of Management and Finance, University of Colombo, Sri Lanka*

Recent developments in artificial intelligence (AI) have opened up new avenues for businesses, offering unique opportunities to enhance customer engagement and operational efficiency. In the hospitality industry, AI serves as a crucial interface between online consumers and service providers. One of the most transformative AI applications in the hospitality industry is the deployment of AI-powered chatbots, which are increasingly shaping the customer experience and satisfaction. Despite the growing global presence, there is still low level of application caused by limited knowledge in understanding the factors affecting the application and driving the adoption of AI chatbots in the hospitality industry in Sri Lanka. Hence, this study investigated the adoption intention of AI-powered chatbots in classified tourist hotels in Sri Lanka by grounding on the technological, organizational, and environmental dimensions conceptualized in the TOE framework. This research surveyed 110 of 156 classified hotels which were conveniently selected and quantitatively analyzed to identify the influential TOE factor for AI-powered chatbot adoption intention. The survey data were analyzed through categorical regression analysis followed by variance analysis to signify the variation between units of analysis. These results revealed that perceived relative advantage (technological factor), top management support, and employee capability (organizational factors), vendor support, and customer pressure (environmental factors) are highly significant in determining the adoption intention. Moreover, the analysis of variance has confirmed that there is no significant variation between different categories of classified hotels and IT manager's expertise in adoption intention of Ai-powered chatbots in classified hotels in Sri Lanka. Based on the results, Sri Lankan classified hotels are recommended to comply with user concerns to cater to diverse guests, leverage local expertise through training and innovation, and collaborate with stakeholders for wider adoption of technology for operational efficiency and customer satisfaction.

Keywords: *Adoption Intention, Artificial Intelligence, Chatbot, Hospitality Industry, Technology Adoption*

The Folk Play of Hook Tugging (*Ankelya*): Cultural Uniqueness of Panama Hamlet in Sri Lanka as Ethno Tourism Destination

K. K. Sunil[1], P. N. Weerasinghe[2]

[1]*Department of Sinhala and Mass Communication, University of Sri Jayewardenepura, Sri Lanka*
[2]*Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka*

Folklore, deeply rooted in oral tradition, is a fundamental aspect of human society. It encompasses folk poems, folk songs, folktales, folk plays, folk dramas, myths, customs, beliefs, rituals, riddles, proverbs, tattoos, and other aesthetic art forms, all of which are integral to village life. These ethnographic elements are universal, found in every ethnic group around the globe. The main objective of this article is to understand about the folk play of *Hook Tugging (Ankeliya)* in Panama Village in the Ampara district of Sri Lanka.This research is a qualitative study utilizing ethno-methodology. The primary data collection methods included in-depth interviews and participant observations, alongside snowball sampling. The main research site was Panama, located in Lahugala, Ampara. The study confirms that Panama village is distinctive for its rituals. While social changes are gradually transforming the traditional lifestyle of the inhabitants, this is a common occurrence in any society. Despite these changes, the people of Panama are committed to preserving their village's traditional characteristics. Today, Panama has emerged as a destination for both domestic and international tourists. The concept of ethno-tourism is gaining popularity globally, attracting many who are keen to explore traditional ethnic groups and their customs. Consequently, the traditional lifestyle and customs of Panama are drawing the interest of local and foreign visitors.

Keywords: *Ethno-Tourism, Folklore, Hook Tugging, Mythology, Ritual*

FACULTY OF INDIGENOUS MEDICINE

One Health Approach for Health Tourism

09th and 10th of August 2024

MESSAGE FROM THE DEAN

Professor Pathirage Kamal Perera

Dean
Faculty of Indigenous Medicine
University of Colombo, Sri Lanka

It is with great pleasure and pride to send this message on the occasion of the Annual Research Symposium of University of Colombo 2024. The International Conference on Ayurveda, Unani, Siddha, and Traditional Medicine (iCAUST) was initiated by the Institute of Indigenous Medicine in 2014 and progressively it became the leading research platform of researchers who are engaged in natural medical systems in Sri Lanka. Launching the 10th iCAUST remarks a premiere milestone. This year, we have taken this research platform from Colombo to the City of Galle. On this precious occasion, I would like to extend my gratitude to the co-organizing partner, Department of Ayurveda, Ministry of Health for facilitating the event. Further, I would like to express my appreciation to the Vice Chancellor, Senior Professor H. D. Karunaratne for giving his expertise and guidance to arrange this event smoothly and effectively. Focusing on the theme 'One Health Approach for Health Tourism' we accommodated interdisciplinary participation to share their evidence-based traditional medicine, recent research evidence, innovations, and clinical experiences among the young, upcoming, and renowned researchers. One of the key anticipations of these resourceful scientific sessions is to develop scientific communication skills among the FIM undergraduates and expose them to research culture. The parallel student scientific forums provide opportunities to FIM undergraduate researchers to develop scientific communication skills while being exposed to the research communities. Further, we expect to unveil the novel products and innovations of FIM scholars through the educational exhibition which is planned to be held with the "De Aa Sukhi Dakshina", Exhibition and Trade fair – 2024. I congratulate the authors of the conference and greatly appreciate the team effort extended by the organizing committee and all the committee members of the 10th iCAUST and 1st International Research Symposium on "De Aa Sukhi Dakshina", Exhibition and Trade Fair – 2024 to bring this event a grand success. Furthermore, I extend my very best wishes for a fruitful deliberation and every success for the annual sessions.

MESSAGE FROM THE SYMPOSIUM CO-CHAIRS

Prof. Kaumadi Karunagoda

Department of Ayurveda Surgery, ENT, Ophthalmology, Gynaecology, Obstetrics, and Pediatrics
Faculty of Indigenous Medicine
University of Colombo, Sri Lanka

Dr. M.S.M. Nasmeer

Department of Economics
Faculty of Indigenous Medicine
University of Colombo, Sri Lanka

The International Conference on Ayurveda, Unani, Siddha, and Traditional Medicine (iCAUST 2024) is organized by the Faculty of Indigenous Medicine, University of Colombo, for the 10th consecutive year. At this special juncture, the faculty decided to extend our patronage by aiming to disseminate research culture beyond the main city. Empowering researchers in our own discipline is considered our responsibility, as we are the national pioneers in our field.

This year's theme, "One Health Approach for Health Tourism," invites us to explore new horizons and opportunities for integrating Ayurveda practices into the global health tourism landscape. Therefore, this year's international conference is jointly organized by the Faculty of Indigenous Medicine (FIM), University of Colombo, and the Department of Ayurveda, Southern Province, Ministry of Health, Sri Lanka.

This conference will provide an overview of the latest information on Ayurveda, Unani, Siddha, and Traditional Medicine approach to health and health tourism including practical strategies for incorporating evidence-based modalities into clinical practice, using practices to prevent illnesses, recommendations for management of specific conditions and tools to evaluate the latest related research findings. There are 12 key note and plenary speakers from Sri Lanka, India, the UK, and Bangladesh. The exhibition and trade fair organized coincide with the conference would add another dimension to the overall impact of the event.

This conference will provide an overview of the latest information on Ayurveda, Unani, Siddha, and Traditional Medicine approach to health and health tourism including practical strategies for incorporating evidence-based modalities into clinical practice, using practices to prevent illnesses, recommendations for management of specific conditions and tools to evaluate the latest related research findings. There are 12 key note and plenary speakers from Sri Lanka, India, the UK, and Bangladesh. The exhibition and trade fair organized coincide with the conference would add another dimension to the overall impact of the event.

On behalf of the faculty, we extend our deepest gratitude to our co-organizers, speakers, sponsors, and organizers, whose dedication and expertise have made this event possible. Moreover, the driving force and guidance received from the Vice Chancellor of the University of Colombo and the Dean of the Faculty of Medicine are greatly appreciated. Your support is invaluable, and it is through your contributions that we are able to achieve such a successful and impactful event.

The grand success of the 10th International Conference on Ayurveda, Unani, Siddha, and Traditional Medicine (iCAUST 2024), 1st International Research Symposium on "De Aa Sukhi Dakshina", the accompanying Exhibition and Trade Fair will continue to advance the field of Ayurveda, Sidhdha, Unani, and Traditional Medicine in its integration into health tourism.

We extend our heartfelt congratulations to the organizing committee of the Annual Research Symposium 2024 and all the presenters for contributing to the resounding success of this grand event.

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SYMPOSIUM PROGRAMME

Time	Programme	
09.20 am – 09.30 am	**Arrival of Guests**	
09.30 am – 09.40 am	**Lighting of Traditional Oil Lamp and National Anthem**	
09.40 am – 09.45 am	***Danwanthari Subrabathum* Cultural *Pooja* Performacne**	
09.45 am – 09.55 am	**Welcome Address** Dr. H.P. Karunawathi Commissioner of Ayurveda, Provincial Ayurveda Department, Southern Province	
09.55 am – 10.05 am	**Launching of the Abstract Book**	
10.05 am – 10.15 am	**Address by Vice-Chancellor** Senior Professor (Chair) H. D. Karunarathne University of Colombo	
10.15 am – 10.30 am	**Keynote Speech** Professor P.K. Goswami Dean, Faculty of Ayurveda, IMS, BHU, INDIA	
10.30 am – 10.40 pm	**Cultural Performance**	
10.40 am – 10.45 am	**Vote of Thanks** Professor P. Kamal Perera Dean, Faculty of Indigenous Medicine University of Colombo	
10.45 am – 11.45 am	**Opening of the Trade Fair and Refreshments**	
12.00 pm – 02.00 pm	**Poster Session I**	Oral Session I
02.00 pm – 03.30 pm	**Oral Session II**	

09.00 am – 10.30 am	Poster Session II (UG)	Oral Session III (UG)	Oral Session IV
10.30 am – 12 .00 pm	Poster Session III (UG)	Oral Session V (UG)	Oral Session VI
01.00 pm – 02.30 pm	Poster Session VI	Oral Session VII (UG)	Oral Session VIII
02.30 pm – 04.00 pm	Poster Session V	Oral Session IX	Oral Session X
04.00 pm – 05.00 pm	Oral Session XI	Oral Session XII	

INTRODUCTION TO THE KEYNOTE SPEAKER

Professor P. K. Goswami

Dean, Faculty of Ayurveda
Institute of Medical Sciences
Banaras Hindu University

Senior Professor Goswami is the Dean of the Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India. He is a Professor of Ayurveda Medicine in the Department of Samhita and Sanskrit of the same faculty. He was appointed as the Head of the Department for 12 consecutive years, starting in 2003. Professor Goswami also served as the Director of the North Eastern Institute of Folk Medicine, Pasighat, Arunachal Pradesh, India, for a short period (three months), and as Director of the North Eastern Institute of Ayurveda and Homoeopathy, Shillong, Meghalaya, for six years.

He has approximately 50 international and 10 national publications to his credit. He has authored Caraka Samhita with Cakrapani Tika, including their Hindi translation and commentary, in four volumes (I-IV), published by Chowkhamba Krishnadas Academy, Varanasi (ISBN No. 978-81-218-0232-6). He also serves as Editor-in-Chief of AYUHOM, the official scientific peer-reviewed journal of NEIAH, Shillong.

Under his deanship, Professor Goswami signed two MOUs with the University of Colombo, Sri Lanka, and the Yeongdeok Culture and Tourism Foundation, Republic of Korea. He is a visionary academic leader, believing that leadership is full of responsibilities and requires transforming young, tender minds into responsible citizens of society.

ABSTRACT OF THE KEYNOTE ADDRESS

Eco-friendly Health Tourism: A One Health Perspective through Ayurveda

Professor P. K. Goswami

Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, India

In the pursuit of holistic wellness and environmental sustainability, eco-friendly health tourism has gained significant traction, particularly when integrated with the One Health approach and the ancient practices of Ayurveda. This presentation explores the intersection of these concepts, highlighting the principles of Ayurveda that emphasize balance and harmony with nature, and their alignment with the One Health framework, which underscores the interconnectedness of human, animal, and environmental health. Through case studies of Ayurvedic resorts in Kerala, India, such as Kairali and Somatheeram, the presentation illustrates successful implementation of eco-friendly practices, including the use of renewable energy, rainwater harvesting, organic farming, and waste management protocols. These practices not only reduce the environmental impact but also enhance the authenticity of the wellness experience, benefiting local communities and ecosystems.

The conservation of medicinal plants, crucial to Ayurveda, is another focal point, showcasing sustainable harvesting techniques and initiatives like the Tropical Botanic Garden and Research Institute (TBGRI), which promote biodiversity and involve local communities. The promotion of eco-friendly Ayurvedic tourism through certification programs like Green Globe and Earth Check, along with effective marketing strategies, can attract environmentally-conscious tourists and bolster the sector's growth. Despite challenges such as high costs and the need for ongoing education, solutions like community-based tourism models and public-private partnerships are proposed to balance tourism growth with conservation. Future directions include leveraging technological innovations and continued research to enhance sustainability. This holistic approach, combining Ayurveda with eco-friendly practices and the One Health perspective, offers a sustainable pathway to wellness, benefiting humans, animals, and the environment.

FACULTY OF INDIGENOUS MEDICINE
List of Abstracts

Management of Chronic Insomnia with Personalized Ayurveda Treatments: A Case Report

M.D.E.P. Gunathilaka[1], P.K. Perera[2]

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[2]Department of Ayurveda Pharmacology and Pharmaceutics, Faculty of Indigenous Medicine, University of Colombo, Sri Lanka

Chronic insomnia is an abiding and debilitating sleep condition that can greatly impact an individual's quality of life. Conventional therapies, such as prescribed medications, often have limitations when it comes to prolonged effectiveness and possible adverse effects. This study explores the efficacy of personalized Ayurveda treatments in a 48-year-old male with a 9-year history of sleep disturbances. The patient reported difficulty falling asleep, frequent nocturnal awakenings, non-restorative sleep, and significant daytime impairments, including fatigue, lethargy, and concentration difficulties. A comprehensive Ayurvedic assessment was made, including the patient's sleep patterns, dietary habits, lifestyle, stress levels, and Ayurvedic constitution. Based on these, a four-week treatment plan was made. Internal medication consists primarily of *Ashwagandha (Withania Somnifera)*, alongside Ayurveda oil treatments such as *Shiro Abhyanga, Nasya Karma,* and *Shirodhara*. The Pittsburgh Sleep Quality Index (PSQI) was employed to evaluate sleep quality, while the Epworth Sleepiness Scale (ESS) was utilized to assess daytime alertness. Subjective reports indicated improvement in sleep quality, including easier sleep onset, fewer awakenings, and increased restfulness upon waking. The patient also noted reductions in daytime fatigue and lethargy, improved concentration, and positive mood. This case highlights the potential of personalized Ayurveda interventions for chronic insomnia, emphasizing a holistic approach tailored to the individual's unique presentation. The absence of quantitative data underscores the limitations of anecdotal evidence and emphasizes the need for rigorous research with robust study designs, larger sample sizes, standardized outcome measures, and long-term follow-up to validate these findings and establish the efficacy of Ayurveda management of chronic insomnia.

Keywords: *Chronic Insomnia, Personalized Ayurveda Treatments, Ashwagandha, Shirodhara, Nasya Karma*

A Clinical Study of the Effect of *Neelyadi* Oil and *Bomi Kola Melluma* in the Management of Sprain *(Ulukku)*

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Kedum Bindum Cikitsa (Orthopedic treatments) has a special place in our traditional medicine that is peculiar to Sri Lanka. The present study was aimed to assess the effect of *Neelyadi* oil and *Bomi kola melluma* in the treatment of Sprain (*Ulukku*), mainly used by the Arangala Tradition. This study was carried out as a literature review and a randomized clinical study. *Ulukku* is a disease condition considered under *Kedum bindum chikitsa*. It closely resembles a sprain in modern medicine. Prior to conducting the clinical study, ethical and administrative clearances were obtained. Fifteen patients diagnosed as *Ulukku* were chosen from Out Patients Department of Rural Ayurveda Hospital, Siripura. They were treated with *Neelyadi oil* and *Bomi kola melluma* for two weeks. Data were collected by using an interviewer administrated Clinical Performa and analyzed by using SPSS software. The clinical study revealed that most of the patients were female (60%). The majority of patients were in the age group of 18- 30 years (33%); 66.67% patients were married. All patients were presented with sudden onset of symptoms (100%). Ankle joint was the most affected area (60%). Every patient experienced pain, tenderness, edema, and restricted joint movements (100%). According to data analysis, *Neelyadi oil* and *Bomi kola melluma* significantly (*p* values 0.01- 0.001) reduced all clinical features of *Ulukku* (Sprain). All patients got varying degrees of relief with 53.33% being completely cured. 33.33% of the patients showed excellent improvement and 13.33% showed good improvement.

Keywords: *Neelyadi* Oil, *Bomi Kola Melluma*, *Ulukku*

The Safety and Efficacy of Bacopa Monnieri (L) Wettst. in Older Adults with Subjective Cognitive Impairment: A Systematic Review

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This systematic review aims to evaluate the safety and efficacy of *Bacopa monnieri* in older adults with subjective cognitive impairment. A comprehensive search was conducted across major databases (PubMed, Google Scholar, Semantic Scholar, Library Databases: Research for Life and World Health Organization institutional repository) for randomized controlled trials and observational studies investigating *Bacopa monnieri* in older adults (aged 60 years and above) with subjective cognitive impairment or related conditions. Studies assessing cognitive function and safety parameters were included. Exclusion criteria for this review included reviews, case studies, editorials, conference proceedings, preclinical studies, trial protocols, book chapters, abstracts, and peer-reviewed articles in which the study population had a diagnosis of mild cognitive impairment or dementia. Data extraction and quality assessment were performed following PRISMA guidelines. Out of a total of 628 articles screened, 10 randomized controlled trial studies met the inclusion criteria. Results revealed that *Bacopa monnieri* supplementation demonstrated promising effects on cognitive function, particularly improvements in memory, attention, and executive function in older adults with subjective cognitive impairment. Safety analysis indicated that *Bacopa monnieri* is generally well-tolerated, with mild gastrointestinal discomfort being the most commonly reported adverse effect. Although long-term studies on its effects on anti-aging markers such as oxidative stress, inflammation, and cellular aging are limited, they suggest potential benefits. *Bacopa monnieri* shows potential as a safe and effective cognitive enhancer in older adults with subjective cognitive impairment. Preliminary evidence supports its use for improving cognitive function, with favorable safety outcomes. Future research should focus on larger, well-designed trials to confirm these findings.

Keywords: *Bacopa Monnieri, Cognitive Function, Subjective Cognitive Impairment, Safety and Efficacy, Systematic Review*

Intervention of *Pasakuru Pattuwa* on Reunion of Fractures: A Clinical Study

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Sri Lanka has a well-established traditional orthopedic treatment system, which is popular among laypersons as an effective treatment modality. Sirimalwatta Parampara is an eminent native practitioner who has practiced for many generations. *Pasakuru pattuwa* is one such paste that has been used by this generation for fracture reunion, which includes the barks of *Terminalia arjuna* (Roxb. ex-DC.), Wight and Arn, *Ficus recemosa* L., *Opuntia ficus-indica*, *Ficus religiosa* L., *Bignonia chelonoides* L. f. and ghee. This clinical study was conducted to evaluate the efficacy of *Pasakuru pattuwa* (paste) in reunion of fractures using four subjective parameters of pain, tenderness, edema, and range of movements as well as X-ray imaging. For this study sixteen patients were purposely selected within the age group of 18-75 years who were having bone fractures (radius, calcaneus, clavicle, humorous shaft, tibial and medial malleolus fractures). The patients were diagnosed at the first stage of the fracture, regardless of sex, occupation, religion, or fracture site from the Kadumbidum clinic at Rural Ayurveda Hospital, Siripura, Sri Lanka. Ethical clearance was obtained from the Ethics Review Committee, Faculty of Indigenous Medicine, University of Colombo (ERC 23/214). The patients were assessed using a standard proforma before treatment and every other week for one month. Data were analyzed using the SPSS and the results revealed that pain, edema, and range of movements were significantly reduced with *p* values of 0.001, 0.014, and 0.055 respectively. However, *Pasakuru pattuwa* did not show a significant effect on tenderness. X-ray images clearly demonstrated callus formation after treatment compared to before treatment. Hence, it can be concluded that *Pasakuru pattuwa* is effective in managing the fracture reunion process by reducing signs and symptoms with notified callus formation. Further clinical studies with this paste are recommended to determine the effectiveness of *Pasakuru pattuwa*.

Keywords: *Pasakuru Pattuwa, Calles Formation, Fracture, Traditional Medicine, Reunion*

Management of *Danta Sharkara* (Supragingival and Subgingival Calculus): A Case Study

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Danta sharkara (Dental Calculus) is one of the *Danta roga* characterized by a yellowish or brownish layer of mineral deposits on the teeth surface, formed by hardened dental plaque, which may lead to inflammation conditions of the gingival tissue. The modern approach to treating *Danta sharkara* is Scaling and Root planing; however, this method has certain drawbacks. The present case study aimed to evaluate the efficacy of a local therapeutic procedure described in Susrutha Samhitha. This process involves Pratisarana using *Laksha churna* mixed with *Madhu* (honey) following *Danta sharkara nirharana* (manual scaling) with a shastra mentioned in Ayurveda (where the procedure has not been standardized) in the management of dental calculus. For this study, 25-years-old female patient with grade 2 supragingival and subgingival calculus on labial and lingual surfaces of the mandibular teeth, with no teeth mobility, and systemic complications was selected. The treatment consisted of 1g of *Laksha churna pratisarana* (rubbing lac) with *Madhu* (honey) as required, followed by manual scaling twice for a period of 21 days. Manual scaling was performed on the 1st and 8th days of the treatment period, followed by a two-week follow up. According to the Marginal Line Calculus Index (MLC-I), no calculus (grade 0) was observed during the oral examination after 21-day treatment period and no calculus reappearance or gum changes were observed after a two-week follow up. Therefore, *Laksha churna pratisarana* with *Madhu* followed by manual scaling, proves to be effective in the management of grade 2 supragingival and subgingival calculus. Furthermore, the efficacy of the treatment protocol can be tested through case series or clinical studies.

Keywords: *Danta Sharkara, Laksha Churna, Manual Scaling, Marginal Line Calculus Index*

A Study of the Effect of Sri Lankan Orthopedic Traditional Treatment on Fracture Healing: A Comparative Observational Case Study

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Fractures are among the most common orthopedic problems in worldwide. Detailed descriptions of fracture management are found in Ayurveda and Sri Lankan traditional medicine. The objective of this study was to compare the effect of two Sri Lankan orthopedic traditional treatment procedures on fracture healing. Two patients with distal end radius fractures were observed for 8 weeks: One treated under the *Matara vehelle weda parampara* (Patient 01) and the other under the *Imbulmalgama weda parampara* (Patient 02). Patient 01 was treated with external medicines, while patients 02 received both external and internal medicines. The effect of treatment on pain was assessed using the Numeric Rating Scale, and other subjective parameters were evaluated through a self-prepared grading system ranging from 00 to 05. The grades for pain decreased from 10 to 00 in Patient 01 and from 10 to 01 in Patient 02. Difficulty in wrist joint movements improved from 04 to 01 in Patient 01 and from 04 to 02in Patient 02. Difficulty in finger movements reduced from 03 to 01 in Patient 01 and from 03 to 02 in Patient 02. Tenderness was reduced from grade 03 to 01 in both patients. Patient 02 showed a more rapid reduction of symptoms, likely due to the use of additional internal medicines. X-ray analysis indicated improvement in fracture healing in both patients. An analysis of the properties of the drugs used revealed that they were dominant in *Vatashamana*, *Shothahara* and *Shulahara* properties. In conclusion, the treatment procedures used in these two traditional systems showed positive effect on fracture healing.

Keywords: *Fractures, Traditional Treatment, Bhagna, Ayurveda*

Evaluation of the Efficacy of the Treatment Regimen Practiced in the Arangala Traditional Medical System in the Management of *Avabahuka* (Frozen Shoulder): A Case Study

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"*Avabahuka*," a term in Ayurveda, refers to a frozen shoulder condition characterized by persistent discomfort and restricted motion, with a prevalence of 6-17% in diabetic patients and 2-5% in the general community. This study aimed to assess the efficacy of the treatment regimen practiced in the Arangala Traditional Medical system, for *Avabahuka*. A 50-year-old female patient presented with discomfort, stiffness, and restricted movement in her left shoulder joint over a year. No abnormalities were found during the systemic examination, but local soreness was noted in the left shoulder joint. Responses to the treatments were evaluated using a previously published grading scale for clinical features including mobility limitation, discomfort, stiffness, crepitus sounds, and muscle atrophy. Along with exercise, she was recommended to undergo internal and external therapy. She was advised to local *Abhyanga* (massage) of oils, along with *Paththu* (medicinal paste) /*Mallum* (special medicinal preparation made with fresh leaves)/ *Peni paththu* (Medicinal paste made with treacle), *Thewilla* (the sudation performed by a specially prepared bundle of herbal ingredients) according to the week of treatment regimen and *Vata shamaka* (Pacify *Vata dosha*) internal medicine was given to the patient. Changes in the symptoms were observed after 2 months. The treatment has effectively resolved movement restrictions, stiffness, and crepitus sounds, each showing 100% improvement. Pain has significantly reduced by 66.67%, indicating a substantial positive effect, though not entirely resolved. Muscle wasting was not changed, as this symptom was not present initially. The study found that the treatment regimen of the Arangala traditional medical system for *Avabahuka* led to significant symptomatic alleviation.

Keywords: *Arangala Veda Paramparawa, Avabahuka, Frozen Shoulder*

Standardization of *Sharbat e Ghudal* (Syrup of Hibiscus Flowers): A Nutritive Unani Medicinal Syrup

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Unani medicines are gaining increasing attention worldwide, due to their time-honoured practice and thier wealth of compound medicines that are effective in treating most ailments. *Sharbat e Ghudal* is nutritive syrup included in several Unani pharmacopeias. The pharmacological actions of this syrup are *Mufarrih* (Exhilarant), *Muqawwi e qalb* (Cardiotonic), *Dafe Qafqan* (regulates palpitation), and *Muwallid e dam* (hemopoietic). Standardization is essential for polyherbal formulations to ensure the quality of these drugs for global standards and to increase patient acceptance. The present study aims to standardize *Sharbat e Ghudal* using organoleptic, physicochemical, and phytochemical parameters. This was conducted according to WHO guidelines and other authentic scientific publications on the standardization of traditional syrups. The product was dark red in colour with the characteristic smell of hibiscus flowers. It has a sweet and sour taste. The pH, specific gravity, extractable matter, and Brix value were found to be 3.7±0.14, 1.34±0.16, 70.7±3.15 and 65.59 ± 0.45 respectively. The TLC fingerprint, tested with artificial colour standards, confirmed that no artificial colours were added to the syrup. Phytochemical screening revealed that the Sharbat was positive for cardiac glycosides, terpenoids flavonoids, tannins, phenols, and alkaloids. Steroids were not detected in the screening. A standard HPLC fingerprint for *Sharbat e Ghudal* was developed, showing seven major peaks at wavelengths of 254 nm. The outcomes of this research provide pharmaceutical standards for *Sharbat e Gudhal*. Further analysis of its phyto-chemicals constituents supports the validation of its pharmacological actions.

Keywords: *Pharmaceutical Standard, Physico-Chemical Properties, Phyto-Chemical Properties, Sharbat e Gudhal*

Cytotoxicity of an Aqueous Traditional Formula against HeLa Cell

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Gynaecological cancers are currently treated with a variety of drugs, but they have several side effects. As a result, the search for novel therapies is crucial. In Sri Lanka, cervical cancer is the second most common cancer among women. In this research, a traditional Sri Lankan formula composed of six herbs was analyzed to study its biological properties, especially its cytotoxic effects on cervical cancer HeLa cells. Currently, this formula is administered to female cancer patients, including those with gynaecological cancers. The formula and the six individual medicinal herbs were extracted using water. The total phenolic content (TPC) of all extracts was measured using the *Folin-Ciocalteu* method. *Cinnamomum zeylanicum* extract showed the highest TPC value, 0.079±0.004mg/ml galic acid equivalent g, while the formula showed 0.035±0.001mg/ml Galic Acid equivalent g. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay exhibited a maximum antioxidant activity of 40.13±1.27% for the formula, while *Zingiber officinale* extract showed the highest activity; 61.10±1.60% at 1 mg/ml. The formula reported an antioxidant activity of 31.43±0.08% at 1 mg/ml for the 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay whereas *Z. officinale* extract showed the highest activity at 85.30±0.01% at 1 mg/ml with consistent results across both assays. The anti-inflammatory activity of the formula was reported as 89.72±0.005% while a similar maximum inhibition of 93.10±0.002% was observed for *C. zeylanicum* in the HRBC assay at 1 mg/ml. In the protein denaturation assay, the formula showed an anti-inflammatory activity of 34.10±0.03% while *Allium sativum* extract had the highest activity at 59.08±0.003%. The anti-cancer effect of the formula was evaluated using the 3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide (MTT) assay on HeLa cervical cancer cell line. The formula showed the highest cell inhibition among all extracts at 65.74±0.01% at 1 mg/ml. The survival fraction of the formula was 51.42±0.10% against the HeLa cell line, as determined by the clonogenic assay. According to this study, these results may suggest that this formula can decrease cervical cancer cell growth. However, further research is warranted.

Keywords: *Phytochemicals, DPPH, ABTS, HRBC, Protein Denaturation, MTT, HeLa Cell Line*

Ayurveda Management of *Sandhigatavata* with Special Reference to Osteoarthritis: A Case Study

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Sandhigata vata is the most common form of articular ailment, affecting millions of individuals globally. Osteoarthritis is considered the closest equivalent to *Sandhigata vata* of Ayurveda medicine. *Sandhigata vata* is primarily caused by vitiation of Vata Dosha though Kapha Dosha vitiation also plays a role in the manifestation of the disease. The major symptoms include *Sandhi shula* (joint pain), *Sandhi shotha* (swelling), *Stabdha* (stiffness), increasingly difficult and painful movements such as *Akunchana* (flexion) and *Prasarana* (extension). This study was conducted to evaluate the efficacy of an Ayurveda treatment plan for *Sandhigata vata* with a special reference to Osteoarthritis. A 62 years old female patient with severe bilateral knee joint pain was enrolled in the study. Before the commencement of the treatment, informed consent was obtained, and clinical signs and symptoms were recorded. The patient was treated for 30 days with internal medicines including *Erandasapthaka kashaya* (1-10 days), *Rasna shigrupunarnawa kashaya* (11-20 days), *Dashamulibalairanda kashaya* (21-30 days), *Rasnadi guggulu* (1-15 days), *Yogaraja guggulu* (16-30 days), *Nawarathna kalka* (1-15days), *Vataroga kalka* (16-30 days), *Vata gajendrasinghe rasa* (16-30 days), and *Dhathri choorna* (1-7 days), and external treatments with *Panchakarma* [*Abhyanga* (30 days), *Nadi svedana* (30 days), *Pattu* (14-30 days for 3 hours duration), and *Anuvasana vasti* (07 days). Using the Kellgren Lawrence Scale, the degree of symptom reduction was evaluated throughout the course of treatment. Excellent progress was observed in the Kellgren Lawrence Scale, decreasing from grade 4 to grade 1. Thus, it can be concluded that the disease was effectively managed by the Ayurveda treatment plan. It is suggested that future clinal trials be conducted with a larger sample size to generalize the results.

Keywords: *Osteoarthritis, Sandhigata Vata, Ayurveda Treatment Plan, Kellgren Lawrence Scale*

Effect of *Kolakulaththadi Upanaha Sweda* in *Janu Sandhigata Vata* (Knee Osteoarthritis)

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Sandhigata vata (osteoarthritis) is a *Vatavyadhi* that significantly limits everyday activities among the elderly population. According to the World Health Organization, osteoarthritis (OA) is the second most common musculoskeletal problem worldwide (affecting 30% of the population) following back pain (affecting 50%). Ayurveda emphasizes various treatment modalities, including *Upanaha*, in the management of *Sandhigata vata*. This single-blind clinical study aims to evaluate the effect of *Kolakulaththadi upanaha sweda*, which consists of *Kola* (*Zizyphus jujube*), *Kulaththa* (*Dolichos biflorus*), *Suradaru* (*Cedus deadara*), *Rasna* (*Pluchea lanceolate*), *Masha* (*Vigna mungo*), *Atasi* (*Linum usitatissimum*), *Tila* (*Ricinus communicus*), *Kushta* (*Saussurea lappa*), *Vacha* (*Acorus calamus*), *Shatahwa* (*Anethum sowa*) and *Yava* (*Hordeum vulgare*) in treading *Janu Sandhigata vata*. Thirty patients with primary OA of the knee, aged between 40 and 70 years and fulfilling the diagnostic criteria of the American College of Rheumatology (ACR) for OA knee, were randomly selected at the National Ayurveda Hospital in Borella. A mixture of 10g of each ingredient of *Kolakulaththadi churna* and mixed with 50ml of *Kanji* (Tamarind juice) and 5g of *Saindhava Lavana* (Rock salt) was prepared. The paste was heated over a light flame and applied over the affected part of knee joints followed by bandaging and retained for 12 hours for 14 consecutive days. Subjective and objective parameters were used to assess the results based on clinical observations before and after treatment. The data were analysed using the Wilcoxon Signed Rank Test and Mann-Whitney U Test. It was observed that 75% reduction in pain, 85% improvement in restricted movement of knee joints, and 90% in swelling and crepitus. This study substantiates the efficacy of *Kolakulaththadi upanaha sweda* in the management of *Janu sandhigatavata*.

Keywords: *Kolakulaththadi, Sandhigatavata, Swedana, Upanaha, Vatavyadhi*

Successful Ayurveda Management of Complication due to Fragile X Syndrome: A Case Study

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Fragile X syndrome is a genetic disorder characterized by behavior patterns similar to Attention-Deficit/Hyperactivity Disorder (ADHD) and autistic behaviors. Fragile X syndrome is caused by a triplet expansion that inhibits expression of the Fragile X Messenger Ribonucleoprotein 1 (FMR1) gene. It is the most frequent form of inherited intellectual disability and is also associated with various neurological and psychiatric disorders. A pre-diagnosed 07-year-old boy with Fragile X syndrome sought Ayurveda treatment at the Pediatric Unit of the Ayurveda National Hospital. He presented with complaints of poor attention, delayed and limited speech, stereotypic social behaviours and hyperactivity. The aim of this study was to evaluate the efficacy of Ayurveda treatment protocol in mitigating signs and symptoms of Fragile X syndrome. According to Ayurveda, this condition was diagnosed as *Balaka Vata Pradhana Mano Vyadhi*. The treatment focused on regulating Tridosha, particularly *Vata Dosha* to alleviate the associated symptoms. The treatment protocol lasted seven weeks and included both *Anthahparimarjana Chikithsa*, and *Bahihparimarjana chikithsa*. In the first week, *Anthahparimarjana Chikithsa* included *Trikatukadi* decoction (½ *Patha*), *Chandra kalka* (1.25g) with *Mahadalu Anupana*, administered twice daily. *Sarasthwata Choornaya* (1.25g) with bee honey was given in the morning while *Vachadi Choornaya* (1.25g) with bee honey was administered at night, along with the *Kola Daunda Vatee* in the morning. During the 2nd week, only the decoction was changed. External treatement included *Sheersha Abhyanga* with *Divyanganadi* oil and *Hastha, Pada Abhyanga* with *Nirgunyadi* oil. *Narayana* oil was applied to the lower back, B/L knees and ankle joints. After the treatment, the child exihibited significant improvement in speech, behavior, memory, study performance, and the strength and tone of bilateral calf muscles. Fragile X syndrome is a *Sahajabala Pravirti Roga* in Ayurveda, and while it may not be completely curable, this treatement protocol proved beneficial in improving the patient's quality of life. Additionally, it has the potential to reduce the economic burden associated with managing this condition.

Keywords: *Fragile X Syndrome, Genetic Disorder, ADHD, Autism, Vata Vyadhi*

Substantiating the Use of *Gul e Surkh* as an Effective *Badal* (Substitute) for *Gul e Gauzaban* in Terms of the Similarities in their Botanical and Chemical Properties

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The Unani system of medicine is one of the indigenous medical traditions in Sri Lanka. It orginated in Greece based on the teaching of Hippocrates (460BC) and Galan (151-201AD). The Unani medical system was later introduced to countries such as India, Pakistan, Bangladesh, and Sri Lanka by the Arab traders. Though the Unani concept of remedial substitution holds immense practical value, it has not been adequately explored by most Unani scholars, with the exception of Razi (Rhazes 865-925 AD), who adopted the concept and outlines rules for prescribing substitute drug when the preferred drugs were unavaialable. The Unani concept of remedial substitution is based on similarities in the actions, temperaments, and physical properties of drugs, primarily botanical, which have already been well-established. However, chemical composition has not been considered a basis for substitution. The objective of this study was to compare the botanical descriptions, morphological characteristics, and chemical components of two plants, and to evaluate the scientific validation of selecting *Gul-e-Surkh* as a potential substitute for *Gul-e-Gauzaban*, with reference to its effects on the heart (*Qalb*) through the Unani concept. The study also explored literary research on effective methods for preparing Unani compound formulations. Unani classical texts, textbooks, reference books, review articles, and relevant papers were reviewed, along with botany books and computer database searches, including PubMed and Google. The study found a similarity between the main and substitute botanicals, with only minor differences. A direct relationship between the physical properties, actions, temperaments, and chemical constituents of the primary and substitute botanicals was observed. While the study appeared to validate the concept based on these factors, further pharmacological studies focusing on properties and activities, pharmacogenetic studies, and clinical trials are needed to strengthen the concept further.

Keywords: *Badal, Substitution, Gul e Surkh, Gul e Gauzaban, Unani Concept*

Evaluation of Antioxidant Capacity of Selected Sri Lankan Herbs Focusing on Hair Growth

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Diverse ecosystems in Sri Lanka support a broad-spectrum medicinal plant. The global plant-based cosmetics market has grown dramatically due to rising consumer awareness of the long-term health benefits associated with natural ingredients. The present study aims to investigate the antioxidant capacity of selected twelve herbs in Sri Lanka, including *Trigonella foenum-graecum* L, *Centella asiatica* (L.), *Alternanthera sessilis* (L.) R.Br. ex-DC, *Indigofera tinctoria* L, *Phyllanthus emblica* L, *Coscinium fenestratum* (Gaertn.) Colebr, *Adenanthera pavonina* L, *Azadirachta indica* L, *Hibiscus rosa-sinensis*, *Cyperus rotundus* L, *Bacopa monnieri* (L.) Wettst, and *Murraya koenigii* (L.) Spreng. These plants were selected based on a literature review of their potential to promote hair growth. In the initial phase of the study, Total Phenolic Count (TPC) and the Total Flavonoid Count (TFC) of ethanolic and water extracts were examined. TPC of ethanolic extracts for *Trigonella foenum-graecum* L, *Centella asiatica* (L.), *Alternanthera sessilis* (L.) R.Br. ex-DC, *Indigofera tinctoria* L, *Phyllanthus emblica* L, *Coscinium fenestratum* (Gaertn.) Colebr, *Adenanthera pavonina* L, *Azadirachta indica* L, *Hibiscus rosa-sinensis*, *Cyperus rotundus* L, *Bacopa monnieri* (L.) Wettst, and *Murraya koenigii* (L.) Spreng were found to be 208.77±2.34, 497.72±3.18, 660.63±5.10, 859.15±4.80, 940.4±5.20, 383.27± 2.07, 855.65±4.17, 839.89±5.68, 808.36±8.36, 371.26±4.96, 304.67±4.35 and 889.36±2.36 in mg of gallic acid eq/g of extract respectively. The TFC of the ethanolic extract were 123.33±3.48, 307.33±2.94, 106.67±2.48, 173.67±3.33, 424.50±3.76, 597.67±5.76, 196.06±3.80, 76.87±2.50, 256.33±4.14 and 196.06±1.80 mg of quercetin eq/ g of extract, respectively, with the excepton of *Indigofera tinctoria* L and *Coscinium fenestratum* (Gaertn) Colebr, which did not show significant functional capacity for promoting hair growth. The findings from this study can be used to develop herbal hair care products utilizing these tested plants.

Keywords: *Antioxidant Capacity, Hair Growth, Herbs, Sri Lanka*

Assessing the Efficacy of Ayurveda Treatment Protocol in Mitigating Signs and Symptoms of Myelomeningocele: A Case Study Analysis

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Myelomeningocele is a neural tube defect where the spinal cord protrudes due to incomplete closure during embryonic development. The efficacy of Ayurvedic treatment was evaluated for a 3 ½-year-old girl who was admitted to the National Ayurveda Hospital in Borella during her second rotation, presenting with walking difficulties, joint contractures, and incontinence. This condition was diagnosed as *Balaka vata vyadhi*. The treatment was designed to regulate *Tridosha*, particularly *Vata dosha*, to alleviate the signs and symptoms associated with the condition. During the first week, the patient was given *Trikatukadi* decoction (½ *Patha*), *Chandra kalka* (1.25g) with *Mahadalu anupana*, *Desadun kalka* (1.25g, *Inguru koththamalli phantaya* (1.25g) all administered twice a day. Additionally, *Sarasthwata choornaya* (1.25g) with bee honey in the morning, and *Vachadi choornaya* (1.25g) with bee honey at night, and *Dhatree choornaya* (1.25g) at night were prescribed. In the second week, the decoction was modified to *Trikatukadi* (½ patha), and *Chandra kalka* was excluded, while the remaining internal medications were continued. As *Bahihparimarjana chikithsa*, *Sheersha abhyanga* was performed using *Divyanganadi* oil, and *Hasth*, *Pada Abhyanga* was done with *Nirgunyadi* oil. Bone marrow paste was applied to bilateral lower limbs. *Pichu* 1 with *Narayana* oil was applied to lower back and *Pichu* 2 with *Prasarani* oil was applied to bilateral knee and ankle joints. The external treatment regimen remained consistent throughout both weeks. Following two cycles of treatment, the child exhibited significant improvements: Bladder control was regained, daytime voiding was reduced, bladder and anal sphincter strength increased, and her ability to walk with support improved. The treatment involved *Shodhana*, *Vata shamana*, and *Tarpana* therapies. While the initial outcomes are encouraging, further clinical studies are necessary to validate the efficacy of this treatement protocol.

Keywords: *Apana Vata, Ayurveda Management, Balaka Vata Vyadhi, Sahaja Roga, Myelomeningocele*

Role of *Isabgol* (Psyllium Husk) in the Management of *Qabs* (Constipation): A Systemic Review

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Constipation (*Qabs*) is a common gastrointestinal disorder characterized by infrequent and difficult bowel movements. In Unani system of medicine, *Isabgol* (Psyllium husk) obtained from the plant *Plantago ovata* seeds, is widely used for its *Mulayyin* (laxative) properties in managing *Qabs*. This systemic review aims to evaluate the role of *Isabgol* in the treatment of *Qabs* by examining contemporary scientific literature and traditional medicinal texts. A comprehensive search was conducted across various databases, including PubMed, Scopus, and Google Scholar, to identify relevant studies investigating the efficacy, safety, and mechanism of action of *Isabgol* in treating constipation. Search terms such as '*Isabgol*', 'Psyllium husk' '*Plantago ovata*' were combined with '*Qabs*', 'Constipation', and 'Bowel regularity' to retrieve articles published from 2014 to 2024. A total of 34 articles were filtered and reveiwed. In the Unani system of medicine, *Isabgol* is used extensively for its various therapeutic actions such as a laxative, purgative, carminative, lubricant, diuretic, anti-inflammatory, anti-microbial, and analgesic agent. The findings indicate that, *Isabgol* effectively improves bowel regularity, stool consistency, and overall digestive health. It primarily works through its high fiber content, which increases stool bulk and promotes peristalsis. Additionally, *Isabgol* exhibits prebiotic properties, enhancing gut microbiota balance. This review also addresses potential side effects and contraindications, emphasizing the importance of proper dosage and administration. In conclusion, *Isabgol* is a valuable therapeutic agent for managing *Qabs*, providing a natural, safe, and effective alternative to conventional laxatives. Further clinical trials and pharmacological studies are recommended to substantiate these findings and explore additional benefits.

Keywords: *Constipation, Isabgol, Bowel Regularity, Psyllium Husk, Qabs*

Evaluating the Efficacy of *Vasthi* in Benign Prostatic Hyperplasia: A Case Study

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Benign prostate hyperplasia is a histological diagnosis characterized by the proliferation of smooth muscle and epithelial cells within the transient zone of prostate gland. The incidence and severity of lower urinary tract symptoms due to benign prostate hyperplasia are increasing day by day and more likely to occur in after 40 years of age. Due to the resemblance of clinical feature, it is often correlated with *Asthila*, a type of *Mutraghata* according to all the *Acharyas*. The objective of this study was to evaluate the effectiveness of an Ayurveda treatment in benign prostate hyperplasia. A male patient presented at the OPD of District Ayurveda Hospital, Bibila, Medagama where he was diagnosed with *Asthila* based on clinical features and an abdomical ultra sound scan. The patient was treated with local *Sneha karma* (application of oil) using *Hingu thriguna* oil, and *Sweda* with *Dashamool* nadi *sweda* followed by *Yoga vasthi* with *Punaenawashtaka kwatha* (480ml). Herbal decoctions and *Vasti* were administered orally for 28 days. Patient assessment was conducted using International Prostate Symptom Score (IPSS), prostate weight, and post void residual urine volume. After completion of Vasthi treatment, significant relief was observed in symptoms. The IPSS score was decreased from 13 before treatment to three after treatment. The volume of the prostate reduced from 26cc to 16cc. This study conclusively demonstrated the effectiveness of *Punarnawashtaka niruha vasti* with favorable results supporting further studies to evaluate the efficacy of this regimen.

Keywords: *Asthila, Benign Prostate Hyperplasia, Punarnawashtaka Niruha Vasthi*

Ayurveda Management of *Garbhashagatha Arbuda* (Uterine Fibroids): A Case Report

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In Ayurveda, uterine fibroids are referred to as "*Garbhashagatha arbuda*" and are considered benign uterine growths. A 43-year-old female patient presented with heavy menstrual bleeding and pelvic discomfort due to uterine fibroids, which she had been experiencing for 2 years. Uterine fibroids can significantly affect a woman's quality of life, causing symptoms such as heavy menstrual bleeding, pelvic pain, and reproductive issues. The objective of this study was to observe the effects of a selected drug on fibroid size, symptom severity, overall health, and to document any adverse effects or improvements in quality of life. This study was designed as a prospective, single-drug intervention, observational study focussing on the impact of *Agraraja kwatha* on uterine fibroids. *Agraraja kwatha* is traditionally used in Ayurveda for gynaecological issues. Its astringent and hemostatic properties are believed to help in shrinking fibroids and reducing excessive menstrual bleeding. The patient was instructed to take 60 ml of *Agraraja kwatha* twice daily on an empty stomach for 3 months with a one-month follow-up. Post treatment, the patient showed a reduction in the number of fibroids from two to one and the average volume decreased from 210cc to 104cc. Significant improvements were observed in quality-of-life scores and menstrual regularity was reported. Other symptoms, such as pain and heavy bleeding were also significantly reduced. After 4 months of data analysis, the baseline assessment was compared with a follow-up assessment. The primary and secondary outcomes showed improvement without adverse effects. The shrinking and anti-inflammatory properties of *Agraraja kwatha* may contribute to the shrinkage of fibroid tissue by reducing *Kapha* and promoting healthy tissue turnover. Compared to conventional treatments like surgery or hormonal therapies, *Agraraja kwatha* offers a non-surgical, low-cost, and well-tolerated alternative. Its holistic approach targets the fibroid and improves overall reproductive health. The study aimed to provide evidence for the efficacy and safety of using *Agraraja kwatha* as a single-drug treatment for uterine fibroids. Future research should focus on long-term outcomes and larger sample size.

Keywords: *Garbashagatha Arbuda, Uterine Fibroid, Agraraja Kawatha*

Effect of *Divyanganadi Taila Kati Vasti* on *Thrikashoola* with Special Reference to Lumbar Spondylosis: A Case Series

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Thrikashoola, commonly referred to as lower back pain, is classified under *Nanathmaja vata vyadhi* in authentic Ayurveda texts. The prevalence of lower back pain has surged due to the sedentary lifestyles and unhealthy work habits in modern society. Clinically, *Thrikashoola* shares similarities with lumbar spondylosis. "*Thaila Pancha Shathakaya*," a traditional Sri Lankan text, mentions the formulation of "*Divyanganadi Taila*," which is indicated for *Thrikashoola*. Despite its historical use by native physicians, no scientific studies have been conducted to validate its efficacy. Therefore, this study aimed to evaluate the efficacy of *Divyanganadi taila kati vasti* along with *Dasamoola nadi sweda* in managing *Thrikashoola*. The study was conducted at the Out Patient Department and Inward Patient Department of the Provincial Ayurveda Hospital in Pallekale, Sri Lanka. The study involved five patients aged between 40-65 years, of either sex, who were randomly selected. The treatment duration was 28 days. Registered patients underwent *Kati Vasti* with *Divyanganadi taila* for thirty minutes, followed by *Dasamoola nadi sweda* for ten minutes over 14 consecutive days. Outcomes were assessed using the Oswestry Disability Index (ODI) and the Physical Impairment Scale (PIS) during the treatment and a two-week follow-up period. Data was recorded in a standard proforma and analyzed using the Wilcoxon signed-rank test. The study revealed significant improvement in symptoms of *Thrikashoola*, with 100% relief in pain and 90% relief in stiffness, tenderness, and range of movement. The combination of this treatment regimen was effective in managing *Thrikashoola*. Further studies with larger sample sizes are recommended to generalize these findings.

Keywords: *Thrikashoola, Divyanganadi Taila, Lumbar Spondylosis, Kati Vasti, Nadi Sweda*

An Observational Study of *Ketakela Pattu* on Colles Fracture

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The Colles fracture is a distal radius fracture characterized by dorsal comminution, dorsal angulation, dorsal displacement, radial shortening. This observational study selected three patients diagnosed with Colles fractures from a government-registered traditional orthopedic practitioner in the Polgahawela divisional secretarial area. The first patient was a 4-year-old male with a left-sided Colles fracture; the second patient was a 41-year-old female patient with a right side Colles fracture, and the third patient was a 37-year-old male patient with a left side Colles fracture. All these three patients presented with severe pain, stiffness, heaviness, edema, and a pricking sensation in the wrist joint. The treatment involved applying a Ketakela Pattu (herbal paste) approximately 2-3 inches thick to the fracture site. Four long bamboo splints (Pathuru) were used to immobilize the fracture area, followed by the application of a 6-inch cotton bandage. The splints and bandages were changed every three days, and fresh materials were used to maintain the optimal limb position for 28 days. The fracture site was observed every three days, and Pattu and Pathuru were reapplied, with clinical features assessed before and after the 28-day treatment period. The treatment involved applying a K*etakela pattu* approximately 2-3 inches thick to the fracture site. Four long bamboo splints (*Pathuru*) were used to immobilize the fracture area followed by the application of a 6-inch cotton bandage. The splints and bandages were changed every three days, and fresh materials were used to maintain the optimal limb position for 28 days. The fracture site was observed every three days and Pattu and Pathuru were reapplied, with clinical features assessed before and after the 28-day treatment period. Improvement in clinical features was graded according to the international scoring system. Pain was reduced by 80.33%, stiffness by 33.33%, pricking sensation by 50%, and heaviness by 83.33%. The range of movements improved by 57% during the treatment period among all three patients. Therefore, it can be concluded that *Ketakela pattu* is effective for managing the clinical features of Colles fracture.

Keywords: *Ketakela Pattu, Colles Fracture, Kanda Bhagna, Indigenous Medicine*

Development and Nutritional Quality Evaluation of *Hulankeeriya (Maranta arundinacea)* Flour Enriched Cookies

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Medicinal plants are a major source of disease prevention and treatment. *Hulankeerya* (*Maranta arundinacea*), also known as arrowroot in English, belongs to the family Maranthacea and is a perennial plant that grows with starch-rich white rhizomes. Starch is a nutrient, an emollient, and a demulcent. *Hulankeeriya* has been used for years due to its easily digestible nature; hence, it is useful in bowel complications such as indigestion, dysentery, skin diseases, and burning sensations. It is used in Sri Lankan traditional medicine as an antidote for food poisoning and venomous snake bites. The present study was conducted to develop cookies using powdered *Hulankeeriya* root and assess their nutritional value. Traditional rice flour, ghee, salt, sugar, vanilla essence, and powdered *Hulankeeriya* root were used to develop herbal cookies based on *Hulankeeriya* flour after several trials to get the proper ratio of the ingredients. The prepared cookies were evaluated to determine the values of the macronutrients such as carbohydrate, protein, fat, moisture, ash content, and energy through proximate analysis methods. The results revealed that the carbohydrate content is 60.8%; protein content is 3.8%; fat content is 27.8%; moisture content is 5.9%; and ash content is 1.7%. The cookies provide 508.6 kcal/100g of energy. This preparation of herbal cookies is innovative and novel research in the realm of functional food production. Hence, the creation and utilization of such functional foods will benefit people with various health conditions while enhancing overall nutritional status.

Keywords: *Hulankeeriya, Herbal Cookie, Nutritional Analysis*

Comparative Study of Scavenging Activity of Halophyte, *Xylocarpus rumphii* Seed Extracts, and its Product *Gopalu Guliya* by *DPPH Assay*

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This study investigates the antioxidant properties of two different seed extracts (A_1 and A_2) from halophyte *Xylocapus rumphii*, as well as its traditional medicinal product *Gopalu guliya* (B), which is unique to the Southern Province of Sri Lanka. Despite its traditional uses, there is no scientifically proven evidence of the pharmacological properties of *Gopolu guliya*. The present study focused on the antioxidant activity of three methanol extracts (A_1, A_2 and B) using the 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. Seed sample A_1 underwent detoxification by boiling with cow milk before methanol extraction, while seed sample A_2 was directly extracted. All samples were extracted using a rotary evaporator. Antioxidant activity was compared among the A_1, A_2, and B methanol extracts using the DPPH assay across varying concentrations. Sample A_1 showed the highest DPPH scavenging activity at 85.3%, followed by A_2 at 83.1%, and B at 55.2% at 50 µg/ml. The extracts from cow milk-boiled seeds and *Gopalu guliya* exhibited higher DPPH scavenging activity compared to the normal seed extract. All extracts demonstrated significant scavenging activity compared to controls and ascorbic acid, highlighting their potent antioxidant properties. Further research is essential to conduct comprehensive investigations into their potential benefits.

Keywords: *Cow Milk, DPPH Assay, Seeds, Gopalu Guliya, Xylocapus rumphii*

Effect of Sri Lankan Traditional Medicine and Ayurveda Management on Endometriosis and Adenomyosis: A Case Study

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Endometriosis affects about 10% of reproductive-age women and girls worldwide. Adenomyosis is a form of the endometriosis where endometrial glands found deep within the myometrium. This study is aimed to showcase a successful management approach for a case involving both endometriosis and adenomyosis. This case study invovles of a patient diagnosed with both endometriosis and adenomyosis with multiple endometrioma in right and left ovaries. She is a 42-year married nulliparous woman without other pathologies. Her body mass index (BMI) is 26.8, blood pressure is 120/78 mmHg, and pulse rate is 78/min. She has a history of laparoscopic bilateral cystectomy in 2021. The intervention period lasted three months. The first drug regimen was administered during OPD management, followed by two IPD treatment regimens 01 month apart. *Sneha sweda*, *Yoga vasti*, *Nadi sweda*, *Udara pattu*, *Mathra vasti* procedures were conducted with the 2nd and 4th oral drug regimen. In between 3rd drug regimen was continued at OPD level. Dysmenorrhea and dyspareunia were assessed monthly using Visual Analog Scale (VAS). Endometriomas and adenomyosis were evaluated before and after the intervention by ultrasound scans conducted by the experts who were blinded to the procedure. Other vital signs and menstrual patterns were monitored every 2 weeks. After the treatments, the VAS score for dysmenorrhea reduced to 10 from 0, and the VAS score for dyspareunia reduced from 4 to 1. The ultrasound scan reports confirmed the total cure of the endometrioma and adenomyosis after the three-month intervention. During the follow up period, the patient's quality of life (QOL) remained unchanged. In conclusion this case was successfully managed using Sri Lankan traditional and Ayurveda treatments.

Keywords: *Endometriosis, Adenomyosis, Sri Lankan Traditional Medicine, Ayurveda, Case Study*

A Physicochemical and Phytochemical Analysis of *Trikantakadi Kwatha*

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The *Kwatha kalpana* is one of the most effective and widely used liquid dosage forms in Ayurveda pharmaceutics. *Trikantakadi kwatha* is a classical formulation mentioned in *Bawaprakasha* under *Jvaradhikara*. The *Kwatha* ingredients are *Nidigdika* (*Solanum xanthocarpum* Schrad & Wendl.), *Shunti* (*Zingiber officinale* Roscoe.) and Amurtha (*Tinospora cordifolia* (Thunb.) Miers). It is indicated for *Jeerna jwara*, *Aruchi*, *Kasa*, *Swasa* and *Agnimandya*. With the increasing demand for herbal medicines, the standardization of herbal drugs through analytical studies has gained significant importance. The present study was designed to execute organoleptic, physicochemical, and phytochemical analysis of *Trikantakadi kwatha* according to standard protocols. *Trikantakadi kwatha* was prepared according to the method described in *Sharangadhara Samhitha*. The *kwatha* was freeze- dried to obtain the concentrated aqueous extract for the phytochemical analysis. *Trikantakadi kwatha* appeared brownish in color, had a pleasant odor, was bitter in taste and had a liquid consistency. *Trikantakadi kwatha* showed a pH of 5.73, a specific gravity of 1.02 and a total solid content of 1.816% w/v. Preliminary phytochemical screening of the freeze-dried aqueous extract of *Trikantakadi kwatha* exhibited the presence of tannin, alkaloids, saponin, flavonoids, and cardiac glycosides. Thin Layer Chromatogram was performed using Ethanol: Water (1:1 v/v%) solvent system and observed under 256nm and 366nm UV light. HPTLC fingerprint revealed eleven peaks (Rf= 0.01, 0.09, 0.18, 0.22, 0.25, 0.34, 0.38, 0.47, 0.61, 0.63, 0.81) for the extract. This physicochemical and phytochemical analysis along with HPTLC profiling, provides preliminary scientific evidence for *Trikantakadi kwatha*. The phytochemicals present in the *Kwatha* suggest anti-oxidant, anti-inflammatory, anti-microbial, and analgesic actions, which could be useful in therapeutic applications.

Keywords: *Kwatha Kalpana, Trikantakadi Kwatha, Physicochemical, Phytochemical, HPTLC*

A Single Case Study of *Dashanga Lepa* on Ankle Sprain

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Ankle sprains are common injuries characterized by ligamentous damage and inflammation. This case study focused on the therapeutic effect of *Dashanga lepa*, an Ayurveda herbal paste comprising a combination of ten medicinal herbs with *Shothahara* (anti-inflammatory) and *Vedanasthapaka* (analgesic) properties, on an ankle sprain. A 30-year-old female patient presented at the Outpatient Department of Ayurveda Nationa Hospital with a history of a recent ankle injury while playing badminton. Initial examination confirmed severe pain and swelling, tenderness, and restricted range of motion (ROM) consistent with a grade III sprain; an X-ray excluded a fracture. *Dashanga lepa*, was applied topically with tamarind (*Tamarindus indica L.*) leave juice on the affected right ankle once every day for ten days, with supportive measures (rest and elevation). Internal treatments were not prescribed. Outcome measures included pain intensity assessed via Visual Analog Scale (VAS), ankle circumference measurements for swelling, and patient reported functional improvements. Assessment was done on every 5th day. Results indicated a gradual reduction in swelling, pain from severe (VAS score of 8/10) to mild (VAS score of 2/10) and increased ROM within the first five days of treatment. Pain and swelling decreased significantly, with a notable improvement in the ankle ROM observed by the 10th day. This case study suggests that *Dashanga lepa* combined with tamarind leave juice may offer effective therapeutic benefits in managing grade III ankle sprains, potentially due to its *Shothahara* and *Vedanasthapaka* properties. Further research, including randomized controlled clinical trials, is required to validate these findings and explore the mechanisms underlying their efficacy.

Keywords: *Dashanga Lepa, Ankle Sprain, Case Study, Analgesic, Anti-Inflammatory*

Effect of an Ayurveda Treatment Protocol in Managing Autism: A Case Study

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Autism spectrum disorder is characterized by difficulties with social interaction, communication, and atypical behavior patterns. According to the WHO, one in 100 children worldwide has autism. Management of autism spectrum disorder typically includes speech therapy, occupational therapy, and physical therapy. This study focused on the effect of an Ayurveda treatment protocol for autism. A four-year, three-month-old boy with a pre-diagnosis of autism was brought to the *Balaroga* Outpatient Department of Ayurveda National Hospital. He exhibited 2-3 single-word speech, communication disturbances, poor eye contact, and hyperactivity for 2 years. He was admitted for inpatient treatment. In the first week, the treatment included *Trikatukadi kasaya* (¼ Patha), *Chandrakalka 1 Madata* with *Mahadalu anupana*. Following this, 14 *Anu thaila pratimarsha nasya* treatments were started, followed by 10 sessions of *Shirodhara* and 10 *Shiro basti* treatments with *Divyanganadi oil*. The child also received *Vacha choorna* (1.25 g), *Kaluduru-thippili leha*, and *Brahmi Mandukaparni kashaya* (¼ Patha) continuously. Finally, *Datri choorna* (2.5 g) and 5 *Matra basti* treatments with 50 ml *Narayana oil* were administered. Progress was evaluated based on professional observations of the child's signs and symptoms and the mother's reports of the child's progress. During the *Nasya karma* treatment, significant improvements in speech were observed, with the child learning 12-15 new words, beginning to read, and forming two-word sentences. Attention improved, and hyperactivity was gradually controlled. In autism, changes are in the brain. According to Ayurveda, the nose is considered the entryway to the head; thus, medicine adiministered through the nasal route reaches the brain, regulates functions, while removing morbid *doshas*. Further, the medicine used in this treatment has *Agni deepana*, *Sroto shodhana*, *Medhya* properties, which control disease by correcting *Agni*, *Tridosha* and enhancing *Dhee*, *Druti*, *Smriti*. This case study demonstrates the efficacy of Ayurveda treatment in managing Autism. Further studies with larger sample are necessary to scientifically validate these findings.

Keywords: *Autism, Nasya Karma, Anu Thaila, Balaroga*

A Study of *Modakaya* with Special Reference to *Sanjeewanie Kameshwari Rasayanaya*

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Modaka, a preparation in Ayurveda pharmaceutics involves grinding powdered ingredients with base like bee honey and ghee. This study focuses on *Sanjeewanie kameshwari rasayanaya* which is renowned for its rejuvenative and aphrodisiac properties among *Modaka* preparations. *Sanjeewanie kameshwari rasayanaya* was prepared according to Sri Lankan Ayurveda pharmacopeia following standard operating procedures at the *Sanjeewani* Ayurveda Drug Company, Embilipitiya. The quality and safety of the product were evaluated through organoleptic analysis, physico-chemical assessments, total sugar content, detection of coloring matter, free fatty acids, aflatoxins, microbiological analysis, and heavy metal analysis using microwave digestion and chromatographic techniques. The drug sample and standard raw material mixture were extracted into dichloromethane separately for chromatographical studies and developed chromatograms (Ethyl-acetate: Dicholomethane: Cyclohexane 0.1:3.4:1.5) were visualized under 254nm and 366nm UV light after spraying with Vanillin-sulphate reagent. Physically, *Sanjeewanie kameshwari rasayanaya* exhibited a loss on drying of 3.6% and total-ash of 2.8%, meeting standard values. Microbiological assessments revealed, aerobic plate count (1.9×10^4), *Escherichia coli* (absent), *Staphylococcus aureus* (<10), yeast and mould count (<100), *Salmonella* spp. (absent), *Pseudomanas aeruginosa* (<100) were within acceptable limits. Heavy metals like lead, cadmium, arsenic, and mercury, aflatoxin B1, B2, G1, G2 and total aflatoxin and synthetic dyes were not detected in the sample. Total sugar content and free fatty acids were 27.7% and 2.0% respectively. The TLC fingerprint profile of the drug sample was comparable in terms of Rf values (0.20, 0.27, 0.39, 0.44, 0.50, 0.58, 0.69, 0.78, 0.89, 0.94) and colors to the profile of standard raw material mixture. In conclusion, *Sanjeewanie kameshwari rasayanaya* demonstrates its status as a standard drug by meeting established safety and quality standards.

Keywords: *Sanjeewanie Kameshwari Rasayanaya, Microbial Contamination, TLC*

Phytopharmacological Evaluation of Leaves and Fruits of *Morinda citrifolia L.* used in Sri Lankan Traditional Medicine

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Faculty of Indigenous Medicine, University of Colombo, Sri Lanka

Morinda citrifolia L. of family Rubiaceae is a perennial tree commonly known as *Ahu* (noni fruit) in Sri Lanka. It features large leaves, white flowers, and green fleshy fruit that turns yellow when ripe. In Sri Lankan traditional medicine, particularly in *Gedi vana pilika vedakama* and *Kedum bidum vedakama*, its leaves and fruits are utilized externally in the form of *Mellum* and *Paththu*. This study aimed to evaluate the pharmacological properties of *Morinda citrifolia* L. as described in authentic Ayurveda texts and to conduct phytochemical and chromatographical analyses on methanol extracts of its leaves and unripe fruits. The extracts were prepared by agitating the plant materials with methanol for 24hrs, followed by concentration using rotary evaporator at 40°C. The developed chromatograms (Chloroform: Methanol 7:3 v/v%) were visualized under 256nm and 366nm UV light. Pharmacological assessments revealed *Morinda citrifolia* L. has sweet and sour tastes, heavy and slimy properties, cold potency and ability to pacify all three *doshas*. Both extracts tested positive for alkaloids, flavonoids, terpenoids, and glycosides, with only the fruit's methanol extract showing the presence of carbohydrates. Previous studies have indicated that alkaloids, flavonoids, glycosides, and terpenoids are effective in orthopedic and wound treatments due to their anti-inflammatory, anti-oxidant, and tissue-regenerative properties. The HPTLC fingerprint profile demonstrated similar numbers of peaks in both extracts, although with differing intensities (R_f for leaves 0.00, 0.06, 0.25, 0.66, 0.83, 0.85 and for fruit 0.00, 0.06, 0.16, 0.34, 0.36, 0.86). In conclusion, *Morinda citrifolia* L. exhibits promising pharmacological potential due to rich chemical composition, suggesting therapeutic benefits consistent with its traditional uses in wound care and orthopedics within Sri Lankan traditional medicine.

Keywords: *Morinda citrifolia L., Traditional Medicine, Phytochemicals, TLC, HPTLC*

A Study of the Effects of a Traditional Treatment Plan in the Management of Radius Bone Fractures "*Arasthi Bhagna*": A Case Series

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Traditional Medicine is a unique heritage of Sri Lanka over centuries and traditional orthopedic treatments are the most popular field in it. In Sri Lanka, many patients who become disabled due to traumatic conditions initially or subsequently seek Ayurveda or indigenous treatments. This study aimed to investigate the efficacy of a traditional treatment plan in managing radius bone fractures. A randomized clinical trial was conducted at *Helabima wedamadura*, Hidallana, Rathnapura. Ethical clearance and administrative approvals were obtained, ensuring adherence to ethical standards and protocol. The first five patients aged 25 to 75, with confirmed radious bone fractures as evidenced by X-ray, were selected for treatment, after informed consent procedure. Traditional drugs were prepared according to established methods, including internal and external formulations. The intervention spanned six weeks, with treatments administered in specific regimens targeting pain relief, inflammation reduction, and fracture stabilization. Data collection involved assessing clinical features before, during, and after treatments, utilizing a grading scale to assess pain, swelling, numbness, stiffness, discoloration, deformity, and difficulty in movements. Data analysis was based on the variation in mean values of each parameter before and after the treatments and after a four-week- follow-up period. Analysis revealed a significant reduction in pain, numbness, discoloration and deformity post-treatment, with complete resolution observed in some patients. Swelling and stiffness showed marked improvement but persisted to a lesser extent after follow-up. Mobility difficulties were significantly reduced but persisted in some cases. Overall, the traditional protocol demonstrated effectiveness in managing radius bone fractures with most patients experiencing complete recovery or significant improvement without any adverse effects. Mobility difficulties were significantly reduced but persisted in some cases. Overall, the traditional protocol demonstrated effectiveness in managing radius bone fractures, with most patients experiencing either complete recovery or significant improvement without any adverse effects.

Keywords: *Sri Lankan Traditional Medicine, Radius Bone Fractures, Arasthi Bhagna, Indigenous Orthopedic Treatments*

Role of Treatment Modality in the Management of *Avabahuka*: A Case Study

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Avabahuka is a type of *Vata vyadhi* affecting the shoulder joint, which significantly restricts the functions of the joint due to the pain and stiffness. The objective of this study was to evaluate the efficacy of a treatment modality for managing *Avabahuka*. A 69-year old male patient presented to the *Panchakarma* Out Patient Clinic at Ayurveda Central Dispensary, Kahanda, Angulugaha, Galle, with pain, stiffness, and restricted movements in the left shoulder for 08 months was selected for the study. The treatment period was spanned 90 days, with treatments administered three days a week (every Monday, Wednesday, and Friday). During the first half of the treatment period, the patient was received *Abhyanga* with *Pinda taila*, *Pinda sweda* with *Aba murungadi pottani*, and *Lakshadi lepa* applied to the left shoulder joint region. Internal medicine included *Navarathna kalkaya* 2.5g and two pills of *Vata Gajendrasingha Vati* twice a day. In the second half of the treatment, the patient was treated with *Abhyanga* with *Masha taila*, *Pinda sweda* with *Eta pottani*, and *Lepa* with Bone marrow Paste applied locally to the left shoulder joint region. The Visual Analogue Scale (VAS) for pain and Ayurveda clinical assessment criteria were used to evaluate the effects of the treatment modality every two weeks during the treatment period. After completion of the treatment, the stiffness of the left shoulder was completely relieved and pain and range of movement in the shoulder joint were partially relieved by 66.6%.

Keywords: *Avabahuka, Movements, Pain, Shoulder*

FACULTY OF LAW

Role of the Law in Development and Democracy

08th and 09th of November 2024

MESSAGE FROM THE DEAN

Professor (Dr.) N. S. Punchihewa

Dean
Faculty of Law
University of Colombo, Sri Lanka

It gives me immense pleasure to send this message on the occasion of the International Research Conference - 2024 of the Faculty of Law, University of Colombo. The relationship between law, development, and democracy is complex and intertwined. On the one hand, the law is often criticized as being too slow to adapt to new trends in society and technological developments. In reality, such criticism is well-founded. Similarly, in hindsight, it appears that Sri Lanka had not effectively used the instrument of law for its economic development during the last seven decades. Perhaps even more significantly, the role of law in strengthening democracy can never be underestimated. Every citizen in our society should be willing to obey the law and protect the democratic institutions. Bearing these factors in mind, the Faculty of Law decided to invite research papers on the timely theme of "Role of the Law in Development and Democracy."

I am pleased to note that there has been a great deal of interest in this theme, which has attracted legal scholarship on a wide range of relevant topics from both local and international academics. These papers which critique legal issues relating to cutting edge scientific innovation, social development, and aspects of democracy will no doubt steer new developments in the law and pave the way for much-needed law reforms. I am also happy to note that this conference will showcase diverse research projects of my staff and serve to reinforce and display the status of the Faculty of Law as the pioneering law teaching and research institute in this country.

I take this opportunity to wish all the participants a fruitful and productive academic exercise and hope that the research papers discussed at the conference will aid the development of the law for the benefit of society at large.

MESSAGE FROM THE SYMPOSIUM CHAIR

Professor (Dr.) Rose Wijeyesekera

Professor of Private and Comparative Law
Faculty of Law
University of Colombo, Sri Lanka

The Faculty of Law focuses on "The Role of the Law in Development and Democracy" as the theme for its International Research Conference - 2024. In a global context where the core values of development and democracy are challenged, the crucial and decisive role that the law has to play in all aspects of human, animal, and plant life, as well as natural and artificial resources, cannot be overemphasized. "Development" in its holistic sense puts people first, and essentially emphasizes on social justice, which cannot be attained without realizing human rights. Democracy literally means rule/government by the people. The contemporary meaning of the term, however, urges a number of requirements that go far beyond its semantic meaning. Even though the two concepts are widely known in public law contexts, they are extremely relevant in other areas of law as well.

Reflecting research competence and capacities of scholars from Sri Lanka and abroad, the International Research Conference – 2024 of the Faculty of Law provides an intellectual platform for over forty research papers under the broad areas of Public law, International Law, Private Law, Comparative Law, and Commercial Law. As the dynamic nature of law expands well beyond the strict parameters of law, the Conference encourages research that focuses on intersections between law and other areas such as medicine, political dynamics, socio-cultural factors, and education.

It gives me immense satisfaction to witness the growing number of scholars presenting at the foremost research platform of the University of Colombo. I take this opportunity to wish all of them a rich and stimulating academic experience!

ORGANIZING COMMITTEE

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SYMPOSIUM PROGRAMME

Time	Programme
08.30 am – 09.00 am	**Registration and Morning Tea**
09.00 am – 09.10 am	**Lighting of the Oil Lamp**
09.10 am – 09.15 am	**National Anthem**
09.15 am – 09.25 am	**Welcome Address** Professor (Dr.) Rose Wijeyesekera Conference Chair, International Research Conference - 2024
09.25 am – 09.35 am	**Introductory Remarks** Professor. (Dr.) N.S. Punchihewa Dean, Faculty of Law
09.35 am – 09.45 am	**Speech by the Guest of Honour** Senior Professor (Chair) H.D. Karunaratne Vice Chancellor, University of Colombo
09.45 am – 10.00 am	**Video Presentation**
10.00 am – 10.05 am	**"Role of Private and Comparative Law in Development and Democracy - An Overview"** **Dr. Udapadie Liyanage** Head, Department of Private and Comparative Law
10.05 am – 10.10 am	**"Role of Private and Comparative Law in Development and Democracy - An Overview"** **Prof. Kokila Lankathilake Konasinghe** Head, Department of Public and International Law
10.10 am – 10.15 am	**"Role of Commercial Law in Development and Democracy – An Overview"** **Prof. Naazima Kamardeen** Head, Department of Commercial Law
10.15 am – 10.25 am	**Cultural Performance**
10.25 am – 10.45 am	**Speech by the Chief Guest** Emeritus Prof. Savitri Goonesekere
10.45 am – 11.30 am	**Speech by the Keynote Speaker** Senior Prof. (Dr.) Usha Tandon, Vice Chancellor Dr. Rajendra Prasad National Law University, Prayagraj, India
11.30 am – 11.40 am	**Distribution of Tokens of Appreciation**
11.40 am – 11.50 am	**Launch of the *Sri Lanka Journal of International Law* (*Volume 30, Issue 1*)** by the Department of Public and International Law
11.50 am – 12.00 pm	**Vote of Thanks**
12.00 am – 01.00 pm	**Fellowship and Lunch**

INTRODUCTION TO THE KEYNOTE SPEAKER

Senior Professor (Dr.) Usha Tandon

Vice Chancellor
Dr. Rajendra Prasad National Law University
Prayagraj, India

Senior Professor Usha Tandon is currently on deputation as the Honourable Founding Vice-Chancellor of Dr. Rajendra Prasad National Law University, Prayagraj, India. She served as the Dean and Head of the Faculty of Law at the University of Delhi (2021-2023), the Professor-in-Charge of Campus Law Centre (CLC), University of Delhi (2013-2019), and the Director of Vivekananda Law School, GGS Indraprastha University, Delhi (2004-2005). As a member of key statutory bodies like the Legal Education Committee of the Bar Council of India, the National Judicial Academy, and the Delhi State Legal Services Authority, she has consistently contributed to advancing legal education in India. She also served as a consultant to the Parliamentary Standing Committee on 'Law and Justice,' advising on strengthening legal education.

A widely acclaimed Professor of Environmental Law, Gender Justice, Family Law, and Alternative Dispute Resolution, she is a recognised scholar for her work on human development, environmental protection, and women empowerment. She has published extensively on Population Law, Energy Law, Biodiversity Law, Mediation, Climate Change, Gender Justice, and Human Trafficking Law. Her research has appeared in prominent international journals, including T*ransnational Environmental Law* (Cambridge University Press, UK), *Coventry Law Journal* (UK), *Yonsei Law Journal* (South Korea), *IIUM Law Journal* (Malaysia), *TOAEP*, (Brussels, Belgium), *OIDA International Journal of Sustainable Development* (Ontario, Canada), *Palgrave* Macmillan (Singapore), and *NOUN International Journal of Private and Property Law* (Nigeria).

She is a Fellow of the Max Planck Institute for International and Comparative Private Law, Hamburg, Germany, and the International Institute of Human Rights, Strasbourg, France (2007). She has received numerous accolades, including the *World Population Day Award, 2000, Phenomenal She, 2019, Exceptional Woman of Excellence, 2023, and Distinguished Woman Researcher in Law, 2023.*

ABSTRACT OF THE KEYNOTE ADDRESS

Law, Democracy, and Political Decision Making: Addressing Feminist Questions in South Asia

Senior Prof. (Dr.) Usha Tandon

Dr. Rajendra Prasad National Law University, India

Women's political participation is a *sine qua non* for true democracy in any country. Women being equal citizens should share equally in public decision-making. It paves the way for women's direct engagement in political decision-making. Quantitative data reveals that women's representation in national parliaments across South Asia remains significantly low. Further, women parliamentarian's participation in decision-making processes often remains superficial, with limited influence on policy outcomes. This paper explores the intricate interplay between law, democracy, and decision-making from a feminist perspective in South Asia. The objective of the paper is to advance understanding about factors that help or hinder women in entering and functioning in Parliament in South Asian countries defined as democratic. (While all the countries of South Asia have democratic Governments, their governance is not truly democratic.) The paper examines how legal frameworks and democratic processes have historically marginalized women and other gender minorities, perpetuating systemic inequalities. By analyzing case studies from countries in South Asia, the research highlights the challenges and successes in advocating for gender-inclusive policies and practices. The paper, thereafter, investigates strategies to enhance the substantive participation of women parliamentarians, such as legislative quotas, gender-sensitive political reforms, and capacity-building initiatives. It also examines the role of feminist movements in shaping legal reforms and democratic discourse, emphasizing the need for intersectional approaches to address the diverse experiences of women across caste, class, religion, and ethnicity. Ultimately, this study underscores the importance of reimagining legal and democratic institutions to foster greater gender justice and inclusivity in South Asia.

FACULTY OF LAW
List of Abstracts

Behind Closed Doors: Redefining Up-Country Tamil Community's Political Identity as a Distinct Minority Group

Selvaraj Puwanitha

Department of Public and International Law, Faculty of Law, University of Colombo, Sri Lanka

The migration of Up-country Tamils to Sri Lanka occurred during the colonial period and was characterized by the movement of millions of Indian Tamils brought to work on the plantation estates in the hill stations of Sri Lanka. Over time, this community faced numerous challenges, including significant cultural and political marginalization within Sri Lankan society. Their ancestral homeland in India became culturally and politically inaccessible to them over successive generations, leading to a complex process of identity formation as they navigated their socio-political status in Sri Lanka. This historical migration and subsequent integration into Sri Lankan society have been marked by a process of ethnogenesis, compelling Up-country Tamils to redefine themselves as a distinct ethnic group within the broader context of Sri Lanka's diverse population. This article examines whether the identity of Up-country Tamils has shifted from being poly-ethnic to that of a national minority and thereby enabling them to establish a strong claim of distinct political identity in the political arena. By doing so, the article aims to navigate the communities' power-sharing negotiations at the second tier of governance with clearer demands based on this redefined political identity. The research employs a qualitative methodology, utilizing an interpretative approach with primary and secondary sources. The article seeks to address critical questions about the community's geographical attachment, its evolution from a poly-ethnic group to a national minority, and ways to present their political identity more robustly. Additionally, the research explores the potential impact of territorial segregation caused by current administrative divisions and proposes methods to redefine the territorial boundaries regionally. With the analytical expansion, the article draws insights and strategies for the Up-country Tamil minority to enhance their political and social standing to place their demands as a strong minority community integral to Sri Lanka's development.

Keywords: *Up-Country Tamils, Ethnogenesis, National Minorities, Poly Ethnic Groups, Minority Identity*

North-South Dimension in Corporate Responses to Climate Challenges: Legal Insights

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The power dynamics between the global North and South play a critical role in determining collective action towards addressing climate change and environmental degradation. The overutilization of resources by the North as a group of nations, since the Industrial Revolution, possesses relatively a bigger share of the historical guilt over the unequal distribution of common global property. Until recently, International Environmental law primarily focused on adaptation and mitigation within interstate frameworks. However, the growing emphasis on loss and damage claims, particularly from the Global South, has brought attention to the potential extension of legal parameters that include various non-state parties. This is supported by the evolution of international law which has expanded beyond traditional state-centric approaches, embracing more inclusive and vertically integrated global governance patterns that allow non-state actors and business entities to influence international standards, particularly in the context of climate change discourse. By employing an interdisciplinary approach that intersects environmental law and corporate governance this research aims to answer two key questions: (i) Based on the CBDR principle, what are the primary challenges faced by businesses in the Global South when implementing the demanding global climate standards? And (ii) based on the loss and damage mechanism, how can the businesses in the Global North effectively transfer technology and best practices to the Global South? Even though the emergence of concepts and principles aimed at addressing environmental challenges in the corporate sector has led to the implementation of comprehensive environmental management systems aligned with ambitious sustainability targets as part of corporate social responsibility (CSR) strategies, yet regulatory gaps and lack of policy coherence in developing countries present challenges to effective enforcement of these measures at the domestic level. To this end, it explores the North and South dynamics in corporate governance based on the CBDR principle and loss and damage mechanism.

Keywords: *Climate Change, Corporate Governance, Loss and Damage, CBDR, CSR*

Eliminating Unnecessary Suffering in War: A Review on the Applicability of International Humanitarian Law and Selected Theravada Buddhist Principles in the Time of Armed Conflict

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International Humanitarian Law and Theravada Buddhism are two different disciplines. While International Humanitarian Law tends to protect humanity during an armed conflict, Theravada Buddhism seeks to attain the supreme bliss of 'Nirvāna' in order to make an end to the suffering throughout the long way of 'Samsāra'. As a religious philosophy, Buddhism acknowledges that unskillfulness (akusala) based on greed (lōbha), hatred (dōsa) and delusion (mōha) is the cause of human suffering. On the other hand, International Humanitarian Law urges belligerents to balance military necessity and humanity by following the principles of Distinction, Proportionality, and Precaution, aiming to reduce suffering on the battlefield. Theravada Buddhist philosophy always emphasizes that the elimination of suffering is not a collective effort but an individual effort. Therefore, each individual is responsible for their own self-spiritual liberation. However, International Humanitarian Law addresses the elimination of suffering in an armed conflict as a collective effort. These efforts focus on promoting compliance with International Humanitarian Law, strengthening accountability mechanisms, advocating for the protection of civilians and non-combatants, and facilitating humanitarian assistance during armed conflict. Hence, this study tends to explore, whether there is a possible compatibility in between core principles of International Humanitarian Law with the fundamental teachings of Theravada Buddhist philosophy to reduce unnecessary suffering of mankind in war. Despite the inherent philosophical disparities, it can be identified possible alignments between Theravada Buddhist philosophy and International Humanitarian Law to reduce the suffering of mankind. Accordingly, the fundamental principles of Theravada Buddhist philosophy such as mettā (loving-kindness), karunā (compassion), and ahiṃsā (non-violence) make an alignment with the Principle of Distinction, Principle of Proportionality, and the Principle of Precaution in International Humanitarian Law.

Keywords: *International Humanitarian Law, Theravada Buddhism, Reducing Suffering, Humanity, War*

Environmental Impact Assessment in the Indian Ocean: Ambiguities and opportunities under the UN High Seas Treaty 2023

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In June 2023, the international community adopted the historic High Seas Treaty, extending legal protection to oceans beyond national jurisdictions with a focus on the conservation and sustainable utilisation of the high seas. This Treaty introduces significant changes, particularly through its comprehensive framework for Environmental Impact Assessment (EIA), which is pivotal for island and developing nations. This paper employs qualitative research to analyse the role of Coastal States in the Indian Ocean region concerning the EIA process under the Treaty. For this purpose, it draws on primary sources such as treaty texts and official reports, as well as secondary sources including scholarly articles and expert analyses. The Indian Ocean, home to many developing nations and rich in marine biodiversity, holds considerable environmental, economic, and social value. Due to these factors, EIAs are critical for the region. This paper argues that the Treaty, viewed as a multilateral environmental agreement, offers Indian Ocean States a significant opportunity to participate in ocean governance, contribute to marine environmental conservation, and protect their self-interests. Through the EIA process, these States can update their domestic legislation and institutional structures, enhancing compliance with the United Nations Convention on the Law of the Sea (UNCLOS). However, challenges include potential marginalisation in decision-making and resource deficits. Despite the Treaty's recent adoption, the paper concludes that the role of Indian Ocean States remains crucial and seeks to contribute to ongoing dialogue by highlighting the potential for effective EIA implementation and sustainable ocean practices.

Keywords: *Environmental Impact Assessment, High Seas Treaty 2023, Indian Ocean Region, Ocean Governance, Marine Resources Conservation, UNCLOS*

Unveiling the Rainbow in Sri Lanka's Troubled Landscape: A Critical Assessment of Legal Recognition of Homosexual Rights in Sri Lanka

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It has been proven that the denial of recognition of one's right leads to the negation of its existence itself. Over countless centuries, individuals within the LGBTQ community have faced relentless deprivation of their inherent rights, from street mistreatments to being disowned by their own kin. Regrettably, these prejudices, often supported by certain religious beliefs and irrational theories devoid of logical foundations, persist prominently in the South Asian Region. In this context, despite Sri Lanka's recent attempts at decriminalizing homosexuality within its borders, doubts arise about whether such amendments would provide the legal recognition that these individuals truly deserve. Amidst this backdrop, this paper evaluates the effectiveness of the contemporary legal landscape concerning the rights of homosexuals in Sri Lanka, assessing whether these amendments strike a balance between the 'protection of LGBTQ Rights against discrimination' and the equally essential dimension of 'respecting and accepting them'. Key findings indicate that while legal protections have been implemented, they fall short of fostering true social integration and dignity for the LGBTQ community. By delving into historical records, legal advancements and seminal legal cases, this paper charts the transformative journey of legal recognition for homosexual rights in India, Nepal, and Bangladesh as well. Conclusively, the paper asserts the pressing need for a paradigm shift in the area of LGBTQ rights, advocating for a comprehensive legal framework that unequivocally secures equal rights and fosters an environment of respect and acceptance.

Keywords: *Homosexual Rights, Decriminalizing Homosexuality, LGBTQ Rights in Sri Lanka, Human Rights, Equality*

Combating the Arbitrary Use of Veto Power: A Critical Study of the Inability of the Security Council to Uphold International Peace and Security under International Law

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The UN Security Council holds the primary mandate to maintain international peace and security, empowered with a unique structure that includes five permanent members (P-5) with veto power. However, numerous instances, including the Ukraine-Russia War, Israel's actions in Gaza, and conflicts in Syria and Yemen, illustrate the arbitrary use of veto power by some P-5 countries. This practice often prevents the adoption of effective resolutions against aggressors, driven largely by geopolitical interests rather than the mandated obligation of achieving global peace and security. In this context, this research explores how the arbitrary use of veto power by the Security Council can be addressed within the current international legal framework to fulfil the original purpose of the UN Charter. The main objective is to identify the reasons behind granting such extensive power to the P-5 countries by the framers of the UN and to propose legal and pragmatic solutions that address the contemporary international law framework governing the prohibition of the use of force. Utilising a doctrinal legal research approach, this study employs a qualitative methodology and analyses primary and secondary data based on international law instruments, case law jurisprudence, scholarly works, and selected case studies. Key findings suggest that the UN General Assembly should exercise its residual powers under the UN Charter and utilize its vested power under the 'responsibility to recommend' and the rarely invoked 'Uniting for Peace Resolution' to deter the P-5 states from the arbitrary use of veto power. The research recommends formalising a new world order that includes neutral states, similar to the formerly active Non-Aligned Movement, to compel hegemonic powers to respect fundamental principles of international law, such as the sovereign equality of states and the prohibition against the use of force.

Keywords: *Veto Power, UN Charter, Security Council, General Assembly, Uniting for Peace*

The Evolution of Climate Change Litigation in South Asia: A Comparative Analysis between India and Sri Lanka

H.M.D.D.A. Senavirathna[1], N. Prajapati[2]

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This paper explores the evolution of climate change litigation in South Asia, with a specific focus on India and Sri Lanka. Climate change poses significant global challenges, and due to its unique geographical and socio-economic conditions, South Asia is particularly vulnerable towards the adverse impacts of climate change. The increasing frequency of climate induced disasters in the region has sparked a rise in climate change litigation, as impacted individuals and groups seek legal recourse. Therefore, this study aims to analyse the legal frameworks and the judicial approaches in India and Sri Lanka on facilitating climate litigation. Despite the lack of specific climate change legislation in both jurisdictions, this research aimed to highlight the crucial role played by the judiciary in implementing and enforcing mitigation and adaptation plans against the adverse impacts of climate change. In an attempt to examine the origin of climate change litigation in Asia, the study also acknowledges how the environmental jurisprudence has been shaped in the backdrop of fundamental rights in both India and Sri Lanka. The research also analysed the judicial approaches of handling climate change lawsuits in the two jurisdictions and to identify common legal arguments prevalent in the cases. The research methodology utilised a combination of doctrinal legal analysis and comparative study. This included a thorough examination of court decisions in the form of a qualitative analysis of selected legal precedents, statutes, and policy documents. The findings of the research suggest that while both judiciaries have demonstrated a proactive step on climate-related issues, the Sri Lankan judiciary should adopt more nuanced approaches in climate litigations in order to safeguard climate justice of its citizenry.

Keywords: *Climate Litigation, Environmental Jurisprudence, Fundamental Rights, India, Sri Lanka*

Periodical Elections and the Role of the Election Commission of Sri Lanka

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Elections are fundamental to the functioning and healthy representative democracy, ensuring the government is accountable, responsive, and representative of the people's will. This supports the stability and progress of the process of governance. Within this context, the Election Commission plays a crucial role in maintaining the integrity, fairness, and transparency of the electoral process. For this to be effective, the Election Commission's independence is vital. Independence refers to the Commission's ability to operate free from political pressures and external interference, which significantly influences public perception of electoral integrity. Thus, assessing the role of the Election Commission is essential for strengthening democracy. Although provision for the Election Commission existed since 2001, it was constituted for the first time only in 2015. However, events from that period raise questions about the actual role of the Commission. The Commission remained silent on the government's arbitrary election delays, resulting in nearly three years without local government elections and the postponement of Provincial Council Elections since 2018. The government cited financial constraints, delimitation needs, and an economic crisis as reasons. The public now eagerly anticipates parliamentary and presidential elections this year following the 2022 people's struggle. This paper examines the independence of the Election Commission as crucial for ensuring regular elections, focusing on factors like tenure security, appointment procedures, decision-making autonomy, expenditure control, regulation proposals, and the right to announce results without interference. It argues that Sri Lanka's Election Commission has failed to maintain its independence. The study uses a qualitative, desk-based approach and further study intends to respond to the literature gap as the institution is very young.

Keywords: *Electoral Integrity, Election Commission's Independence, Periodical Elections, Sri Lanka's Election Commission, Democracy*

Addressing Gendered Online Violence against Women in Sri Lanka: A Critical Analysis of Online Safety Act No. 9 of 2024

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Sri Lankan parliament recently enacted Online Safety Act No. 9 of 2024 (OSA 2024) which purportedly aims to provide greater protection for Sri Lankan women against gendered online violence. From its inception, Online Safety Bill attracted severe criticisms due to its potential negative impact on freedom of expression. Despite public protests, the government maintained its stance, emphasising its promise to address challenges posed by online harm, with a particular focus on protecting women and children. Gendered online violence is a global issue that affects women across the globe and Sri Lanka is not an exception to this phenomenon. Women, including those with public profiles, are prone to different forms of online abuse and already existing threats against them have evolved embracing new online facets. Such transformed threats range from casual sexist comments to publishing revenge porn. These also include harassment, doxing, cyber mobbing, sharing of unsolicited nudes, and deep fake videos of women. In this context this paper offers to examine some selected provisions of part III of OSA 2024, relating to prohibition on online communication of false statements. The objective of this doctrinal research is to understand whether they adequately provide protection against gendered online violence against women in Sri Lanka. It suggests that OSA 2024 only addresses limited instances of gendered online violence and fails to adequately protect Sri Lankan women against various forms of such violence within its legal framework. Further, it does not proactively protect all women from gendered online violence due to its reactive and individualistic approach towards protection and promotion of online safety. Further, the Act fails to acknowledge the existence of gendered hate speech in the digital sphere and leaves out many common forms of gendered online hate speech which necessarily target women as a group of individuals with certain characteristics.

Keywords: *Online Safety Act, Gendered Online Violence, Women's Rights, Cyber Violence*

The Legality of "Taking" Colonial Cultural Property: Special Reference to the Period of Dutch Occupation in Sri Lanka

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Recent demands for, and return of, cultural objects taken during colonial occupation, have raised several questions that have not been satisfactorily answered yet. Primary among these is the basis for return. While early requests (such as those made by Hemasiri de Silva on behalf of Sri Lanka), focused on the importance of the object to the home state, the host states have been more concerned with the provenance of the object itself. The return of colonial cultural property thus far has not satisfactorily considered the legality of the taking, rendering the returns made so far rather ad hoc. Acquisition during colonial times has taken place through various means, and discerning the legality of these means is difficult due to the ambiguous and often contested legal norms that were operational at the time. Contemporary thinking on the legality of the actions of the colonial era has added a further layer of complexity to this issue. In the context of the return by the Dutch government to Sri Lanka of certain colonial cultural objects in 2023 in keeping with the Dutch Restitution Policy, this research will investigate the legality of the taking of colonial cultural property during the Dutch period of occupation of Sri Lanka. It will do so through an examination of the legal system in operation in both the Netherlands and Sri Lanka at the time of the taking, as well as the international legal standards of the time. It will attempt to categorise the takings in order to provide a rational legal basis on which future restitution efforts can be made. The research employs both doctrinal as well as socio-legal methods of inquiry. Desk-based investigations are the primary method of data collection while empirical methods such as expert interviews are used to shed more light into this novel area of research.

Keywords: *Colonial Cultural Property, Legality, Dutch Restitution Policy, Restitution, Taking*

Constitution as a Living Document: An Analysis of Judicial Construction in Sri Lanka and India

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The constitution is the fundamental law of a state. Sometimes, the constitution necessitates evolution through judicial interpretation to respond to the contemporary needs of the society. Traditionally, originalists argue that the meaning of the constitutional provisions is fixed and that should be applied in its original form. Whereas, living constitutionalists oppose the originalist view and argue that constitutional law can and should evolve in response to changing circumstances and values. Constitutional interpretation during the last few decades has evidenced a gradual evolution of the meaning of the constitution as a living document in Sri Lanka. Nevertheless, there are some judgements where a significant decline in broadening the constitutional protection through interpretation. This inconsistency has resulted in violating people's rights, societal imbalance, social unrest, and losing faith in the justice system. This paper aims to investigate the possible reasons for such inconsistencies and attempts to evaluate the constitutional interpretative theory 'rationalism' to promote the concept of 'living constitutionalism' with reference to India. Rationalism has been termed as a general approach to the recurrent inquiry required by different provisions of a constitution. Rational conduct is something related to the behaviour deliberately directed to achieve a formulated purpose and governed exclusively by that purpose. This paper lays down that constitutional evolution as a living document is crucial in countries like Sri Lanka where several rights of the people including the right to life have not been expressly guaranteed. This research is mainly carried out using the black letter approach using primary and secondary sources. A comparative research methodology is followed to evaluate the position of constitution as a living document in Sri Lanka and India.

Keywords: *Constitutional Interpretation, Rationalism, Living Constitutionalism, Originalism, Constitutional Evolution*

Divorcing over the Change of Gender Status and its Consequences: A Proposal to Amend the Divorce Law of Sri Lanka

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Marriage is usually based on inseparable natural and social attributes. The natural attributes of marriage are formed and reflected in all aspects of the legislation while the social attributes are determined by certain social and cultural norms. This dichotomy of attributes echoes the same way in the question of whether marriage continues to be valid after gender change. In Sri Lanka, a marriage is considered as the pioneer social union and further an 'emotional and legal bond' between a man and a woman. Nevertheless, according to the modern principles of family law, the main basis of marriage is probably no longer gender but emotional basis, common rights, obligations, and so forth. From this point of view, a simple change of gender will not lead to the dissolution of marriage, however, causes the breakdown of the couple's feelings and emotions, and it can become the legal cause of divorce based on no-fault grounds. The key problem is that Sri Lanka has fault-based divorce laws that require individuals to establish specific grounds for divorce which makes the process complex and discouraging. This research analyzes the significant challenges of Sri Lankan law in obtaining a divorce based on the transformation of gender after marriage as a no-fault ground and discusses the consequences with special reference to the rights of the parties, child support, and custody. The black letter research method is used to conduct this research with a comprehensive analysis of primary and secondary sources. The research finds it significant and essential to highlight the no-fault grounds for the dissolution of marriage mostly in modern relationships and it requires a balanced approach, open dialogue, and legal reforms to simplify the divorce process, and supportive mechanisms to safeguard individual rights and well-being.

Keywords: *The Change of Gender, Validity of Marriage, No-fault Grounds, Civil Procedure, Sri Lanka*

An Assessment of Jurisdictional Immunity before Courts for Violation of Employment Rights by International Organizations in Sri Lanka

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International Organizations engage in promotion of civil, political, economic, social, and cultural rights of the people in the host countries, and they enjoy jurisdictional immunity before the domestic courts. The problem in the research is while the Organizations promote these rights of the people, for what reason they claim jurisdictional immunity in the domestic courts for violation of employment rights of the workers in the Organizations. The main objective of the research is to assess whether jurisdictional immunity before domestic courts should be given to the Organizations for violations of employment rights. The research is a qualitative research based on the analysis of legal materials. State immunity or sovereign immunity is gramted to the states based on the Latin maxim of *par in parem non habet imperium* viz., one state cannot exercise its authority over the other state. However, immunity is granted to the International Organizations based on the theory of functional necessity. Although functional necessity of the Organizations requires jurisdictional immunity before the domestic courts, it does not justify immunity for violation of employment rights. In Sri Lanka, jurisdictional immunity of an International Organization before domestic courts is governed by the Agreement between the Organization and Sri Lanka and an Order made by the Minister in terms of Section 4(1) of the Diplomatic Privileges Act, No.9 of 1996. The combined effect of the provisions of the Convention on the Privileges and Immunities of Specialised Agencies (1947), Agreement between an International Organization and Sri Lanka, Constitution of Sri Lanka and the Diplomatic Privileges Act is that Sri Lanka could exempt jurisdictional immunity for violation of employment rights by the Organizations. It is also suggested that international legal regime should develop to exempt jurisdictional immunity in domestic courts for violation of employment rights by International Organizations.

Keywords: *Immunity, International Organizations, Domestic Courts*

An Analysis of Citizens' Participation in Governance in Sri Lanka

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This article explores the impact of the Right to Information Act, Personal Data Protection Act, and Online Safety Act of Sri Lanka, respectively enacted in 2016, 2022, and 2024, on citizen's participation in governance. Although the laws serve different purposes according to their respective preambles, they purport to safeguard citizens' ability to participate meaningfully in public life, to safeguard their personal data and overall safety in the online space. Through a qualitative analysis of primary and secondary sources, including where possible, political developments that led to the enactment of the respective Acts, this article draws two main conclusions. First, through a textual interpretation of the Acts, the implementation of the Right to Information Act, and relevant constitutional provisions, the article observes that while these legislative enactments promise robust citizen participation in governance, they undermine it by allowing compromises in privacy, information self-determination, and online speech. Secondly, although the three Acts may be theoretically reconcilable, the complex web of legislation creates contradictions, raising concerns about the meaningful implementation of any of these laws. This article excludes certain other laws that may have an impact on citizens' participation in governance, such as laws on elections, terrorism and security, as they, respectively, focus on procedure and have been enacted to prevent terrorism and facilitate public safety as opposed to specifically citizens' participation in governance. Thus, the article offers an examination of citizen participation in governance in Sri Lanka. Nevertheless, it demonstrates how laws can be severely compromised when inherent tensions between them are not explicitly addressed and reconciled, resulting in weak enactments and ineffective implementation.

Keywords: *Right to Information, Personal Data Protection, Online Safety, Sri Lanka*

The Price of Safety: A Jurisprudential Analysis of Censorship under the Online Safety Act

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Humans have historically sacrificed a certain degree of individual liberty for the safety and security of society. The Online Safety Act No. 9 of 2024 (OSA), one of the most controversial statutes enacted by the Sri Lankan parliament in recent times, appears to require a similar compromise: It seeks to limit the freedom of expression in the interests of online safety. But what is the true nature and extent of the censorship it enables? In this article, I attempt to answer this question by exploring the philosophical foundations of the OSA in its approach to censorship. To this end, I will identify, classify, and evaluate the different forms of both direct and indirect censorship arising from the OSA, based on balancing four different interest groups: The state, the service providers, the public, and the individual. I will adopt a qualitative, hermeneutic methodology in interpreting the OSA within the broader socio-political context of censorship in Sri Lanka. My analysis will be grounded in Roscoe Pound's theory of interests, H.L.A. Hart's internal point of view, and J.S. Mill's defence of free speech. Based on the offences created under Part III of the OSA, I identify three main justifications for state censorship and the specific mechanisms through which it is perpetuated. I argue that the OSA creates an initial perimeter of *state censorship*, but that this perimeter expands exponentially due to *overzealous censorship* by service providers, *social censorship* by the public, and *self-censorship* by individuals. I conclude that this expansion of the perimeter of censorship at the expense of individual liberty is inevitable under the operation of the OSA. This has a chilling effect on the freedom of expression and poses a severe threat to a functioning democracy. Censorship is ultimately a choice between safety and liberty, and society must pick its poison.

Keywords: *Online Safety Act, Freedom of Expression, State Censorship, Social Censorship, Self-Censorship*

Legal and Ethical Challenges in the Use of Human Biomaterials in Stem Cell Therapies and Regenerative Medicine: A Focus on Sri Lanka

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The field of biomedical engineering, especially in the areas of stem cell therapies and regenerative medicine, has experienced significant advancements, providing transformative potential for treating a wide range of diseases and injuries. These advanced medical techniques enhance the body's natural healing capabilities, thereby greatly improving patients' quality of life. However, the increasing reliance on human cells and tissues has led to the development of a growing market for human biomaterials, which presents substantial ethical and legal challenges. Sri Lanka, recognized as one of the largest donors of human cells and tissues, faces unique challenges due to its diverse religious background and economic conditions. Despite its significant contribution, the legal framework in Sri Lanka concerning the procurement and use of human biomaterials remains inadequate. The Transplantation of Human Tissues Act No. 48 of 1987, along with existing regulations, primarily addresses transplantation and fails to comprehensively cover the broader use of human biomaterials in fields like stem cell therapies and regenerative medicine. This regulatory gap raises serious ethical and legal issues, as it does not sufficiently protect donors' rights. This research aims to clearly articulate the ethical and legal challenges associated with using human biomaterials in biomedical engineering research, with a particular emphasis on stem cell therapies and regenerative medicine in Sri Lanka. The research will compare the legal regimes of Sri Lanka with those of India to identify ethical and legal issues in the commercialization of human biomaterials and the consequences of inadequate legal frameworks and enforcement mechanisms. Additionally, the research will address how these inadequacies affect the rights of donors and propose ways in which international cooperation can enhance regulatory standards to address these challenges effectively. A doctrinal approach will be adopted, utilizing qualitative methods for the analysis of both primary and secondary data.

Keywords: *Human Biomaterials, Biomedical Engineering Research, Stem Cell Therapies, Regenerative Medicine, Human Biomaterials, Ethical and Legal Challenges*

Gender Stereotyping and Maternity Protection in Sri Lanka: Reconciling Work-Family Conflict and Promoting Women's Economic Participation

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The conflict between work and family responsibility is a significant barrier to women's economic participation, but addressing this issue could unlock significant potential. Although Sri Lanka has made extensive progress in human capital development, it has not translated to labour market gains. In ancient Sri Lanka, women participated alongside men in an agricultural economy where work and family were harmoniously intertwined. As a result of colonisation and industrialisation, women were incentivised to 'go out to work', changing the work-family dynamics. This physical and ideological separation is gendered and has a disproportionate impact on women and their economic participation. Men are more visible in the public sphere, whilst women dominate the private sphere without any 'real' authority. The public sphere is regulated by the distinction between work and childcare responsibilities and the different people who perform them, the latter biologically and historically being the primary responsibility of women. These distinctive gender roles and paternalistic attitudes towards women influenced state regulation and welfare legislation. The British introduced paid maternity leave in Sri Lanka by statute, recognising the unique position of women as mothers and protecting the special relationship between mother and child. Feminists argue that such legislation perpetuates gender stereotypes and patriarchy, suppressing women's choices, escalating women's subordination, and depriving women of access, let alone equality, in the workplace. Empirical studies support this assumption. The article is a doctrinal study that critically examines the legal approach of maternity protection in Sri Lanka and its relationship to the work-family conflict and low women's economic participation. It does so by engaging in a comparative analysis of the United States' anti-discrimination approach and European countries' family-friendly policy approach to highlight ways Sri Lanka could rethink its legal framework to reconcile women's roles within the family and the workplace to promote women's economic participation.

Keywords: *Gender Stereotype, Maternity Protection, Work-Family Conflict, Comparative Approach, Sri Lanka*

Do Not Resuscitate (DNR) Orders in Sri Lanka: A Comparative Legal Analysis with the United Kingdom and Australia

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A Resuscitation Plan is a medically authorised order to use or withhold resuscitation interventions. Do-Not-Resuscitate (DNR) order concepts are widely used in healthcare systems in developed countries to assist in the delivery of high-quality care, particularly for individuals who are at the end of life and for whom palliative approaches, rather than aggressive medical care, are most appropriate. These orders uphold patient autonomy, ensuring that medical interventions align with individual values and preferences. The existing laws relating to DNR orders in Sri Lanka seem to be incomplete and perhaps lacking comprehensive provisions. The main objective of this research is to explore the current legal state of DNR orders in Sri Lanka and gain insights for a comprehensive legal framework, through a comparative legal analysis with the well-established legal frameworks in the United Kingdom (UK) and Australia. For this purpose, the following aspects are addressed in this paper: (i) the legal and ethical challenges related to DNR orders in Sri Lanka; (ii) legal frameworks for DNR orders in the UK and Australia compared to those in Sri Lanka; and, (iii) evidence-based recommendations for developing a robust and ethically sound framework for DNR orders in Sri Lanka. This research employs a qualitative methodology, focusing on the comparative analysis of legal and ethical frameworks. The study involves a thorough review of relevant literature, legal documents, guidelines, and policies from Sri Lanka, the UK, and Australia. Comparative legal analysis highlights differences and similarities between the countries' approaches to DNR orders. In terms of research implications, this study aims to enhance the quality of end-of-life care for patients. Developing a robust framework for DNR orders will provide legal and ethical clarity for patients, substitute decision makers, and healthcare providers, reducing uncertainty and potential conflicts in clinical practice. These recommendations aim to address the compelling need of making policy suggestions to develop a robust law on DNR orders by addressing this legal void.

Keywords: *DNR Orders, End-of-life Decision-making, Health Law, Patient Autonomy*

Admissibility of Expert Evidence in the Justice System of Sri Lanka: Challenges and Insights

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The contemporary justice system in Sri Lanka provides for a highly evident intersection between law and science. Expert evidence based on scientific data is used to achieve a more desirable outcome in domestic legal proceedings. However, this widespread use of expert evidence has posed several challenges for judges in determining the authenticity and neutrality of such evidence. Against this background, this paper addresses whether the existing Sri Lankan law on the admissibility of expert evidence is adequate to ensure that such testimony is reliable and impartial. Therefore, the main objective of this research is to evaluate the challenges that may occur in admitting expert testimony and to propose feasible policy-based suggestions to those challenges. This paper adopts a qualitative method based on primary and secondary resources to achieve this purpose. It is found that the Evidence Ordinance merely defines who qualifies as an expert and when their opinions are considered relevant. The Ordinance does not provide special provisions for assessing their authenticity, reliability, and credibility, except the general rules of credibility. The courts can grant leave to summon such expert witnesses for prosecution or defence upon the parties' request. This lack of legal or policy guidelines for assessing the reliability of expert witnesses may pose several challenges, such as potential biases of the experts due to personal incentives, the 'hired gun' phenomenon, 'junk science' or the lack of scientific consensus. These challenges may mislead the judges, resulting in a potential miscarriage of justice. This paper proposes several policy solutions to address these concerns, such as appointing experts by the court, improving pre-trial disclosure of expert testimony and establishing an ethical conduct for expert witnesses. Based on the above analysis, it is concluded that Sri Lanka urgently needs a policy reform to ensure the reliability and impartiality of expert testimony in legal proceedings.

Keywords: *Admissibility, Challenges, Expert Evidence, Policy Reforms, Sri Lanka*

Towards Effective Judicial Review Mechanism: Comparative Insights into Supreme Court Contempt Decisions

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The Contempt of Court, Tribunal, or Institution Act, No. 8 of 2024 was introduced to standardise procedures and clarify punitive measures for contempt convictions in Sri Lanka. However, critical deficiencies persist within the Act, particularly the lack of avenues for judicial remedies against Supreme Court verdicts on contempt charges, which remains a pivotal issue. Drawing on comparative analysis with the legal frameworks of the United Kingdom and India, the research underscores the effectiveness of their review mechanisms in ensuring accountability and preventing potential miscarriages of justice in contempt convictions. The research proposes constitutional amendments in Sri Lanka to institute a similar review mechanism tailored to the nation's legal landscape. By adopting such provisions, Sri Lanka can mitigate the risk of miscarriages of justice, uphold judicial integrity, and reinforce public confidence in the judiciary. This paper examines the feasibility and implications of introducing these reforms, emphasizing their potential to enhance the judiciary's credibility and contribute to a more equitable legal system. Methodologically, the study employs a comparative approach, analysing legislative enactments, case law, and scholarly literature from Sri Lanka, the UK, and India. It evaluates the operational aspects and institutional requirements necessary for implementing a strong review mechanism, offering insights into achieving a balanced judicial framework conducive to justice and accountability.

Keywords: *Contempt of Court, Appeal, Judicial Review, Miscarriage of Justice, Fairness*

Plea to Recognize Constitutional Delicts in Sri Lanka

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The horizontal application of fundamental rights in Sri Lanka crafted a legal culture where basic human rights are protected only against state violations and nothing beyond. As a result, fundamental rights violations by private individuals have escaped the purview of the legal system highlighting a niche area which needs state regulations. The article explores whether judicial recognition of constitutional delicts under the category of delictual activities would contribute to closing the gap. The proposal is based on three main points of contention: First, the paper makes the case that the vertical application of fundamental rights could fall under the purview of delictual activities without the need for any legislative enactments authorising such an action. Second, personal liability for compensation cases has been justified by fundamental rights jurisprudence developed under the 1978 constitution as equitable. This article examines why the same equitable principle cannot be applied to validate the vertical application of fundamental rights before first instance courts. Thirdly, the article views the Sri Lankan Supreme Court's decision in *Karunanayake and Others v. Mannaperuma Mohotti Appuhamilage* (SC Appeal No. 130/15) as the testimony for the judicial thinking and desire to develop the Sri Lankan common law in general and particularly for delictual actions as opposed to the colonial legal heritage of Roman Dutch Law. The Mannaperuma judgement's legal reasoning is based on distributive justice and social engineering, which call for the law to be the catalyst for social change by equitably allocating the duty to compensate. The paper concludes that the Mannaperuma case has started the process of establishing a new legal framework for Sri Lanka, one that might translate the arbitrary distinction between public and private law and imagine the recognition of "constitutional delicts" by the judiciary in Sri Lanka.

Keywords: *Constitutional Delict, Common Law, Social Engineering, Roman Dutch Law*

Protection of Migrant Workers: Moving towards a Responsibility-Based Approach from the Rights-Based Approach

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The protection of migrant workers who encounter various challenges while working in foreign countries is challenging due to multiple reasons. Currently, the protection of migrant workers' rights relies on a rights-based approach, using human rights instruments such as the UDHR, the ICCPR, the ICESCR, and the CEDAW. The International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families (CMW) is the main legal international instrument that provides the standards for the protection of the rights of migrant workers and their families. The rights-based approach aims to strengthen the capabilities of both duty-bearers and rights-holders towards the realization of human rights and address the challenges of human rights-connected issues. However, some countries that receive migrant labour, such as those in the GCC, are hesitant to ratify such human rights treaties. International organizations like the UN and the ILO do not have the power to force these countries to become parties to the treaties. Therefore, while there are mechanisms to protect migrant workers through a rights-based approach, the likelihood of success is uncertain. The responsibility-based approach is a framework that emphasizes accountability and ethical duty to act responsibly. Consequently, this research aims to investigate how a responsibility-based approach, involving all stakeholders including officials from both sending and receiving countries, can be utilized alongside a rights-based approach to protect migrant workers. To achieve the outcome of this research, doctrinal research methods have been utilized. Conventions, covenants, recommendations, and legislation were used as primary sources and journal articles, e-resources, and books were used to collect secondary data. The finding of the research reveals that it can be employed the responsibility-based approach coupled with a rights-based approach to develop an appropriate mechanism to safeguard the rights of migrant workers imposing responsibilities to relevant parties including sending and receiving countries.

Keywords: *Migrant Worker, Human Rights, Rights-based Approach, Responsibility-based Approach*

Navigating Copyright in the Age of Generative Artificial Intelligence: Prospects and Challenges for Sri Lankan Intellectual Property Legal Regime

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Generative Artificial Intelligence (AI) can generate diverse forms of content including text, images, music, and literature, autonomously by learning the patterns and structures of the training data set. The creations of generative AI have made a profound impact on the traditional foundation of copyright law regarding the attribution of ownership and originality requirements. It is still debatable whether the creations of generative AI are eligible for copyright protection and who should qualify as the author of such creations. This paper aims to explore this contemporary debate on generative AI and copyright while highlighting its implications for the Sri Lankan intellectual property legal regime. The research has utilized the doctrinal legal research approach with an in-depth analysis of primary and secondary legal sources. The research findings reveal that the current judicial interpretations of comparative jurisdictions, including the United States, European Union and China tend to prevail over the human authorship principle in copyright law while extending the copyright protection for the works created by the AI system with sufficient human contribution. This judicial approach reflects that current copyright law still considers only AI-assisted outputs for copyright protection rather than AI-generated outputs without human involvement. The Sri Lankan copyright legal framework is limited to granting copyright protection for human authors. Since AI is playing a significant role in IT investments, this paper emphasizes the need to strike a fair balance between copyrights and technological advancements under the Sri Lankan intellectual property legal framework.

Keywords: *Generative AI, Copyright, Authorship, Originality, AI-assisted Outputs*

Utilising Technology for the Effective and Efficient Functioning of Community Mediation in Sri Lanka: Challenges and Prospects

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Community mediation in Sri Lanka has achieved high user satisfaction over the years. At the same time, it is also criticised for its ineffectiveness and inefficiency. This research mainly focuses on the possibilities and challenges of utilizing technology-based legal tech tools to address the drawbacks of the existing community mediation framework in Sri Lanka. This qualitative research contains a critical analysis of primary and secondary resources. This paper also deals with an evaluation of the facts gathered through the one-to-one interviews conducted with the clients and mediators. The designated area for this part of the study is the Kaduwela municipal area. This research also evaluates the process of mediation from the stage of appointing mediators to the issuing of a settlement or non-settlement certificate based on the interests of the stakeholders. This research discovers that the community mediation framework in Sri Lanka is one of the least technology-utilized sectors in the justice system since it remains at the grassroots level as a dispute resolution method. It has also been discovered that certain inherent features in community meditation demotivate the utilisation of technology. However, this paper argues through its exemplary approach, showcased at the end, that community mediation should embrace the legal tech solutions that can be developed, tested, and implemented gradually in order to remedy the drawbacks in its functioning at the grassroots level. In doing so, this paper suggests a better mechanism that is sensitive towards ironing out the issues of data privacy of all stakeholders, training, monitoring, and reporting for mediators.

Keywords: *Community Mediation, Data Privacy, Legal Tech, Meditation Boards*

The Evolving Role of the Central Bank of Sri Lanka towards Achieving Economic Stability and Growth: A Critical Legal Analysis

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This research critically examines the transformation of the Central Bank of Sri Lanka (CBSL) and its profound impact on the nation's economic stability and growth. As a result of the Central Bank of Sri Lanka Act No. 16 of 2023, the CBSL has undergone a paradigm shift concerning its objectives, roles, and functions. The new mandate introduced through these provisions, including lucrative and developed provisions, has opened avenues for inclusive considerations of the monetary policy of Sri Lanka, the stability of the economic growth, the sustainability of state and non-state financing sectors, and the inflation control aspects at both macro and micro levels. In this context, this research delves deep into the implications of these changes, shedding light on the new emphasis on price stability within an inflation-targeting framework. This research further explores how the CBSL effectively manages the payment system, undertakes agency functions such as public debt management, and acts as the custodian of the Employees Provident Fund. It highlights the pivotal functions of the CBSL, including the formulation and implementation of monetary policy, currency issuance, and the maintenance of financial stability. Moreover, it explores CBSL's crucial role as the lender of last resort during financial crises and its active involvement in the regulation and supervision of banks and financial institutions. The research also sheds light on the CBSL's role in managing foreign exchange reserves and promoting international trade. By offering a comprehensive analysis, this research reveals the far-reaching implications of these transformations for Sri Lanka's economic landscape and financial sector. At the same time, this research intends to make policy proposals for further developments in the new CBSL Act. To achieve these objectives, this research adopts a doctrinal legal research method comprising the critical review of literature on the role, powers, and functions of the CBSL.

Keywords: *Central Bank of Sri Lanka, Economic Growth, Financial Stability, Monetary Policy*

The Complexities of Cultural Property Restitution: The Case of the Lewke Cannon in Sri Lanka

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This paper investigates the legal intricacies surrounding the removal and restitution of Lewke's Cannon from Kandy, an artifact in the Rijksmuseum since 1875 following its confiscation by the Dutch during the 1765 conquest of Kandy, using the doctrinal research method. The exploration unfolds against the backdrop of diverse legal frameworks that governed Sri Lanka during the incident in 1765. The Dutch, asserting control, imposed Roman Dutch Law on their territories. Kandyan Law, which governed the specific region of Kandy, vested ultimate power in the King, designating royal properties, such as the Lewke's Cannon, as expressions of regal ownership. Roman Dutch Law, notably influenced by the Roman Principle of Occupancy, had profound implications for international law concerning the acquisition of war spoils. Concurrently, the field of Cultural Property Law emerged, reflecting a synthesis of public, private, and international legal elements, underscored by ethical considerations in preserving cultural assets. The study examines international legal conventions, including the UNESCO Convention, UNIDROIT Convention, and the 1954 Hague Convention, that shape the landscape for repatriating cultural property. Simultaneously, it evaluates Sri Lanka's domestic legal apparatus, revealing the inadequacies of the 1940 Antiquities Ordinance No. 9 and the 1988 Cultural Property Act No. 73 in addressing contemporary legal exigencies. The conclusion navigates the complexities surrounding Sri Lanka's inability to file a claim under the Hague Convention, with the Dutch restitution prompting considerations of ethical dimensions beyond explicit legal imperatives.

Keywords: *Canon of Kandy, Dutch Removal, Restitution, Cultural Property Law, Sri Lanka*

Cutting the Gordian Knot: Evaluating the Effectiveness of EU-Inspired Confiscation Strategies to Sever the Economic Lifelines of Organised Crime in Sri Lanka

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This research critically examines the efficacy of the European Union's (EU) confiscation strategies in undermining the economic bases of organised crime and proposes best practices for their implementation in Sri Lanka. Organised crime poses a significant global threat with profound societal, public, and economic impacts, necessitating robust countermeasures. Confiscation has emerged as a central component of the EU's multifaceted approach to combatting organised crime, comprising both classical and modern strategies, each with unique methodologies and challenges. This study aims to evaluate the relevance and applicability of these strategies within the Sri Lankan context. Further, this study highlights the crucial role of strong legal frameworks and effective enforcement mechanisms in combatting organised crime. By targeting the economic infrastructure of organised crimes, confiscation strategies can significantly disrupt their operations. Additionally, the research underscores the importance of harmonizing national laws with international standards to ensure effective implementation. The research is significant for its economic analysis and "Law and Economics" perspective, focusing on the impact of implementing EU-inspired confiscation strategies to dismantle the economic bases of organised crime. Utilizing qualitative data analysis as the primary methodology, this study meticulously examines legal documents, policy papers, and scholarly literature related to confiscation and organised crime. The doctrinal legal approach facilitates a comprehensive review and interpretation of existing laws, regulations, policies, and jurisprudence, extracting critical insights from the EU's confiscation strategies. The findings contribute to a nuanced understanding of how Sri Lanka can adapt and implement effective confiscation strategies, promoting a legal and economic environment resilient to organised crime. The recommendations aim to guide policymakers and legal practitioners in Sri Lanka, informing the development of tailored strategies that capitalize on the strengths and address the weaknesses observed in the EU's approach.

Keywords: *Confiscation, Asset Recovery, Organised Crime, Law and Economics*

Empowering Whistleblowers: Strengthening Corporate Fraud Detection and Financial Integrity in Sri Lanka through Comprehensive Legal Protections

W.I. Nanayakkara

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Whistleblowing refers to the act of reporting illegal, fraudulent or unethical activities within an organization to the appropriate authorities. Whistleblowing was previously limited to the public sector, but has now extended to the corporate sector. This expansion is a result of recognizing the significant and widespread consequences of corporate fraud on the general public. Whistleblowers are vital in the fight against corporate fraud and financial crimes, thereby preventing further harm and holding the perpetrators accountable. They play a crucial role in uncovering unethical practices and exposing financial wrongdoing, acting as a necessary safeguard for corporate integrity and accountability. This paper explores the effectiveness of whistleblowers in detecting and preventing corporate fraud, using global examples to highlight the significance of robust frameworks and protective measures. In countries like the United States and the United Kingdom, where comprehensive whistleblower protection laws exist, whistleblowers have made significant contributions to uncovering fraudulent activities, resulting in promoting transparency and corporate governance. The current laws in Sri Lanka lack adequate provisions for whistleblowing and fail to effectively protect whistleblowers, which hinders the fight against corporate fraud. This study employs library research to gather primary and secondary qualitative data from statutes, case studies, books, and journal articles with a comparative approach to the United States and the United Kingdom to suggest effective whistleblowing mechanisms and legal frameworks to help prevent fraud in Sri Lanka. The paper provides practical recommendations for implementing strong whistleblower protection legislation in Sri Lanka to promote ethical behavior within organizations and safeguard their financial integrity. This paper emphasizes the urgent need for Sri Lanka to enact comprehensive whistleblowing laws and sufficient whistleblower protection to create an environment where individuals can report misconduct without fear of retaliation. By adopting global best practices, Sri Lanka can effectively combat financial and corporate frauds.

Keywords: *Whistleblowing, Corporate Fraud, Financial Integrity, Legal Protections*

Morbid Libraries and Digital Access to Copyright Content: A Comparative Study of Germany and Sri Lanka

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"The libraries of the future will be morbid, or it will cease to be"
(Eric Steinhauer, 2021)

The idea of the digital library is sweeping through the public discourse around the world which has resulted in building cemeteries for books on the library's shelf. The essence of a physical book is more than knowledge in which the copyright of an author is respected and protected. Significantly, it is a secret place where readers connect with the thoughts of authors that cannot be experienced in the digital world and it has built a tradition which enables economically deprived people to become rich in knowledge and wisdom. Although the digitalized library is yet to become a real threat to legal depository rights of physical books, readers are now compelled to access the content of digital libraries which are more convenient in terms of time and accessibility. Consequently, it has created a pathway for plagiarism that violates the author's copyright while turning live physical libraries into morbid libraries. Therefore, the purpose of this research is to determine whether there is a legal depository right for online publications, similar to the legal depository right for physical books in the Sri Lankan context. Additionally, this research explores the possibility of connecting morbid libraries and copyright by considering the copyright as a more personal right, such as in Germany while inquiring who should be responsible for the development of digital cultural memory as a solution for the death of libraries. The research dwells within the black letter legal research coupled with comparative legal analysis. This research reveals that the concept of digital libraries has the potential of creating morbid libraries that will enable copyright violation of authors and sheds light on crucial legal questions pertaining to digital libraries that need to be answered in an era of the Internet.

Keywords: *Morbid Library, Copyright, Access to Digital Library*

Integration of Artificial Intelligence in Legal Education: Prospects and Challenges from a Sri Lankan Perspective

Menaka Harankaha[1], K. A. A. N. Thilakarathna[2], Yohan Perera[3]

[1]*Department of Commercial Law, Faculty of Law, University of Colombo, Sri Lanka*
[2]*Department of Public and International Law, Faculty of Law, University of Colombo, Sri Lanka*
[3]*Department of Human Resources Management, Faculty of Management and Finance, University of Colombo, Sri Lanka*

Artificial intelligence (AI) has made significant strides, prompting discussions on its potential on all aspects of human life. In today's era, AI's pervasive influence encourages us to consider its integration into all aspects of life, including legal education. While there are numerous benefits to incorporating AI in legal education, it is crucial to exercise caution to ensure that its use enhances rather than dictates the educational process. Currently, the discourse on AI's role in legal education within Sri Lanka lacks comprehensive policies or guidelines outlining its implementation. This research employs a qualitative methodology with a doctrinal approach to explore how AI can be effectively integrated into Sri Lankan legal education, emphasizing the need for clear guidelines and limits. The study reveals that AI holds considerable potential for assisting both academics and students in the study of law. AI's ability to accurately retrieve information from relevant sources can significantly enhance the ease of accessing information and acquiring new knowledge, which would otherwise require substantial time and effort. However, the research also highlights the risks of over-reliance on AI. Without necessary human oversight and critical engagement, AI-driven outputs may suffer from inaccuracies and lack the depth of critical analysis. Thus, this research aims to propose policy guidelines for integrating AI into legal education in Sri Lanka, ensuring that its use does not compromise educational quality. If properly managed, AI can be a powerful tool to augment legal education, providing valuable support to educators and learners while avoiding allegations of plagiarism and copyright violation and strengthening academic integrity.

Keywords: *AI Integration, Legal Education, Legal and Policy Reform*

Recent Amendments and their Impact to APIT Tax Regime under the Income Tax Law of Sri Lanka: A Special Reference to State University Academics of Sri Lanka

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As a country that has been moving forward very slowly after a severe economic recession, the government of Sri Lanka made many oppressive decisions to improve the situation. It has launched various proposals to alleviate the current situation in Sri Lanka, especially in accordance with the regulations of the International Monetary Fund. Accordingly, the primary plan among the financial policies of the current government was the positive changes made in the country's tax policy. There, the changes made to Advance Personal Income Tax (APIT) and Pay as You Earn Tax (PAYE) under the employment income were controversial among the people. Based on the above facts, the research problem to be addressed is whether tax amendments have an impact on academics and, if not, why this may be the case. The primary purpose of this research is to assess the impact of APIT and PAYE tax amendments on the academic staff of state universities. This research concludes that due to excessive taxation of their income, these professionals are facing severe psychological stress, unsatisfactory lifestyles, and economic and social problems. Accordingly, it recommends that if taxes are levied on academics with the aim of improving the economic status of the country, it is essential to uplift their living standards and improve their quality of life through the taxes levied.

Keywords: *Employment Income, APIT Tax and PAYE Tax*

From Innovation to Regulation: The EU's AI Act as the Global Benchmark

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The growth of Artificial Intelligence (AI) causes several challenges, not only technological but also legal, ethical, and social dimensions. Initiatives are being undertaken globally to formulate suitable legal mechanisms to regulate AI. The European Union (EU) adopted the world's first-ever comprehensive legal framework for AI, the AI Act, effective from 2nd August 2024. The primary purpose of the Act is to protect fundamental rights, democracy, the rule of law, and the environment from the harmful effects of AI, while supporting innovation and promoting trustworthy AI. The research aims to examine the mechanisms adopted under the Act by addressing questions regarding how comprehensively the term 'AI' is defined and how effective the risk-based classification introduced by the Act is. The study explores, the risk-based approach of the Act to regulate different AI applications ranging from minimal risk to applications which are banned entirely, based on the level of risk they pose to the society. The research analyses how such a method is beneficial for addressing the existing challenges of AI faced by the global population in different fields. The study is primarily designed as doctrinal legal research, utilizing the black letter approach, and adopting qualitative methodology to evaluate the effectiveness of the Act in addressing current AI challenges, with a focus limited to the identified areas. Since this Act is a brand-new addition, there is a dearth of previous literature examining adequacy, coverage, and effectiveness at industry levels, which justifies undertaking this research. However, the suitability of the mechanisms and any regulatory gaps cannot be identified until the Act is properly implemented, which limits the scope of this study. Furthermore, the research findings will highlight the necessity for similar mechanisms in Sri Lanka, admitting that the challenges posed by AI are not limited to developed jurisdictions alone.

Keywords: *Artificial Intelligence (AI), European Union (EU), Risk*

Laying Eggs in Others' Nests: The Need for Recognition of Co-authorship in Copyright Law from a Sri Lankan and European Perspective

N.S. Punchihewa

Department of Commercial Law, Faculty of Law, University of Colombo, Sri Lanka

The issue of recognizing co-authorship in a work has created a considerable tension in Sri Lanka and Europe. The legal questions raised in the German and French cases of *Kippernberger* and *Druet* respectively offer new significant insights into analysing the recent decision issued by the Supreme Court of Sri Lanka in *Dharma Samaranayake v Sarasavi Publishers*. Copyright law aims to protect the rights of the individual authors. The works of joint authorship or co-authorship are recognized under the Sri Lankan as well as European copyright law. Therefore, the purpose of this paper is to explore what criteria can be effectively used to establish the co-authorship in a copyrightable work. While the European authors' right regime requires a work to reflect the personality of the author, the common law copyright system applies the skill, labour, and judgement doctrine. In terms of the methodological approach, this research dwells within the positivist black-letter legal research methodology coupled with comparative legal analysis. The results of this research indicate that *Kippernberger* and *Druet* cases shed significant light on the principal question raised in the *Dharma Samaranayake* case. Even though no arguments had been made in favour of establishing the co-authorship rights in the said Sri Lankan case, it is clear that a different outcome could have been reached had that the particular argument been taken up by the parties. Therefore, the decisive factor should be "who holds the creative control of the work." It is evident that both the author mentioned in the book and editor who claimed the authorship of the work had played a significant role in creating the final work. Therefore, it may be prudent to revisit the decision *Dharma Samaranayake* case in light of this research and enlighten legal minds about the need of fair crediting of creative contribution of authors.

Keywords: *Copyright, Co-authorship, Creative Control, Fair Crediting*

FACULTY OF MANAGEMENT AND FINANCE

The 19th International Research Conference on Management and Finance (IRCMF 2024)

25th and 26th of November 2024

MESSAGE FROM THE DEAN

Professor H.M. Nihal Hennayake

Dean
Faculty of Management and Finance
University of Colombo, Sri Lanka

It is with great pleasure that I write this message for the Annual Research Symposium 2024, organized by the University of Colombo. The university's commitment to both undergraduate and postgraduate education has earned it a prestigious position, ranking among the top 1000 universities in the world, according to several global university ranking indices such as QS, Times Higher Education, and Webometrics.

The University of Colombo continues to prioritize research, as demonstrated by the organization of over 20 annual research conferences by its various faculties and institutions. This dedication to academic excellence reflects the university's significant role in advancing knowledge and contributing to global scholarship. In line with this, the Faculty of Management and Finance is organising the IRCMF 2024 for the 19th consecutive year along with a Doctoral Colloquium and an Industry Dialogue.

I wish the Annual Research Symposium (ARS) 2024 all the best for continued success.

MESSAGE FROM THE CONFERENCE CO-CHAIRS

Dr. K Ravinthirakumaran

Department of Business Economics
Faculty of Management and Finance
University of Colombo, Sri Lanka

Mr. R.Y.H.De Alwis Senaviratne

Department of Business Economics
Faculty of Management and Finance
University of Colombo, Sri Lanka

The 19th IRCMF of the Faculty of Management and Finance will take place on 26th November 2024. The conference is scheduled as a hybrid event with the participation of local and international scholars. An industry dialogue will be part of this event where this year's theme will be "Digital Transformation, Human Interaction, and Future of the Business".

There are five tracks in this conference, namely Accounting and Management Information Systems, Business Economics and Finance, Human Resources Management, Marketing and Hospitality Management, and Management, Organizational Studies, and International Business. The accepted full papers will be published as the Proceedings of the 19th International Research Conference on Management and Finance 2024, bearing the ISBN number 978-624-5518-01-2.

The keynote speaker of the conference will be Professor Mario Fernando, Faculty of Business and Law, University of Wollongong. He will deliver a speech on "Leading Responsibly during Challenging Times: Perspectives from Business".

We are thankful to the co-secretaries, members of all committees and all members representing the five tracks, the reviewers, and most importantly the scholars who submitted their research papers to the conference. Our thankfulness also goes to all academic, administrative, non-academic, and support staff of the Faculty of Management and Finance for their services to make this event a reality. We hope you will enjoy the IRCMF 2024.

MESSAGE FROM THE DOCTORAL COLLOQUIUM CO-CHAIRS

Dr. J.C. Athapaththu

Department of Management and
Organization Studies
Faculty of Management and Finance
University of Colombo, Sri Lanka

Mr. D.D.C. Lakshman

Department of International Business
Faculty of Management and Finance
University of Colombo, Sri Lanka

It is with great pleasure that we welcome you to the Doctoral Colloquium 2024, held in conjunction with the 19th International Research Conference on Management and Finance (IRCMF 2024). This colloquium serves as a unique platform dedicated to nurturing the next generation of scholars in the fields of Management, Finance, and related disciplines. This forum not only allows participants to gain critical feedback from a scholarly panel but also fosters meaningful connections and collaborations that will serve them throughout their academic and professional journeys. This year's colloquium is enriched with exciting elements, including the Precis Competition and the Poster Presentation Competition. These activities are designed to challenge our participants to distill their research into concise, impactful presentations, sharpening both their analytical and communication skills.

As we embark on this intellectual journey together, we encourage all participants to actively engage in the sessions, share your perspectives, and explore new collaborations. We look forward to the stimulating discussions and fruitful exchanges that Doctoral Colloquium 2024 promises to deliver.

ORGANIZING COMMITTEE

Co-Chairs of IRCMF 2024

Dr. K Ravinthirakumaran	– Department of Business Economics
Mr. R.Y.H.De Alwis Senaviratne	– Department of Business Economics

Co-Chairs of Doctoral Colloquium 2024

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Mr. Duleepa Lakshman	– Department of International Business

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Ms. D. Gooneratne	– Department of Finance
Ms. A. De Silva	– Department of Human Resources Management

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IT and Publicity Committee

Mr. H. Hettiarachchi	– Faculty of Management and Finance

INAUGURATION PROGRAM - 19TH IRCMF 2024

Agenda – 26th November 2024

Time	Programme
09.00 am – 09.10 am	**Greeting the Guests / National Anthem**
09.10 am – 09.15 am	**Lighting the Oil Lamp**
09.15 am – 09.25 am	**Faculty Video**
09.25 am – 09.35 am	**Welcome Address** Conference Co-Chairs
09.35 am – 09.45 am	**Address by the Dean** Professor H. M. Nihal Hennayake Faculty of Management and Finance
09.45 am – 10.00 am	**Address by the Guest of Honour** Senior Professor. (Chair) H.D. Karunaratne Vice Chancellor, University of Colombo
10.00 am – 11.00 am	**Keynote Address** Professor Mario Fernando
11.00 am – 11.10 am	**Vote of Thanks**
11.10 am – 11.30 am	**Refreshments**
11.30 am – 01.00 pm	**Panel Presentations**
01.00 pm – 01.30 pm	**Lunch Break**
01.30 pm – 02.30 pm	**Panel Presentations**
02.30 pm – 04.30 pm	**Industry Dialogue**

INTRODUCTION TO THE KEYNOTE SPEAKER

Professor Mario Fernando

Professor of Management, Faculty of Business and Law
Director, Centre for Cross-Cultural Management
University of Wollongong
Australia

Dr Mario Fernando is a Professor of Management at the Faculty of Business and Law and the Director of the Centre for Cross-Cultural Management at the University of Wollongong. His research and teaching interests focus on exploring how responsible managerial actions drive positive social change. His particular research interest is in responsible leadership, identity work, and online privacy. More broadly, his works encompass leadership, business ethics, and human resource management. In addition to his academic pursuits, Mario mentors start-up entrepreneurs and has served on the advisory committee member of the Nan Tien Institute in Australia. His sustained contributions to learning and teaching over a sustained period have earned him recognition at both national and institutional levels. He is an Australian Learning and Teaching Council citation winner (Australian Office for Learning and Teaching, OLT). He is also a winner of the Australian and New Zealand Academy of Management's (ANZAM) Educator of the Year and a recipient of the Vice Chancellor's Outstanding Contribution to Teaching and Learning Faculty Award.

ABSTRACT OF THE KEYNOTE ADDRESS

Leading Responsibly During Challenging Times: Perspectives from Business

Professor Mario Fernando

Faculty of Business and Law and Centre for Cross-Cultural Management, University of Wollongong, Australia

Businesses face unprecedented and complex challenges in an increasingly environmentally turbulent and technology-driven era. Responsible leadership has been touted as a better value-based leadership style that engages both internal and external stakeholders in business operations. In this talk, he will look at what responsible leadership is and how it can make a difference in business leadership.

FACULTY OF MANAGEMENT AND FINANCE
List of Abstracts

Debt-Maturity and Share Price Crash Risk: Evidence from Sri Lanka

H.A.B.B. Perera

Department of Finance, Faculty of Management and Finance, University of Colombo, Sri Lanka

This research intends to empirically investigate the impact of debt-maturity structures on stock price crash-risk (SPCR) among listed entities in Sri Lanka. The quantitative research adopts secondary information gathered from annual reports and the Colombo Stock Exchange database. Data type is Panel, using a sample of 151 companies that excludes banking and financial institutions, between the 10-year period of 2011 and 2020. A multiple regression model is used to empirically investigate the relationship. Chen et al.'s (2001) model for negative conditional return skewness ("NCSKEW") is employed to measure the crash-risk of a firm specific share price. Findings indicate a significant negative correlation between short-term borrowings and stock price crash-risk, suggesting that companies with more frequent loan renewals are less prone to future stock collapses. This negative relationship is more pronounced in firms with higher individual ownership. In contrast, larger firms and those with higher growth potential are more susceptible to crashes. The outcomes will contribute to a growing body of research documenting the strategic use of debt and maturity options to safeguard shareholder capital against stock volatility. In addition, it will be of practical use for other emerging markets, capital market players, investors, regulators, and Sri Lankan policymakers.

Keywords: *Information Asymmetry, Debt-Maturity, Crash-Risk, Negative Skewness*

An Analysis of Association between Global Oil Prices and Stock Returns in Sri Lanka

M.R. Samarasinghe, H.A. Samarasunadara, S.S.H. Wickramathunga, T.C. Ediriwickrama

Department of Finance, Faculty of Management and Finaince, University of Colombo, Sri Lanka

Oil price is an important factor that influences stock returns in almost all the economies in the world. The purpose of this paper is threefold: The first and second were to identify the association between oil prices and sectoral stock returns in both the short and long run in Sri Lanka. The third aim was to assess the moderating impact of exchange rates on the relationship between stock returns and oil prices. The short-run relationship was assessed using the Wald test which found a positive short-run association with oil prices for five sectors as well as aggregate market returns. A single equation cointegration test was used to examine the long-run association, and all sectors showed a significantly negative relationship with oil prices. A significant moderating impact of exchange rates was found in eight sectors along with aggregated market returns. This study provides useful insights into theory, practice, and policy. It is suggested that future research consider oil intensity when analyzing the impact of oil prices on sectoral stock returns.

Keywords: *Stock Returns, Oil Prices, Exchange Rates, CSE, Sri Lanka*

Phygital HRM Practices and Employee Performance in Hybrid Organizations

Mayuri Atapattu, Rajith Silva, Yohan Perera, Asheni De Silva, Isuru Chandradasa, Sachin Calton

Department of Human Resources Management, Faculty of Management and Finance, University of Colombo

The evolution of Human Resource Management practices, driven by telework, work-from-anywhere trends, and the digital economy, has raised "hybrid work" and "hybrid workspaces" as significant post-pandemic phenomena. Hybrid workspaces, which integrate physical and virtual environments, have become a basis of modern organizational structures, offering flexibility and leveraging information technology to allow employees to work from diverse locations such as home, corporate offices, and co-working spaces. This shift necessitates innovative Human Resource Management practices to effectively manage hybrid work environments and drive employee performance. Phygital HRM, which combines physical and digital elements, emerges as a critical framework in this context. This conceptual paper explores the impact of phygital HRM practices on employee performance in hybrid organizations. Based on the available literature and application of various theoretical frameworks, the study examined key areas: Phygital job design, organizational identity, learning and development, performance management, hiring, and employee well-being. These six phygital human resource management practices were conceptualized as the key antecedents of fostering a supportive environment that enhances employee performance in hybrid organizations. The conceptualization provided in the paper highlights the necessity of adopting phygital HRM practices tailored to hybrid work settings, providing a clue on the shape of the HR strategy to enhance employee performance in the evolving work systems. By bridging the gaps in existing research and offering practical insights, this study contributes to the development of effective HRM practices that align with the demands of hybrid organizations.

Keywords: *Employee Performance, Hybrid Organizations, Phygital HRM practices*

FACULTY OF MEDICINE

Advancing Health and Wellness through Impactful Research

09th – 13th of December 2024

MESSAGE FROM THE DEAN AND SYMPOSIUM CO-CHAIR

Vidya Jyothi Professor Vajira H. W. Dissanayake

Dean
Faculty of Medicine
University of Colombo, Sri Lanka

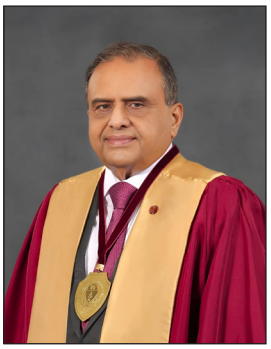
Welcome to the Colombo Medical Congress 2024 on '*Advancing Health and Wellness through Impactful Research*'. In an era where the boundaries of medicine are constantly being redefined, this conference serves as a pivotal platform for exchanging knowledge, fostering collaborations, and exploring innovative approaches to enhancing health and well-being globally.

The theme of this year's conference underscores the vital role of research in driving the evolution of healthcare. Our collective commitment to impactful research not only advances our scientific understanding, but also translates into meaningful improvements in patient outcomes and public health. Through rigorous inquiry and collaborative efforts, we can address the pressing health challenges of our time, from chronic diseases to emerging health threats, ensuring a healthier future for all.

We have gathered a diverse and distinguished group of researchers, clinicians, policymakers, and healthcare leaders to share their expertise and insights. The programme is designed to inspire and challenge us to think critically about the ways in which our research can be applied to make a tangible difference in the lives of individuals and communities. As we engage in these discussions, let us keep in mind the broader impact of our work. Together, we have the opportunity to shape the future of healthcare, making it more equitable, accessible, and effective for everyone.

Thank you for your participation and dedication to advancing health and wellness through research. I wish you all a productive and inspiring conference.

MESSAGE FROM THE SYMPOSIUM CO-CHAIR



Dr. D. K. D. Mathew

President
Colombo Medical School Alumni Association

Dear Colleagues and Esteemed Alumni,

The Colombo Medical Congress 2024, the flagship scientific gathering organized by the Colombo Medical Faculty and the Colombo Medical School Alumni Association (CoMSAA) is scheduled to be held in December 2024. I take this opportunity as Co-Chair of the Congress and President of CoMSAA to extend a cordial invitation to all of you - very especially to our Alumni - to be part of this event.

The Colombo Medical Congress brings together a galaxy of experts in medicine and all branches of academia from all over the world. The environment of the Congress encourages and ensures exchange of ideas and concerns, vibrant discussion, networking and fellowship as we tackle the challenges and innovations shaping current and future healthcare.

This year's Congress promises to be a landmark event, featuring keynote presentations, panel discussions, and cutting-edge research presentations across a wide range of specialties. Your presence will not only enhance the depth of discussion but also further strengthen the bonds within our medical community.

We look forward to seeing you at the Faculty of Medicine, Colombo for what will undoubtedly be an inspiring, impactful, and memorable event.

MESSAGE FROM THE SCIENTIFIC CO-CHAIRS

Professor Anuja Abayadeera

Department of Anaesthesiology
and Critical Care
Faculty of Medicine
University of Colombo, Sri Lanka

Professor Hemali Goonasekera

Department of Anatomy, Genetics,
and Biomedical Informatics
Faculty of Medicine
University of Colombo, Sri Lanka

It is with great pleasure that we send this message to the Colombo Medical Congress 2024, which will be held from 9th to 13th of December at the UCFM Tower, Faculty of Medicine, University of Colombo. This annual international event is jointly organized with the Colombo Medical Faculty Alumni Association (CoMSAA) as a component of the Annual Research Symposium of the University of Colombo. This year's theme "Advancing Health and Wellness through Impactful Research" was chosen to showcase basic and translational research by Faculty members and Alumni which have contributed to advance health and wellness of our fellow countrymen and others beyond our shores.

Pre-congress activities comprising workshops by individual Departments and Clinical Centers of the Faculty, will give an opportunity to showcase their varied research activities and how they translate into service components. The Alumni Day will provide a forum for Alumni practicing around the globe to present their research and build collaborations with the Colombo Medical Faculty.

The Inauguration ceremony held on 12th of December will mark the commencement of the Main Congress. Senior Professor (Chair) H. D. Karunaratne, the Vice Chancellor of the University of Colombo will grace the occasion as Chief Guest and Dr. Ajantha Athukorale, Director, University of Colombo School of Computing will deliver the keynote address on a timely topic for the nation, Artificial Intelligence (AI) for medical sciences. This year's scientific programme of the Main Congress is unique as the themes of the symposia and plenaries are centered on the undergraduate curriculum, thereby aiming to achieve greater student engagement whilst creating awareness, interest and inculcating a research culture.

The Congress will include two plenaries, six symposia, and presentation of scientific work during oral and poster sessions. The Medical Faculty Oration and the CoMSAA Oration are the highlight events and will be delivered following the inauguration ceremony and at the closing

ceremony of the main congress respectively. Continuing our tradition, a post-congress workshop titled "Non-Academic Career Development 2024" will be held, marking the conclusion of this year's Congress. In view of the 'green' concept of the Faculty and Congress, the proceedings book will be in an electronic form and the link will be shared with the participants.

The event was planned and organized by the faculty organizing committee comprising staff members from three Departments namely, Departments of Allied Health Sciences, Anaesthesiology and Critical Care, and Anatomy Genetics and Biomedical Informatics of the Faculty of Medicine, President and Council of CoMSAA, and ably supported by academic and non-academic staff of other departments, Dean's office staff and both medical and allied health sciences students.

The success of the Congress depends on many people who have worked alongside the organizing committee in planning, organizing the conference and precise implementation of the planned activities. We express our sincere gratitude to the Co-Chairs of the Congress, Senior Professor Vajira H.W. Dissanayake, Dean of the Faculty of Medicine, University of Colombo and Dr. D.K.D. Matthew, President of CoMSAA for their leadership and constant support. We also wish to extend our gratitude to our Co-secretaries Dr. Asha Wettasinghe and Dr. Nilanka Wickramasinghe for their untiring work, and all members of committees for their hard work. Special thanks go out to oration and abstract reviewers, orators and keynote speakers, resource persons in the workshops, plenaries and symposia, free paper presenters, judges and session chairs. Finally, we wish to thank our sponsors for their generous support for our conference. Above all, a big thank you to our audience without whom no conference is complete!

We welcome all dignitaries, invitees and delegates to the Colombo Medical Congress 2024 and wish fruitful deliberations.

ORGANIZING COMMITTEE

Co-Chairs of the Colombo Medical Congress 2024

Vidya Jyothi Prof. Vajira H.W. Dissanayake	– Chair and Senior Professor Department of Anatomy, Genetics, and Biomedical Informatics Dean of the Faculty of Medicine
Dr. D.K.D. Mathew	– President, Colombo Medical School Alumni Association (CoMSAA)

Co-Chairs of the Scientific Committee

Prof. Anuja Abayadeera	– Professor and Head Department of Anaesthesiology and Critical Care
Prof. Hemali Goonasekera	– Associate Professor and Head, Department of Anatomy, Genetics, and Biomedical Informatics

Co-Secretaries

Dr. Asha Wettasinghe	– Senior Lecturer in Physiotherapy Department of Allied Health Sciences
Dr. Nilanka Wickramasinghe	– Co-Secretary, Colombo Medical School Alumni Association (CoMSAA) Lecturer, Department of Physiology

Co-Editors

Dr. Ashwini de Abrew	– Lecturer, Department of Medical Education
Dr. Rachini Withanage	– Senior Lecturer, Department of Anaesthesiology and Critical Care
Dr. Sumithra Thissera	– Editor, Colombo Medical School Alumni Association (CoMSAA)

Treasurer

Dr. Vipula Bataduwaarachchi	– Colombo Medical School Alumni Association (CoMSAA)

Committee Members

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COLOMBO MEDICAL CONGRESS 2024 PROGRAMME

Date / Time	Programme	
09.12.2024	**Pre-Congress Symposia**	
10.12.2024	**Pre-Congress Symposia**	
11.12.2024	**CoMSAA Day**	**Main Auditorium, UCFM Tower**
09.00 am – 10.30 am	Symposium 1: CoMSAA Australia	
10.30 am – 11.00 am	Tea	
11.00 am – 12.00 pm	Keynote address	
12.00 pm – 01.30 pm	Symposium 2: CoMSAA Bhutan	
01.30 pm – 02.30 pm	Lunch	
02.30 pm – 04.00 pm	Symposium 3: CoMSAA UK	
11.09.2024	**Main Auditorium, UCFM Tower**	
05.00 pm – 08.00 pm	Ceremonial Inauguration and Faculty Oration	
11.12.2024	**Main Congress**	
	Main Auditorium, UCFM Tower	Hall A, UCFM Tower
08.30 am – 09.00 am	Plenary 1	
09.00 am – 10.30 am	Symposium 1: Respiratory Medicine	Oral Presentation Session 1
10.30 am – 11.00 am	Tea	
11.00 am – 12.30 pm	Symposium 2: Nephro-urology	Oral Presentation Session 2
12.30 pm – 01.30 pm	Student (MFRC) Symposium	Poster Presentations
01.30 pm – 02.00 pm	Plenary 2	
02.00 pm – 03.30 pm	Symposium 3: Neurology	Oral Presentation Session 3
03.30 pm – 04.00 pm	Closing Ceremony	
04.00 pm – 05.00 pm	CoMSAA Oration	
05.00 pm – 05.30 pm	Fellowship	
05.30 pm – 06.30 pm	CoMSAA Annual General Meeting	
07.00 pm onwards	Colombo Medical Congress Party and CoMSAA Reunion: Sri Lankan Night	
13.12.2023	**Post-Congress Workshop**	**UCFM Tower**
08.30 am – 04.00 pm	Non Academic Day 2024 for Career Development	

INTRODUCTION TO THE KEYNOTE SPEAKER

Dr. Ajantha S. Atukorale

Director
University of Colombo School of Computing, Sri Lanka
President, Computer Society of Sri Lanka (CSSL)

Ajantha Atukorale received his B.Sc. Degree with First-Class Honors in Computer Science from the University of Colombo, Sri Lanka, in 1995. He obtained his Ph.D. degree in 2002 from the University of Queensland, Australia, in Neural Pattern Recognition. Currently, Dr. Atukorale is a Senior Lecturer and Director at the University of Colombo School of Computing (UCSC). His research interests include Neural Networks, Pattern Recognition, Machine Learning, Data Analytics, Computer Networks, and Virtualization. He is a Council member of the Computer Society of Sri Lanka (CSSL) since 2013/2014 and is currently the President of the CSSL from 2023.

ABSTRACT OF THE KEYNOTE ADDRESS

AI for Medical Sciences

Dr. Ajantha. S. Atukorale

University of Colombo School of Computing, University of Colombo, Sri Lanka

The integration of Artificial Intelligence (AI) into medical sciences has ushered in a new era of healthcare innovation, transforming diagnostic accuracy, treatment planning, and patient outcomes. This Keynote Address will explore the evolving role of AI in medical sciences, focusing on its current applications, challenges, and the transformative potential it holds for the future. The talk will begin by introducing the fundamentals of AI, including machine learning, deep learning, and natural language processing (NLP), as they apply to medical sciences. Breakthroughs in predictive analytics will be highlighted, showcasing how AI can predict patient outcomes and help design personalized treatment plans tailored to individual patients' needs. In addition to diagnostics, AI is revolutionizing surgical procedures through robotic systems that enhance precision, and he will examine case studies where AI has contributed to improved surgical outcomes. The integration of AI with wearable technologies and telemedicine will also be discussed, illustrating how continuous health monitoring and remote care are becoming more efficient through AI-powered solutions. However, the implementation of AI in medical practice also brings challenges. Issues such as data privacy, ethical considerations, and the need for regulatory frameworks will be addressed. Special attention will be paid to the relationship between AI and healthcare professionals, emphasizing that AI is a tool to augment, rather than replace, human expertise. The talk will conclude with a forward-looking perspective on emerging AI trends in medical sciences, including advancements in drug discovery, AI-augmented medical research, and the promise of fully automated healthcare systems.

FACULTY OF MEDICINE
List of Abstracts

ORAL PRESENTATION : SESSION 1

ORAL PRESENTATION : SESSION 2

ORAL PRESENTATION : SESSION 3

ORAL PRESENTATION – SESSION 1

Preliminary Results of Alpha-Amylase Inhibitory Activity of Six Selected Herbal Teas Used in Sri Lanka: Potential Application in the Management of Hyperglycemia

K.M.N.P. Kumari, K. Siridewa

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Hyperglycemia is the key characteristic of diabetes and pre-diabetes. Starch, a prevalent carbohydrate in meals, contributes to hyperglycemia through enzymatic hydrolysis. This process commences with the action of α-amylase. Inhibition of α-amylase arrests hydrolysis of starch and attenuates glucose absorption, and is a convenient approach to lowering blood glucose levels. Synthetic inhibitors have been developed and are known to have side effects. Plant metabolites such as flavonoids, tannins, and certain proteinaceous compounds are reported to possess α-amylase inhibitory potential. Sri Lanka boasts a rich tea culture and evaluating the α-amylase inhibitory ability of the consumable state is important. This study assessed salivary α-amylase inhibitory activity of six selected herbal teas used in Sri Lanka for prospective application in managing hyperglycemia. Testing materials included complete plants of *Cardiospermum halicacabum* (Wel penala), *Eleusine indica* (Belathana), *Hemidesmus indicus* (Iramusu), *Bacopa monnieri* (Lunuwila), and bark and leaves from *Terminalia arjuna* (Kumbuk). Fresh clean samples were boiled separately using 100mL of distilled water at 80°C for 30 minutes. Resulted decoctions were tested for α-amylase inhibitory activity using salivary amylase samples obtained from random six adult healthy males. The inhibitory assay was done using the DNS (3,5-dinitrosalicylic acid) method at 540nm wavelength. Data was analyzed using Turkey's one-way ANOVA and values were considered significant at $p < 0.05$. Three of six herbal teas showed significant salivary α-amylase inhibitory activity. The highest mean inhibitory percentage was shown by Kumbuk bark (86.29±24.79) followed by Kumbuk leaves (31.16±18.9) and Wel penala (8.08±6.83). Kumbuk bark extract has the highest potential to be developed into a therapeutic against hyperglycemia. Further evaluations are imperative to discern potential inhibitory molecules and other associated metabolites in significant herbal teas to develop precise therapeutic targets for hyperglycemia with minimal side effects.

Keywords: *Alpha-Amylase, Diabetes, Enzyme Inhibitors, Herbal Teas, Hyperglycemia*

Evaluating the Genotoxicity of Betel (Piper Betle) Leaves on Human Buccal Cells Using the DNA Comet Assay

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Betel (*Piper betle*) leaves are consumed by as many as 600 million people worldwide mostly in South Asia – as a component of betel quid (a chew of betel). While the genotoxicity (damage to DNA), mutagenicity, and carcinogenicity of other common betel quid constituents-*Areca catechu* (betel nut) and tobacco-are agreed upon by the scientific community, the presence or absence of the aforementioned properties in betel leaves have not yet been conclusively confirmed. Therefore, this study aimed to optimise the DNA comet assay to evaluate the genotoxicity of Sri Lankan betel leaves on human buccal cells. Buccal cells from a single individual were pelleted and separately exposed to one of four solutions: an undiluted or half-diluted extract of *Piper betle* containing distilled water and saliva, or a negative or positive control (phosphate-buffered saline or H_2O_2, respectively), after which they were subjected to an optimised comet assay protocol. DNA damage was evaluated by measuring tail length, tail length: head diameter ratio, and tail moment of comets. DNA damage parameter values obtained through the comet assay did not follow a Gaussian distribution (substantial positive skewness was observed). However, nonparametric comparison using the Kruskal-Wallis test revealed a significant difference between the medians of the four samples as a whole for all three parameters. Dunn's post-hoc multiple comparisons showed significant difference between medians of the positive and negative control, and between the negative control and undiluted betel extract, for all three damage parameters. Results indicate genotoxicity in the undiluted betel extract but not in the diluted extract. To definitively establish genotoxicity, optimising assays to produce normally-distributed data and including multiple individuals is crucial, as depending on results from a single subject presents a considerable limitation.

Keywords: *Piper Betle, Betel Leaves, Comet Assay, Genotoxicity, Comet Assay*

Antioxidant Activity and *In Vitro* Cytotoxicity of Two Edible Mushrooms Cultivated in Sri Lanka

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With growing interest in natural antioxidants and anticancer agents, mushrooms have gained prominence as significant sources of bioactive compounds. Investigation of medicinal properties of the edible mushrooms enhances understanding of their therapeutic potential. Therefore, this study investigates antioxidant and cytotoxic properties of *Agaricus bisporus* and *Lentinula edodes*, two edible mushrooms cultivated in Sri Lanka. To the best of our knowledge, this is the first study to explore cytotoxic activities of these mushrooms. Fresh samples of *A. bisporus* and *L. edodes* were obtained from mushroom farms in Sri Lanka. The mushrooms were cleaned, dried, powdered, and extracted using a sonication extraction method with distilled water. The resulting solution was filtered and freeze-dried to obtain a powdered extract. Antioxidant activity was determined using the DPPH radical scavenging assay, while the cytotoxicity was assessed using the MTT assay on Rhabdomyosarcoma (RD) human cancer cell line. All experiments were performed in triplicate and results were expressed as the mean ± standard deviation (Mean ± SD). Both mushroom extracts exhibited significant antioxidant activities. *A. bisporus* showed antioxidant activity with an EC_{50} of 2.77+0.01 mg/mL, while L. edodes exhibited an EC_{50} of 2.45+0.04 mg/mL. In the MTT assay, *A. bisporus* and *L. edodes* extracts demonstrated IC_{50} values of 11.82+0.01 mg/mL and 1.80+0.04 mg/mL, respectively, against the RD cancer cell line. Despite the comparable antioxidant activities of the two mushroom extracts, the markedly lower IC_{50} value of *L. edodes* suggests a substantially stronger cytotoxic effect compared to *A. bisporous* against the RD cancer cell line. Both *A. bisporus* and *L. edodes* possess potent antioxidant and cytotoxic activities, and are promising candidates for studies on developing functional foods or nutraceuticals.

Keywords: *Piper Betle, Betel Leaves, Genotoxicity, Comet Assay*

Evaluation of Antioxidant Activity in *Tinospora cordifolia* Stem Extract Combined with Sri Lankan Bee Honey

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Department Biochemistry and Molecular Biology, Faculty of Medicine, University of Colombo, Sri Lanka

In Sri Lankan traditional medicine, the stem of the Rasakinda plant (*Tinospora cordifolia*) is used in decoctions and mixed with wild bee honey for Ayurvedic applications. Presence of antioxidant compounds in *T. cordifolia* and honey may be responsible for the medicinal effects, and honey added to improve the taste. This study evaluates the antioxidant activity of *T. cordifolia* stem extract and wild bee honey, individually and in combination. Extracts of *T. cordifolia* (80% methanol: 20% water), Sri Lankan wild bee honey, and mixtures of both components at weight ratios of and honey, 1:1, 3:1, and 1:3 were evaluated for their antioxidant properties. The antioxidant activity was assessed using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity assay. All experiments were performed in triplicate, and results expressed as mean values. Mean EIC50 values were 3.66 mg/ml for 100% plant extract, 487.50 mg/ml for 100% Sri Lankan wild honey, 4.51 mg/ml for the 3:1 mixture of *T. cordifolia* and honey, 10.091 mg/ml for 1:1 mixture of *T. cordifolia* and honey and 12.98 mg/ml for 1:3 mixture of *T. cordifolia* and honey, and 12.98 mg/ml for 1:3 mixture of *T. cordifolia* and honey. The mixture of plant extract and honey showed a decrease in antioxidant efficacy with increasing honey proportion. Findings indicate that both *T. cordifolia* and Sri Lankan bee honey possess antioxidant properties, with efficacy of their combination being dependent on their relative proportions. *T. cordifolia* extract exhibits significant antioxidant activity, as evidenced by its low EC50 value. Higher concentrations of *T. cordifolia* extract were more effective in scavenging DPPH radicals. It is important to optimize proportions of *T. cordifolia* and bee honey to maximize antioxidant benefits in traditional medicinal applications.

Keywords: *Tinospora cordifolia, Sri Lankan Bee Honey, Antioxidant Aativity, Traditional Medicine*

Diversity of Pharmacogenomic Variants Affecting Clopidogrel Metabolism in Sri Lankans

P.B. Gunarathna[1], H. Jeyapragasam[1], P. Ranasinghe[1], N. Sirisena[2], C.D.P.B. Hendalage[2], V.H.W. Dissanayake[2]

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Clopidogrel is an oral antiplatelet medicine used in management of acute coronary syndromes and as secondary prevention against recurrent ischemic events. However, marked interindividual variability in antiplatelet effects of clopidogrel exist within and between different ethnicities due to differences of metabolism. *CYP2C19* enzyme is involved in oxidation of clopidogrel to its active metabolite. We describe the frequencies of pharmacogenomic variants of *CYP2C19* enzyme affecting efficacy of clopidogrel in Sri Lankans. PharmGKB online database (https://www.pharmgkb.org/) was used to obtain *CYP2C19* pharmacogenomic variants and the global distribution of their minor allele frequencies (MAF). Five variants were selected with 1A level of evidence. Sri Lankan variant data was obtained from an existing anonymized genomic database of 670 Sri Lankans referred for whole exome sequencing at the Human Genetics Unit, Faculty of Medicine, Colombo. All included variants were consistent with the Hardy-Weinberg equilibrium. Among the five *CYP2C19* gene variants, both rs12769205 (A>G) (41.9% [95% CI:38.2-45.7]) and rs4244285 (G>A) (41.9% [95% CI:38.2-45.6]) had the same MAFs, which were the highest compared to the other three: rs3758581 (A>G) (9.7% [95% CI:7.7-12.2]), rs4986893 (G>A) (0.5% [95% CI:0.2-1.4]) and rs28399504 (A>G) (0.1% [95% CI:0-0.4]). Sri Lankans exhibited significantly higher frequencies of rs12769205 (A>G) and rs4244285 (G>A) variants compared to Latin Americans, African Americans. and Europeans. For variant rs28399504 (A>G), Sri Lankans exhibited relatively lower frequency compared to the Ashkenazi Jewish population. Sri Lankans exhibit significantly higher frequencies of the *CYP2C19**2 loss-of function alleles, rs12769205 (A>G) and rs4244285 (G>A), which is associated with marked decrease in platelet responsiveness to clopidogrel and hence contributing to clopidogrel resistance. Therefore, a need arises to genotype Sri Lankans before starting clopidogrel therapy for improved drug efficacy.

Keywords: *Clopidogrel, Pharmacogenomics, CYP2C19 Gene-Variants, Personalized Medicine*

Knowledge and Practices of Pesticide Use and Associated Health Effects among Paddy Farmers in Sammanthurai, Ampara District, Sri Lanka

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Since the 1950s, despite its known health and environmental risks, pesticide usage has remained the dominant pest control method among paddy farmers. This study aims to assess the diverse practices, behaviors, knowledge levels, and attitudes regarding pesticide use among paddy farmers in Sammanthurai, Ampara, Sri Lanka. A descriptive cross-sectional study involving 141 paddy farmers in Sammanthurai, Ampara, was conducted using simple random sampling. Data were collected through a pre-tested, interviewer-based questionnaire. The mean knowledge score was 4.62, with 63.10% scoring above 5. The mean attitude score was 14.7, with 53.3% scoring above 16. The mean behavior score was 4.49, with 60.3% scoring 4 or above. Most participants dumped empty pesticide containers (n=107) and used long-sleeved body covers (n=123). Discomfort was the primary reason for non-adherence to safety precautions. Farmers reported an average of 3 hours per day and 12 spraying days per season. The most common health effect was skin irritation (53.9%). Significant associations were found between behavior and the number of acres cultivated (p=0.03) and spraying hours (p=0.053). Age, ethnicity, income, years farming, spraying days per season, knowledge, and attitudes were not significantly associated with behavior (p<0.05).The study identified significant associations between behavior and factors such as the number of acres cultivated and spraying hours. However, variables such as age, ethnicity, income, and years of farming did not significantly impact behavior. The research identified gaps in knowledge, attitudes, behaviors, and practices related to pesticide use. Findings can be used to tailor awareness programs to reduce the health and environmental impacts of pesticides. The authors would like to acknowledge the support and assistance provided by the Community Stream, Faculty of Medicine, University of Colombo.

Keywords: *Paddy Farmers, Pesticides, Health Effects*

Knowledge, Attitudes, and Other Factors Associated with Medication Adherence among Patients with Type 2 Diabetes Mellitus in Primary Care Clinic Settings

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Type 2 Diabetes Mellitus (T2DM) is a growing public health concern in developing countries such as Sri Lanka. Promoting medication adherence is crucial in disease management, particularly in primary care settings where most newly diagnosed patients are followed up. This study assessed the knowledge, attitudes, and factors associated with medication adherence among T2DM patients in primary care clinics. A descriptive cross-sectional study was conducted at a primary care clinic among 120 diabetes patients who were chosen by convenience sampling. Data were collected via an interviewer-administered questionnaire comprising two sets: One for all participants and another specifically for insulin users. A scoring system (1, 0) evaluated the knowledge, with correct answers scoring 1 indicating good knowledge. The association of factors with medication adherence was determined by the chi-square test ($p < 0.05$). Despite 91.7% receiving education on medication adherence and 92.5% understanding the necessity of lifelong medication use, only 59.2% knew their medication names. Additionally, 45% had difficulty remembering the correct dose, and 70% lacked awareness of medication purposes. Among insulin users ($n = 11$), all knew the insulin delivery devices and storage methods, with 72.7% rotating injection sites every time. The study found that 50.8% of participants demonstrated good knowledge of medication adherence, according to a scoring system that considered aforementioned factors. Further, gender ($p = 0.031$), employment status ($p = 0.001$), regular clinic attendance ($p = 0.028$), good knowledge ($p = 0.027$), and positive attitude ($p = 0.027$) significantly influenced adherence. Transport costs and medication availability showed no significant associations. This study revealed that majority of participants had a good knowledge on medication adherence. However, even with extensive educational initiatives in primary care settings, the retention of medication adherence knowledge remains relatively low.

Keywords: *Piper Betle, Betel Leaves, Comet Assay, Genotoxicity*

Anticoagulation Control, its Associated Factors and Adherence among Patients on Warfarin Therapy Attending the Hematology Clinic at the National Hospital of Sri Lanka

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Warfarin is a commonly prescribed oral anticoagulant in Sri Lanka. Maintaining good anticoagulation control is key in warfarin therapy to achieve the desired therapeutic effects while reducing the risk of serious side effects, such as major bleeding. Time in therapeutic range (TTR) is a widely used validated measure of anticoagulation control. This study assessed the anticoagulation control, its associated factors and adherence among patients on warfarin therapy who are attending the Haematology clinic at the National Hospital of Sri Lanka, Colombo. A total of 212 patients attending the Haematology clinic were recruited for this study using consecutive sampling. TTR was calculated by the Rosendaal method and was used to assess the patients' anticoagulation control. Data on socio-demographic factors, clinical factors, and adherence to warfarin were collected using a pretested self-administered questionnaire. The chi-squared test was used to identify the factors associated with anticoagulation control and variables with a p-value less than 0.05 were considered to be significantly associated. Prosthetic valve replacement was the commonest indication for warfarin therapy. Marital status (p = 0.008), household status (p=0.034) and body mass index (p=0.017) were significantly associated with anticoagulation control. The majority of the study population (65.6%, n = 139) had poor anticoagulation control (TTR < 65%), while remaining 34.43% (n = 73) had good anticoagulation control (TTR ≥ 65%). Most participants (~75%) did not miss a day of taking warfarin. Nearly 95% of the patients have never discontinued taking warfarin due to reasons such as feeling better, feeling ill, the physical appearance of the tablet, advice of nonmedical people, misplacing warfarin tablet or due to side effects. A majority of participants (~95%) knew the usefulness of warfarin. While the adherence to warfarin therapy appears to be high among the patients, the poor TTR reported in this study calls for further efforts to identify patients who are at risk of poor anticoagulating control and those requiring remedial measures.

Keywords: *Warfarin, Anticoagulation, Time in Therapeutic Range, Adherence*

Occupational Injuries and Associated Factors among Tunnel Gem-Miners in Nivitigala, Sri Lanka

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Sri Lanka's gem industry plays a pivotal role in country's economy, yet battles with a noteworthy challenge of occupational injuries despite the county's reputation as the "Gem Island". Since existing evidence on occupational safety in the gem mining industry is scarce, this study aimed to assess the socio-demographic characteristics, occupational injuries, and their associated factors among the tunnel gem miners in Nivithigala, Sri Lanka. A descriptive cross-sectional study was carried out in Nivithigala, Sri Lanka from March to November, 2023. Cluster sampling method was used to select 110 tunnel gem miners aged 18-70 years, without severe co-morbidities with work experience of more than 6 months at tunnel gem mines. An interviewer-administered questionnaire was used to collect socio-demographic, behavioural, work-related, and occupational safety-related factors and occupational injury-related data which were analyzed using SPSS version 26. Associations were assessed using the chi-squared test. The response rate was 100% (n = 110). More than half of tunnel gem miners (52.7%, n = 57) experienced occupational injuries in the past 6 months, mainly due to machines/tools (n = 79, 73.8%). Most injuries were abrasions (n = 65, 60.8%) commonly affecting lower limbs (n = 68, 63.7%). Occupational injuries were significantly associated with working more than 8 hours per day (p = 0.036, $p < 0.05$), experiencing excessive heat/ cold during underground work (p = 0.003, $p < 0.05$), and paucity of identification and addressing of safety issues in the workplace (p = 0.038, $p < 0.05$), but not associated with mining experience (p = 0.198, $p > 0.05$) and working under the influence of alcohol (p = 0.309, $p > 0.05$) or tobacco (p = 0.134, $p > 0.05$). Incidence of occupational injuries among employees is relatively high and often due to machine/tool mishandling and unfavourable work environments. Measures should be taken to reduce long working hours and extreme temperatures during underground work. Increasing the use of personal protective equipment remains a potential target for improving mineworkers' safety.

Keywords: *Occupational Injuries, Tunnel Gem Mining, Personal Protective Equipment*

Relationship between Cumberland Ankle Instability Tool Score with Postural Stability, Muscle Strength, and Balance among University Athletes

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Lateral ankle sprains are common among athletes. Chronic ankle instability (CAI) contributes to recurrent sprains and functional impairments. We investigated the correlation between the Cumberland Ankle Instability Tool score (CAIT) and postural instability, lower limb muscle strength, and balance among university athletes with and without ankle instability. Participants were 114 university athletes aged 18-30 years from running, football, and basketball. Inclusion required at least 1 year of training and injuries within the last 3 years. Participants were categorized into 3 groups: Chronic Ankle Instability (CAI, n = 38); prior ankle sprains but no subsequent instability (copers, n = 38); and without ankle sprains (healthy, n = 38). CAIT-Sin, Time-in-Balance and Y-Balance tests assessed ankle instability severity, static and dynamic balance, respectively. The Balance Error Scoring System (BESS) and a hand-held dynamometer assessed postural instability and muscle strength. The three groups significantly differed in CAIT-Sin score (p = 0.000). BESS score, Time-in-Balance, and Y-balance reach distances differed significantly among groups (p = 0.000). The CAI group exhibited significant differences in BESS (p = 0.000) and Time-in-Balance (p = 0.000) scores compared to copers, along with significant differences in posterolateral (p = 0.002), posteromedial (p = 0.000) and anterior (p = 0.008) reach distances between the two groups. Significant differences existed in lower limb muscle strengths between CAI and coper groups, except for plantar-flexors (p = 0.127), hip adductors (p = 0.282), hip flexors (p = 0.266). The BESS score had a moderate negative correlation (r = -0.522) with CAIT-Sin, while CAIT-Sin correlated positively with Y-balance reach directions (r = 0.415, r = 0.471, r = 0.301). Ankle invertors (r = 0.355), dorsiflexors (r = 0.399), and hip extensors (r = 0.353) were moderately positively correlated with CAIT-Sin score. Chronic ankle instability correlates with dynamic balance deficits, weakened ankle, hip musculature, and impaired ankle inversion, dorsiflexion control in postural tasks, as evidenced by balance and CAIT scores.

Keywords: *Lateral Ankle Sprain, Muscle Strength, Postural Instability*

Comparison of Living Environments among Elderly People Living in the Community and Long-Term Care Homes in Matara District, Sri Lanka

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The incidence of falls is one of the primary contributors to both morbidity and mortality among the elderly, mainly due to its constraining effect on their mobility, leading to physical deconditioning and a subsequent decline in their overall well-being. The living environment is paramount in determining the likelihood of falls. This study aimed to compare living environments among the elderly people living in the community and long-term care homes. Addressing these differences is crucial for developing environmental modifications and fall prevention strategies to improve safety among the elderly. This cross-sectional study enlisted 130 elderly participants aged 65 years and above, comprising 55 from community settings, and 75 from long-term care facilities. Demographic data and fall histories were assessed through interviewer-administered questionnaires. The Home Falls and Accident Screening Tool (HOME FAST) was deployed to evaluate environmental fall risk factors. Data analysis employed the independent sample t-test via SPSS version 20. Of the total participants, 36.2% (n = 47) were male and 63.8% (n = 83) were female, with 93.8% (n = 128) identifying as Sinhalese, with a mean age of 71.77±6.66 years. Among community-dwelling elderly (mean age = 70.44±6.77 years) a higher mean score was reported for HOME FAST as 13.16 ±3.48, in contrast, among elderly residing in long-term care facilities (mean age = 72.75±6.45 years), the lower mean score was reported for HOME FAST as 6.96±2.74. A significant difference was found in these two living environments (p = 0.001). Accordingly, environmental modifications, particularly for community dwellings are recommended to mitigate the ecological fall risks. Routine fall risk assessments and preventive actions should also be conducted for both groups.

Keywords: *Elderly, Falls, Living Environment, Community, Long-Term Care Homes*

Identification and Description of the Pattern between BMI and Physical Activity among Patients with Schizophrenia Registered at Outpatient Clinics of Psychiatric Services at National Hospital of Sri Lanka

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Schizophrenia is a chronic, severe mental disorder that affects the way a person thinks, acts, expresses emotions, perceives reality, and relates to others. This study aimed to identify and describe the relationship between BMI and physical activity levels among patients with schizophrenia attending outpatient clinics of the psychiatric wards at the National Hospital of Sri Lanka. This descriptive, analytical, cross-sectional study recruited 144 schizophrenia patients, with a mean age of 44.10 (±11.22) years, attending outpatient clinics of the psychiatric wards at the National Hospital of Sri Lanka. Demographic data were gathered using a semi-structured questionnaire. BMI was calculated using the BMI formula, and the Short Form of the International Physical Activity Questionnaire (IPAQ-SF) was used to assess physical activity levels. Descriptive statistics, as well as Chi-square and ANOVA tests, were applied. The majority (68%) of the participants were overweight or obese (BMI > 25), while only 26% had an acceptable BMI. Additionally, 26% of the sample demonstrated Health-Enhancing Physical Activity (HEPA), while 40% were classified as "minimally active" and 34% as "inactive." Low and vigorous activity levels, as well as total weekly energy expenditure, were associated with BMI ($p = 0.009$, $p < 0.001$, $p = 0.0032$, respectively). The BMI category was also associated with physical activity levels ($p = 0.049$). Schizophrenia patients tend to have higher BMI levels and are more commonly associated with inactive or minimally active lifestyles. Those with low BMI are more likely to engage in walking compared to patients with acceptable or higher BMI. In contrast, patients with acceptable BMI are more likely to participate in vigorous activities and have a higher total weekly energy expenditure. Moreover, individuals with normal body weight are more likely to meet HEPA standards, while underweight and obese patients are more prone to leading inactive lifestyles.

Keywords: *Schizophrenia, BMI Category, Physical Activity, Physical Activity Level*

Development and Validation of a Sports Nutrition Knowledge Questionnaire for Sri Lankan Track and Field Athletes

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Satisfactory sports nutrition knowledge (SNK) is crucial for athletes to develop proper dietary habits, address deficiencies, and enhance sports performance. Identifying knowledge gaps is essential for improving athletes' general nutrition knowledge (GNK) and SNK, ideally through a contemporary tool. The development and validation of a new Sports Nutrition Knowledge Questionnaire (SNKQ) is essential for enabling health professionals and coaches to accurately assess athletes' nutrition knowledge. This study aimed to develop and validate the Athletic-Sports Nutrition Knowledge Questionnaire (A-SNKQ) for Sri Lankan track and field athletes. The A-SNKQ was developed following a systematic literature review of existing SNKQs, guidelines, local literature, and a qualitative study with key athletic stakeholders for cultural insights. After formatting and translation, content validity was established via expert ratings and face validity through telephone interviews with elite athletes. Construct validity was assessed using nutrition-trained doctors, non-nutrition-trained professionals, and athletes. The final tool comprised 123 items, formulated as 32 questions within 12 sub-sections: GNK (n = 15) and SNK (n = 17). The questionnaire used single-best-response and multiple-choice questions. Content validity was confirmed by integrating 49 of 70 comments for each sub-section and partially integrating 4 comments. Face validity was established by integrating 33 of 40 comments from 16 athletes. Construct validity was confirmed using the Kruskal-Walli's test, indicating significant differences in total scores among NTG (462.5, 92.5%), NNTG (223.5, 44.7%), and AG (235, 47.0%; $p < 0.001$). Reproducibility was established with strong test-retest reliability between scores from two test attempts, three weeks apart ($r = 0.98$, $p < 0.05$). Internal reliability for each sub-section met psychometric requirements (Cronbach's $a > 0.7$). The newly developed A-SNKQ meets all psychometric measures, providing a valid and reliable tool to assess general and sports nutrition knowledge among Sri Lankan track and field athletes.

Keywords: *Sports Nutrition Knowledge, Dietary Assessment, Track and Field Athlete, Questionnaire, Validation*

Prevalence of Musculoskeletal Pain among Postpartum Women in Two Selected Hospitals: A Follow-Up Study

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Prevalence of musculoskeletal pain (MSKP) during the postnatal period is attributed to hormonal effects of breastfeeding on the musculoskeletal structure. This study aimed to determine the prevalence and characteristics of MSKP among postpartum women (PPW) and determine the changes in MSKP characteristics between pregnancy and the postpartum period. Two interviews were conducted with 118 participants, initially in the ward and the second via telephone two months after delivery. Data from both interviews were then compared. Validated interviewer-administered questionnaires where specific pain locations were explained using reference points were used. Descriptive statistics and paired t-tests were performed using SPSS version 23.0. The mean age was 30±5.10 years. During the 2-month postpartum period, 54.2% (n = 64) reported experiencing pain, with an average pain rating of 6.13. Among them, 85.9% reported experiencing localized pain. Common pain locations were the lumbar (84.3%) and knee region (29.7%). 5.9% of mothers reported MSKP during breastfeeding and 5.1% after breastfeeding. The most frequently reported breastfeeding positions included the cradle hold (49.2%) and side lying (44.9%). Among carrying postures, the shoulder hold (77.1%) and cradle hold (48.3%) were commonly reported. During pregnancy, 77.1% (n = 91) of mothers reported MSKP with an average pain rating of 4.46. Among these, 95.6% experienced MSKP specifically during the third trimester. Commonly reported pain locations included the lumbar (84.6%) and pelvic region (60.4%). Localized pain was reported by 82.4% of the sample. There was a significant change ($p < 0.05$) in pain intensity in 2 months after the delivery compared to the pregnancy period. Pain intensity significantly decreases in the first two months postpartum compared to pregnancy. Lumbar and localized pain were common during both pregnancy and the first two months postpartum. The study recommends further investigation to determine the prevalence and characteristics of MSKP among PPW at six months post-delivery.

Keywords: *Postpartum, Pregnancy, Breastfeeding Musculoskeletal Pain, Pain Characteristics*

Risk Factors Associated with Urinary Incontinence and the Quality of Life among Affected Women Attending Two Selected Hospitals in the Colombo District

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Urinary incontinence is an involuntary leakage of urine that affects quality of life. This study was conducted to identify associated risk factors for urinary incontinence (UI) among women and its impact on their quality of life. A cross-sectional study was conducted among 156 women aged 40 - 78 years (mean: 54.7) attending the physiotherapy units of the Castle Street Hospital for Women and De Soysa Maternity Hospital in Colombo. Data were collected over a period of one month using an interviewer administered questionnaire. Risk factors were assessed using 11 questions and UI diagnosed by Questionnaire for Urinary Incontinence Diagnosis (QUID). Quality of life of the affected women was assessed using King's Health Questionnaire (KHQ). All data were analyzed by chi square test and Spearmen's correlation test using SPSS statistical software version 25.0. In this study population, 71% (n = 111) of women had UI. Those with diabetes mellitus (43.6%; n = 68) showed a significant association with UI (p = 0.002); a high body mass index (BMI – overweight: 36.5%; n = 57 and obese: 56.4%; n = 88) and a past history of hysterectomy (53.8%; n = 84) were also associated with UI ($p < 0.05$). However, factors such as age, hypertension, smoking, number of children, number of vaginal deliveries, number of caesarian sections, menopausal state, and the use of hormone therapy were not associated with UI ($p > 0.05$). Majority of women felt that UI negatively impacted on their general health (mild: 51.4%; moderate: 33.3%; severe: 4.5%). A positive correlation was observed between severity of UI and role limitation, personal relationships and emotions ($p < 0.05$). However, severity of UI did not appear to affect physical activities, social life, or the quality of sleep ($p > 0.05$). Diabetes mellitus, high BMI, and having undergone hysterectomy were significant risk factors for UI, while role limitation, personal relationships, and emotions were significantly affected by severity of UI.

Keywords: *Urinary Incontinence, Women, Risk Factors, Quality of Life, Colombo District*

ORAL PRESENTATION – SESSION 3

Perception and Knowledge on Cyberbullying and its Association with Exposure to Online Services in School, among Adolescents in Two Schools in the Colombo District

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Cyberbullying is bullying, orchestrated by digital communication media. The transition from physical to virtual learning in the adolescent age group has increased the risk of cyberbullying victimization, resulting in adverse psychosocial health outcomes. The perception and knowledge on cyberbullying and factors associated with them, including exposure to online services at school, have not been studied in Sri Lanka. Our comparative study aims to bridge this knowledge gap. A cross-sectional study with an analytical component was conducted in a selected national and international school in Colombo. 114 students from the national school (who were not exposed to online services at school) and 95 students from the international school (who were exposed to online services at school) were recruited using cluster sampling. A self-administered questionnaire designed by the investigators and validated by subject experts was used for data collection. Students who used smart devices with special permission in the national school were excluded from the study. Results revealed that the international school students had a higher level of perception of cyberbullying, compared to the national school students, and the difference was statistically significant, for most domains of cyberbullying when analyzed via chi-square significance test. International school students exposed to regular online services at school possessed better knowledge on cyberbullying compared to the national school students. The difference in the levels of knowledge was statistically significant ($p < 0.05$). Factors associated with unsatisfactory knowledge on cyberbullying were analyzed in the national school where inappropriate parental supervision ($p = 0.03$) and male gender ($p < 0.05$) were found to be statistically significant, whereas monthly family income level was not significantly associated. The national school students had a lesser level of perception and knowledge on cyberbullying compared to those of the international school. Inappropriate parental supervision and male gender were found to be risk factors for cyberbullying victimization.

Keywords: *Cyberbullying, Adolescents, Perception, Knowledge*

Socioeconomic and Psychological Impact on Parents with Autistic Children and Factors Associated with Socioeconomical and Psychological Impact in a Selected Tertiary Care Hospital in the Western Province

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Autism among children can be debilitating and impact both the child and the parent. The impact on parents of autistic children can be influenced by factors such as gender, age, and sociodemographic factors, making it crucial to accurately assess these factors. We aimed to assess socioeconomic and psychological impact on parents of autistic children and to determine the factors associated with socioeconomic and psychological impact in a selected tertiary care hospital in the Western province. A cross-sectional study with 110 participants was conducted, at the Lady Ridgway Hospital for Children, Sri Lanka. The population was selected consecutively, and self-stigma prevalence was assessed using an interviewer-administered questionnaire. The data was analysed using IBM SPSS version 25. A score of 40 or higher indicated a significant level of impact, while a score below 40 indicated no significant impact. The majority were female (86.3%), had an advanced education (60.0%), and were non-employed (68.18%). Mean age was 40 years, and most were married or in a relationship (90.09%). Prevalence of significant impact was 81.81%. No statistically significant association was found between impact level and sociodemographic factors, except for parental age. Parents aged 40 or older had a significant impact (96.68%), while parents younger than 40 had a significant impact (75.30%). Further research in this field could enhance the study's purpose by increasing the sample size for a more representative and accurate measurement of the impact level.

Keywords: *Autism, Socioeconomical, Psychological, Parents, Impact*

Physical Activity Level and the Perceived Barriers for Leisure Time Physical Activity Participation of Adolescents with Hearing Impairment Compared to Adolescents with Normal Hearing

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Physical activity (PA) is important for the development of adolescents with hearing impairments (HI). Globally, 80% of adolescents are physically inactive. Adolescents' PA is crucial for improving physical, mental, and social health. However, disabilities and associated conditions can limit PA participation. This study aimed to determine the deaf adolescents' PA levels and perceived barriers for PA participation compared to their hearing peers. The study was conducted among 402 adolescents between 14-19 years with severe (71-90 dB) hearing impairments and 201 with normal hearing, recruited from Rathmalana Deaf School and Rathmalana Kandawala M.V. respectively. A questionnaire gathered demographic data and PA level was assessed using the physical activity questionnaire for adolescents (PAQ-A); and perceived barriers were assessed using the leisure time physical activity barrier questionnaire (LTPABQ). Descriptive statistics and an independent sample t-test were used during statistical analysis. There were significant differences in PA levels across the two groups (p = 0.006). Hearing-impaired adolescents had lower levels of PA than the hearing group. The mean PA of adolescents with hearing impairment (AWHI) was 1.60 (±0.150) and adolescents with normal hearing (AWNH) was 1.66 (±0.262). Only 9.5% of the hearing individuals met the WHO's PA recommendations; whereas none of the hearing-impaired adolescents (0%) met the recommendations. The difference in mean PA participation barrier scores in the groups was significant (p = 0.025). The AWHI (2.72±0.272) reported a higher mean barrier score than the AWNH (2.66±0.275). Primary obstacles for deaf adolescents included lack of family support, lack of safe facilities nearby, and societal attitudes. Implementing PA programs, counseling programs, and developing facilities as well as raising awareness of the hearing-impaired population within mainstream society are important to increase PA involvement and overcome perceived barriers.

Keywords: *Hearing Impaired, Adolescents, Physical Activity Level, Physical Activity Barriers*

Reflective Journaling as a Tool to Enhance Happiness: User Perceptions about a Seven-Week Happiness Journal Intervention

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The definition of 'happiness' may vary across philosophy, psychology, and religion. However, the uniqueness of these definitions at the individual level is widely recognised. This study evaluates perceptions about the effectiveness and usefulness of a reflective journal in promoting a scientific approach to (1) explore personal meanings of happiness and (2) incorporate happiness-promoting activities into daily life. The participants were those who did the "My Happiness Journal," a structured reflective journal, during a certificate course on the science of happiness and meditation (n = 46) conducted at the Faculty of Medicine, Colombo. Participants were only assessed on their timely completion of activities, with reflections not reviewed. On completion of the 7-week journal, an anonymous, voluntary, self-report measure was administered to evaluate (1) and (2) as described above. Response rate was 74%. A majority rated their overall experience with the Happiness Journal positively (81.8%), and highly rated it for the degree to which it improved their self-awareness about their personal meaning of happiness (73.5%), its effectiveness in identifying what makes them happy (61.8%), and the extent to which it helped in identifying personal strategies to become happy (61.7%). The usefulness of the process adopted in the journal towards their discovery of what happiness is to them was rated 3.5 out of 5. Many rated the Journal highly in terms of increasing their overall happiness during the exercise period (38.2%). Open-ended responses indicated that the Journal helped in discovering what makes them personally happy and pointed to the reflective process in the Journal, as what they liked most. The findings highlight the Journal's effectiveness in enhancing self-awareness about how to make oneself happy in a personally meaningful way, suggesting its utility in promoting personal growth and introspection. The reported increase in overall happiness supports its use as a mini-intervention for personal well-being. Further research with larger sample sizes is needed to better assess its effectiveness.

Keywords: *Happiness, Reflective Journaling, Self-Awareness*

Barriers and Facilitators for Good Practices in Electronic Medical Records (EMR) System Usage among Intern House Officers at Selected Hospitals in Western Province, Sri Lanka

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In this era of digital transformation, implementing EMRs has made a positive impact on healthcare services. Efforts are ongoing to expand the EMR usage across more hospitals in Sri Lanka. A cross-sectional descriptive study was conducted among 111 intern house officers in 4 hospitals. The data were collected using a self-administered questionnaire which contained three separate sections: Sociodemographic data, practice related questions, barriers/facilitators related questions. Statistical analysis was conducted using SPSS software, utilizing chi-square analysis and Pearson correlation tests. Associations with p values less than 0.05 were considered statistically significant. Response rate was 87.39% (n = 97). Mean practice score was 54.25 (SD = 21.77) out of a total score of 70. Most of the respondents, 70.1% (n = 68) were found to have poor practice. The most frequently mentioned barriers were the unavailability of wireless connectivity (76, 78.4%) and unfavorable social environment (67, 69.1%). The most frequently mentioned facilitators were good knowledge about the system (95, 97.9%) and having enough time to use the system (80, 82.5%). Most of the intern house officers were found to have poor practice with logistic and social barriers impeding their practice, while good knowledge was a facilitator. These findings suggest that improving EMR system access and promoting a more EMR-supportive work environment could significantly enhance EMR usage.

Keywords: *EMR, EHR, Electronic Medical Records*

Factors Associated with Attitudes and Practices related to Emigration among Medical Officers in a Tertiary Care Hospital of Sri Lanka

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Emigration of doctors is a phenomenon that has impacted the healthcare systems globally. Sri Lanka, being a developing country, experienced an increase in the emigration of medical officers (MOs) particularly following the recent economic crisis. This study evaluated the attitudes and practices of medical officers regarding emigration and identified the factors influencing these attitudes and practices. A descriptive cross-sectional study was conducted among 120 medical officers at a tertiary care hospital in Colombo. A three-component self-administered questionnaire was distributed to collect data on associated factors, attitudes, and practices respectively. Scores for attitude and practices were obtained using Likert scales. The relationship of various factors with attitudes and practices were assessed using Chi-square test ($p < 0.05$). Pearson correlation was used to determine the correlations. The majority of the study population had a positive attitude (64.8%), but negative practices (86.7%) related to emigration. Having plans of post-graduate studies ($p = 0.005$), MO grade ($p = 0.048$), and job satisfaction ($p = 0.006$) were identified to have a significant association with attitude. Practices were associated with being a local versus foreign graduate ($p = 0.033$), having plans of doing post-graduate studies ($p = 0.008$) and plans of engaging in research ($p = 0.003$). Working hours had a positive correlation with both the attitude ($r = 0.290$; $p = 0.004$) and practices ($r = 0.315$; $p = 0.002$). There was no significant association of monthly income with the attitude or practices. The majority had a positive attitude but exhibited negative practices regarding emigration. Significant associations were identified between attitude and factors such as plans of post-graduate studies, MO grade, and job satisfaction. Practices were recognized to be significantly associated with mainly the education related factors. There was a positive correlation of working hours with both attitudes and practices whereas no significant association of monthly income was identified.

Keywords: *Attitudes, Practices, Doctors, Emigration*

Knowledge, Attitudes, and Willingness of Patients in Selected Medical Specialty Wards at National Hospital of Sri Lanka regarding Medical Students and their Involvement in Patient Care

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The ailing patient is irreplaceable to medical education. However, studies describing the patient's stance on this relationship have been few and far apart. We assessed the knowledge, attitudes, and willingness of patients in selected wards at the National Hospital of Sri Lanka (NHSL) regarding medical student involvement in their care. This cross-sectional study involved 151 patients from medical, cardiology, and nephrology wards at NHSL. Patients were selected using a multi-stage approach of stratified sampling followed by systematic sampling. An interviewer-administered questionnaire was developed by the investigators. Questions assessing knowledge of patient rights were based on Indian and British patients' rights charters. Likert scales were utilized to assess willingness. Open-ended and closed questions were used to gather patient attitudes regarding medical students. A significant number of patients were unable to correctly identify a medical student in the wards. Half the patients thought medical students had completed medical school. Similarly, 61% believed that medical students had a role in patient treatment. Most participants (63%) had poor knowledge of patient rights. Only 51.0% were aware of the right to 'privacy and confidentiality.' Letting students do invasive examinations on them obtained a mean willingness score of 3.33 ±1.53 out of 5, a lower score compared to other procedures. Female patients were significantly less willing than males for examinations. Most patients preferred a specific gender of medical student. Most patients (75%) felt good about helping students learn. However, they gave low scores for students' ability to take an interest in patients' stories. There were significant gaps in the knowledge of patients regarding medical students. The majority was willing to have students engage in their care, but this decreased with invasive procedures and sometimes based on student gender. Some negative attitudes towards students were observed.

Keywords: *Medical Students, Patients' Rights, Patients' Attitudes, Informed Consent*

POSTER PRESENTATIONS

Knowledge, Attitudes, and Practices about Leishmaniasis among the Community in Tangalle and Beliatta

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Cutaneous leishmaniasis is a notifiable tropical vector borne and recently reported disease in Sri Lanka. Leishmaniasis in Sri Lanka is at unique position in global scale. Our research is to assess the knowledge, attitudes, practices, and community opinion towards awareness on Leishmaniasis in Tangalle and Beliatta which are two main disease hotspots in Sri Lanka. To assess the level of knowledge with regards to Leishmaniasis in selected population in Southern Sri Lanka and to describe the attitudes with regards to Leishmaniasis in selected population in Southern Sri Lanka. A descriptive cross-sectional study was conducted among 119 inhabitants from Tangalle and Beliatta Divisional Secretariat divisions, age between 18-60 years following informed written consent. Study sample was selected by multistage cluster sampling. A pretested, interviewer-administered questionnaire was used. Majority in both regions recognized "a disease caused by a fly leading to skin lesions" (Beliatta 93.6%, Tangalle 94.4%). However, awareness of the term "Leishmaniasis" was low (Beliatta 17.0%, Tangalle 8.3%). Only minority could identify the shown insect sample (Beliatta 17%, Tangalle 5.6%). Poor knowledge existed regarding the vector habits such as biting time and breeding places was elicited. Attitudinal differences were observed between the regions. In Beliatta, 48% (^{n} = 23) believed in the disease's curability, while in Tangalle, 63.9% (^{n} = 46) lacked clarity on this aspect. However, there was no statistically significant association ($p > 0.05$) with age, education, occupation or DS divisions regarding knowledge or attitude levels. This study reveals familiarity with the disease which indicates long term existence of the disease. However, lack of awareness about symptoms and vector control methods, limited recognition of the term "Leishmaniasis" and insufficient knowledge regarding vector and associated high – risk factors were identified.

Keywords: *Leishmaniasis, Sri Lanka, Knowledge, Attitudes, Sand Fly*

Knowledge, Attitudes, Health Seeking Behaviour and Factors Associated with Knowledge and Attitudes on Leprosy among Adults in Moratuwa MOH Area

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Leprosy is a chronic infectious disease that remains a public health challenge in Sri Lanka. Early detection is crucial for preventing disease transmission. This study aims to fill the knowledge gap in local studies and generate evidence to support the interventions in the Moratuwa MOH area, known for its high endemicity. A cross-sectional descriptive study with an analytical component was conducted as a household survey in Moratuwa MOH area. A sample of 120 adults was selected using cluster sampling. Data were collected using an interviewer-administered questionnaire covering socio-demographic factors, knowledge, attitudes, and health-seeking behaviors regarding leprosy. The total knowledge score was calculated using core knowledge questions, with a cut-off determined through expert opinion. Statistical analysis, including descriptive statistics and chi-square test was performed. The study included 120 participants with a 100% response rate; 88 (73.3%) were females. Among participants, only 41 (34.2%) were aware of Anti-leprosy Campaign programs. Additionally, 66 (55%) correctly identified aerosol/inhalation as the transmission route. However, 67 (55.8%) had overall poor knowledge, and 53 (44.2%) had good knowledge. Attitude level was poor in 64 (46.7%) participants. Knowledge and attitude were not significantly associated with age, gender, ethnicity, occupation, or educational level. A significant majority 88 (73.3%) would seek healthcare within a week of noticing symptoms. The study reveals that significant deficiencies persist in awareness and attitudes toward leprosy among residents in Moratuwa MOH area. To address this, further educational efforts are recommended to improve public understanding of leprosy, thereby aiding in its prevention and control.

Keywords: *Attitude, Leprosy, Knowledge, Health Seeking, Moratuwa*

Knowledge, Attitudes, and Practices of Food Handlers on Food Safety in a Selected MOH Area in the Colombo District in Sri Lanka

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Millions of people suffer from foodborne diseases annually due to poor food handling practices. Urbanization and changing consumer behaviour have led to an increase in outside food consumption, making food handlers' knowledge, attitudes, and practices crucial for ensuring food safety and hygiene. This study aimed to assess the knowledge, attitudes, and practices on food safety and hygiene and factors associated with knowledge and practices among food handlers. A descriptive cross-sectional study was conducted among 131 food handlers from 46 food-handling establishments in Pitakotte MOH area, Colombo district. An interviewer-administered questionnaire developed based on the PHI manual, Food Act, WHO recommendations, and expert comments was used to collect data. Knowledge, attitudes, and practices were classified as good or poor based on a scoring system and chi-square tests were used to assess associations. The majority of the establishments belonged to 'Hotel' category (43.5%, n = 20) and were below A-grade (69.6%, n = 32). Most food handlers were between 20 – 39 years (66.4%, n = 87) and were males (63.4%, n = 83). A 'good' knowledge level was seen in 62.6% (n = 82), and 74.8% had good attitudes (n = 98). However, only 58.0% had good practices (n = 76). Occupation-related training, lesser work-years, higher grading, higher monthly income, not smoking, good knowledge, and favourable attitudes on food safety were significantly associated with better practices ($n < 0.05$). Age, sex, higher education level, and low alcohol consumption were not significantly associated with better practices ($n > 0.05$). Food handlers should be given proper training focused on areas where their knowledge is poor before employment. Fostering positive attitudes towards food safety and promoting good food safety practices should be continued through supportive supervision at the field level.

Keywords: *Food Safety, Food Handlers, Knowledge, Attitudes, Practices*

Prevalence of Hypertension, its Risk Factors, and Associations among Sanitary Workers in the Colombo Municipal Council Area

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The sanitary worker population is a marginalized group whose health problems are poorly examined through research and inadequately addressed through government policy. The disease burden of NCDs in the nation, and the heterogeneity of the population in the CMC Area lay the grounds for this research aimed at describing the prevalence of hypertension, risk factors, and its associations in this population. A descriptive cross-sectional study design was used with a convenient sampling method to recruit sanitary workers. The study was carried out at the Drainage and Supply division office, District 2B, and District 3 offices of the CMC Area. An interviewer-administered questionnaire was utilized to identify factors associated with hypertension, while blood pressure was measured using a calibrated standard digital sphygmomanometer on two occasions. The average blood pressure was classified according to JNC-8 Guidelines. Associations were established by Chi-squared analysis. The prevalence of hypertension in this population was 28.6% (95% CI: 20.4% - 37.9%), while the established incidence was 13.9%. A high prevalence of smoking (41.9%), current alcohol use (64.3%), and illicit drug use (20.5%) were identified. Correlates that were significantly associated with hypertension were age of ≥ 50 years ($p = 0.02$), diabetes ($p = 0.01$), high stress levels ($p = 0.005$), and high salt consumption ($p = 0.02$). The prevalence of hypertension in sanitary workers is similar to the national prevalence. However, unique risk factors identified such as poor coping mechanisms to high stress levels and unsatisfactory dietary practices warrant the need for targeted interventions for this often-overlooked subpopulation.

Keywords: *Hypertension, Sanitary Workers, Non-Communicable Diseases, Substance Use*

Knowledge and Attitudes Regarding Cardiovascular Disease Risk among Rheumatoid Arthritis Patients Attending the Rheumatology Clinic At National Hospital of Sri Lanka

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Rheumatoid arthritis (RA) is a chronic inflammatory disease that primarily affects joints and subsequently multiple organ systems in the body. RA patients have a significantly increased cardiovascular disease (CVD) risk, which is similar to that of type 2 diabetes mellitus. In Sri Lanka, the prevalence of early RA is 0.7%. Our study aimed at describing the knowledge and attitudes regarding cardiovascular disease risk among rheumatoid arthritis patients attending the rheumatology clinic at National Hospital of Sri Lanka (NHSL). A descriptive cross-sectional study was conducted among 110 RA patients attending the rheumatology clinic at NHSL. Participants were selected using a systematic sampling method. Data regarding knowledge and attitudes were collected using an interviewer-administered questionnaire. Knowledge was assessed using a modified version of the HDFQ-RA questionnaire (Heart Disease Fact Questionnaire-Rheumatoid Arthritis). Knowledge scores for 'general' and 'RA-specific' CVD risk were calculated, with good knowledge defined as a score above 50%. Scores for attitude were obtained using Likert scale. Among the participants, 82.73% had good knowledge regarding 'general' CVD risk, but 62.73% had poor knowledge regarding 'RA-specific' CVD risk. 84.5% of participants did not have an idea or had misconceptions regarding medications given to treat RA. Despite the neutral attitude that indigenous medications for RA have fewer cardiovascular side effects, the overall attitude towards reduction of CVD risk associated with RA was positive. This study revealed that majority of the participants had a good 'general' CVD risk knowledge; however, their knowledge on 'RA specific' CVD risk was poor. The overall attitude was positive towards reduction of CVD risk associated with RA.

Keywords: *Knowledge, Attitudes, Rheumatoid Arthritis, Cardiovascular Disease Risk*

Prevalence of Diabetes Mellitus and its Association with the Fasting Duration, among Buddhist Monks, in Kelaniya Divisional Secretariat

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Diabetes mellitus (DM) is a global epidemic, including in Sri Lanka. Buddhist monks, who are a part of the Sri Lankan community, are at risk of developing this condition due to their distinct dietary practices. This study aimed to examine the prevalence of diabetes among Buddhist monks in Sri Lanka and to investigate its association with fasting duration. This cross-sectional study included 110 Buddhist monks in the Kelaniya Divisional Secretariat area. Upon cluster sampling, a validated interviewer-administered questionnaire was utilized to collect data on socio-demographic characteristics, participant reported diabetes status and fasting duration. Fasting blood glucose levels from capillary blood samples were measured using a glucometer in monks who reported not being previously diagnosed with diabetes. The study assessed the association between diabetes prevalence and the duration of the longest fasting period using a Chi-square test. With a response rate of 95.45%, the prevalence of diabetes in Buddhist monks was 35.6% (n = 31). It was noteworthy that the prevalence of diabetes increases significantly from 5.2% in the youngest age groups to 38.5% as the population reaches their 30s. Among monks with longer fasting periods, DM prevalence was 26.6% (n = 6) compared to 37.5% (n = 25) among monks in the shorter fasting period group. Furthermore, there was a significant relationship between the duration of fasting periods and the prevalence of diabetes ($p < 0.05$). Due to rising diabetes rates in monks, as they reach their 30s, it's recommended to start diabetes screening in their 20s for early detection. It was concluded that the prevalence of diabetes was significantly lower in those who were fasting for a longer duration. Longer fasting hours may conceivably be a notable subject matter for further study to postulate interventions for the prevention of DM.

Keywords: *Buddhist Monks, Diabetes Mellitus, Fasting Periods, Sri Lanka*

Risk Factors for Acne among Acne Patients Attending Dermatology Clinics in Colombo: A Case Control Study

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Acne, prevalent both globally and locally, causes significant psychosocial distress in individuals. Due to limited research in Sri Lanka, our analytical study aims to identify familial, lifestyle, and nutritional risk factors for acne in patients aged 16-35 years. A hospital-based case-control study was conducted at dermatology clinics and outpatient units in NHSL and CSTH, involving 140 patients aged 16-35 years over one month. Cases and controls (70 each) were matched by age, sex, and hospital. Data, collected through an interviewer-administered questionnaire, were analysed using odds ratios and chi-squared tests. Positive family history showed a significant positive association with acne development (OR 2.88 (95% CI [1.45- 5.72])). However, the severity of familial acne, indicated by the treatment status of first-degree relatives, did not have a significant risk (OR 0.98 (95% CI [0.38 - 2.52]). Frequent cosmetic usage showed a significant risk for acne (OR 5.22, (95% CI [1.97-13.83]). BMI, analysed in five categories (p = 0.8) or dichotomized as underweight and overweight showed no significant association (p = 0.49 and p = 0.88, respectively). Sleep (OR 1.12 (95% CI [0.58 - 2.18])) and smoking (OR 0.62 (95% CI [0.24 - 1.63])) were not significant risk factors. Frequent milk and dairy consumption both overall (OR 1.00 (95% CI [0.24 - 4.17])) and individual (milk, ice cream, cheese, yoghurt, and curd) revealed no significant risk as well as frequent chocolate consumption. Overall trans-fat (fried food, margarine, snacks, baked goods) consumption (OR 1.78 (95% CI [0.74 - 4.25]) showed no significant positive association even though frequent snack consumption was a significant risk factor for acne development (OR 2.39 (95% CI [1.21- 4.71]). Positive family history, frequent cosmetic usage and snack consumption were identified as risk factors for acne. No significant association was observed between acne and other lifestyle and nutritional factors.

Keywords: *Acne, Case Control, Risk Factors, Family History, Lifestyle Factors*

Complementary and Alternative Medicine (CAM) Usage among Type 2 Diabetic Patients: Prevalence, Associated Factors, Knowledge, Attitudes, and Practices in Selected Medical Clinics at the National Hospital of Sri Lanka

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This study aims to describe the prevalence, perceptions, awareness, and habits concerning complementary and alternative medicine (CAM) use among type 2 diabetic patients visiting the National Hospital of Sri Lanka (NHSL). A validated questionnaire was used to collect information on demographic and clinical factors like age, gender, education level, family history of diabetes, duration with diabetes, and some complications. This cross-sectional study had 120 participants. Assumptions about these variables were obtained by means of statistical analyses using chi-square test, Fisher's exact test and t-test. The study results showed that the percentage of CAM users in a lifetime was 60.8%. The main one was herbal remedies like Costus Speciosus (Thebu), Fenugreek, and Starfruit. The study did not discover a relationship between CAM usage and demographic or clinical variables except for positive family history of diabetes (p = 0.05). High levels of awareness about CAM existed (95.8%) but there were significant differences between and among the users and non-users in relation to specific knowledge about these modalities, their safety, or efficacy, which were reflected in their different opinions (p = 0.001) [For example]. The people's views towards CAM treatments differed with 34% having faith and 42% expressing doubt while this was mainly influenced by the fact whether an individual used it or not (p < 0.01). This included various ways in which complementary medicine was being used within practice resulting in low disclosure rates to healthcare practitioners such as doctors who primarily handle patients' health care issues (82%). The survey finds a large proportion of type 2 diabetic patients at NHSL who use CAM. It underscores the need for health care to consider patient opinion and enable communication between patients and providers in order to enhance overall care of diabetes mellitus.

Keywords: *Complementary and Alternative Medicine, Type 2 Diabetes, Prevalence, Knowledge*

Relationship between Musculoskeletal Complaints, and Quality of Life among Pregnant Women during their Third Trimester Attending an Obstetrics and Gynecology Clinic: A Cross-Sectional Study

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Musculoskeletal issues are frequent during pregnancy and can have a major impact on quality of life, especially in the third trimester. This study aimed to determine the relationship between musculoskeletal complaints and quality of life among pregnant women during their third trimester. This analytical cross-sectional study was conducted among 100 pregnant women attending the Obstetrics and Gynecology clinic of University Hospital, General Sir John Kotelawala Defence University. Participants aged 18-45 years and in their third trimester were recruited using non-probability purposive sampling. An interviewer administered questionnaire, Nordic Musculoskeletal questionnaire (NMQ) and SF-36 questionnaire were used to collect data. Descriptive statistics and One way ANOVA test were used to analyze data. The study population's mean SF-36 score was 53.17, indicating a moderate quality of life. The physical component summary (PCS) mean score was 52.94, and the mental component summary (MCS) mean score was 56.41, suggesting relatively better mental health compared to physical health. Most participants reported musculoskeletal complaints in one or more body regions (n = 84, 84%). Significant differences were observed in the mean scores of the MCS ($p = 0.017$), MCS ($p < 0.0001$), and overall quality of life ($p < 0.0001$) among those with musculoskeletal complaints. This study underscores the substantial impact of musculoskeletal issues on pregnant women's quality of life. Addressing musculoskeletal health and promoting interventions tailored to pregnant women is recommended to enhance their overall well-being during the third trimester.

Keywords: *Musculoskeletal Complaints, Quality of Life, Pregnant Women, Mental Component Summary, Physical Component Summary*

Knowledge and Skills of Caregivers of Pediatric Asthma Patients of Lady Ridgeway Hospital, Colombo, regarding the Use of Metered-Dose Inhalers and Associated Factors

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Prevalence of asthma, which has a significant impact on quality of life, varies between 13% and 25% in children aged 5 to 11 in Sri Lanka. As knowledge and skills regarding the use of metered dose inhalers (MDIs) of caregivers are crucial for effective asthma control in children, this study aims to assess the above along with associated factors. A descriptive cross-sectional study involving 122 caregivers of asthmatic children attending the pulmonology clinic at Lady Ridgeway Hospital was conducted from September to October 2023. Caregivers of children diagnosed with asthma and using MDIs for at least a period of 6 months were included and data was collected through an interviewer-administered questionnaire, developed by investigators with the aid of a consultant pediatrician and incorporating Inhaler Device Assessment Tool (IDAT), a validated tool for assessing inhaler technique. A score of 5/5 according to IDAT was considered as "appropriate" inhaler technique while a score of 10/13 or more for the section assessing knowledge was considered as "adequate" knowledge. The questionnaire captured sociodemographic data, asthma, and MDI use-related data too. Data analysis was performed using SPSS version 26, and significance of associations was assessed using Pearson chi square tests ($p < 0.05$). Results revealed that the majority of caregivers were female (93.4%). Only 42.6% of caregivers had "adequate" knowledge in contrast to the 72.1% that demonstrated "appropriate" inhaler technique. Caregivers with higher monthly household income had better knowledge while lesser frequency of symptom reliever use and education on asthma and inhaler use by healthcare professionals was associated with better inhaler technique. Furthermore, caregivers with "adequate" knowledge had significantly better inhaler technique. There is a lack of knowledge regarding asthma and inhaler use among caregivers and education of caregivers may be beneficial in further improving inhaler technique.

Keywords: *Knowledge, Skills, Pediatric, Asthma, Metered-Dose Inhalers*

Unveiling Behavioral Patterns: Proportion of Such Children and Factors Associated among Children Attending a Child Guidance Clinic in the Colombo District

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Behavioral problems in children significantly affect their emotional, social, and intellectual development. In Sri Lanka, limited access to specialized mental health services, along with socio-cultural barriers such as stigma and low awareness, complicates effective interventions for these children. Early identification and intervention are crucial for achieving better outcomes. This study aims to describe the proportion of behavioural problems and explore the socio-demographic factors associated with these issues among children attending a specialized child guidance clinic in Colombo. A cross-sectional descriptive study was conducted at the child and adolescent clinic of Lady Ridgeway Hospital for Children, Colombo. The sample consisted of 183 children aged 5-18 years, diagnosed with behavioral problems using the Strengths and Difficulties Questionnaire (SDQ) and SNAP-IV. Systematic sampling was employed to ensure representativeness and data from parents or caregivers were collected through a structured interviewer-administered questionnaire, with focus on socio-demographic information and the types of behavioural problems. Data analysis used SPSS software, with a significance level set at $p < 0.05$. Significant behavioural problems were exhibited by 48% of children. Common issues included school refusal (12%), hyperactivity (12%), and poor academic performance (18%). The majority (51.9%) was from the Colombo district, and most belonged to nuclear families. Parental education and occupation were significantly associated with the severity of behavioural issues ($p < 0.05$). These results align with previous studies, which reported a 13.8% prevalence of behavioural and emotional disorders among school-aged children in other regions of Sri Lanka. Prevalence of behavioural problems among children attending the clinic was high. Socio-demographic factors, particularly parental education and occupation, were significantly associated with the problems. Addressing these factors may improve outcomes for affected children.

Keywords: *Behavioral Problems, Socio-Demographics, Child Guidance Clinic, Colombo, Cross-Sectional Study*

What is Humaneness? Conceptions of Medical Students and Professionals

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The current focus to make healthcare more person-centred goes hand-in-hand with attempts to develop more humane doctors. However, these attempts must be preceded by an understanding of what humaneness is and how it is construed within the relevant socio-cultural context. The objective of this study was to explore perceptions of medical students and professionals in Sri Lanka on the construct of humaneness. A convenience sample of medical students, medical practitioners, and academic staff was recruited during the Colombo Medical Congress 2023 at the Faculty of Medicine, University of Colombo. A large cut-out of a doctor was placed in a central and open space at the venue to facilitate easy access to it for the potential participants. It was accompanied with a printed prompt stating "Pen your thoughts on what a humane doctor is". Post-it notes and pens were placed nearby, with instructions to respond in any language without restricting their answers to written form. The notes were collected and given unique identifiers. They were analysed by two independent coders using thematic analysis based on grounded theory approach. From a total of 84 responses, 11 were considered unrelated to the question and excluded from analysis. The remaining 73 responses were coded to identify themes. The preliminary round of analysis found the following themes to occur in > 10% of the responses: compassion (25%), kindness (16.6%), using a holistic approach (16.6%), providing psychological comfort (14.3%), empathy (14.3%), and care (11.9%). This study reveals perceptions of humaneness mainly as a combination of positive emotional attributes and behaviours directed towards patients. Participants also highlighted that a humane doctor should use a holistic approach extending beyond addressing immediate medical needs to improve overall patient condition. These findings underscore the importance of incorporating these values into medical practices which strive to enhance the humaneness of practitioners as a key element of person-centred care.

Keywords: *Humaneness, Kindness in Healthcare, Compassion in Healthcare, Empathy in Healthcare, Good Doctor*

Prevalence of Falls Risk and Falls-Associated Risk Factors among Older Patients with Knee Osteoarthritis attending Rheumatology Clinics at National Hospital of Sri Lanka

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Falls increase morbidity and mortality in older patients. Knee osteoarthritis (KOA) increases the risk of falls in these patients. We aimed to assess the prevalence of falls risk and falls-associated risk factors and examine the relationships between falls risk and falls-associated risk factors. This descriptive cross-sectional study was carried out at the Rheumatology physiotherapy clinics at the National Hospital of Sri Lanka, among KOA patients 60 to 80 years. An interviewer-administered questionnaire collected demographic data, falls history within previous 12 months, footwear types, and duration of using footwear/being barefoot. Time-up and go test, tandem stance test, berg balance scale, hand-held dynamometer, and International Physical Activity Questionnaire-Short Form were used to assess falls risk, static balance, dynamic balance, quadriceps muscle strength (QMS), and physical activity level (PA) respectively. Of 152 patients (mean age 67.17 +5.69 years), 96.1% were female. Majority (84.9%) had bilateral KOA. 17.8% reported falls during the previous 12 months. Majority (65.1%) had a high risk of falling. 59.4% of patients engaged in high levels of PA. Most (34.21%, n = 52) were obese 1 category and had poor static (59.9%, n = 92) and poor dynamic balance (65.1%, n = 99). There was a significant relationship between falls risk and PA level, static balance, dynamic balance. There was no significant relationship between falls risk and body mass index, footwear types. There was a negative correlation with a significant association between falls risk and QMS, time duration of wearing footwear, and a positive correlation between falls risk and time duration of being barefoot. QMS, PA level, duration of wearing footwear/being barefoot, static and dynamic balance were associated with falls risk among older adults with KOA. Improving muscle strength, flexibility, and balance are recommended for older adults with KOA to reduce falls risk and falls.

Keywords: *Knee Osteoarthritis, Balance, Falls Risk, Quadriceps Muscle Strength, Physical Activity*

Association between Self-Reported Exercise Adherence and Quality of Life of the Patients with Knee Osteoarthritis Attending Rheumatology and Rehabilitation Clinics at National Hospital of Sri Lanka

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Osteoarthritis is the world's most common rheumatologic disease. Consistent exercise regimes can improve quality of life (QOL) for patients with knee osteoarthritis, even though adherence may decrease over time. We describe the association between self-reported exercise adherence (SREA) and QOL of patients with knee osteoarthritis. We used simple random sampling to recruit 141 participants with knee osteoarthritis (22 male, 119 female) with a mean age of 57.39±5.56 years, attending Rheumatology and Rehabilitation clinics of the National Hospital Sri Lanka. Inclusion criteria were males and females aged 50-70 years with a history of knee osteoarthritis of approximately one year, who had been exercising for at least 3 weeks and performing specific exercises for one or both lower limbs. Patients with recent surgeries, spinal issues, other impairments, a history of knee osteoarthritis beyond one year, and those doing an incorrect number of exercise types were excluded. Demographic data were gathered using an interviewer administered questionnaire. The medical outcome study SF-36 questionnaire was used to assess QOL and the Exercise Adherence Rating Scale (EARS) was used to assess SREA. Descriptive statistics, the Spearman correlation test and the non-parametric chi-square test were used for data analysis in SPSS version 20. The majority of the participants experienced unsatisfactory exercise adherence (93.6%) and unsatisfactory QOL (62.4%). There was a statistically significant association between SREA and QOL with the chi-square test ($p = 0.029$) and a week positive correlation existed with the spearman correlation test ($p = 0.031$). The mean scores of the EARS were 29.19 ± 7.42 and the SF 36 questionnaire was 46.97 ±16.70. The study demonstrates the majority of participants with unsatisfactory SREA and QOL being a significant concern. These findings underscore the importance of adhering to the exercises among the patients with knee osteoarthritis to enhance their QOL.

Keywords: *Self-reported Exercise Adherence, Quality of Life, Knee Osteoarthritis*

Comparison of Ankle Range of Motion and Dorsiflexor Muscles Strength Between Habitual High Heeled Shoes Wearing and Flat Heeled Shoes Wearing Undergraduates in the University of Colombo

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A high heeled shoe (HHS) is a type of a shoe that has an upward angled sole, which places the heel of the wearer's foot at a significantly higher position compared to the fore-part of the foot. This prolonged plantar-flexed position can cause changes in soft tissue around the ankle joint resulting in altered range of motions. This study describes and compares the active and passive ankle range of motion and foot dorsiflexor muscles strength between habitual high-heeled shoe (HHS) wearers and flat-heeled shoe (FHS) wearers among undergraduates at the University of Colombo. The study recruited 156 healthy female undergraduates (mean age 24.3±1.2 years), 78 of them who wore HHS and 78 who wore FHS in the past 6 months, 3 days per week, for at least 5 hours per day. Active and passive ankle range of motion were measured using universal goniometer and dorsi-flexor muscle strength was measured using 1 repetition maximum (1RM) test. In bilateral ankle range of motions, both active and passive plantar-flexion (Active 52.1±3.5 > 41.6±3.3, Passive 57.2±3.2 > 48.5±2.5) and inversion (Active 21.6±2.1 > 18.7±2.3, Passive 27.7±2.3 > 24.0±2.3) ranges were significantly higher in the HHS group ($p < 0.05$). Both active and passive dorsi-flexion (Active 15.9±1.7 < 20.4±1.9, Passive 19.4±2.3 < 23.5±3.0) and eversion (Active 14.2±2.3 < 18.5±2.9, Passive 18.5±2.7 < 25.2±2.6) ranges were significantly higher in the FHS group ($p < 0.05$). Bilateral dorsi-flexor muscle strength (HHS 3942.3±371.3, FHS 4000.0±355.8) was not significantly different between two groups ($p > 0.05$). Habitual wearing of HHS is associated with alterations in the ankle range of motion; increase in plantar-flexion and inversion ranges, decrease in dorsi-flexion, and eversion ranges in both passive and active range of motions. HHS did not have any significant effects on dorsi-flexor muscle strength.

Keywords: *High Heeled Shoes, Flat Heeled Shoes, Range of Motion, Dorsiflexor Muscle Strength*

Prevalence and Associated Factors of Hamstring Tightness among Undergraduates of a Leading University of Information Technology in Colombo

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Muscle tightness is common among those leading sedentary lifestyles and occurs due to a decrease in muscle's ability to deform and reduced range of motion. Regular computer users are more prone to develop hamstring tightness which may lead to low back pain. Undergraduates studying Information Technology are going to be Information Technology professionals in future and this study aimed to determine the prevalence of hamstring tightness, association between hamstring tightness and socio-demographic characteristics, and association between hamstring tightness and level of physical activity among undergraduates of a leading University of Information technology in Colombo. A descriptive cross-sectional study used simple random sampling to recruit 162 undergraduates (males = 87, females = 75; mean age 22.66 ±1.36 years). Hamstring tightness was assessed by the Active knee extension test and BMI was calculated by measuring weight and height of the participants. Physical activity level (PAL) was measured by International Physical Activity Questionnaire (IPAQ). The physical activity level was categorized into three groups as low, moderate, and high according to the IPAQ scoring protocol. Pearson's chi-square test was performed during statistical analysis. According to results, the majority had hamstring tightness either in left side (n = 142, 87.7%) or right side (n = 143, 88.3%). Bilateral hamstring tightness was present in 136 (84%). There was a significant association between hamstring tightness and BMI in bilateral (p = 0.002), right side (p = 0.001) and left side (p = 0.049). 37.7% had low PAL, 47.5% had moderate PAL and only 14.8% had high PAL. There was a significant association between hamstring tightness and physical activity level on the left side (p = 0.017). Of participants with left side tight hamstrings, 51.4% had moderate PAL, 33.8% had low PAL, and 14.8% had high PAL. Low and moderate physical activity levels in undergraduates could lead to develop hamstring tightness. Identifying associated factors for hamstring tightness and providing physical exercise programs can improve muscle flexibility and general wellbeing of undergraduates.

Keywords: *Hamstring Tightness, Body Mass Index, Physical Activity Level*

Relationship between Q Angle and Lower Limb Muscle Strength of Knee Osteoarthritis Patients attending Rheumatology Clinics of National Hospital Sri Lanka

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Osteoarthritis is the most common chronic musculoskeletal (MSK) disease and is characterized by breakdown of the articular cartilage of the joint. Among the various types, knee osteoarthritis is the most common form which affects the bones, cartilage, and the synovium of the knee joint. This study aims to identify the relationship between Q angle and lower limb muscle strength of knee osteoarthritis patients attending Rheumatology clinics of National Hospital Sri Lanka. This analytical cross-sectional study recruited 112 knee osteoarthritis patients with mean age of 61.86 ± 10.24 years attending Rheumatology clinics of National Hospital Sri Lanka. Without using any criteria for duration of OA, all the OA patients were recruited according to the inclusion and exclusion criteria. Demographic data were gathered by using an interviewer administered simple general information questionnaire. A long-armed universal goniometer was used to measure the Q angle, while a hand-held dynamometer was employed to assess the lower limb muscle strength of the study participants. Quadriceps, Hamstrings, Hip flexors, Hip extensors, Hip adductors, Hip abductors, Ankle plantar flexors, and Ankle dorsiflexors are the muscles groups which were tested. The most symptomatic leg, according to the medical records, was selected to take these measurements. Descriptive statistics and Pearson's correlation were used during statistical analysis. Among the study participants (mean age 61.86±10.24 years) 75.8% (n = 85) were females and 24.1% (n = 27) were males. There was a statistically significant negative correlation between Q angle and Quadriceps muscle strength (r = -0.219, p = 0.021), Q angle and the hip flexor muscle strength (r = -0.212, p = 0.025), and Q angle and the hamstring muscle strength (r = - 0.206, p = 0.029) among knee OA patients attending Rheumatology clinics NHSL. These findings suggest that addressing Q angle-related muscle weakness in clinical practice could improve patient outcomes. Future research should explore targeted interventions to strengthen these muscles.

Keywords: *Q Angle, Lower Limb Muscle Strength, Knee Osteoarthritis*

Relationship between Pain and Disability and Type 2 Diabetes Mellites among Patients Diagnosed with Adhesive Capsulitis Attending Musculoskeletal Clinics at the National Hospital, Sri Lanka

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Adhesive capsulitis of the shoulder is also known as frozen shoulder, characterized by severe shoulder pain and progressive loss of shoulder motion. It affects 2-5% of the population, with most female patients aged 40-60 years. In Sri Lanka, adhesive capsulitis is the most common cause of shoulder pain in middle-aged and older people. This study aimed to identify the relationship between pain and disability and Type 2 Diabetes Mellites (DM) among patients with adhesive capsulitis. This cross-sectional analytical study included 114 patients with adhesive capsulitis using convenient sampling (mean age 61.29±8.97 years), attending musculoskeletal clinics at the National Hospital of Sri Lanka (NHSL) between October to November 2023. Demographic data were collected using a patient assessment form, excluding patients with any other medical conditions. The shoulder pain and disability index (SPADI) questionnaire was used to detect shoulder pain and disability. Type 2 DM diagnosis was confirmed through clinical records. Descriptive statistics and independent sample t-test were used during the statistical analysis in SPSS version 25. According to results, pain and disability exhibited a strong significance (p = 0.001) with Type 2 DM among patients with adhesive capsulitis. The mean total SPADI score for patients diagnosed with Type 2 DM was higher (70.92 + 16.53) than those without Type 2 DM (54.90 + 23.57). Therefore, patients with Type 2 DM (n = 79) experienced higher levels of shoulder pain and disability than those without Type 2 DM (n = 35). Therefore, it is crucial to develop targeted interventions aimed at patients diagnosed with adhesive capsulitis and Type 2 Diabetes mellitus in order to improve pain and disability.

Keywords: *Adhesive Capsulitis, Pain and Disability, Type 2 Diabetes Mellitus, Frozen Shoulder*

Fall-related Injury Patterns in Elderly People Admitted to National Hospital - Sri Lanka

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Falls represent a significant worldwide health issue, ranking as the second most common cause of unintentional injury deaths among individuals aged 60 years and above. Falls account for three percent of all traumatic injury deaths in Sri Lanka. Older individuals are more susceptible for fall related injuries due to higher prevalence of comorbidities, age related physiological changes, and delayed functional recovery. Therefore, this study aimed to assess the fall injury patterns in elderly people admitted to the National Hospital, Sri Lanka. This analytical cross-sectional study recruited 132 individuals aged 60 years and above who admitted to the National Hospital, Sri Lanka due to fall injuries. Demographic and fall related data were collected using an interviewer administrated questionnaire. Descriptive statistics were used to analyze data. Fractures were the most common injury type found among elderly due to falls (79.5%), followed by superficial injuries and strain/sprain/dislocations (11.4%). Fractures (72%) predominantly affected the extremities, while superficial injuries primarily impacted the head, neck or cervical region (6.1%). The elderly population often experiences falls-related injuries, with fractures at pelvis/extremities being the most common. Females are more likely to suffer from falls, and these injuries are more severe than those with acute medical conditions. To reduce falls-related fractures, it is crucial to provide vitamin D and calcium supplements, strengthen exercise programs, and educate the elderly on safe-landing strategies and fall prevention.

Keywords: *Fall, Fall Injuries, Elderly, Injury Pattern*

Relationship between Dynamic Sitting Balance and Chest Expansion of Acute and Sub-Acute Post-Stroke Patients in National Hospital of Sri Lanka

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Stroke survival is accompanied by severe disabilities worldwide. Chest expansion is often hindered during early post-stroke phases, which negatively impact the recovery. Though previous studies have shown a correlation between dynamic sitting balance and respiratory muscle strength, none have investigated its effect on chest expansion. Furthermore, there is a relationship between respiratory muscle strength and chest expansion, which is correlated more strongly with lower chest expansion. Therefore, this study aims to explore the impact of dynamic sitting balance on chest expansion. A cross-sectional study was carried out at the Neurology Physiotherapy Unit of the National Hospital of Sri Lanka (NHSL). It included 84 stroke patients aged 20-75 years within 12 weeks of onset. Excluded were those who declined consent or had medical conditions affecting variables. Assessment tools used were the Trunk Impairment Scale (TIS) and tape measurements for sitting balance and chest expansion. Pearson and Spearman correlation tests were used for statistical analysis. There were 65 males and 19 females. The average age was 59.64±10.31 years, and the average stroke onset was 53.55±30.82 days. The mean TIS score for dynamic sitting balance was 6.86±2.20 points, while the mean chest expansion values were 2.54±0.85 cm (upper) and 3.01±1.17 cm (lower). A significant positive correlation was found between dynamic sitting balance and lower chest expansion ($r = 0.45$, $p < 0.0001$). There was no significant correlation with upper chest expansion. Findings show that impaired dynamic sitting balance can lead to reduced lower chest expansion. It is suggested to begin working on dynamic sitting balance from the early stages of rehabilitation itself, as it has the ability to improve chest expansion also, reducing the risk of pulmonary complications during the early stages of recovery which improves their quality of life.

Keywords: *Stroke, Dynamic Sitting Balance, Chest Expansion, Trunk Impairment Scale (TIS)*

Range of Motion of Paretic Side Ankle and its Impact on Dynamic Balance of Chronic Post Stroke Individuals Visiting Physiotherapy Clinic in NHSL

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Poor dynamic balance is a common complication in chronic post stroke survivors causing debilitating injury or fatal falls during ambulation. Ankle joint plays a crucial role in maintaining balance. Identifying an association between ankle joint mobility parameters and dynamic balance will help to develop more effective intervention to improve balance in chronic post stroke population. This study aimed to find the association between active dorsiflexion range of motion (AROM-DF) of the paretic side ankle and dynamic balance in chronic post stroke individuals. A descriptive cross-sectional study was conducted in a sample of 87 participants visiting Neurology physiotherapy unit, National Hospital of Sri Lanka. Chronic post stroke subjects with ≥3 months' post stroke duration with hemiparesis or hemiplegic due to hemorrhagic or ischemic type of stroke were included to the study. Individuals who had a history of other neurological diseases or disorders, vision impaired were excluded. AROM-DF was measured using Universal Goniometer. Timed Up and Go (TUG) test was used to measure the dynamic balance of the participants. Spearman's correlation was used for statistical analysis. Among 87 chronic post stroke participants (mean age = 58.8 ±10.11 years) with mean post stroke duration of 18 months (*SD* ± 29.48), 78.2% (*n* = 68) were males and 21.2% (*n* = 19) were females. Mean AROM-DF of paretic ankle was 6.62° (±5.74). Mean TUG test score was 37.35s (±30.41). There was a significant negative correlation between paretic side AROM-DF and TUG score ($p < 0.001$, $r = -0.443$). No significant level of association ($p > 0.05$) was found between non-paretic ankle AROM-DF and TUG scores. AROM-DF of the paretic side ankle is associated with dynamic balance of chronic post stroke hemiplegic individuals visiting Physiotherapy clinic in NHSL. Findings of this study suggest reduced active motion of the paretic side has limited the dynamic balance of this population.

Keywords: *Stroke, Hemiplegic, AROM, Dynamic Balance*

Prevalence and Association of Foot Arch Abnormalities with Lower Limb Joints Range of Motions in Obese Adults Attending Selected Clinics at the National Hospital of Sri Lanka

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Increased mechanical load in obese individuals adds more strain on lower limb joints, altering lower extremity biomechanics, leading to foot arch abnormalities. These foot arch abnormalities affect the lower limb range of motion (ROM), causing gait deviations and overuse injuries. This study explored the prevalence and associations of foot arch abnormalities with ROM in the lower limb joints among a cohort of obese patients. A cross-sectional study was conducted enrolling 85 obese (BMI > = 27.5kg/m^2) male (n = 10) and female (n = 75) Adults (20-65 years) attending selected clinics in the National Hospital Sri Lanka. Foot arch abnormalities (flat foot and high-arch foot) were assessed using static foot arch index (FAI). Lower limb joint ROMs were assessed using a universal goniometer. Associations of foot arch abnormalities with ROMs were assessed using Bonferroni Post Hoc test in SPSS 21. The mean age was 63.74±9.43 years in participants and 88.2% were females. The mean BMI was 32.28 ± 3.23 kg/m^2. The prevalence of flat foot and high-arch foot were 61.2% and 20.0% respectively. Both abnormalities were common on the left side (flat foot: 51.8% and high-arch foot: 14.1%). Right FAI show significant difference in Right Dorsiflexion among foot types (p = 0.036). Left side plantar flexion ROM showed a significant difference among flat foot and high-arch foot (p = 0.011) (95% CI 1.18-11.99). Foot arch index does not show any significant difference with Hip, Knee joint Range of Motion. However, the prevalence of foot arch abnormalities is considerably high among the obese population. The ankle joint ROMs are significantly affected with the foot arch abnormalities in obese population. These abnormalities can alter gait patterns and increase the risk of overuse injuries among the obese.

Keywords: *Foot Arch Index, ROM, Foot Arch Abnormality, Obesity*

Muscular Dystrophy Landscape in Sri Lanka: A Systematic Review of Molecular Diagnostics and Socio-Economic Factors

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Muscular dystrophies (MDs) are inherited myogenic disorders characterized by progressive muscle wasting and weakness of variable distribution and severity. MDs pose significant diagnostic and therapeutic challenges. Accurate diagnosis and subtyping using molecular techniques are crucial for optimum management and care. This study investigated the spectrum of MDs in Sri Lanka focusing on types, associated genetic mutations, molecular diagnostics employed, challenges in accessing these facilities, and the determinants affecting MDs. A systematic review of literature (1993-2023) using PubMed and google scholar databases identified 11 studies comprising of 4 case presentations, 5 clinical cohorts, one multi-center observational survey, and one retrospective analysis. The studies reported Duchenne MD (8) followed by Becker MD (3) and Limb-girdle MD (3). The total number of patients included was 333, with some overlap due to shared study locations. The statistics indicate 220 cases of Duchenne, 15 of Becker, 3 of Congenital, 2 of Myotonic, and 1 of Limb-girdle MDs with 92 cases unclassified. Deletion/duplication patterns in Duchenne MD mirrored global and Indian trends. Notably, clinical data was available only through case presentations. Studies on Ullrich Congenital MD and limb-girdle MD reveal instances of first and second-degree consanguinity within affected families. However, limited access to molecular diagnostics, particularly outside Colombo, hindered comprehensive diagnosis and patient care. Socioeconomic barriers, including poverty and geographic disparities, exacerbated these challenges. This study highlights the critical need for increased access to molecular diagnostics, personnel training, and resource allocation to address the likely underdiagnoses of MDs in Sri Lanka in order to improve outcomes for affected individuals.

Keywords: *Muscle, Muscular, Dystrophy, Sri Lanka*

Sports Injuries and Knowledge and Attitudes towards Physiotherapy Treatments following Sports Injuries

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Sports injuries are a common occurrence and have a significant impact on athletes' sports performances and quality of life with a possibility of permanent disabilities later. Physiotherapy is vital in preventing and managing sports injuries, yet awareness and attitude towards physiotherapy is insufficiently researched in the local context. A descriptive cross-sectional study was conducted among 123 athletes, representing 10 sports from University of Sri Jayewardenepura. Socio-demographic characteristics, sports related factors, history of sports injuries, and knowledge and attitudes towards physiotherapy treatments following sports injuries were assessed using a pre-tested, expert-reviewed, self-administered questionnaire. Subjects were selected using stratified random sampling according to the sports. Knowledge level was assessed using a scoring system. Descriptive statistics were used to analyze sports injuries, knowledge, and attitudes. Mean age of the sample (n = 123) was 23 years, with 95.1% having experienced at least one sports injury, majority involving lower limbs (73.5%). In seven sports, the injury prevalence was 100%. Only 48% of participants scored 'adequate' knowledge. Out of all the respondents, majority (54.5%) of participants had expressed a strong opinion regarding the importance of physiotherapy. However, only 48.4% of the injured athletes had started proper physiotherapy management and 44.4% followed the treatment regimen for the entire duration. Difficulty in time allocation was the main reason stated by the injured athletes for neither starting (53.1%) nor continuing (24%) the treatment. Sports injuries were highly prevalent among athletes. The majority of players lacked knowledge about physiotherapy treatment; however, they acknowledged its importance. The minority had initiated and continued physiotherapy treatment. To improve treatment adherence, feasible availability of facilities and proper guidance need to be addressed. Further research is needed to explore ways to increase athletes' knowledge of sport-specific injuries and the impact of physiotherapy management, building upon this study as an initial overview.

Keywords: *Sports Injuries, Physiotherapy, Treatment Adherence*

Prevalence and Associated Risk Factors of Depression Symptoms among Athletes of the University of Colombo, Sri Lanka

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University student athletes have responsibilities and commitments beyond that of their non athlete peers. They devote a substantial amount of time to improving their athletic performance in addition to the stressors experienced by a typical university student. Athletes are at risk for similar or slightly higher rates of depression than their non athlete peers and 'athletic status' is not necessarily a protective factor for depression. This study aimed to determine the prevalence of symptoms of depression associated factors for depression symptoms and the association between severity of depression symptoms with the subjective performance satisfaction of athletes in the University of Colombo, Sri Lanka. This descriptive cross-sectional study was conducted among athletes of the University of Colombo. Athletes were randomly recruited for the study using 2-stage random sampling. Depression symptoms were assessed by the Centre of Epidemiological Data (CED) Scale and athletes' subjective performance was assessed by Athletes Subjective Performance Scale (ASPS). Demographic data and athlete related variables were gathered using a semi-structured questionnaire to assess the associated factors for depression among athletes. Descriptive statistics, Chi- square test were used to analyze data. Response rate was 58% (n = 113). There was a high prevalence of clinically relevant depression symptoms (61.9%) in this sample. There was a statistically significant association ($p < 0.05$) with gender, athletic injury, and mental health accessibility. Scholarship status, sport, competition status, history of clinically diagnosed depression, and certain academic factors assessed were not associated with depression symptoms. A weak negative correlation (r = -0.195) was found between CES D scores and athletes' subjective performance. There is a high prevalence of depressive symptoms among athletes, and identifying the associated factors for depression, along with the detection and prevention of this condition, can lead to improved athletic performance.

Keywords: *Mental Health, Depression Symptoms, College/University Athletes, Performance*

Association of Dynamic Balance with the Incidence of Ankle Injury among University Level Football Players in the Western Province, Sri Lanka

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Ankle injuries are a leading cause of musculoskeletal injuries among athletes, particularly in high-impact sports like football. These injuries can be debilitating, causing significant pain, swelling, and instability, often forcing athletes to miss crucial games and training sessions. This study aimed to investigate the association between dynamic balance and the incidence of ankle injury among football players at the university level in the Western Province of Sri Lanka. In this prospective cohort study, 136 participants were recruited across five universities using a self-administered questionnaire and the Y-Balance Test at baseline. Injury details were collected during a follow-up period (3 months) via an interview administered questionnaire. Descriptive statistics were used to summarize participant characteristics and injury data. Mann-Whitney U tests were used to assess the relationships between baseline dynamic balance scores and future ankle injuries. Among 136 football players with a mean age of 23.22 (±0.910) years, 43.4% of the players sustained ankle injuries, with lateral ankle sprains (64.4%) being the most frequent. A majority of these injuries happened during competitions (61%). Lower scores in the Y-balance test (normalized anterior reach, normalized posteromedial reach, normalized posterolateral reach, and composite score) for both dominant and non-dominant legs were significantly associated with an increased incidence of ankle injuries ($p < 0.015$). Poor dynamic balance is linked to higher ankle injuries in football players. The study recommends integrating dynamic balance training programs, including exercises like single-leg stance variations, BOSU ball, and wobble boards to help prevent ankle injuries.

Keywords: *Ankle Injury, Dynamic Balance, Y-Balance Test, Football Players*

Association of Lower Extremity Injuries on Weight Bearing Ankle Dorsiflexion among University Netball Players in the Selected Universities in the Western Province

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Lower extremity injuries are common among netball players. Ankle movements are often affected by these injuries, leading to the risk of recurrent and further injuries. The aim of this study was to determine the association of lower extremity injuries on weight-bearing ankle dorsiflexion among selected university netball players in the Western province. A cross-sectional comparison study was conducted among 89 netball players from selected universities in the Western Province, including players aged 19 to 25 years with a history of lower limb injuries lasting from one month to six months, as well as non-injured players. Socio-demographic characteristics and information about training time, injury history, and competitive level were collected using a pre-tested interviewer-administrated questionnaire. Weight bearing ankle dorsiflexion (WBADF) was assessed using the weight bearing lunge test with measurements taken using a digital inclinometer. Data were analyzed using the Statistical Package for the Social Sciences version 25. The mean age of the study population (n = 89) was 22.2±1.3 years with the mean of 22.3 ±1.2 years in the injured group (n = 64) and 21.9 ±1.5 years in the non-injured group (n = 25). There was a statistically significant difference (p = 0.00001 < 0.05) in WBADF between the injured and non-injured group. The WBADF of injured players was less than that of the non-injured players. The mean value of WBADF for the population was 43.3˚±5.9˚. The mean value of WBADF of non-injured players was 43.3˚±5.9˚ degrees. The mean value of WBADF of bilateral injured players (n = 24) was 37.4˚±6.1˚ degrees. Compared to players who were non-injured and injured, injured players had a lower WBADF than non-injured players.

Keywords: *Netball, Lower Extremity Injuries, Weight Bearing, Ankle Dorsiflexion, Weight Bearing Lunge Test*

The Relationship between Wrist Extension Flexibility and Grip Strength with Bowling Speed among the Cricket Bowlers in the Western Province Sri Lanka

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In cricket, bowling speed plays a major role in bowling success. Grip strength and wrist extension flexibility (maximum wrist extension angle) contribute to bowling speed. The current study aimed to identify the relationship between wrist extension flexibility and grip strength with bowling speed among cricket bowlers. This analytical cross-sectional study was conducted among 100 fast bowlers who were recruited using a convenient sampling method from cricket clubs and Universities in the Western Province. Male players aged 18 to 35 years who had been playing more than 10 matches and have a 5.1 - 6.3 feet height range were recruited. Those who had recent injuries or surgeries were excluded. A speed gun, goniometer, and dynamometer were used to collect data. I took 3 values for each variable and evaluated the mean value. Ethics approval was obtained from the Ethics Review Committee, Faculty of Medicine, University of Colombo. Spearman test was used to assess the relationships. Among fast bowlers, there is a significant relationship ($p = 0.004 < 0.05$) between grip strength and bowling speed. Also, there is a significant relationship ($p = 0.004 < 0.05$) between grip strength and bowling speed among fast bowlers in the Western Province. Mean bowling speed score, grip strength score, and wrist extension score were 102.57 ± 5.31 km/h, 38.27 ± 7.79 kg and 75.22 ± 13.33 degree respectively. Height, weight, leg length, upper limb length, wrist circumference, shoulder width, and chest girth were also measured. According to previous research and the Australian Strength and Conditioning Association, these anthropometric measurements contributed significantly to fast bowling performance. There is a significant relationship between wrist extension flexibility and grip strength with bowling speed. This suggests for fast bowlers in cricket that ball velocity requires advanced hand grip strength and wrist extension flexibility. Therefore, increasing wrist extension flexibility and grip strength is important to improve the bowling speed of fast bowlers.

Keywords: *Bowling Speed, Grip Strength, Wrist Extension Flexibility, Fast Bowlers*

The Relationship between Core Muscle Endurance and Serve Performance among Badminton Players in Selected Sports Clubs in the Colombo District

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Badminton serve is a fundamental skill that provides players with the initial opportunity to gain an advantage in a match. Optimal core stability is crucial for efficiently transferring force from the core to the extremities. Core endurance is particularly vital for sustaining this stability, assisting athletes in executing precise and powerful movements in extremities. Thus, understanding the distribution and correlation between these variables is important to enhance player development. This study aims to investigate the relationship between core muscle endurance and serve performance among badminton players in selected sports clubs in Colombo district. This analytical cross-sectional study recruited 116 badminton players aged 18-30 years with a minimum of 3 years of experience from selected sports-clubs in the Colombo district. The Sport-specific Endurance Plank Test and the Serve Accuracy Test were used to assess core endurance and serve performance respectively. Descriptive statistics and Spearman's correlation test were used during statistical analysis. In the study, participants exhibited a mean BMI of 21.24 ± 1.89 kg/m^2. The mean core endurance value among badminton players was 106.28 ± 37.71 seconds, with a mean serve performance score of 13.64 ± 3.53. A significant moderate positive relationship was observed between serve performance and core endurance ($p < 0.001$, $r_s = 0.454$). The findings indicate a significant positive relationship between core muscle endurance and serve performance in badminton players. Enhancing a player's core endurance has the potential to optimize their serve performance in badminton.

Keywords: *Badminton, Serve Performance, Core Muscle Endurance*

Prevalence and Factors Associated with Dietary Supplement Use among Athletes in University of Colombo

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Despite the knowledge on balanced diets, supplements remain popular, with significant usage differences between various levels of athletes. Studies on Sri Lankan university athletes are limited. This study aimed to determine the prevalence and factors associated with dietary supplement use among undergraduate athletes at University of Colombo. A descriptive cross-sectional study was conducted among 125 athletes from 12 types of sports in University of Colombo. Athletes were selected using stratified random sampling and provided with self-administered questionnaires to collect information. The questionnaire included four sections assessing socio demographic, lifestyle related and sports related factors affecting dietary supplement intake, knowledge and attitude about dietary supplements, and pattern of dietary supplement intake. A five-point Likert scale assessed knowledge and attitudes. The prevalence of dietary supplements usage was 29.6% (n = 37). Sports drinks (n = 25; 67.6%) and mixed nutrition (n = 22; 59.5%) were main types of dietary supplements used. Considering them as energy supplement (n = 23; 62.2%) and performance enhancers (n = 22; 59.5%) were the main reasons for using dietary supplements. Other players (n = 23; 62.2%), media and the Internet (n = 21; 56.8%) were major information sources. There was significantly ($p < 0.05$) higher usage of dietary supplements in first year athletes (n = 7, 70%) and vegetarian athletes (n = 8, 57.1%), and in athletes who do non-intense training (n = 9; 52.9%). Knowledge and attitude towards dietary supplements did not appear as a significant factor. A notable percentage of University of Colombo athletes use dietary supplements, significantly higher among first-year athletes, vegetarians, and non-intense athletes. As first year athletes are using more dietary supplements, we recommend doing research in school level athletes and should do targeted education for the relevant populations.

Keywords: *Dietary Supplements*

The Effects of a Nutritional Intervention on the Sports Nutrition Knowledge and Nutritional Status of Elite Athletes: Protocol for a Randomized Controlled Trial

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Sports nutrition plays a crucial role in providing the fuel to meet energy demands of athletes' training programs, enhancing adaptations associated with training, and ensuring rapid recovery between workouts. Evidence suggests that dietary habits of many athletes are unsatisfactory when compared to sport-specific nutrition recommendations, mainly due to a lack of up-to-date, evidence-based nutritional knowledge. We report the protocol of a parallel-group, randomized controlled clinical trial to evaluate the effectiveness of a 16-week evidence-based, culturally appropriate, personalized sports nutrition intervention on the sports nutrition knowledge and nutritional status of elite track and field athletes, competing at national level and/or representing Sri Lanka internationally. Participants were randomly allocated to either the intervention group (IG, n=15) or the control group (CG, n=15). The IG received an evidence-based, culturally acceptable, personalized sport nutrition intervention at three time points (0^{th}, 4^{th} and 8^{th} weeks). The primary outcome is the number of IG participants who achieve at least a 10% increase in mean sports nutrition knowledge score at the end of the 16^{th} week, compared to the CG. Secondary outcomes include nutritional status and sports performance-related measures at the beginning and end of the 16^{th} week. It is anticipated that improvements in nutritional status and overall health may significantly impact sports performance, overall health, and career longevity of the athletes (Trial Registration number: SLCTR/2024/013).

Keywords: *Sports Nutrition, Knowledge, Sports Performance, Track and Field Athletes*

Relationship between Dietary Patterns and BMI among Female Nursing Students in Colombo Nursing School

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Females have a higher prevalence of being overweight and underweight, with female nursing students being a population with limited research evidence. A descriptive cross-sectional study was conducted on second-year female students at the Nursing School Colombo. A custom designed self-administered questionnaire was used to test associations between dietary patterns, BMI, and other factors using Chi square test at a 0.05 level of significance. Out of 120 participants, the mean age was 24.77 years (*SD* = ±1.035). the majority resided in hostels (67.5%) and were from the Sabaragamuwa province (65%). Most (89.17%) had a monthly allowance of Rs. 33,001-35,000. The majority (87.5%) was non-vegetarian and had breakfast (64.2%), lunch (65%), and dinner (65.8%) from the hostel. Most (42.74%) skipped breakfast less than three times a week. 79.13% and 65.25% did not miss lunch and dinner respectively. Most (35.83%) drank something before breakfast. Rice and curry was most frequently eaten for breakfast (92.5%), lunch (99.2%), and dinner (89.2%). The majority (81.7%) did not consume beverages with main meals. Most (47.5%) consumed biscuits daily, while 45.83% consumed tea daily. 95.8% preferred consuming three main meals per day. Mean height was 1.56 m (*SD* = ± 0.051), median weight 50 kg, median BMI 19.7978 kg/m^2. The Majority (56.7%) was "Normal weight". Statistical significance was found between main meal sources and living status, province, and awareness of increased fast-food consumption. Physical activity was associated with beverages before breakfast. Rice and curry consumption was associated with living status and province. Homemade foods were associated with age, living status, and province. Consuming short eats was associated with extra income and state allowance. No associations were found with BMI. However, statistical significance was identified between dietary patterns and factors such as age, living status, province, and extra income. These factors influenced dietary habits including the source of the main meal, skipping breakfast, consuming rice and curry, food preparation, and eating short eats.

Keywords: *Dietary Patterns, BMI, Nursing Students*

Nutritional Awareness, its Association with Dietary Patterns, and Barriers to a Healthy Dietary Pattern among Students in the Faculty of Law, University of Colombo

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In today's world, diet plays a crucial role, especially for university students. Dietary habits during youth play a crucial role in the development of non-communicable diseases (NCDs) later in life. This study explores how much students in the Faculty of Law know about healthy eating, what they usually eat, and the challenges they face in trying to improve their dietary habits. They alter their eating patterns according to stress and their environment, aiming to keep life engaging. By assessing their nutritional awareness, observing their eating patterns, and uncovering the obstacles to healthier choices, this research allows us to provide advice specific to their needs. An analytical and descriptive cross-sectional study was conducted, using a multifaceted research approach incorporating both quantitative and qualitative methods. A structured, pretested questionnaire, food frequency questionnaire (FFQ), and in-depth interview guide were used in this study. Data was collected from 135 law undergraduate students. The sample for both quantitative and qualitative studies was selected through simple random sampling. We classified the population based on the questionnaire responses into two categories: Those with adequate nutritional awareness and those lacking adequate nutritional awareness. Additionally, we classified the population based on the FFQ responses, distinguishing individuals with healthy dietary patterns from those without. The findings suggest that 67.7% of students have adequate nutritional awareness, and a statistically significant association was identified between nutritional awareness and healthy dietary patterns. We identified barriers such as time, motivation, stress, environment, social support, and financial constraints. The findings of this study suggest that there is a high level of nutritional awareness among law students. However, consumption of fruits and dairy products was low among the students. We also found that the transition from home to boarding and hostel life was a major reason for unhealthy behaviors.

Keywords: *Nutritional Awareness, Dietary Patterns, Barriers*

Nutrition-based Knowledge, Attitudes, Practices, and their Association with Body Mass Index (BMI) of Adolescents in Selected Urban and Rural Schools of Sri Lanka

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Proper nutrition is crucial for adolescent well-being, influencing growth, health outcomes, and disease prevention. In Sri Lanka, economic and demographic changes lead to emergence of a double burden of under- and over-nutrition which pose a public health challenge. Adolescents are particularly vulnerable. Understanding the factors influencing adolescent nutrition is essential for targeted interventions and policy development. We explored nutrition-related knowledge, attitudes, practices, and body mass index (BMI) among adolescents in both urban and rural settings in Sri Lanka. A descriptive cross-sectional study was conducted on 204 adolescents in grades 9, 10, and 11 from Colombo district (urban-Dharmapala Vidyalaya, Pannipitiya) and Kurunegala district (rural-Galgamuwa Maha Vidyalaya, Maharachchimulla). Participants completed a self-administered questionnaire on nutrition-based knowledge attitudes and practices, with weight and height measured to calculate BMI. Urban students had significantly higher knowledge scores than rural students, with means of 19.38±4.68 and 16.61±2.94 respectively. However, there was no significant association between nutrition related knowledge and BMI. Most students agreed or strongly agreed that they apply their nutritional knowledge into daily practice. Over 80% believed in the importance of eating healthy foods (87.7%, n = 179) and significance of reading nutrition labels (81.9%, n =167). Males had a more positive attitude towards avoiding cholesterol-raising foods compared to females. Significant differences were found in the Pro-Healthy Diet Index and Diet-Quality Index between urban and rural students (p = 0.000). Rural students were more likely to skip breakfast. Sri Lankan adolescents in urban schools have better nutritional knowledge and diet quality than those in rural schools. Implementation of nutritional education programs in rural schools are recommended to improve knowledge and to establish healthy diet practices.

Keywords: *Adolescents, Attitudes, BMI, Nutrition, Knowledge*

Comparison of Saponification Values in Fats Extracted from King Coconut Milk, Buffalo Milk, and Walnut using the Folch Method: Implications for Food Science Applications

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This study examines and compares the saponification values (SV) of fats extracted from king coconut milk, buffalo milk, and walnuts to assess their potential applications in the food and nutritional industries. SV is an important measure in food science, providing insight into the fatty acid composition of fats, which is essential for their functional properties in food formulation, texture, and shelf-life. It helps determine the suitability of fats for specific applications such as emulsification, flavor release, and stability. Fats were extracted using the Folch method, selected for its proven efficiency in isolating total lipids and ensuring accurate SV measurements. Microbial lipase (Lipase, Type II from Candida rugosa) was used to hydrolyze the fats into glycerol and fatty acids, followed by titration with 0.5 M HCl using phenolphthalein as an endpoint indicator. Results showed that king coconut milk, sourced locally, had the highest SV (390.66 ± 4.16 mg KOH/g), reflecting its high medium-chain triglyceride content. Buffalo milk (338.33 ± 2.08 mg KOH/g), obtained from a local farmer, exhibited a balanced fatty acid profile, including short, medium, and long-chain fatty acids. Walnut fat, purchased from a local market, had the lowest SV (153 ± 6.92 mg KOH/g), indicative of its long-chain polyunsaturated fatty acid content, which is more resistant to saponification. While the SV provides useful insights into the general fatty acid composition, it does not identify individual fatty acids. Further analysis, such as gas chromatography, is necessary for a detailed profile. Despite this limitation, the study highlights the potential applications of these fats in food science, particularly in product development and nutritional enhancement. Future research should focus on detailed fatty acid profiling to expand the understanding of these lipid sources with more number of samples.

Keywords: *Saponification Value, Lipid Extraction, Folch Method, Fatty Acid Composition*

Contribution of Selected Risk Factors to the Burden of Stroke in the South-East Asia Region

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Stroke is a leading cause of death globally, and a significant cause of morbidity and mortality in South-East-Asia Region (SEAR). Our objective was to analyze stroke related deaths attributable to selected risk factors in SEAR, and diet and physical activity (PA) in relation to hypertension and BMI in Sri Lanka. Secondary analysis was performed on two data sources: The Global Burden of Disease (GBD) database and STEPwise approach to non-communicable disease risk factor surveillance (STEPS) data for Sri Lanka. Analysis included stroke related deaths in SEAR from GBD between 1990 and 2021, and STEPS sample included $n = 868$, 60+year-olds. Linear regression on GBD data to analyze stroke deaths attributable to the risk factors: Diet low in fruits, diet high in sodium, low PA, smoking, high BMI, and high systolic blood pressure in three age groups, adults (20-54 years), elderly (65-74 years), and older elderly (80+years) in SEAR. Multiple regression was used on STEPS data to assess risk of hypertension or overweight/obesity among elderly who did not follow the WHO guidelines for vigorous and moderate PA, sitting time per day and fruit and vegetable intake. Results revealed that stroke deaths attributable to diet low in fruits, smoking, and high BMI were higher ($p < 0.05$), among adults than elderly while stroke deaths attributable to diets high in sodium, low PA and high SBP were higher ($p < 0.05$) among elderly than adults in SEAR. In Sri Lanka, daily intake of fruits and vegetables was significantly associated with hypertension ($p < 0.05$) but not with BMI among elderly. Meeting vigorous PA guidelines was significantly ($p < 0.05$) negatively and sitting time per day was positively associated with both hypertension and BMI. Risk factors for stroke need to be addressed in an age specific manner in SEAR. Meeting the WHO guidelines on fruit and vegetable intake and vigorous physical activity is a priority for reducing stroke risk in Sri Lanka.

Keywords: *Global Burden of Disease, Risk factors, South East Asia, Sri Lanka, Stroke*

A Regulatory Compliance Platform to Monitor the Impact of Food Advertisements

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Digital food advertisements strongly influence children's preferences, behaviour, and health. Exposure to advertisements for unhealthy foods high in fat, sugar, and salt increases children's preference for these items, leading to poor long-term eating habits that contribute to obesity and non-communicable diseases. Ethical food advertising, with regulatory guidelines, safeguards children's health by promoting healthy choices and transparent marketing. Using Design Science Research Methodology (DSR), we developed and tested a platform to study food advertisements, emphasizing regulatory compliance and high-quality content to mitigate negative effects. During problem identification, we considered the impact of food advertising on children, gathered insights, and identified gaps. The platform was developed with features such as video uploads, duplication checks, and content annotation. Effectiveness was evaluated through performance metrics, reliability through stress tests, and objectivity using WHO's nutrient profile model. User satisfaction was measured via structured surveys, and expert feedback was incorporated throughout to ensure platform refinements. Rigorous testing confirmed the platform's reliability and performance. User and expert feedback drove refinements that enhanced functionality and resolved issues. Overall, the platform was effective in accessing regulatory compliance and promoting healthier choices. User-friendly interfaces enabled easy uploads and effective content management. The platform achieved high regulatory compliance and efficiently categorised food products based on nutritional profiles. The platform prioritises regulatory compliance and high-quality content in evaluating food advertisements targeting children. Features include video uploads, duplication checks, and annotation of advertisements for appropriateness for advertising. Rigorous testing and feedback-driven refinements ensured reliability and efficiency promoting ethical practices and safeguarding children's health.

Keywords: *Food Advertisements, Children's Health, Regulatory Compliance, Unhealthy Food Products*

FACULTY OF NURSING

Nursing beyond the Tradition: Advancing Health Care through Integration of Health Informatics

28th of November 2024

MESSAGE FROM THE DEAN

Professor S.S.P. Warnakulasuriya

Dean
Faculty of Nursing
University of Colombo, Sri Lanka

It is my great pleasure to address the 3rd International Nursing Conference, 2024, at the Faculty of Nursing, University of Colombo, Sri Lanka, under the theme 'Nursing Beyond Tradition: Advancing Healthcare through Integration of Health Informatics.' This annual event has been a cornerstone of our academic calendar, consistently showcasing high-quality research from academics, undergraduates, and scientists. This year's symposium is particularly significant, as it aligns with the global shift towards digitalized healthcare and marks the presentation of research projects by our recent nursing graduates. I strongly believe this symposium would be a very successful event as this time we have organized two technical sessions, and the number of abstracts has increased and therefore, more scientific dialogues are expected to occur.

The proceedings include 45 research abstracts, thoroughly reviewed and assessed by a panel of academics to ensure quality. I extend my sincere gratitude to the organizing committee, led by Ms. Chandrani Herath, for their dedication and hard work. I thank the Heads of departments, academic staff, Senior Assistant Registrar, and non-academic staff for their unwavering support. I congratulate all the presenters who are presenting their research at this conference. I extend special thanks to Senior Professor Vajira Dissanayake, the Dean of the Faculty of Medicine, University of Colombo, the Keynote Speaker, and all the plenary speakers of the 3rd International Nursing Conference. I would like to place a special remark to Senior Professor H.D. Karunarathne, the Vice Chancellor University of Colombo for his moral support, visionary leadership, correct guidance, and inspiration during the recent past for the development and smooth running of the Faculty of Nursing. I hope all the participants enjoy the glamor of the 3rd International Nursing Conference in the Faculty of Nursing.

I wish the 3rd International Nursing Conference 2024 would be a great success!

MESSAGE FROM THE SYMPOSIUM CHAIR

Mrs. H. M. Chandrani Menike Herath

Department of Clinical Nursing
Faculty of Nursing
University of Colombo, Sri Lanka

It is with great pleasure that I compose this message for the 3rd International Nursing Conference (INC 2024) organized by the Faculty of Nursing, University of Colombo, Sri Lanka. The theme of this year's conference, 'Nursing beyond Tradition: Advancing Health Care through Integration of Health Informatics,' underscores the dynamic and evolving nature of our profession as we embrace new technologies and methodologies to enhance patient care. This conference comes at a critical time when the healthcare industry is undergoing rapid transformation. The integration of health informatics into nursing practice is not just a trend but a necessity, offering unprecedented opportunities to improve healthcare outcomes, streamline processes, and provide more personalized and efficient care. As nursing professionals, we are at the frontline of this transformation, and our ability to adapt and lead in this era of digital health is crucial. The collection of abstracts from this international conference reflects the breadth and depth of research and innovation in this field. It showcases the dedication and creativity of nursing professionals and researchers who are pushing the boundaries of traditional practice and exploring how health informatics can be leveraged to address the challenges of modern healthcare.

I extend my heartfelt thanks to all the contributors whose work is featured in these proceedings. Your research and insights are vital to the advancement of nursing practice and the betterment of patient care worldwide. I also wish to acknowledge the hard work and dedication of the organizing committee, reviewers, and all those who have contributed to making this conference a success. As you consider the content of this conference, I encourage you to consider how these innovative approaches can be applied in your own practice and research. Let us use this platform to share knowledge, foster collaboration, and inspire one another to continue advancing the field of nursing beyond tradition. Thank you for your participation, and I wish you a fruitful and inspiring conference experience.

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SYMPOSIUM PROGRAMME

Time	Programme
08.00 am – 08.30 am	**Inauguration of the 3rd International Nursing Conference 2024**
08.30 am – 08.45 am	**Welcome Address** Mrs. Chandrani Herath, Chairperson INC 2024
08.45 am – 08.55 am	**Address by the Dean** Professor S.S.P. Warnakulasuriya, Faculty of Nursing
08.55 am – 09.00 am	**Introduction to the Chief Guest** Dean, Faculty of Nursing, University of Colombo
09.00 am – 09.15 am	**Address by the Chief Guest** Senior Professor (Chair) H. D. Karunaratne Vice-Chancellor, University of Colombo
09.15 am – 09.20 am	**Introduction to the Keynote Speaker** Conference Chair
09.20 am – 09.45 am	**Keynote Address** Vidya Jyothi Professor Vajira H.W. Dissanayake Chair and Senior Professor of Anatomy Department of Anatomy, Genetics, and Biomedical Informatics Faculty of Medicine, University of Colombo
09.45 am – 09.55 am	**Promotional Video Clips of the Main Sponsors**
09. 55am – 10.05 am	**Vote of Thanks** Dr. M.D. Thilina Lakmini Gunathilaka, Secretary, INC 2024
10.05 am – 10.35 am	**Refreshments** (Promotional Video Clips of the Sponsors)
10.35 am – 10.40 am	**Introduction to the Plenary Speaker**
10.40 am – 11.00 am	**Plenary Speech** Associate Professor Lau Siew Tiang Lydia Director of Education Alice Lee Centre for Nursing Studies Yong Loo Lin School of Medicine National University of Singapore
11.00 am – 11.15 pm	**Brief Introduction to the Technical Sessions**
11.15 am – 12.00 pm	**Lunch** (Promotional Video Clips of the Sponsors)
12.00 pm – 02.00 pm	**Technical Sessions**
02.00 pm – 02.30 pm	**Awarding of Certificates to the Presenters and Closing of the Event**

INTRODUCTION TO THE KEYNOTE SPEAKER

Vidya Jyothi Professor Vajira H.W. Dissanayake

Dean, Chair and Senior Professor of Anatomy
Department of Anatomy, Genetics, and Biomedical Informatics
Faculty of Medicine, University of Colombo

Professor Vajira H. W. Dissanayake is the Dean, Chair, and Senior Professor of the Department of Anatomy, Genetics, and Biomedical Informatics of the Faculty of Medicine, University of Colombo. He is the current President of the Sri Lanka Medical Council and the Registrar of the Ceylon Medical College Council. He has held many leadership positions in the field of medicine including being the President, Sri Lanka Medical Association, the President of the Commonwealth Medical Association, the President of the Health Informatics Society of Sri Lanka, the President of the Asia Pacific Association for Medical Informatics, the Vice President of the International Medical Informatics Association, and the Founder Chairperson of the Commonwealth Centre for Digital Health. He has authored 178 papers in peer reviewed journals with an h-index of 24, i10 index of 80, and a citation count of 2838. In recognition of his scientific achievements, he was elected a Fellow of the National Academy of Sciences of Sri Lanka, a Fellow of the International Academy of Health Sciences Informatics, and a Fellow of the Royal College of Physicians. He was conferred the Sri Lankan national titular honour of Vidya Jyothi in 2019 by His Excellency the President of Sri Lanka on the recommendation of the Sri Lanka Medical Association.

ABSTRACT OF THE KEYNOTE ADDRESS

Advancing Healthcare through Integration of Digital Technologies, Data Sciences, and Artificial Intelligence

Vidya Jyothi Professor Vajira H.W. Dissanayake

Department of Anatomy, Genetics, and Biomedical Informatics, Faculty of Medicine, University of Colombo, Sri Lanka

The integration of digital technologies, data sciences, and artificial intelligence (AI) in healthcare represents a transformative shift towards more efficient, personalized, and accessible medical services. This talk would explore the potential of these technologies to revolutionize various aspects of healthcare, including diagnostics, treatment, patient management, and operational efficiency. Digital technologies such as electronic health records (EHRs), telemedicine, and wearable health devices enable the seamless collection and analysis of patient data, facilitating real-time monitoring and early detection of health issues. AI algorithms, particularly in machine learning and natural language processing, enhance diagnostic accuracy, predict patient outcomes, and personalize treatment plans by analyzing vast datasets and identifying patterns beyond human capability. Moreover, AI-driven automation can streamline administrative tasks, reduce errors, and lower costs, allowing healthcare professionals to focus more on patient care. The talk would also address challenges such as data privacy, ethical considerations, and the need for robust regulatory frameworks. By leveraging the power of digital technologies, data sciences, and AI, the healthcare industry can achieve significant advancements in delivering quality care, improving patient outcomes, and increasing accessibility, ultimately transforming the future of healthcare.

FACULTY OF NURSING
List of Abstracts

Factors Associated with Postpartum Depression among Postnatal Mothers in Selected MOH Areas in the Western Province, Sri Lanka

S.M.S. Ratnayake[1], K.M.H. Nimeshika[1], S.P.T.A. Senevirathna[1], D.S. Tharuka[1], M.A.N. Karunathilaka[1], S.H.M.P.E.H. Wijewardhana[1], T.R.U. De Silva[1], M.R.I. Haq[1], T.L. Gunathilaka[2], H.M.C.M. Herath[3]

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The changing role of motherhood presents emotional and physical challenges, often leading to postpartum depression (PPD), a common psychiatric condition post-childbirth that affects mothers' mental health, child development, and family dynamics. Identifying risk factors is essential for mitigating its effects. This study aimed to identify factors associated with PPD among postnatal mothers in selected MOH areas in the Western Province of Sri Lanka. Mothers 1-6 months postpartum were selected via simple random sampling and screened for PPD using the Edinburgh Postnatal Depression Scale (EPDS) with a cut-off score of 9. Potential factors were assessed through an interviewer-based questionnaire and medical records. Associations were examined using Pearson correlation and Chi-square tests with SPSS version 27. A total of 422 mothers from 10 MOH areas in the Western Province participated, with a mean EPDS score of 5.41. Significant factors associated with PPD included the newborn's age (p=0.001), partner support (p=0.001), in-law support (p=0.001), socio-economic level (p=0.005), sleep duration during antenatal (p=0.002) and postnatal periods (p=0.001), satisfaction with postnatal sleep (p=0.003), and breastfeeding satisfaction (p=0.006). Positive correlations were found between EPDS scores and both the duration of newborn hospitalization and breastfeeding initiation time, while negative correlations were observed with newborn and maternal age, parity, socio-economic level, sleep duration, breastfeeding frequency, and breastfeeding infant's age. This study highlights the importance of addressing postnatal mental health and suggests mitigating PPD by increasing awareness, addressing financial challenges, promoting breastfeeding, advocating supportive policies, and researching new treatments.

Keywords: *Associated Factors, Edinburgh Postnatal Depression Scale, Postpartum Depression, Postnatal Mothers*

Readiness for the Implementation of Simulation-Based Learning among Nursing Educators in State Universities of Sri Lanka

K.S.I. Perera[1], P.M.W. Gamage[1], G.H.E. Jayarathna[1], U. Vithusha[1], J.V.P.A. Madhushani[1], W.U. Sanjeewani[1], A. Atputharajah[1], M.F. Sujana[1], U.G.N. Priyadarshani[2], M.W.N. Nisansala[3]

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The integration of Simulation-Based Learning (SBL) in nursing education is increasingly adopted to address challenges faced by nursing undergraduates. The successful implementation of SBL in curricula depends on nursing educators' readiness, making its assessment crucial. A descriptive cross-sectional study was conducted among 86 nursing educators from seven state universities in Sri Lanka using total population sampling. Data was collected via a pre-tested, self-administered questionnaire, which included socio-demographic information and readiness towards SBL across three dimensions: Self-readiness, institutional readiness, and technological readiness, using section-wise mean values. Scores were categorized as Not ready: 0-19, A Little: 20-38, Somewhat: 39-57, Moderately: 58-76, Very Much: 77-95. Descriptive statistics were performed using SPSS (Version 27), with significance set at 0.05. Ethical approval was granted by the Ethics Review Committee, Faculty of Medicine, University of Colombo. Most participants were females (83.7%, 72), between 31-40 years (39.5%, 40), and senior lecturers (36.0%, 31). Overall, a majority of the participants (58.1%, 50) were moderately ready to implement SBL. Participants exhibited average self-readiness with a mean of 19.40±4.74, but perceived high institutional readiness and high technological readiness as indicated by mean values of 26.94±6.15 and 16.43±3.89 respectively. Nursing educators are moderately ready to implement SBL in the nursing curricula, demonstrating a willingness to adopt this teaching method. Therefore, initiating SBL implementation appears feasible. However, to ensure successful integration, targeted interventions to enhance educators' self-readiness, institutional readiness and technological readiness are recommended. This approach will support the effective incorporation of SBL into nursing education in Sri Lankan state universities.

Keywords: *Nursing Education, Readiness, Simulation-Based Learning, Sri Lanka*

Awareness and Perception of Spiritual Care amongst Student Nurses in Selected Colleges of Nursing - Western Province, Sri Lanka

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Spiritual care is a vital component of holistic care, addressing the intangible spiritual needs of patients who require support. Student nurses can provide spiritual care to enhance overall patient health. This study aims to determine the level of spiritual care awareness and perception among student nurses in Western Province, Sri Lanka. A descriptive cross-sectional study was conducted with a systematic randomized sample of 333 second-year nursing students from three colleges (Colombo, Kandana, Kalutara). A 14-item instrument measured spiritual care awareness (Cronbach alpha = 0.701), and a 35-item scale assessed spiritual caregiving perception (Cronbach alpha = 0.981). The study was registered under ERC/2023/023 of the Ethics Review Committee, Open University of Sri Lanka. Descriptive statistics were employed to identify the level of awareness and perception using SPSS version 01. The majority of the sample comprised female students (*n*=302, 90.7%), with a mean age of 25.02 (±1.06) years. The observed spiritual awareness score was 10.65(±1.79) (moderate), with similar means for both genders. The spiritual caregiving score (SCGS) of the sample was 163.42 (± 21.37), 4.66 (± 0.61), indicating a moderate level. Males (*n*=31) had a lower mean score (161.35) than female students (*n*=301, 163.63). Among the five attributes, "spirituality perspectives, spiritual care values, defining spiritual care, spiritual care attitudes, attributes of spiritual care" of the SCGS, and "perceived spirituality" earned the highest mean score of 4.89 (± 0.93), while "spiritual care values" had the lowest mean score of 4.491 (± 1.12). Spiritual care awareness and perception were at moderate levels. Further research in spiritual care in nursing is needed, and additional educational interventions should be implemented to enhance student nurses' spiritual awareness.

Keywords: *Spiritual Awareness, Spiritual Caregiving, Nursing Students*

Knowledge, Attitudes, and Practices on Epilepsy Management among State Sector Final-Year Diploma Nursing Students in the Western Province, Sri Lanka

B.P.G.H.D. Balasooriya[1], M.K.C.P. Gunasekare[1], L.K.R.N. Jayawikrama[1], R.W.M.R.V. Rajawardhana[1], N.D.K.R.S. Sankha[1], K.M.D.T. P. Sumanarathna[1], S.I. Wannakuarachchi[1], H.S. Senarathne[1], T.A. Asurakkody[2].

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Epilepsy is a chronic, non-communicable, and highly prevalent neurological condition. As nursing students are pivotal to the future healthcare system, it is crucial they have adequate knowledge, attitudes, and practices regarding epilepsy. This study aimed to describe the knowledge, attitudes, and practices related to epilepsy management among final-year diploma nursing students in selected state-sector nursing training schools in the Western Province, Sri Lanka. A descriptive cross-sectional study was conducted with 385 participants from three nursing training schools in the Western Province. Ethical clearance was obtained from the Faculty of Medicine, University of Colombo (EC-23-136). Systematic random sampling was applied, and a self-administered questionnaire was used for data collection. Knowledge, attitudes, and practices on epilepsy management were assessed. Descriptive statistics were used for mean, standard deviation, frequencies, and percentages, while inferential statistics included the chi-square test, independent sample T-test, and one-way ANOVA using SPSS version 27.0. One score for correct answer and 0 for incorrect were given for scoring and the total score was categorized. The majority of participants had moderate knowledge (50.3%), positive attitudes (98.2%), and satisfactory practices (90.9%) on epilepsy. They were lacking knowledge regarding activities to be avoided and medications. Only 14% (n=54) of participants were aware that Phenytoin was the main drug treatment for epilepsy. There were significant associations between nursing school and knowledge, attitudes, and practices on epilepsy. Additionally, a significant association was found between the living province of participants and knowledge, attitudes, and practices on epilepsy. The majority of them have a moderate level of knowledge on epilepsy while the most have positive attitudes and satisfactory practices. The results indicate the necessity of interventions to improve the knowledge of epilepsy management.

Keywords: *Attitudes, Epilepsy, Knowledge, Nursing Students, Practices*

Knowledge, Attitudes, and Practices regarding the Prevention of Thalassemia among Parents of Thalassemic Children at the National Thalassemia Center, Kurunegala, Sri Lanka

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Thalassemia is a prevalent genetic blood disorder in Sri Lanka, particularly in the Northwestern Province, due to consanguineous marriages and inadequate preventive measures. This study addresses this issue by evaluating the knowledge, attitudes, and practices related to thalassemia prevention among parents of thalassemic children. A descriptive, cross-sectional study included 237 parents of children under 12 in 2023 at the National Thalassemia Center in Kurunegala. Data were collected using a pretested, interviewer-administered questionnaire. Knowledge was scored from 0 to 100 points, while attitudes and practices were assessed on a 5-point Likert scale, categorized as poor (<60%), moderate (60%-80%), and good (>80%). Statistical analyses, including t-tests and ANOVA, were performed using SPSS version 27.0, with significance set at <0.05. The mean age of participants was 36.5 years. Most participants (79.6%) were female. The average knowledge score was moderate at 72.42±10.89 out of 100. Nearly all participants (99.1%) had satisfactory attitudes toward prevention, and 60.9% exhibited satisfactory practices. Significant determinants of knowledge included age (p = 0.04), education level (p = 0.0001), and income (p = 0.0001). Gender significantly affected attitudes (p = 0.007), with males scoring higher. Practices were significantly linked to age (p = 0.043) and income (p = 0.001). The study underscores a generally satisfactory level of knowledge and positive attitudes toward thalassemia prevention among parents. Despite these strengths, there are gaps in practices, particularly concerning preventive measures. To address these gaps, there is a need for comprehensive health education sessions, targeted information dissemination, and enhanced access to genetic counseling and preventive services. Improving awareness and preventive practices among parents is crucial for reducing the burden of thalassemia.

Keywords: *Thalassemia, Prevention, Parental Knowledge, Attitudes, Practices*

Knowledge, Attitudes, and Practices towards Human Papillomavirus (HPV) Infection, Cervical Cancer, and HPV Vaccination among Antenatal Clinic Attendees in Homagama MOH Area, Sri Lanka

L.U. Danthanarayana[1], P.G.C. Rangana[1], U.D.I.U. Gunasinghe[1], T. Nilaxsan[1], H.C. Kaluarachchi[1], W.M.R.S. Wijekoon[1], G. Thanusan[1], M.A.G.C. Senevirathna[1], M.G.A.S Malkanthie[2], N.P. Edirisinghe[2]

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Human Papillomavirus (HPV) infection is a prevalent sexually transmitted infection globally, with cervical cancer being the most common associated carcinoma. Cervical cancer prevention is achievable through HPV vaccination and cervical screening via the Pap smear test. However, inadequate knowledge, attitudes, and practices concerning HPV infection and cervical cancer can significantly elevate morbidity and mortality rates. This descriptive cross-sectional, quantitative study assessed the knowledge, attitudes, and practices regarding HPV infection, cervical cancer, and HPV vaccination among 379 antenatal clinic attendees in the Homagama MOH area, Sri Lanka, from August 2023 to April 2024, using a validated, pretested interviewer-administered questionnaire. Participants were selected using stratified simple random sampling. Descriptive analyses were performed with SPSS version 27.0 to obtain percentages, means, and standard deviations. Most participants (43.3%; *n*=164) were aged 25-30, 96.6% (*n*=366) were Sinhala, and 95% (*n*=360) were Buddhist. The study revealed that 82% (*n*=311), 31.1% (*n*=118), and 69.1% (*n*=262) had poor knowledge of HPV infection, cervical cancer, and HPV vaccination, respectively. Overall, 75.7% (*n*=287) had poor knowledge across all areas. Meanwhile, 68.9% (*n*=261), 62.8% (*n*=238), and 80.2% (*n*=304) showed moderate attitudes toward HPV infection, cervical cancer, and HPV vaccination. Overall, 84.7% (*n*=321) exhibited moderate attitudes in all areas. Moreover, 94.2% had poor practices related to HPV infection, cervical cancer, and HPV vaccination, with only 12.4% (*n*=47) having undergone the Pap smear test and 5.2% (*n*=20) receiving the HPV vaccine. The study highlights poor knowledge, moderate attitudes, and poor practices, underscoring the need for improved health education to enhance knowledge, attitudes, and practices in this population.

Keywords: *HPV Infection, Cervical Cancer, Knowledge, Attitudes, Practice*

Knowledge and Practices towards Foot Self-Care among Patients with Diabetes Mellitus Attending all Base Hospitals in Colombo District

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Diabetes Mellitus (DM) is one of the most common health problems worldwide. Diabetic foot is a serious and disabling complication of DM that consists of lesions in the deep tissues resulting in lower extremity amputations. The incidence of diabetic foot ulcers has increased due to poor knowledge and practice of diabetic foot self-care. The study aims to assess the knowledge and practices towards foot self-care and its associated factors among patients with DM attending diabetic clinics at all Base Hospitals in Colombo District, Sri Lanka. A descriptive cross-sectional study was conducted among 423 participants selected using systematic random sampling. Data were collected by using a validated and pre-tested interviewer-administered questionnaire. Knowledge and practice level was categorized as good, moderate, and poor. Descriptive and inferential analysis were performed using SPSS. V (26). A p-value < 0.05 was considered significant. The majority of the participants (71.2%) were females. Only 22.5% of the participants showed a good level of knowledge regarding foot self-care. Females had a significantly higher mean knowledge score [60.5 (±19.7)] than males [55.4 (±23.7)] (p = 0.03). Further, the patients attending the diabetic clinic at the District General Hospital Awissawella showed a significantly higher mean knowledge score compared to those at other hospitals (ANOVA, p = 0.01). Nearly 28% of the participants had good practice levels related to diabetic foot care. One-third of the patients had poor knowledge regarding foot self-care while more than half of the study participants had only satisfactory practice. There is an urgent need for enhancing knowledge and practices to reduce further complications of foot ulcers.

Keywords: *Diabetes Mellitus, Foot Self-Care, Knowledge, Practice, Associated Factors*

Prevalence and Associated Factors of Polypharmacy among the Elderly in Care Homes in Colombo District, Sri Lanka

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Polypharmacy, defined as the concurrent use of five or more medications, is a critical healthcare concern among the elderly, heightening their risk of multimorbidity and adverse drug reactions. This study aimed to determine the prevalence and associated factors of polypharmacy, with a focus on cardiovascular-specific polypharmacy among elderly residents in Colombo, Sri Lanka. A descriptive, cross-sectional study was conducted among 373 residents (aged >60 years) from 10 elderly care homes in Colombo. Proportionate stratified sampling with an interviewer-administered pre-validated questionnaire and checklist was used. The Charlson Comorbidity Index (CCI) assessed comorbidities. Data were analyzed using SPSS version 27.0 with chi-square, student t-test, and ANOVA, considering p <0.05 as significant. The mean age of participants was 74.74±7.56, with 75.1% being female. Polypharmacy prevalence was 59%, including 10.5% with excessive polypharmacy (>10 drugs). The mean medication count per patient was 5.50±2.98. Oral blood glucose-lowering drugs were most commonly prescribed (60.9%), followed by lipid-modifying agents (58.2%). Significant associations were found between polypharmacy and general practitioner contact (p<0.001), recent hospitalization (p<0.001), surgical history (p=0.004), number of medical conditions (p<0.001), family history of disease (p=0.008), family cardiovascular disease history (p<0.05), and CCI score (p<0.001). Cardiovascular-specific polypharmacy (20.9%) was linked to abnormal BMI (p=0.018), recent hospitalization (p<0.001), chronic illnesses (p<0.001), family cardiovascular disease history (p=0.014), and CCI score (p<0.001). This study highlights the high prevalence of polypharmacy and cardiovascular-specific polypharmacy among the elderly in Colombo care homes, associated with clinical characteristics and multimorbidity.

Keywords: *Elderly, Medication, Polypharmacy, Cardiovascular-Specific Polypharmacy, Associated Factors*

Knowledge, Practice, and Associated Factors towards Stoma Care among Surgical Nurses in Teaching Hospitals in Colombo District

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Stoma care is essential for postoperative recovery and patient well-being. Surgical ward nurses, being key providers of this care, need comprehensive knowledge and skills. However, research shows varying levels of stoma care knowledge and practice among nurses, often due to gaps in ongoing education and adherence to clinical guidelines, impacting patient adaptation and complication management. The study aims to assess the knowledge, practice, and associated factors towards stoma care among surgical nurses in teaching hospitals in the Colombo district. A descriptive cross-sectional study was conducted among 422 surgical ward nurses at three teaching hospitals in the Colombo district using a simple random sampling method. Data were collected via a self-administered, pretested questionnaire and descriptively analyzed to obtain percentages and frequencies and correlations were obtained through Pearson's analysis by SPSS v.26.00. This study was approved by the Ethics Review Committee, Faculty of Medicine, University of Colombo. Out of 317 respondents (75.11%), the mean age was 33.67 ± 8.11 years. Most participants (64.7%) had a diploma in nursing, and the majority (65%) had 1-10 years of experience. The mean knowledge score towards ostomy care was 10.25 ± 1.93, with 73.2% demonstrating good knowledge. The mean practice score was 5.92 ± 1.80, with 71.6% showing a moderate level of practice. Age was the only factor found to have a positive correlation with practice ($r = 0.29$, $p < 0.000$), with participants aged 32-41 years showing a significantly good level of practice. The study revealed that the majority of nurses demonstrated good knowledge and general practice levels towards ostomy care. Notably, age significantly influenced practice, with those aged 32-41 years exhibiting better practices. These findings suggest that targeted education programs on practical skills for younger nurses may improve care delivery.

Keywords: *Stoma Care, Knowledge, Practice, Surgical Nurses*

Quality of Life among Parents of Children with Autism at the "Ayati National Centre for Children with Disabilities" in Ragama

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Autism spectrum disorder (ASD) is marked by persistent deficits in social communication and interaction across multiple contexts, including social reciprocity and nonverbal communicative behaviors. As there is no complete cure for ASD, raising children with autism challenges the quality of life (QOL) of their parents. This study aimed to assess QOL among parents of children with autism attending the Ayati National Centre for Children with Disabilities, Ragama. A quantitative descriptive cross-sectional study was conducted at the Ayati Centre after ethical approval from the Ethics Review Committee of the National Hospital of Sri Lanka. A sample of 180 parents of children aged 3-12 years, diagnosed with autism by a pediatrician or neurologist and confirmed by a clinical psychologist, was recruited using convenience sampling. The WHOQOL-BREF questionnaire assessed QOL, with scores transformed to a 0–100 scale, where higher scores (>50) indicate better QOL. Data were analyzed with SPSS v.29 using descriptive and inferential statistics (ANOVA). Most of the participants (52.8%) represented the age category of 30-40 years. The majority were mothers (85%) and 15% were fathers. The mean scores for the WHOQOL-BREF domains were: Physical Health (M = 64.09, SD = 24.35), Psychological Health (M = 41.78, SD = 16.02), Social Relationships (M = 47.91, SD = 16.14), and Environment (M = 43.28, SD = 19.16). In the physical domain, the QOL of parents in the age group 30-40 yrs showed a higher mean score (27.90±40972), than age > 40yrs (18.39±8.329). An ANOVA revealed significant differences in the Physical Health domain across the above age groups (F= 33.736, $p < 0.001$). Overall, parents of children with autism reported a good quality of life in the physical domain, however, improvements are needed in environmental, psychological, and social aspects. It is recommended that psychological and social support services for all age groups be enhanced, with a particular focus on parents over 40 years old, to improve their physical well-being through targeted health and wellness programs.

Keywords: *Quality of Life, Parents, Autism, WHOQOL-BREF*

Quality of Life and Associated Factors in Adult Cancer Patients at Apeksha Hospital, Maharagama, Sri Lanka: A Cross-Sectional Study

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Cancer is a prevalent and debilitating disease that significantly impacts patients' Quality of Life (QOL). A comprehensive understanding of QOL and its associated factors is crucial for improving the well-being of cancer patients. This study aimed to determine QOL and identify factors associated with QOL among adult cancer patients attending Apeksha Hospital, Maharagama, Sri Lanka. A descriptive, cross-sectional study comprising consecutively recruited 309 adult cancer patients at Apeksha Hospital, Maharagama was conducted. The validated Short Form Brief Pain Inventory and the European Organization for Research and Treatment of Cancer QOL C30 (version 3) Questionnaire were used to measure pain and QOL, respectively. Data analysis was performed using, descriptive statistics, Chi-squared test, logistic regression analysis, Spearman's correlation analysis (p <0.01), and a confidence interval of 95% was considered. The mean QOL score was 54.0 (SD = 23.9), the mean functional score was 66.4 (SD = 21.3), and the mean symptoms score was 32.6 (SD = 20.1). Notably, the items with the highest mean scores, indicating greater impairment, were 'Trouble doing strenuous activities' (M = 2.62, SD = 1.02), 'Trouble taking a long walk' (M = 2.47, SD = 1.00), and 'Need to stay in bed or a chair during the day' (M = 1.79, SD = 0.77). There was a significant association between monthly household income and stage of cancer with QOL (p <0.05). Pain level exhibited statistically significant negative correlations with QOL score (r = -0.144, p < .01), functional score (r = -0.210, p < .01), and positive correlation with symptoms score (r = 0.209, p < .01). Participants experienced moderate impairment in QOL, especially with physical activities. Lower income and advanced cancer stages were associated with lower QOL. Higher pain levels were associated with lower QOL and increased symptom severity indicating the impact of pain on overall well-being.

Keywords: *Associated Factors, Cancer Pain, Functional Capacity, Symptom Severity, Quality of Life*

FACULTY OF SCIENCE

Innovation in Science and Technology for Sustainability

05th of November 2024

MESSAGE FROM THE DEAN

Senior Professor (Chair) D. U. J. Sonnadara

Dean
Faculty of Science
University of Colombo, Sri Lanka

I am pleased to extend my sincere congratulations to the staff and students on the occasion of the Annual Research Symposium of the University of Colombo and the Technical Sessions of the Faculty of Science, scheduled for 04th and 05th of November 2024.

The theme for the faculty research sessions this year 'Innovation in Science and Technology for Sustainability' portrays the emphasis that the Faculty of Science places on research and innovation. Our academics and postgraduate students continue to generate knowledge in diverse fields of science that is both nationally and globally relevant. The research spanning across seven disciplines of study leads to a considerable number of publications annually in high ranking local and international journals and conferences. Our research has also led to many innovations and international patents which have contributed to the development of locally applicable products and practices. We have taken many important steps to elevate the effectiveness and quality of research, one of which is the establishment of the Centre for Postgraduate Studies (CPGS).

Over 500 postgraduate students are currently enrolled in master's and research degree programmes offered by the faculty. While focusing on research, we have also attempted to produce postgraduates who are distinguished by their professionalism, committed to learning and personal development, capable of spearheading research and blending into the wider contexts in which they work. We continuously strive to equip them to be globally competitive, effective, and productive individuals.

The postgraduate research sessions will without doubt provide a platform for knowledge-sharing and I am confident that it will prove to be very productive. I wish all those involved in the Annual Research Symposium the very best.

MESSAGE FROM THE DIRECTOR OF POSTGRADUATE STUDIES

Professor C. D. Tilakaratne

Director of Postgraduate Studies
Faculty of Science
University of Colombo, Sri Lanka

Following the tradition, the Postgraduate Technical Sessions of the Faculty of Science, 2024 are organized in-line with the Annual Research Symposium of the University of Colombo. This time the sessions are scheduled to be held on 5th November. This event is organized by the Center for Postgraduate Studies (CPGS) in collaboration with the seven academic departments and the IT Service Center of the faculty. Organization of such an event will contribute to the enhancement of research culture of the faculty.

The theme of this year's technical sessions is 'Innovation in Science and Technology for Sustainability'. This event will be graced by the keynote speaker Dr. S. R. S. N. Sudasinghe, the Director General of the National Science Foundation of Sri Lanka. Another highlight of this year is the special session on 'Machine Learning Strategies for Research Enhancement' conducted by three senior academics of the faculty.

The importance of the technical sessions is that they set up an opportunity for postgraduate students as well as academic staff members of the faculty to showcase their research work. This time twenty-four research studies will be presented under the three tracks, namely, Chemistry, Biological Sciences, and Physical Sciences, and Nuclear Science.

As the Director of Postgraduate Studies of the faculty, I wish all the best to the presenters who will enlighten the technical sessions with their research findings. Moreover, I will take this opportunity to extend my sincere thanks to the keynote speaker and the three presenters of the special session on machine learning strategies, the Dean of the faculty, the members of the organizing committee, reviewers of the abstracts, the faculty editorial committee, the staff of the Information and Learning Centre (ILC), and the staff of the Dean's office for their immense contribution to the success of the event.

ORGANIZING COMMITTEE

This year, the Annual Research Symposium (Postgraduate Technical Sessions) of the Faculty of Science is organized by the Centre for Postgraduate Studies (CPGS).

Co-Coordinators of the Programme

Dr. Pradeepika Saputhanthri	– Department of Plant Sciences
Dr. Gayan Dharmarathna	– Department of Statistics

Advisors

Prof. Upul Sonnadara	– Dean, Faculty of Science
Prof. Chandima Tilakaratne	– Director of Postgraduate Studies, Faculty of Science and Director of the CPGS

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Dr. Manuja Lamabadusuriya	– Department of Nuclear Science
Dr. Siyath Gunewardene	– Department of Physics
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PROGRAM OF THE POSTGRADUATE TECHNICAL SESSIONS

(Venue: ILC Auditorium, Faculty of Science)
Tuesday, the 05th of November 2024

Time	Programme
08.15 am – 08.45 am	**Registration of Participants**
08.45 am – 08.55 am	**Lighting of the Oil Lamp and National Anthem**
08.55 am – 09.00 am	**Welcome Address** Senior Professor Upul Sonnadara Dean, Faculty of Science, University of Colombo
09.00 am – 09.30 am	**Keynote Address** Dr. S. R. S. N. Sudasinghe Director General, National Science Foundation, Sri Lanka
09.30 am – 10.30 am	**Machine Learning Strategies for Research Enhancement** Dr. Pemantha Lakraj Dr. Dilanga Siriwardane Dr. Sameera Viswakula
10.30 am – 10.35 am	**Vote of Thanks** Co-Coordinators of the Programme
10.35 am – 11.00 am	**Refreshments**
11.00 am – 01.15 pm	**Postgraduate Technical Sessions:** Track 1 – Chemistry Track 2 – Biology Track 3 – Physical Sciences and Nuclear Science
01.15 pm – 02.00 pm	**Lunch**

INTRODUCTION TO THE KEYNOTE SPEAKER

Dr. S. R. S. N. Sudasinghe

Director General
The National Science Foundation
Sri Lanka

Dr. Sepalika Sudasinghe is the Director General/ CEO of the National Science Foundation, Sri Lanka. She is also a Senior Consultant to the Sri Lanka Institute of Development Administration (SLIDA). She received her basic degree from the University of Sri Jayawardenepura, Sri Lanka, a Postgraduate Diploma in Economic Development and a Master's Degree in Economics from the University of Colombo. Her PhD was in the Development Administration, specializing Public Policy Management, from the National Institute of Development Administration, Thailand.

Dr. Sudasinghe has an impressive track record of over 30 years in the public sector, contributing professionally in academia, teaching, research, and administration. She has chaired several national policy formulation committees, including the National Tourism Policy, National Traditional Medicine Policy, and the National Food Security Policy (Draft). Additionally, she was a facilitator for the Sri Lanka National Social Protection Policy.

In recognition of her exceptional contributions and achievements in the state and government sectors, Dr. Sudasinghe received the Professional and Career Woman Award for Leadership Excellence in 2018, organized by Women in Management (WIM) in partnership with the International Finance Corporation (IFC), a member of the World Bank Group.

ABSTRACT OF THE KEYNOTE ADDRESS

Innovation in Science and Technology for Sustainability

Dr. Sepalika Sudasinghe

The National Science Foundation, Sri Lanka

It is an honour for me to send a message for the Annual Research Symposium 2024 of the Faculty of Science, University of Colombo, Sri Lanka. Society and its citizens face numerous challenges, including poverty, climate change, sustainability, and pandemics. These wicked problems are social or cultural in nature and are difficult or impossible to solve due to their complexity and interconnectedness. Moreover, these problems are often multifaceted and require holistic approaches that consider political, economic, or social dimensions. In today's rapidly evolving world, governments face a multitude of challenges that demand change. According to recent developments, a transdisciplinary approach is emerging as the global best practice for addressing complex problems. Researchers and professionals in the science and technology sectors play a crucial role in this as impactful scientific research and development are vital for decision-making providing the knowledge and insights needed to tackle societal issues effectively.

Evidence-based decisions enable evidence-based policymaking, helping governments chart a path to sustainable growth. Coherent and more effective policies and regulations require governments to consider all pertinent information for informed decision-making. Innovation is integral to a country's performance as a key driver of economic transformation. For developing countries like Sri Lanka, in particular, unlocking innovation potential can facilitate the transition to a digital economy. The importance of innovation is underscored by Sustainable Development Goal 9, which highlights the strong interconnections between industry, innovation, and infrastructure. Therefore, science and technology-driven innovation plays a crucial role in achieving the Sustainable Development Goals, with research in the field being critical for providing impactful findings that address human well-being.

I commend the organizers for hosting this timely and important conference, bringing together scholars in the fields of science, technology, and innovation on a common platform. I wish the conference great success, with fruitful deliberations and impactful proceedings.

FACULTY OF SCIENCE
List of Abstracts

TRACK 1: CHEMISTRY
Chairperson: Dr. S. M. Vithanarachchi

TRACK 2: BIOLOGY

Chairpersons: Prof. M. R. Wijesinghe and Prof. H. D. D. Bandupriya

TRACK 3: PHYSICAL SCIENCES AND NUCLEAR SCIENCE
Chairperson: Dr. K. A. D. Deshani

TRACK 1: CHEMISTRY

Designing Surface Enhanced Raman Scattering (SERS) Substrates Using Citrate-capped and Cysteamine-capped Gold Nanoparticles to Modify Glass Substrate and Polystyrene Well Plates

D. Rodrigo[1], S. Gunewardene[2], H. Jayaweera[2,3], N. Abeyasinghe[1]

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Surface-enhanced Raman scattering (SERS) is a powerful technique for enhancing Raman signals of molecules adsorbed on metallic plasmonic nanostructures such as gold nano particles. This study examines the synthesis and application of two types of gold nanoparticles: Citrate-capped Au nanoparticles (CT-Au NPs) and cysteamine-capped Au nanoparticles (CY-Au NPs). These NPs were synthesized using chemical reduction methods which employ trisodium citrate and cysteamine as capping agents. Two different substrates, a glass slide and a polystyrene well plate were functionalized with CT-Au NPs CY-Au NPs respectively. Polystyrene well plates were exposed to UV/O_3 treatment to modify the surface, followed by treatment with EDC (1-Ethyl-3-diaminopropyl carbodiimide) and NHS (N-hydroxysuccinimide) to facilitate the deposition of cysteamine-capped Au NPs. Additionally, glass substrates were treated with piranha solution and (3-aminopropyl) triethoxysilane (APTES) to introduce amine groups, enabling the deposition of citrate-capped Au NPs. Characterization was performed using a Raman spectroscopy for their potential for sensitive and reliable SERS-based detection.

Keywords: *SERS, Au Nps, Substrate Functionalization, Well Plate, Glass Slide*

Determination of Antioxidant and Antimicrobial Activities of Different Parts of *Leucas zeylanica* (Gata Thumba) Plants

M. S. D. Fernando, C. Hettiarachchi

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Leucas zeylanica is a medicinal plant that contains a variety of antioxidant and antimicrobial compounds and it is widely distributed in Asian and African countries. Although few studies have published the antioxidant and antimicrobial activities of the whole plant, none have been conducted to test the activity of different parts of the plant. Hence, the present study was designed to evaluate the antioxidant and antimicrobial activities of the roots, stem, leaves, petals, and sepals of *L. zeylanica*. The different parts of the plants were air dried and subjected to maceration for two weeks using absolute methanol as the solvent. The crude extract of each part was separately collected. The crude extract was tested for antioxidant activity with 2,2-di(4-tert-octylphenyl)-1-picrylhydrazyl (DPPH) radical scavenging activity assay and the maximum antioxidant activity with an IC50 value of 524.09 ppm was showed in sepals. The agar disc diffusion assay was used to determine the antibacterial activity against *Escherichia coli* (ATCC 25922) and *Staphylococcus aureus* (ATCC 25923). In antibacterial assay ciprofloxacin (0.5 mg/ml) used as the positive control and sepals at the concentration of 143 mg/ml showed antibacterial activity with an inhibition zone of 7.3 mm ± 0.58 against *E. coli* (ATCC 25922) and 6.6 mm ± 0.58 against *S. aureus* (ATCC 25923). The leaves at 292 mg/ml concentration showed antibacterial activity with a zone of inhibition of 12.6 mm ± 0.58 against *S. aureus* (ATCC 25923). The antifungal assay was conducted against *Candida albicans* using agar disc diffusion assay by using itraconazole (25 mg/ml) as the positive control. The results showed that the leaves 292 mg/ml (3.3 mm ± 0.58), sepals 143 mg/ml (5.7 mm ± 0.58) and roots 144 mg/ml (5.6 mm ± 0.58) as having antifungal activity against *C. albicans*. Altogether, the present study results showed that *L. zeylanica* sepals are having antioxidant and antimicrobial activity and be a potential part of this plant's use in Ayurveda medicines.

Keywords: *Leucas zeylanica, Antioxidant, Antibacterial, Antifungal*

Fitness Evaluation of Two Component Release of Insects Carrying Dominant Lethality (RIDL) Based Transgenic *Aedes aegypti* Mosquito Lines

P. V. D. Dilani[1], R. S. Dassanayake[1], H. M. Dilruk[2], M. Hapugoda[3], F. Zurita[4], C. Hettiarachchi[1], Y. I. N. Silva Gunawardene[3]

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Transgenic *Aedes aegypti* mosquito lines are developed for effective dengue control. A two-component RIDL system, with driver and effector transgenes, was previously engineered into the mosquito genome to create two separate transgenic lines. To ensure minimal fitness costs from transgenesis, this study assessed the fitness by measuring adult longevity, fecundity, egg hatch rate, and wing length. Analyses of mosquito survivorship utilized the log-rank test (Mantel-Cox) while fecundity and egg hatch rate between transgenic (TM) and wild-type mosquito (WM) were evaluated using unpaired t-test. Wing length was compared using the Mann–Whitney U test. The survival curve of adult females and males of driver TM were significantly different than those of WM ($p< 0.05$) whereas effector TM had no significant difference when compared to WM ($p>0.05$). Fecundity between TM (72.83 ± 6.8 for driver, 79.49 ± 1.7 for effector) and WM (78.07±3.6) showed no significant differences for both lines ($p>0.05$). However, the egg hatch rate was significantly reduced for driver TM (72.51%± 5.2) when compared to WM (90.44%± 3.7) ($p<0.05$) while no significant difference observed in effector TM (86.9%± 5.1) ($p>0.05$). Further, there was no significant difference between the effector or driver TM when compared to WM of wing length ($p>0.05$). The different survivorship and reduced egg hatch rate in driver TM could probably be attributed to the position effect during the integration or transgene expression causing minor fitness cost. In contrast, the absence of significant difference between effector TM and WM indicates that transgenesis does not impact the fitness of effector TM.

Keywords: *Ae Aegypti, Mosquito, Driver, Effector*

Acknowledgements: Accelerating Higher Education Expansion and Development Operation Grant 6026-LK/8743-LK and International Atomic Energy Agency Grant SRL 50/47

Evaluation of Kithul Treacle as a Potential Substrate to Grow *Monascus purpureus* in Preparation of *Monascus*-fermented Black Tea

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Monascus purpureus is a valuable fungal strain that produces different bioactive pigments, and it is being used to produce a variety of food products. The secondary metabolites synthesized by *M. purpureus* are used as colorants for culinary purposes, food supplements, preservatives, and traditional medicine. Monacolin K is a secondary metabolite produced by *M. purpureus* that is identical to the structure of lovastatin and used as a drug to inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase. The present study aimed to produce *Monascus* fermented black tea using *M. purpureus*. Due to its lack of nutrients and high polyphenol content, black tea is not a favorable substrate for the optimum growth of *M. purpureus*. Therefore, it is necessary to identify a favorable substrate to grow *Monascus* on black tea. Kithul (*Caryota urens* L.) treacle is a nutrient-dense medium that has the potential to proceed with the liquid-state fermentation of *M. purpureus*. Kithul treacle, having a lot of health benefits, was investigated as a potential substrate for *M. purpureus*. For this purpose, different dilutions—1:1, 1:2, and 2:1—of authentic kithul treacle (density 1.346 g/mL) to distilled water were tested, and authentic kithul treacle was identified as a potential substrate for the growth of *M. purpureus*. Mycelial growth was observed after 4 days in each dilution without black tea leaves and after 7 days with black tea leaves in test tubes. Visible pigment developed in test tubes without tea leaves after 12 days in 1:1 and 2:1 dilutions and after 14 days in 1:2 dilutions. Furthermore, compared to the control (tea leaves without *Monascus* inoculation), a visible density of color development was observed after 10 days in test tubes with tea leaves that were inoculated with *M. purpureus*, confirming pigment development by *Monascus*. Altogether, these results confirmed the possibility of growing *M. purpureus* on the black tea leaves with kithul treacle as a substrate to produce *Monascus*-fermented black tea.

Keywords: *Monascus purpureus, Monacolin K, Kithul Treacle, Black Tea Leaves, Mycelial Growth*

Optimized PEI Mediated Reverse Transfection Methodology for Transient Transfection of HEK293 Cells

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Non-viral vectors are increasingly used for gene delivery due to their safety and flexibility. Polyethyleneimine (PEI) is widely applied in transfection, but high PEI and DNA concentrations can induce cytotoxicity, necessitating careful optimization of the PEI ratio. This study aimed to optimize PEI-mediated reverse transfection for HEK293 cells and compare its efficiency with the conventional forward transfection method. For reverse transfection, plasmid DNA (pEGFP-N1) and PEI (25 kDa branched) were separately diluted in PBS and then gently mixed to promote complexation. The PEI-DNA mixture was incubated at room temperature. HEK293 cells were seeded at 1×10^5 cells/well in a 6-well plate during this period. The PEI-DNA transfection mixtures were added to the freshly seeded cells, mixed gently, and incubated overnight at 37°C in a 5% CO_2 humidified incubator.18 hours post transfection, the transfection medium was replaced with fresh cell culture medium. Transfection efficiency was assessed 72 hours post-transfection using fluorescence microscopy. PEI ratios (1:1, 1:2, 1:3, 2:3, and 2:6) were tested for both forward and reverse transfections. Paired t-tests showed significant differences in efficiency between the methods at ratios 1:2, 1:3, 2:3, and 2:6, with p-values of 0.0055, 0.0012, 0.0068, and 0.0034 ($p < 0.05$). Significant differences between the two methods highlight the critical influence of transfection methodology on efficiency. Based on the observed results, a 1:3 DNA to PEI ratio in reverse transfection showed optimal efficiency and eliminated the need for prior cell seeding, streamlining the workflow compared to forward transfection. Higher DNA ratios (2:4 and 2:6) increased efficiency but caused notable cytotoxicity, as evidenced by cell death observed visually 48 hours post-transfection. This underscores the need to optimize the DNA: PEI ratio to achieve optimal transfection efficiency and mitigate cytotoxic effects.

Keywords: *PEI, Reverse Transfection, HEK293, PEI: DNA Ratio*

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Preparation and Characterization of Solid Lipid Nanoparticles Loaded with Ceylon *Citronella* Oil as a Potent System for Slow-releasing Mosquito Repellent

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Ceylon *Citronella* oil (CCO) is known to possess mosquito-repellent activity. The effective use of CCO is limited by its hydrophobic and high volatility profile. This research study focused on developing solid lipid nanoparticles (SLNs) loaded with CCO as a slow-releasing delivery system. CCO was extracted from Ceylon citronella by steam distillation. The chemical composition of CCO was analyzed by GC-MS and GC-FID, and physicochemical properties were determined at 25 ℃. CCO was incorporated into SLNs by high shear homogenization and ultrasound technique using stearic acid as the solid lipid and span 80 and Tween 20 as surfactants. Varying CCO and surfactant amounts, different formulations were prepared and encapsulation efficiency (EE%) was investigated by measuring absorbance at 230 nm using geraniol as the index. Particle size was investigated by dynamic light scattering. The stability of CCO-SLNs was determined at 4 °C, 25 °C, and 45 °C for 4 weeks by calculating the EE%. The evaporation release percentage was determined at 35 °C. The percentage of extracted CCO was (0.4%), and geraniol (18.8%), camphene (13.8%) and D-limonene (10.6%) were found as major compounds. Relative density, refractive index and optical rotation were 0.9345, 1.4872, and 16.2950º, respectively. CCO-SLNs composed of 0.3 wt. % CCO, 0.4 wt.% of stearic acid, and 0.8 wt.% of tween 20 and span 80 showed the highest EE% of 68.96±2.32. The average particle size of CCO-SLNs was 172.9 ± 4.85 nm with a polydispersity index of 0.541±0.043 and 59.7±4.0 mV zeta potential value. After 4 weeks, minimum deviation in EE% was shown in CCO-SLNs stored at 4 ℃ and 25 ℃. CCO-SLNs exhibit a slower release rate over 24 h with less than 50% of release percentage within the first 4 h compared to CCO emulsion. The results conclude that CCO-SLNs are suitable for use as a slow-releasing agent in mosquito-repellent formulations.

Keywords: *Ceylon Citronella Oil, Mosquito-Repellent, Solid Lipid Nanoparticles*

Synthesis of Alpha-pinene Peroxide from Alpha-pinene Using Singlet Oxygen [O_2 ($^1\Delta_{2g}$)]

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Alpha-pinene is a naturally occurring monoterpene found in the essential oils of many plants, and its oxidation using singlet oxygen [O_2 ($^1\Delta_{2g}$)] produces alpha-pinene hydroperoxide and hydroxide, compounds with potential biological activities. Given that alpha-pinene's anxiolytic activity, its oxidized derivatives may exhibit similar or amplified effects, warranting further investigation. A previous report on computational work shows that singlet oxygen can be used to get the peroxide from alpha pinene. This study aims to synthesize alpha pinene peroxide and hydroxide using singlet oxygen ($^1O_2$) generated with a light source and a photosensitizer. Initially, (1S,5S)-2,6,6-trimethylbicyclo [3.1.1] hept-2-ene ((−)-α-pinene) was characterized using ^{1}H NMR spectroscopy to confirm its structural integrity. Oxidation was performed using 1 cm^3 (0.858 g) of alpha-pinene and 0.001 g of methylene blue photosensitizer in 50 mL of chloroform, with a 200W tungsten halogen lamp radiation source and a continuous flow of oxygen. The reaction mixture was irradiated for 6 hours, and the reaction progress was monitored with Thin Layer Chromatography (TLC), indicating the presence of the alpha pinene peroxide and hydroxide with unreacted alpha-pinene. The products were isolated via column chromatography using a hexane-ethyl acetate (1:1) solvent system and characterized by ^{1}H NMR and IR spectroscopic techniques. The isolated alpha pinene peroxide yield was 0.13 g (18.6%). Important ^{1}H NMR chemical shifts were at ppm 7.99 (OOH), 5.07 and 4.83. IR key absorption bands at 844.08 cm^{-1} (O-O stretching vibrations), 1024.99 cm^{-1}(C-O stretching) and 3339.75 cm^{-1}(O-H stretching). The major product alpha pinene hydroxide yield was 0.526 g (61.3%) where the ^{1}H NMR 7.99 peak and the IR 844.08 cm^{-1} peak corresponding to the peroxide was absent. Analysis confirmed successful oxidation and as expected pinene peroxide was converted to the more stable pinene hydroxide. The method, utilizing methylene blue and a tungsten halogen lamp, proved effective for this oxidation process. In conclusion, alpha-pinene peroxide was synthesized and characterized, however further studies are in progress to force the reduction of pinene peroxide to hydroxide to get the more stable hydroxide in a better yield.

Keywords: *Alpha-Pinene Peroxide, Singlet Oxygen, Methylene Blue, Tungsten Halogen Lamp*

Fabrication of a Chitosan/Alginate/TiO_2 Based Carrier System for the Encapsulation of Gibberellic Acid and Investigating their Release Profiles

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This work aims the development of a novel chitosan/alginate based carrier system namely, chitosan/alginate/nanoTiO_2 (CS/AL/TiO_2) for the encapsulation of Gibberellic Acid (GA_3), a plant growth regulator, and the investigation of its pH-based release profiles. The carrier system with the same polymer blend was also prepared without TiO_2 nanoparticles to comparatively investigate the effect of TiO_2. Both carrier systems were prepared by gelation method, with each containing final concentration of 50 µg mL^{-1} of GA_3. The releasing studies were carried out using a system with acceptor and donor compartments, where the donor compartment is a cellulose membrane with a 14 kDa exclusion pore size. Samples, including carriers and free GA_3, were separately placed in donor compartments. The acceptor compartment contained $CaCl_2$ solution (11 mM) for all the systems. Aliquots were periodically collected from the acceptor compartments, and cumulative releasing percentages were determined at room temperature, at two different pH (pH 2 and 8), using a UV-visible spectrophotometric method. After 6 hrs., CS/AL/TiO_2 system exhibited a 6.58%, and 13.16% release at pH 2, and pH8 respectively. In the same duration releasing percentages of the carrier without TiO_2 were recorded as 7.89%, and 14.21 % at pH 2, and pH8 respectively while that for the free GA_3 at the considered pH conditions were correspondingly 14.47%, and 19.74%. The CS/AL/TiO_2 carrier system reached a maximum after 96 hrs. at both the pH showing maximum release percentages of 91.27, and 96.29 respectively at pH 2, and 8. Both the free GA_3 and CS/AL reached a maximum release after 72 hrs. and that for the CS/AL blended carrier was 60.59% at pH 2 and 85.56% at pH 8 while those for free GA3 were 74.94%, and 91.57% correspondingly at pH 2 and 8. Both studied systems exhibited an enhanced release in alkaline medium compared to acidic conditions, convincing the suitability of higher pH to facilitate the release. Moreover, results suggested that the carrier system incorporated with TiO_2 nanoparticles is better at achieving a slow release compared to the carrier without TiO_2.

Keywords: *Chitosan, Alginate, Gibberellic Acid, TiO_2*

Development of a Fluoride Riboswitch-based Whole-cell Biosensor for Detecting Fluoride in Drinking Water

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Drinking water is the main dietary source of fluoride for humans. Despite the benefits, high ingestion of fluoride causes adverse health concerns. Interference with other ions is a major drawback associated with conventional methods available for detection of fluoride concentration in drinking water. Bacterial riboswitches are well known for their high selectivity towards the ligand. The novel method of fluoride detection utilizes an *Escherichia coli* mutant carrying a plasmid cloned with fluoride responsive riboswitch (FRS), coupled to the *lacZ* reporter gene. Fluoride binding into the aptamer region of FRS induces the expression of *β*- galactosidase which then hydrolyzes the colorless Ortho-Nitrophenyl-*β*-galactoside (ONPG) into yellow color product, Ortho nitrophenol (ONP) which can be detected at 420 nm. The ONP absorbance was used to quantify the fluoride level in the aqueous samples. The calibration curve for the absorbance of ONP showed a linear relationship for the concentrations between 5 μM - 40 μM with R^2>0.9. The groundwater samples from ten different regions of Sri Lanka were analyzed for fluoride concentration using the constructed biosensor. The highest and lowest level of groundwater fluoride was found in Polonnaruwa (23 μM) and Kurunegala (14 μM) regions respectively. These values were compared with fluoride concentrations obtained using a fluoride ion selective electrode (FISE). Eight samples showed significant discrepancies between the FISE and the FRS-based biosensor, except for the water sample obtained from Polonnaruwa. Further, the biosensor performance was evaluated in the presence of common interfering ions (Na^+, K^+, Ca^{2+}, CO_3^{2-}, HCO_3^- and NO_3^-). The results showed low interference from these ions, indicating the biosensor's high sensitivity towards the analyte. The FRS-based whole-cell biosensor must be further optimized for on-site detection of fluoride levels in drinking water to ensure its practical application and reliability.

Keywords: *Riboswitch, Fluoride Ions, Drinking Water, Portable Biosensor, E. coli*

TRACK 2: BIOLOGY

Evaluation of Network-based Function Prediction Algorithms on *Oryza sativa japonica* Protein-Protein Interaction Data

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Protein-protein interactions (PPIs) in an organism can be represented as a computational network and can be used to predict unknown protein functions using appropriate algorithms. This method is shown to outperform other computational techniques using human data. Several such network-based function predictions exist but the majority of these have only been evaluated on well-annotated species such as yeast and humans. No evaluations have been done for plant PPI networks. To address this deficit, an evaluation methodology was proposed for four well-known network algorithms: Majority voting (MV), Hishigaki method (HM), network propagation (NP), and Markov Random Fields (MRF) for functional annotation of PPI networks of *Oryza sativa japonica*. The PPI network was downloaded from STRING while annotations for Gene Ontology (GO) terms were downloaded from the Gene Ontology database. The algorithms were coded and compiled in Python 3.9. For evaluation, only GO terms that had at least 10 direct or indirect annotations were considered. A ten percent leave-out cross-validation was performed for each GO term for each algorithm. The area under the ROC curve (AUROC), area under the PR curve (AUPRC), and average precision (AP) were obtained for each algorithm to compare their performance. Overall, the four algorithms had similar performances, but the NP method slightly outperformed at AUROC (0.733) and AP (0.289) over the other algorithms (whereas the AUROC and AP for these methods are as follows; MV=0.688 and 0.221, HM=0.630 and 0.283, and MRF=0.712 and 0.275, respectively), indicating its superiority over others for predicting plant protein functions. This evaluation could be extended to other plant crops and algorithms and will be beneficial for bioinformaticians when selecting algorithms for protein function prediction.

Keywords: *Plant Proteomics, Protein-Protein Interactions, Function Prediction, Networks, Systems Biology*

Hanthana Mountain Range: A Sanctuary for Sri Lankan Lichens

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Lichens, a unique symbiosis of algae or cyanobacteria with multiple fungi, exhibit diverse forms, including crustose, fruticose, foliose, and intermediate squamulose forms. Sri Lanka, a renowned biodiversity hotspot, offers ideal habitats for lichen communities, particularly in the Hanthana Mountain Range. This protected area, located in the central highlands at an elevation ranging from 1000 to 1200 meters, boasts of unique climatic conditions conducive to lichen proliferation, such as a mean annual temperature of 23^0C to 25^0C and a mean annual rainfall of 2000 mm. In a comprehensive study, lichen samples were collected using random sampling methods, two meters off the trail, from 20 localities in the Hanthana Mountain Range during the rainy season. These samples were identified through standard morphological and chemical analysis techniques (K test and C test) and categorized into 12 genera belonging to 9 families. The results revealed a substantial diversity, with 42% of the samples being crustose, 36% foliose, and 22% fruticose lichens, highlighting the rich lichen diversity in the area. Diversity indices further underscored this richness, with the Shannon diversity index recorded at 1.92 for crustose lichens, 1.32 for foliose lichens, and 0.68 for fruticose lichens. One-way ANOVA revealed a significant *p*- value of 0.016, indicating notable diversity differences among the lichen forms. These findings affirm that the Hanthana Mountain Range provides an excellent habitat for lichen growth, fostering a remarkable diversity of these symbiotic organisms. This study underscores the ecological importance of the Hanthana Mountain Range and its role in supporting lichen biodiversity. The significant diversity and distribution of lichens in this area not only highlight the unique climatic and environmental conditions but also emphasize the conservation value of the Hanthana Mountain Range. As such, the area proves to be an excellent terrain for lichen research and conservation efforts, contributing to the broader understanding of lichen ecology and biodiversity in Sri Lanka.

Keywords: *Lichens, Diversity, Hanthana, Symbiotic Organisms*

Endophytic Fungi of the Mangrove Plant *Avicennia marina* in the Batticaloa Lagoon of Sri Lanka: Diversity and Their Bioactivities

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Mangroves provide essential ecosystem services such as fisheries, coastal protection, carbon sequestration, decomposition, and bioremediation. These distinct ecosystems support diverse fungal communities and help them survive in these unusual environments. This study aimed to assess the richness, composition, and bioactivities of endophytic fungal communities in the mangrove plant, *Avicennia marina*, from the Batticaloa District of Sri Lanka. The Sathurukondan area in the Batticaloa District (7°44'25.1"N 81°39'47.6"E) was selected for initial sampling. A total of 750 leaf segments, 288 stem segments, and 390 root segments from five *A. marina* plants were surface sterilized using 2% NaOCl, and 70% ethanol and placed on PDA media for fungal endophyte recovery. All tissue types yielded 1140 isolates belonging to 40 distinct morphotypes. Endophyte colonization rates for leaf, stem, and root samples were 87.2%, 95.13%, and 62.05%, respectively. The highest Shannon Weiner diversity index (H' = 2.523) was observed in plant 5, while the lowest diversity (H' =1.6837) was observed in plant 1. Among the putative endophytic fungal isolates, three demonstrated high salt tolerance (NaCl at 65 ppm), while 27 isolates showed phosphate solubilization ability, which could be useful in agricultural applications where phosphate availability is limited for plant growth. Seven isolates showed promising laccase activity. Laccases can degrade a variety of environmental pollutants, including synthetic dyes, polycyclic aromatic hydrocarbons (PAHs), and endocrine-disrupting chemicals. Moreover, four isolates showed anticancer activity (L-asparaginase test), whereas isolate 37 exhibited a promising level of IAA production (110.18 ppm) under in vitro conditions. These studies have revealed a diverse endophytic fungal community in *A. marina* plants in the sampled region, as well as interesting bioactivities with potential industrial applications.

Keywords: *A. marina, Endophytic Fungi, Phosphate Solubilization, Morphotype, Bioactivity*

Plant Growth Promoting Capabilities of Endophytic Fungal Isolates from *Terminalia arjuna*

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Endophytic fungi that have synergistic interactions with their host plants are well-known for boosting plant growth and minimizing the negative effects of environmental stresses. This study was carried out with the objective of isolating and identifying putative endophytic fungi from *Terminalia arjuna* and screening them for plant growth promoting properties. Leaves and roots were collected from *Terminalia arjuna* plants from two sites in the wet and dry zones of Sri Lanka. Leaves and roots were triple surface-sterilized using 70% ethanol and 5% sodium hypochlorite and sterile distilled water. After surface sterilization, leaves and roots were dried and cut into 1 cm pieces before plating on antibiotic supplemented potato dextrose agar. A total of 24 putative endophytic fungal isolates were recovered. Based on morphological traits such as colony shape, color, elevation, and growth rate, these isolates were classified into 15 different morphotypes. Seven morphotypes were selected to assess their ability to produce Indole Acetic Acid (IAA). These isolates were further screened to assess their ability to solubilize phosphate, produce siderophores, and for cellulolytic activity. Six of the seven isolates generated IAA, with RO1A having the highest concentration (0.750 µg/mL). Four of the seven isolates produced siderophores, with RO1A yielding the highest index of 4.2 ± 0.2. Five of the seven isolates were able to solubilize phosphate, with RO1A having the highest capacity (phosphate solubilizing index of 6.3 ± 0.29). All the isolates demonstrated cellulase activity, with isolate LLL02A showing the highest cellulolytic activity with an index of 2.197± 0.00579. Isolate RO1A provided positive results for all the plant growth promoting tests. This study demonstrated the significant plant growth-promoting potential of *Terminalia arjuna*-associated endophytic fungi.

Keywords: *Terminalia arjuna, Endophytes, Indole Acetic Acid, Siderophores, Cellulase*

Drivers of Land Use Land Cover Changes in Wilpattu National Park and the Surrounding Area

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Monitoring Land Use Land Cover (LULC) changes in protected areas is essential for assessing ecosystem health, guiding conservation strategies, and ensuring the effectiveness of protected area management in mitigating environmental degradation and biodiversity loss. The objective of this study is to evaluate LULC changes in and around Wilpattu National Park (WNP) using Landsat 5 and 8 images (year 2000-2021) using the GIS (ArcMap), while considering local perceptions of influencing factors using a community survey. The LULC changes indicate that the extent of waterbodies (0.6% of total WNP area) underwent a slight reduction (0.2%) from 2000 to 2010, and a slight increase (0.4%) from 2010 to 2021. Thick vegetation decreased in extent from 70% in 2000 to 65% in 2021. Other vegetation increased in extent from 23% in 2000 to 30% in 2021. Settlement areas expanded marginally in extent from 1% in 2000 to 2% in 2021. Open areas increased in extent from 0.2% in 2000 to 0.4% in 2021. Open sand areas decreased from 5.1% in 2000 to 4.7% in 2010, followed by a decline in extent to 2% in 2021. A questionnaire survey was conducted in 251 households across 16 nearby villages, revealed that farming, agriculture, timber harvesting, and settlements are perceived to be the main drivers of LULC changes while landfilling, natural causes, and garbage dumping were perceived to be the least influential. Chi-square testing showed significant associations (p <0.05) between several anthropogenic factors and respondents' distance from the core WNP. Additionally, 49% of respondents noted a reduction in the WNP extent during last 20 years, with 58% predicting a further decrease in the next decade, which supports the community experience in LULC changes. This study suggests considering the community perspective when proposing and implementing new policies and legislation for the WNP and buffer area while targeting sustainable development goals.

Keywords: *LULC, Wilpattu National Park, Community Perspective*

The Role of e-Waste Pickers in Wattala and Kolonnawa Local Authority Areas: Contribution to the Circular Economy

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The present study investigated the role of waste pickers in e-waste management and their contribution to circular economy. Data was gathered through in-depth interviews with 60 randomly selected waste pickers from the Kolonnawa UC and Wattala PS areas. The data was analyzed using SPSS software. The sample comprised 33.33% women in Wattala, while in Kolonnawa, the sample comprised entirely males. The findings revealed that 21.67% of waste pickers earn a monthly income of Rs.10,000 to Rs.30,000 in both areas by selling e-waste. Frequently, waste pickers in Wattala collect e-waste from houses (31.58%) while in Kolonnawa, waste is collected from streets and dump sites (31.33%). Computers (9.67%) and mobile phones (11.68%) are the most common e-waste types in Kolonnawa and Wattala, respectively. The amount of e-waste collected per picker is between 15 and 25 kg per month. The waste pickers primarily engage in three methods of e-waste management: The majority sell e-waste without repair (58.25%), a considerable proportion repairs and then uses the waste themselves (24.27%), and a smaller portion repairs and subsequently sells the waste (17.48%). Heavy metals dismantled from e-waste, such as Copper (Cu), Silver (Ag), Gold (Au), and Mercury (Hg), are sold in local markets (3.34%) contributing to the circular economy. Nearly 39% report suffering wounds while engaged in e-waste collection. A high proportion of pickers (78.33%) are aware of the detrimental environmental impacts of e-wastes. This study highlights the need for government involvement in improving the livelihoods, working conditions, and the socio-economic status of waste pickers.

Keywords: *e-Waste Pickers, Circular Economy, e-Waste Management, Social Participation*

Changes in Total Antioxidant Activities of Sri Lankan Rice (*Oryza sativa* L.) during Domestic Cooking and Antioxidative Benefits of Rice Consumption in the Daily Diet

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Rice (*Oryza sativa L.*) is renowned for its richness in bioactive compounds, which can be altered by cooking. This research explored the effects of cooking on the antioxidant activities of Sri Lankan rice varieties and assessed antioxidant benefits of rice consumption in Sri Lankan households. Twenty-five raw grain composites underwent a standardized domestic cooking process. Aqueous crude extracts from lyophilized grain powders (n_1=*75*) from raw, washed, and cooked stages were assayed for the Radical Scavenging Activity (RSA) and Total Antioxidant Capacity (TAC) and expressed as L-Ascorbic Acid Equivalents on dry weight (AAE mg dw), and wet weight basis (AAE mg ww), per 1g and 100g portions. RSA from raw, washed to cooked grain fractions were; 0.696 (±0.107), 0.415 (±0.082) and 0.275 (±0.112) mgg^{-1}dw, respectively, resulting a % loss of RSA during washing and cooking (p<0.05) at 40.15 (±4.97) and 61.81 (±11.08). TAC decreased as 0.279 (±0.074), 0.136 (±0.073) and 0.076 (±0.057) AAE mgg^{-1} dw corresponding to %loss (p<0.05) of 45.46 (±14.78) and 74.34 (±11.92). A standard 100 g cooked rice contained RSA and TAC of 14.55 (±6.45) and 4.07 (±3.19) AAE mg100g-1ww respectively. A mean (±*SD*, n_2=41) rice consumption of 267.41 (±60.66) g $person^{-1}meal^{-1}$ contributed to 38.88(±17.27) and 10.90 (±8.53) RSA and TAC respectively. RSA and TAC values were higher in red pericarp grains than white (p<0.05) and in traditional varieties than in improved varieties (p_{RSA} >0.05; p_{TAC}<0.05). Sri Lankan rice is a reliable source for routine intake of natural antioxidants. However, domestic cooking processes significantly reduce antioxidants in raw rice grains.

Keywords: *Rice, Antioxidant Activity, Cooked Grains, Consumption, Nutraceutical Properties*

Role of FLT3 Receptor in Peripheral White Blood Cells of Newly Diagnosed Diffuse Large B Cell Lymphoma Patients and Healthy Individuals: A Preliminary Study

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Diffuse Large B Cell Lymphoma (DLBCL) is a major subtype of lymphoma. FLT3 (FMS-related-receptor-tyrosine-kinase-3) receptor stimulates the proliferation of lymphocyte/ monocyte lineages, and FLT3 mutations cause abnormal production of cells. This study aimed to detect the behavior of peripheral WBCs and cell ratios in new DLBCLs (before chemotherapy) with the expression of FLT3. The peripheral blood of DLBCL patients (*n=21*) that included FLT3 (+) (*n=5*) and FLT3 (-) (*n=16*) and healthy (*n=32*), were FLT3 (-) as analyzed by flow cytometry. WBC counts were acquired by a Mindray-BC-6800 hematology analyzer. Mean values were compared using the One-way-ANOVA with Bonferroni test. The whole group of new DLBCLs showed a significant increase ($p<0.05$) in Absolute-Neutrophil-Count (ANC), Neutrophil/ Lymphocyte Ratio (NLR) and significant decrease in the Peripheral-Blood-Mononuclear-cells, Absolute-Lymphocyte-Count (ALC), and Lymphocyte/ Monocyte Ratio (LMR) than the healthy individuals. A significant increase ($p<0.05$) in the total WBC, ANC, NLR, and Immature-Granulocytes (IMG) were detected in FLT3 (+) DLBCL compared to FLT3 (-) DLBCL. When comparing means, a significant increase ($p<0.05$) was noted in WBC, ANC, NLR, IMG, and a significantly decreased in ALC, LMR in FLT3 (+) DLBCL compared to the healthy individuals. In contrast, only PBMNCs, ALC, and LMR were significantly lower in FLT3 (-) DLBCL than in the healthy individuals. Higher NLR and lower LMR indicate that the FLT3 (+) DLBCL patients may have been associated with inflammation in comparison to the FLT3(-) and healthy group.

Keywords: *DLBCL, FLT3, Absolute WBC Counts, NLR, LMR*

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Isolation and Identification of Long Chain *n*-Alkane Degrading Bacteria from Crude Oil-contaminated Soil in Sapugaskanda, Sri Lanka

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The devastating impacts of anthropogenic petroleum pollution affect all organismal life in marine and terrestrial ecosystems in many ways. Alkanes being the major constituent of crude oil do not degrade efficiently and thus persist in the environment for long periods. In this study, we aimed to isolate novel microbial species from the crude oil-contaminated soil in Sapugaskanda, Sri Lanka, and to identify them at the molecular level for future bioengineering purposes. Soil samples were collected from a crude oil-contaminated site in the Sapugaskanda oil refinery. Soil samples (2.5 g) were inoculated with 50 ml of BSM supplemented with 1 g/L *n*-alkanes (*n*-hexadecane (C16), *n*-docosane (C22) and *n*-octacosane (C28)) separately and incubated at 25 ℃ for 7 days, continued up to six enrichments. Each enrichment culture was plated onto LB (Luria Bertani) agar plates and sub-cultured. Bacterial colonies with different morphologies were further purified by four-way streaking and incubated at 25 ℃ overnight. The pure cultures were examined morphologically, followed by Gram staining. Bacterial genomic DNA was extracted with Phenol-Chloroform extraction and the 16s rRNA gene was amplified and sequenced using 16s rRNA universal primers. The fragments were sequenced with Oxford nanopore sequencing and identified using Genius prime®, the sequences were annotated with the NCBI database. A total of seven different bacterial isolates (i.e., *Pseudomonas* sp., *Acinetobacter* sp., *Stenotrophomonas* sp., *Enterobacter* sp., *Serratia* sp., *Bacillus* sp. and *Brucella* sp.) were identified from the contaminated site. Future work will involve evaluating the growth of isolated strains in the presence of long chain *n*- alkanes of varying chain lengths as the sole carbon source. Additionally, the *n*-alkane degradation efficiencies of these strains will be assessed using gas chromatography-mass spectrometry (GC-MS).

Keywords: *Hydrocarbons, Long Chain n-Alkane Degrading Microorganisms, Pseudomonas sp., Stenotrophomonas sp., Serratia sp.*

TRACK 3: PHYSICAL SCIENCES AND NUCLEAR SCIENCE

Violation-based Feature Selection for Isolation Forest

D. M. Dissanayake[1], R. Navarathna[2], S. Viswakula[1]

[1]Department of Statistics, Faculty of Science, University of Colombo, Sri Lanka
[2]OCTAVE, John Keells Group, Sri Lanka

Anomaly detection is crucial in sectors like finance and healthcare to identify deviations from normal behavior. The Isolation Forest (ISF) algorithm, introduced by Liu et al. (2008), is effective but has limitations, such as bias towards correlated variables and suboptimal results with irrelevant features. This study introduces the Violation Features Based Isolation Forest (VFIF) algorithm, which improves on ISF by evaluating the features used to build each tree and prioritizing those trees with features that violate strong patterns in the data. Unlike ISF, which aggregates all trees, VFIF strategically selects a subset of trees for anomaly scoring. Our empirical evaluation, using five real-world datasets from the UCI Machine Learning Repository, involved selecting subsets of trees at α = 30%, 50%, and 75%. Here, α represents the subset of trees from the full set of trees; for example, α = 30% means selecting 30% of trees from the total tree count. α can take any value greater than 0%, up to 100%, allowing for flexible selection of the subset size. Results show that VFIF outperforms ISF in most cases regarding Area Under the Curve (AUC), True Positive Rate (TPR), and False Positive Rate (FPR). Users can tune the α parameter to optimize their desired metric, highlighting VFIF's flexibility and enhanced performance over ISF. Tuning α involves experimenting with different subset proportions to balance computational efficiency and detection accuracy, enabling users to find the optimal trade-off for their specific application. Experimental results demonstrate that VFIF offers a novel and effective approach to anomaly detection by strategically selecting and prioritizing trees, and improving metrics across diverse datasets. Future work will focus on refining the selection criteria and incorporating additional parameters to enhance VFIF's performance through extensive simulation studies.

Keywords: *Isolation Forest, Anomaly Detection, Rule Violation*

Comprehensive Analysis of S-wave Intensity Prediction in New Zealand Earthquakes: A Multilevel Modeling Approach

E. V. T. Eranthi, G. P. Lakraj

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Earthquake early warning systems (EEWS) are crucial in seismically active regions like New Zealand. Various methodologies are used in EEWS to generate warnings, with estimating earthquake intensity being particularly important as it is directly related to ground shaking and damage probability. Earthquakes produce two wave types: Primary (P) and secondary (S). P-waves travel faster but are less destructive than S-waves. Therefore, most EEWS detect P-waves, estimate the intensity of the following S-waves, and issue a warning within those precious few seconds. This study aims to identify the best factors for S-wave intensity estimation, explore the impact of parameters (P-wave, station characteristics, earthquake-id, year-index), and develop a nationwide S-Wave intensity prediction model. Data from 29,057 earthquake waveforms recorded by 293 stations, documenting 9,206 earthquakes in New Zealand (2013-2022), were analyzed, including only seismic records with magnitudes exceeding 3 ($M > 3$) and within 100 km epicentral distance. The non-independence of the data, due to multiple station records per event, posed a challenge. Traditional regression models were inadequate, prompting the adoption of a multilevel model (MLM) with random effects for stations, earthquakes, and time. Initial correlation analysis identified log (Pv) as the best predictor for estimating log (PGV) over other P-wave parameters; Pv and PGV are peak ground velocities of P and S waves, respectively. The necessity of MLM was assessed, revealing significant variance between stations (ICC = 0.459), earthquakes (ICC = 0.610), and years (ICC = 0.162), highlighting the importance of random effects. The MLM significantly improved model fit (conditional R^2 = 0.826, marginal R^2 = 0.718), reducing RMSE and MAPE compared to ordinary regression. The results demonstrate that the MLM provides a better fit and applying this model at the station level can enhance the accuracy of ground-shaking intensity predictions, potentially improving the reliability of warning systems and public safety.

Keywords: *Multi-Level Modeling, Linear Mixed Effect Modeling, S-Wave Intensity Estimation, EEWS*

Factors Affecting Grade 11 Students' Academic Performance in Mathematics at a Homagama Zone School

N. D. Kumarasinghe, R. A. B. Abeygunawardana

Department of Statistics, Faculty of Science, University of Colombo, Sri Lanka

Academic performance in mathematics is a key indicator of overall academic success of students and their preparedness for future careers in science, technology, engineering, and mathematics (STEM) disciplines. The objectives of this study are to identify the most important factors that affect academic performance, to identify the relationship between selected variables and academic performance, and to determine the most accurate model for predicting academic performance in mathematics of Grade 11 students. The study was conducted at Vidyartha National College, Awissawella. The data were collected using a questionnaire. The sampling procedure was a two-stage cluster sampling technique. Primary data were collected through a questionnaire that consisted of 21 five-point Likert scale questions and 18 multiple choice questions. The secondary data were collected from the Department of Examinations, the Zonal Education Office of Homagama, Vidyartha National College, websites, and research journals. The population size is 463 and the sample size is 209 students. The methodologies that were applied were univariate analysis, bivariate analysis, multiple regression analysis, factor analysis, and random forest classifier. According to the multiple regression analysis, the adjusted R^2 value was 0.669. This means 66.9% of the variability of the third term mathematics score can be explained by the predictors. The academic performance in mathematics of male students was slightly better than that of female students. However, gender is not statistically significant. Considering factor analysis, many student-related factors, two home-related factors, and the occupations of the mother and father were identified as high loading factors. The evaluation was conducted using precision, recall, F1 score, and overall accuracy metrics, and the confusion matrix was used to assess the Random Forest model's performance. The overall prediction accuracy of the model is 93%. According to feature importance, the student-related factors have the highest importance value. Moreover, the occupations of the mother and father, and student related factors also affect academic performance.

Keywords: *Sampling Technique, Multiple Regression Analysis, Factor Analysis, Confusion Matrix, Random Forest Model*

Dynamics of Bridged Water Molecules in the Vicinity of a Collagen Microfibril

S. Rangana, W. A. M. Madhavi

Department of Physics, Faculty of Science, University of Colombo, Sri Lanka

It is well known that the MRI spin relaxation rates measured in ordered collagenous tissues such as cartilage and tendon are anisotropic across the depth of the tissues. This anisotropy termed as the "magic angle effect" is a consequence of incomplete averaging of dipolar spin interactions due to binding of water molecules to the collagen fibers. Two main hypotheses are proposed regarding the microscopic origin of the magic angle effect: The ice-like water bridges and spatial confinement of water molecules in cavities in the collagen network. This study investigated the nature of the bonds made by water molecules and collagen using a microfibril incorporating molecular dynamics (MD) simulations. All-atom MD simulations of a microfibril consisting of seven tropocollagen fragments in a water box were carried out. The radial distribution function of water molecules was calculated to determine the thickness of the different hydration shells. The continuous residence time of water molecules in each hydration shell was calculated and the molecules that are residing a longer time in the first and second hydration shell were considered for further analysis. The translational motion of long residing molecules was studied to understand their bonding nature and twenty-four long residing molecules (resident time which are longer than 2 ns) were identified. Several bridge sites in collagen that these water molecules make bonds with were also identified. The average duration where the water molecules were translationally restricted was found to be 54.02 ps which is considerably longer than previously reported water bridge residence times which were less than 10 ps. However, during this time, water molecules were not rotationally restricted. Depending on the nature of the hydrogen bonds formed, three types of rotational motion could be identified. Few water bridges that formed between the long residing water molecules and the collagen were ice-like water bridges. However, most bonds between collagen and water molecules were flipping between atoms of the bonded molecules being partially ice-like or trapped.

Keywords: *Collagen, Hydration Shell, Molecular Dynamics Simulation, Magic Angle Effect, Spin Relaxation*

Acknowledgements: TWAS research grant - 22-212 RG/PHYS/AS_I

Investigation of ^{60}Co BEBIG High Dose Rate Brachytherapy Dose Distribution in Different Media Using GEANT4 Monte Carlo Simulation

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[3]*Teaching Hospital, Jaffna, Sri Lanka*
[4]*Tellipalai Trail Cancer Hospital, Jaffna, Sri Lanka*
[5]*Swasthya Kalyan Group, Jaipur, India*

High Dose Rate (HDR) Brachytherapy (BT) using ^{60}Co source, uses radioactive sources placed inside patient's body, targeting tumour regions. Consequently, treatment planning is the main step in HDR-BT, which relies on the computer algorithm 'Treatment Planning System' (TPS). The current approach to TPS is based on the American Association of Physicists in Medicine (AAPM) Task Group No. 43 (TG-43) formalism. A major limitation of TPS is its assumption of homogeneous water for dose calculations without accounting for tissue heterogeneity, which can lead to inaccuracies in treatment planning. This study addresses this key limitation in TPS by exploring how different tissue densities and compositions affect dose distribution, focusing on the ^{60}Co BEBIG Co0.A86 HDR-BT source through GEANT4 Monte Carlo simulation. The source was modelled using GEANT4 (version 10.7.1). Validation was performed against TG-43 dosimetric parameters by simulating air kerma strength per unit source activity (S_k/A) and dose rate constant (Λ). Radial dose distributions were simulated in water and various tissues, including bone, lung, adipose tissue, and breast for different radial distances. The S_k/A and Λ values were calculated as 3.048×10^{-7} ±0.003 UBq^{-1} and 1.096 ± 0.012 cGyh^{-1} U^{-1}, respectively. Significant variations in bone tissue relative to water were shown by calculated radial dose functions, with under-dosing as high up to 39.35%. Comparatively, minor over- and under-dosing was observed in the lung, adipose tissue, and breast tissue compared to the water medium. The study concluded that assuming water as a homogeneous medium in HDR-BT planning leads to inaccurate dose calculations. By considering the compositions and densities of various tissues, GEANT4 simulations combined with TPS can achieve more accurate dose distributions.

Keywords: *HDR Brachytherapy, ^{60}Co, GEANT4 Simulation, Dose Distribution, Tissue Heterogeneity*

Mathematical Modelling of Automatic Tube Current Modulation in Computed Tomography using a Customised Phantom

U. Hishaam[1], J. Jeyasugiththan[1], S. Viswakula[2], D. M. Satharasinghe[1], T. Amalaraj[1], A. Pallewatte[3], S. Peterson[4]

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[2] *Departments of Statistics, Faculty of Science, University of Colombo, Sri Lanka*
[3]*Department of Radiology, National Hospital of Sri Lanka, Colombo, Sri Lanka*
[4]*Department of Physics, University of Cape Town, South Africa*

The introduction of automatic tube current modulation (ATCM) has resulted in more complex relationships between Computed Tomography scanner parameters, patient body contours, radiation dose, and image quality. ATCM automatically modulates tube current angularly and/or along the longitudinal axis, by adjusting x-ray flux based on attenuation characteristics and selected scanner protocols. This study aims to develop regression models for these complex relationships, considering all relevant exposure parameters. A customised homogeneous phantom, comprising of 5 discrete diameter steps, a conical section, and an air-pocket to mimic the lungs, was developed following guidelines of the AAPM TG-233 report. Data was collected from a Philips Brilliance iCT 256, a GE Healthcare Optima CT660, and a Canon Aquilion ONE PRISM edition scanner. R statistical software was used to fit the multiple linear regression models. While previous studies have explored the impact of varying settings on ATCM, none have quantitatively modelled these relationships considering all relevant parameters. This study modelled tube current (I) and image noise (σ) as a function of tube potential (U), pitch (P), rotation time (t) and diameter (D) for all 3 scanners with adjusted R-squared values over 0.9 and 0.7, respectively. Further, this study present clinicians with the ability to predict the impact of fine-tuning exposure parameters on patient radiation dose and output image quality, by plugging scanner settings and patient effective diameter into the regression models to predict I and s values in a holistic manner. Thus, the models developed may be used as a practical tool to optimize scan protocols according to specific patient requirements and clinical objectives before their implementation in clinical operations.

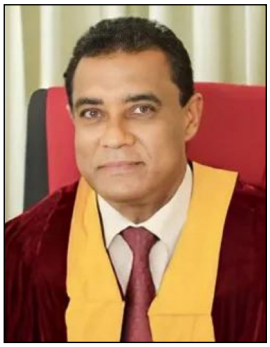
Keywords: *Computed Tomography, ATCM, Modelling, Dose Optimization, Image Quality*

FACULTY OF TECHNOLOGY

Research in Technology for a Sustainable Future

03rd of December 2024

MESSAGE FROM THE DEAN



Professor R.U.K. Piyadasa

Dean
Faculty of Technology
University of Colombo, Sri Lanka

It is with great pride and a deep sense of responsibility that I extend my warmest wishes to all participants of the Annual Research Symposium 2024 of the Faculty of Technology, University of Colombo. This symposium reflects the hard work and creativity of our faculty, students, and researchers. In an era where technology plays an increasingly important role in shaping the future, the research and innovation emanating from our faculty hold the potential to address some of the most pressing challenges of our time. From sustainable development to advancements in digital technologies and biotechnologies, our faculty continues to lead the way in producing research that is not only academically robust but also socially impactful.

The theme of this year's symposium, 'Research in Technology for a Sustainable Future' is particularly significant as it aligns with our mission to bridge the gap between academic research and practical solutions that can benefit society. This event serves as a platform for our researchers to showcase their work, engage in meaningful discussions, and collaborate with peers across disciplines. It is through such collaboration that we can truly push the boundaries of knowledge and innovation.

I would like to extend my heartfelt appreciation to the organizing committee for their unwavering commitment and hard work in bringing this symposium to fruition. Their efforts have ensured that this event continues to be a cornerstone of our academic calendar, fostering a culture of research excellence within our faculty.

To all the participants, presenters, and attendees, I encourage you to engage fully in the discussions and activities of this symposium. Let this be an opportunity not just to share your findings, but to inspire and be inspired, to challenge and be challenged, and to collectively contribute to the advancement of technology for the betterment of humanity.

I wish you all a productive and enlightening symposium.

MESSAGE FROM THE SYMPOSIUM CHAIR

Dr. B.L.S. Thilakarathne

Department of Instrumentation and Automation Technology
Faculty of Technology
University of Colombo, Sri Lanka

It is my pleasure to welcome you to the 'Research in Technology for a Sustainable Future' symposium, hosted by the Faculty of Technology, University of Colombo. This symposium is a unique opportunity for us to come together and share our knowledge, expertise, and innovations in harnessing technology to create a more sustainable future. As we gather here today, we are reminded of the urgent need to address the pressing challenges facing our world. Climate change, environmental degradation, and social inequality are just a few examples of the complex issues that require innovative solutions. As technologists, we have a critical role to play in developing and deploying technologies that can mitigate these challenges and promote sustainable development.

The symposium will feature a diverse range of presentations and discussions on topics such as agriculture, energy, environment, green technologies, automation, instrumentation and digital transformations. We will also explore the intersection of technology with other disciplines, such as social sciences, and humanities, to better understand the complexities of sustainability. This symposium is not only a celebration of the remarkable research being conducted by our faculty members and students but also a platform for us to collaborate and learn from each other. We will share our experiences, best practices, and lessons learned in designing and implementing sustainable technologies that can benefit society as a whole.

I would like to extend my gratitude to all the speakers, presenters, and organizers who have contributed to making this symposium a success. Your dedication to advancing research in technology for a sustainable future is truly inspiring. Let us join hands in exploring how technology can shape our future, challenge conventional thinking, and contribute to a more sustainable world. Thank you for your participation; I look forward to a stimulating and productive symposium.

ORGANIZING COMMITTEE

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Mr. L.M. Samarathunga	–	Department of Instrumentation and Automation Technology

SYMPOSIUM PROGRAMME

Time	Programme
08.15 am – 08.30 am	**Registration**
08.30 am – 08.35 am	**National Anthem**
08.35 am – 08.40 am	**Lighting of the Oil Lamp**
08.40 am – 08.50 am	**Welcome Address** Professor R.U.K. Piyadasa Dean, Faculty of Technology, University of Colombo
08.50 am – 09.00 am	**A Short Video Clip on Faculty of Technology, University of Colombo**
09.00 am – 09.10 am	**Address by the Chief Guest** Senior Professor (Chair) H.D. Karunaratne Vice Chancellor, University of Colombo
09.10 am – 10.00 am	**Tea Break/Undergraduate Research & Innovation Showcase**
10.00 am – 10.30 am	**Keynote Address I : '*Sustainable Forestry Bioeconomy through Higher Education in Greece*'** **Prof. George Ntalos** Head of the Department of Forestry, Wood Science and Design School of Technology, University of Thessaly, Greece
10.30 am – 11.00 am	**Keynote Address II : '*Bionics Limbs: Innovations and Challenges in Robotic Prosthetics*'** **Prof. R.A.R.C. Gopura** Dean, Faculty of Graduate Studies, University of Moratuwa
11.00 am – 11.30 am	**Keynote Address III : '*Technology for a Sustainable Future*'** **Dr. Chaminda Ranasinghe** Founder/Chief Executive Officer at IDEAHUB (Pvt.) Ltd. and Former Group Vice President of Dialog Axiata
11.30 am – 11.40 am	**Awarding of Certificates (Undergraduate Research and Innovation Showcase)**
11.40 am – 11.45 am	**Vote of Thanks** Dr. B.L.S. Thilakarathne Faculty Symposium Chair
11.45 am – 12.30 pm	**Students' Panel Discussion**
12.30 pm – 01.15 pm	**Lunch Break**
01.15 pm – 03.15 pm	**Technical Sessions I and II**
03.15 pm – 03.20 pm	**Concluding Remarks - Technical Sessions I and II**
03.20 pm – 03.40 pm	**Tea Break**
03.40 pm – 05.10 pm	**Technical Sessions III and IV**
05.10 pm – 05.15 pm	**Concluding Remarks - Technical Sessions III and IV**

INTRODUCTION TO THE KEYNOTE SPEAKER I

Professor Georgios Ntalos

Professor
Department of Forestry, Wood Sciences, and Design
School of Technology, University of Thessaly, Greece

Dr. Georgios Ntalos is the Head and Professor in the Department of Forestry, Wood Sciences, and Design at the University of Thessaly, specializing in Wood Technology. He oversees the Laboratory of Quality Control of Wooden Products and Wood Constructions. Dr. Ntalos holds a Ph.D. from the Department of Forestry and Natural Environment at Aristotle University, with a dissertation titled '*Exploitation of Lignin-Cellulose Remains of Agricultural Plants for Wood Composite Production*.'

He represents Greece in various European Union initiatives related to wood, wood composites, furniture, and wooden frames. His teaching experience spans universities, seminars, and educational programs in countries including Cyprus, Egypt, Denmark, Portugal, Albania, Finland, Japan, and Germany.

Dr. Ntalos is the Director of the Institute for Wood, Furniture, and Wooden Packaging at the Academic Centre for Research, Innovation, and Growth (IASON) of Thessaly University. He has been the scientific lead for over 200 national and international projects concerning wood and its applications. Additionally, he serves on the advisory committee for several PhD candidates. In his role at the University of Thessaly, Dr. Ntalos delivers undergraduate modules such as Wood Technology, Forest Products Quality Control and Certification, Wood Composites, Furniture Quality Control, Contemporary Materials for Wood Structures, and Innovative Wood Products. He also teaches postgraduate courses on Quality Control of Raw Materials and Packaging–Certification and Biological Threats to Forest Trees and Wood in the Department of Forestry, Wood Sciences and Design, School of Technology at the University of Thessaly, Greece.

ABSTRACT OF THE KEYNOTE ADDRESS I

Sustainable Forestry Bioeconomy through Higher Education in Greece

Professor George Ntalos

Department of Forestry, Wood Sciences, and Design, School of Technology, University Thessaly, Greece

The development of a sustainable forestry bioeconomy involves integrating environmental stewardship, economic viability, and social responsibility into the forestry sector in each local area around the world. The forest-based sector has the opportunity to take the lead in the sustainable development of the bioeconomy. Greece, with 3.84 Mha of forest, accounting for 29% of the country's total area, has powerful tools in place that can be adapted and further developed for application in the bioeconomy as a whole. The country's low productivity of the Forest Sector to the GDP, which employs only 0.1% of the total workforce of Greece, is due to the fact that the forests are of low productivity alongside a small variety of species. The regional research institutes and universities are focused on identifying sustainable exploitation methods for forest management, harvesting, transport, and processing of wood products together with information technology. The lack of a circular and sustainable approach from the NFS (National Forest Strategy) and the current challenges related to this, together with the University's role to combat this are being presented aiming to support the conservation of the country's forest resources while contributing to economic growth and the well-being of the communities dependent on forest ecosystems.

INTRODUCTION TO THE KEYNOTE SPEAKER II

Professor R.A.R.C. Gopura

Dean
Faculty of Graduate Studies
University of Moratuwa

Prof. Ruwan Gopura earned his B.Sc. Eng. degree with honors in Mechanical Engineering in 2004, followed by an M.Eng. degree in Manufacturing Systems Engineering, both from the University of Moratuwa, Sri Lanka. He later pursued a Ph.D. in Robotics and Intelligent Systems at Saga University, Japan, in 2009. Subsequently, he engaged in postdoctoral research in bio-robotics at the same institution. Currently, he is a Professor in the Department of Mechanical Engineering at the University of Moratuwa and serves as the Dean of the Faculty of Graduate Studies.

Prof. Gopura played a pivotal role as the founding Head of the Department of Medical Technology in the Faculty of Medicine at the University of Moratuwa. He also held the position of Director/Research at the university from February 2021 to January 2024. His past leadership roles include serving as the Head of the Department of Mechanical Engineering. Prof. Gopura is recognized for his expertise in developing bionic devices, such as robotic prostheses, orthoses, and exoskeletons. He has authored 160 research articles, including publications in peer-reviewed journals and conference proceedings, and holds several patents.

In addition to his academic contributions, Prof. Gopura serves as an academic editor for several journals. He was the chairperson of the IEEE Sri Lanka Section in 2020 and the IEEE Robotics and Automation Society Sri Lanka Section from 2017 to 2020. His work has been acknowledged with numerous research awards and grants.

ABSTRACT OF THE KEYNOTE ADDRESS II

Bionics Limbs: Innovations and Challenges in Robotic Prosthetics

Professor R.A.R.C. Gopura
Faculty of Graduate Studies, University of Moratuwa, Sri Lanka

The rapid advancements in bionic technology have paved the way for the development of highly sophisticated robotic prosthetic devices, offering enhanced functionality and improved quality of life for individuals with limb loss. This keynote speech explores the evolution and present state of bionic devices, with an emphasis on robotic prosthetics. The speech will begin with an introduction to bionics and prosthetic devices, followed up with an overview of their development and related technologies.

It will particularly focus on the latest innovations and the limitations of current prosthetic technologies that continue to challenge the field. Moreover, he will explore the unique difficulties associated with developing such devices in Sri Lanka, offering insights into the local context and the potential for growth in this area.

The speech will also highlight the experiences gained from the work carried out at the Bionic Laboratory of University of Moratuwa in this domain. These developments represent the forefront of efforts to enhance the functionality and accessibility of robotic prosthetics on both a local and global scale.

Finally, the speech will address the future direction of bionic and prosthetic device development, emphasizing the importance of interdisciplinary collaboration and innovation in overcoming the current barriers. By bringing these issues to light, this presentation aims to inspire further research and development in the field, with the ultimate goal of improving the lives of those who rely on these essential technologies.

INTRODUCTION TO THE KEYNOTE SPEAKER III

Dr. Chaminda Ranasinghe

Founder/Chief Executive Officer of IDEAHUB (Pvt.) Ltd.
Former Group Vice President of Dialog Axiata
Sri Lanka

Dr. Chaminda Ranasinghe is the Founder and Chief Executive Officer of IDEAHUB (Pvt.) Ltd. He earned his B.Sc. (Hons) Degree in Computer Science from the University of Colombo, Sri Lanka, in 1997, and a Diploma in Marketing from the Chartered Institute of Marketing (UK) in 1995. Dr. Ranasinghe completed his Ph.D. in Machine Learning (Software Agent Technology) at the University of Colombo in 2008. He is a member of the Chartered Institute of Marketing (UK), IEEE, ACM, and the Computer Society of Sri Lanka (CSSL). In addition to his role at IDEAHUB, Dr. Ranasinghe serves as a Senior Lecturer at the University of Colombo School of Computing, teaching in both the M.Sc. and B.Sc. programs.

With over 25 years of experience in the IT industry, Dr. Ranasinghe began his career as a Software Engineer, where he designed and developed technology platforms for the telecommunications and banking sectors. He has held various managerial positions, including Head of Research and Development, Chief Information Officer, Chief Operating Officer, and Chief Executive Officer.

ABSTRACT OF THE KEYNOTE ADDRESS III

Technology for a Sustainable Future

Dr. Chaminda Ranasinghe
University of Colombo School of Computing, University of Colombo, Sri Lanka

Sustainability is a multifaceted concept encompassing environmental, social, and economic dimensions. In terms of focus and popularity, there is much emphasis on using technology for environmental sustainability. However, overall long-term sustainability will not progress in equilibrium without focus and efforts in social and economic sustainability. Technology has made progress in research and real-world solutions related to renewable energy, climate change mitigation, circular economy (recycling), sustainable materials, clean transportation, water purification, and reuse and precision agriculture. The primary challenge of using technology for sustainability seems to have more to do with enhancing knowledge, understanding, and acceptance from a minority to the majority of the human population.

Sustainability demands changing human nature in terms of habits, behaviour, and most importantly the degree of ever-increasing human greed and desires. While technology is a potent tool for addressing environmental, social, and economic issues, it is less direct in altering human behaviour. Greed and desire are deeply ingrained psychological constructs influenced by cultural, societal, and economic factors. However, technology can indirectly influence these behaviours by creating new norms and incentives such as awareness and education, financial incentives on sustainable choices (tax rebates), redesigning systems and environments (smart cities), and of course mindful and well-being technologies for promoting inner peace, reducing materialistic desires, and helping individuals understand their stress levels and emotional responses to consumption

FACULTY OF TECHNOLOGY
List of Abstracts

Evaluation of Pumpkin (*Cucurbita spp.*) Accessions for Morphological Traits, Yield Attributes, and Resistance to Cucurbit Mosaic Virus (CMV) in Sri Lanka

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Pumpkin (*Cucurbit spp.*) is an important vegetable crop in Sri Lanka due to its nutritional and culinary value. The development of high-yielding varieties resistant to common virus diseases is essential to sustain pumpkin production in Sri Lanka. Hence, the present study evaluated virus-resistance, morphological and yield attributes of 60 pumpkin accessions developed at the World Vegetable Center, Taiwan. The study was conducted at the farm of Onesh Agri (Pvt.) Ltd, Thanamalwila (DL1b) using a randomized complete block design. The border rows were planted with virus susceptible commercial variety Suprema F1 (East-west Seed/ Philippines). According to the cluster analysis results, accessions were grouped into two main clusters 23 and 34 accessions for group 1 and 2 respectively based on their quantitative traits. Moreover, eleven of the evaluated accessions, PUMP003, PUMP009, PUMP017, PUMP019, PUMP023, PUMP026, PUMP030, PUMP033, PUMP034, PUMP043, and PUMP047 identified as partially resistant to CMV. According to the morphological and yield characteristics, PUMP017 was identified as an early flowering (36.50±1.18 days) and PUMP033, as early maturing accessions (62.0±1.95 days). Moreover, PUMP030 resulted in the heaviest fruits (4121.00±195.98 g) with desirable fruit length (28.10±0.77 cm), breadth (21.00±0.77 cm), and flesh thickness (29.80±2.02 mm), and PUMP026 yielded the higher number of fruits per vine (5.60±0.48). Hence results of the present study would be helpful for future pumpkin breeding programs to develop new pumpkin varieties with multiple resistant to common virus diseases.

Keywords: *Accession, CMV, Cucurbita spp., Morphological and Yeild Attributes*

Determination of Genetic Diversity of the *Xanthomonas campestris* pv. *campestris* (XCC), Causal Organism of Black Rot Disease in Brassica Crops Cultivated in the Up-country Wet Zone of Sri Lanka

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Bacterial black rot disease reports significant outbreaks in Brassica crop fields worldwide. This research focuses on examining the genetic diversity and distribution of soilborne bacterial pathogen of *Xanthomonas campestris* strains in the up-country wet zone of Sri Lanka. That impacts Brassica crops including broccoli, radish, cabbage, and so forth. Three hundred plant samples were collected from the main agro-ecological zones in the upcountry wet zone of Sri Lanka. Sixty strains were isolated from different Brassica species, and out of 300 samples, 32 strains were subjected to biochemical tests including, KOH, catalase oxidation, starch hydrolysis, and pathogenicity tests. Molecular barcoding was performed with XCC-specific primer Dhrp. Out of 32 samples, 16 samples were submitted for sequencing. DNA sequencing verified 12 out of 16 samples as XCC. Phylogenetic analysis identified evolutionary relationships among strains, with clusters showing differences in virulence and symptom severity distribution. The SEC 9 bacterial strain has a different evolutionary distance than other bacterial strains and the evolutionary distance of SEC 9 is 0.13 and Koch's postulate highlighted that SEC 9 as highly virulence for this disease and SEC 16 exhibits the lowest virulence for black rot in cabbage. Single nucleotide polymorphism (SNP) revealed that there was a genetic diversity among the isolated XCC strains from different locality. Overall, the study sheds light on the molecular and biochemical characteristics of XCC and its role in black rot disease in cruciferous vegetables. This information would be beneficial for the development of proper management strategies for XCC strains in Sri Lanka.

Keywords: *Brassica Crops, Black Rot, Xanthomonas campestris pv. Campestris (XCC), Molecular Barcoding, Phylogenetic Analysis*

Performance of Submergence Tolerance Ability of Rice Advance Lines Derived from Submergence Breeding Program

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Rice is a vital food crop in Sri Lanka, significantly contributing to the national economy. However, submergence stress, particularly in the low country wet zone, poses a substantial challenge to rice cultivation. Developing submergence-tolerant rice varieties is essential for enhancing resilience and productivity. This study evaluated the submergence tolerance of advanced rice breeding lines from a cross between Bw312/FR 13A and Bw367/IR119 at the seedling stage. Two-week-old seedlings were subjected to two weeks of submergence stress under greenhouse tank conditions at the Rice Research and Development Institute, Bathalegoda, Sri Lanka. Plant survival percentages were recorded after an 18-day recovery period. The results indicated that all surviving rice cultivars exhibited elongation after14-days of submergence stress at the seedling stage compared to control plants. Some cultivars reduced plant height under stress. Notably, FR13 A, Sambamashuri Sub1, and IR 64 Sub1 demonstrated a high level of tolerance, with survival rates of 95.2%-100% and SES score of 1. Breeding lines Bw22-2442-b and Bw22-2442-C showed significant tolerance with 95% survival and SES score of 3. Additionally, 14 line genotypes exhibited moderate tolerance with survival rates ranging from 94.9% to 75% and SES score of 5. Molecular screening using SSR markers validated submergence tolerance, with the Sub1A 203 marker being particularly effective in distinguishing tolerant from intolerant genotypes. This marker outperformed AEX and RM 219 in marker-assisted breeding programs. Genotypes were grouped into three clusters with four sub-clusters based on Sub1-specific SSR markers. This research provides valuable insights into the genetic basis of submergence tolerance and supports the development of more climate-resilient rice varieties, crucial for sustaining rice production in flood-prone areas.

Keywords: *Submergence Stress, Breeding Lines, Genotypes, SSR Markers, Marker Assisted Breeding*

Feasibility Study on Convective Drying of Multi-Petal Blue Pea (*Clitoria ternatea* L.)

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Blue pea (*Clitoria ternatea* L.) is a perennial herbaceous plant in equatorial Asia. It possesses flowers with dark blue to purple petals and is well known for its nutraceutical benefits. Rising demand for natural colourants has increased interest in blue pea flowers. More scientific evidence must be found regarding optimal drying conditions for preserving their beneficial properties. This study investigated the optimal conditions for convective drying of multi-petal blue pea flowers to maximize anthocyanin retention with minimum colour degradation. The drying characteristics were evaluated at four air temperatures (45, 50, 55, and 60 ℃) with a constant air velocity of 1 ms^{-1}, repeating each test four times. The effect of drying temperature on the moisture content, total anthocyanin content, total colour change (ΔE) and lightness (L*) was analyzed. The final moisture of 7-9% (wb) of the multi-petal blue pea flowers reached after 14, 8, 6, and 4 hours at drying temperatures of 45, 50, 55, and 60 ℃ respectively. During the first two hours, the drying rate was high due to high free moisture content, and then the drying rate gradually declined. The retained total anthocyanin content varied significantly ($p<0.01$) within the 45-55 ℃ temperature range. The total anthocyanin content of the dried flowers at 55 ℃ was 44.5±1.0 mg.cyd-3-glc/l. However, there was no significant difference ($p<0.01$) in total anthocyanin content when the flowers were dried at 55 ℃ compared to 60 ℃. A significant total colour change ($p<0.01$) was observed when blue pea flowers were dried at 60 ℃. Convective drying of multi-petal blue pea flowers at 45 ℃ effectively preserves colour and retains total anthocyanin content, although it requires an extended drying time of 14 hours. Considering the drying time, total colour change, and retention of total anthocyanin, multi-petal blue pea flowers are the best dried convectively at 55 ℃. The moisture content of 7-9% (wb) is reached after 6 hours of drying, which is a sensible drying time for industrial applications.

Keywords: *Blue Pea, Colour, Convective Drying, Temperature, Total Anthocyanin*

Proximate Composition of Selected Peanut (*Arachis hypogaea*) Breeding Lines in Sri Lanka

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Peanut (*Arachis hypogaea*) is a significant oilseed crop globally, used in various food products, making it vital to understand the composition of human nutrition and health. Despite extensive global studies on the composition of peanut varieties, research in Sri Lanka is still limited. This study aimed to assess the proximate composition of selected peanut breeding lines, which are planned to be released as varieties in Sri Lanka. The study included 12 peanut breeding lines ICGV 3089, ICGV 04195, ICGV 4118, ICGV 3098, ICGV 00068, ICGV 06214, ICGV 87187, ICGV 00073, ICGV 06233, ICGV 05198, ICGV 3090, and Red Spanish. These breeding lines were sourced from the Grain Legumes and Oil Crops Research and Development Center, Angunukolapelessa, Sri Lanka. As proximate composition moisture, crude fat, crude protein, crude ash, crude fiber, and total carbohydrate contents were studied following AOAC methods (n=3 each). Results showed significant differences (p<0.05) among the peanut breeding lines on a dry weight basis. Moisture, crude fat, crude protein, crude ash, crude fiber, and total carbohydrate contents ranged from 5.97±0.01 to 8.52±0.01, 44.71±0.01 to 58.69±0.01, 20.63±0.02 to 24.67±0.00, 2.43±0.00 to 2.96±0.01, 4.64±0.00 to 5.98±0.01, and 11.27±0.01 to 25.23±0.02 percent respectively. ICGV 04195, ICGV 00068, ICGV 00073, ICGV 87187, and ICGV 3090 exhibited the highest crude fat, crude protein, crude ash, crude fiber, and total carbohydrate contents respectively compared to the other peanut breeding lines in this study. Therefore, ICGV 04195, ICGV 00068, ICGV 00073, ICGV 87187, and ICGV 3090 can be considered as the best breeding lines in terms of proximate composition and are recommended to be released as nutrient-rich peanut varieties in Sri Lanka.

Keywords: *Peanut Breeding Lines, Crude Fat, Crude Protein, Crude Ash, Carbohydrate*

Formulation and Quality Assessment of Greek-Style Drinking Yogurt Utilizing Whey from Mozzarella Cheese Production

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The focus of this study was to formulate and assess the quality of Greek-style drinking yoghurt made by incorporating mozzarella cheese whey with different concentrations. The whey obtained from the pizza mozzarella cheese-making process was used for the study. Different concentrations (T1:60%, T2:65%, T3:70%, T4:75%, T5:80%) of whey were mixed with fermented Greek yoghurt, and the control sample was produced by mixing 60% water and 40% Greek yoghurt. A sensory test was conducted for the sensory attributes and overall acceptability separately using ten trained panelists with five points hedonic scale. The highest consumer acceptance formula was analyzed for pH and the titratable acidity within three days intervals of 14 days at 4oC of the storage period. Proximate analysis was done for moisture, total protein, total sugar, carbohydrate, fat, and ash in the selected formula. All the parametric data were analyzed using one-way analysis of variance (ANOVA) and non-parametric data were analyzed using the Minitab software package. Greek-style drinking yoghurt with 75% whey acquired the highest sensory acceptance. The titratable acidity for treatment with 75% whey yoghurt drink increased during storage life from 0.17±0.001 to 1.19±0.005 and the pH value declined from 6.06±0.003 to 5.96±0.005. According to Sri Lankan standards, titratable acidity and pH values were within the acceptable limits for 14 days of storage period. Proximate analysis carried out according to the AOAC procedures revealed that the fat content of 1.62±0.004, protein content of 1.33±0.005, moisture content of 89.95±0.0008, ash content of 0.72±0.0009, total sugar content of 4.62±0.006, carbohydrate content of 7.36±0.0009, and total energy of 48.53±0.006 kcal/100g were in the yoghurt with 75% whey. The yeast and molds, and coliform were not detected in the yoghurt with 75% whey. According to the results, it can be concluded that Greek-style drinking yoghurt with 75% whey has the best sensory attributes, and chemical and physiochemical parameters in fourteen days of storage life without adding any chemical preservative.

Keywords: *Greek-Style Drinking Yoghurt, Mozzarella Cheese Whey, Quality, Sensory*

Mineral Profile of Whole Grains of Wild *Oryza* Species in Sri Lanka

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This study evaluated the mineral profile of wild *Oryza* species in Sri Lanka. The whole grains of *Oryza nivara, Oryza rufipogon, Oryza eichingeri, Oryza granulata*, and *Oryza rhizomatis* were assessed for 20 minerals (n=4 each; mg/kg) which consisted of macro minerals (K, Mg, Ca, Na, Fe), micro minerals (Zn, Al, Mn, Cu, Ni, Cr, Se, Co, Ba, Ag, Si), and heavy metals (As, Hg, Pb, Cd). Samples were analyzed using intra-laboratory validated test methodologies combined with inductively coupled plasma mass spectrometry (ICP-MS). Results showed significant differences (p <0.05) among the studied species for macro minerals, micro minerals, and heavy metals. Among macro minerals Fe (84.74±0.73) and Na (45.37±2.04) were significantly high (p <0.05) in *Oryza rhizomatis* while both *Oryza rhizomatis* (1533.10±58.09) and *Oryza nivara* (1506.47±48.71) showed the highest Mg content. In contrast, K and Ca contents were significantly high (p <0.05) in *Oryza nivara* (2273.84±79.02) and *Oryza granulate* (2339.73±58.48) respectively. Among important micro minerals, Zn (44.04±2.78), Al (23.11±1.82), Cr (2.69±0.05), and Co (0.08±0.00) were significantly high (p <0.05) in *Oryza rhizomatis*, while Cu (7.85±0.49) and Se (0.82±0.03) were significantly high (p <0.05) in *Oryza eichingeri* and *Oryza rufipogon*, respectively. Both *Oryza eichingeri* and *Oryza granulate* were free of tested heavy metals. However, *Oryza rhizomatis* (Hg & As) and *Oryza nivara* (As) were found to exceed the CODEX Alimentarius maximum allowable limits for certain minerals. Thus, it can be concluded that wild *Oryza* species in Sri Lanka are rich in macro and micro minerals. However, further studies are required to confirm the presence of exceeded levels of heavy metals in certain species. This is the first study to report mineral profile of wild *Oryza* species in Sri Lanka and, notably, is the first globally to report the mineral profile of *Oryza rhizomatis*, an endemic wild *Oryza* species in Sri Lanka.

Keywords: *Mineral Profile, Macro Minerals, Micro Minerals, Heavy Metals, Wild Oryza Species*

Evaluation of a F1 Hybrid Tomato Progeny for Morphological Attributes and Bacterial Wilt Resistance

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Tomato production in Sri Lanka suffers due to bacterial wilt, with limited resistance breeding efforts. The present study was conducted to screen the morphological attributes and bacterial wilt resistance of F1 hybrids between cultivar "Chena" and "Thilina". The "Chena" known for its resistance to bacterial wilt, and the high-yielding yet susceptible variety "Thilina", were utilized as parents. When parents reached reproductive maturity, emasculation, and hybridization were performed to develop F1 hybrids. Two parental lines and 153 F1 hybrids were evaluated as a pot experiment in a completely randomized design. The plant height, leaf area index, and number of branches were assessed as the parameters that determine the plant architecture. The F1 hybrids had inherited a similar architecture to the cultivar "Chena". Most of the yield characteristics of the cultivar "Thilina" were inherited to the F1 hybrids. The average number of seeds per fruit (40.3±0.279) and total soluble sugar content (7.5±0.27) were increased in F1 hybrids compared to "Thilina" (p<0.05). Days to flowering (38.5±0.098) and days to ripening (32±0.632) were reduced in the F1 hybrids compared to "Thilina". The number of fruits per plant (33.4±0.121) and the fruit size (16.18±0.142 cm) were significantly higher in F1 than the "Chena" and were not significantly different from "Thilina" (p<0.05). The heterosis analysis revealed that the F1 was superior to the better parent "Thilina" in terms of chlorophyll content (9.9), number of flowers (66.67), number of seeds per fruit (60.75), and the total soluble sugar content (54.5). Correlation analysis identified chlorophyll content and plant height as significant morphological markers for predicting days to flowering (p<0.001). One F1 genotype was highly resistance to bacterial wilt. Fourteen were resistant and two were moderately resistant. The F1 hybrids had a significant variation and out of that, five superior phenotypes were selected in terms of high yield and bacterial wilt resistance.

Keywords: *Tomato, Bacterial Wilt Disease, F1 Hybrids, Morphological Attributes, Heterosis*

Yield Evaluation and Molecular Screening of Selected Sunflower Accessions for High Oleic Acid Content and Downy Mildew Resistance

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There are rarely any proper records on evaluating available sunflower accessions in Sri Lanka. The high oleic acid content of sunflower is very important for heart disease due to its rich monounsaturated fatty acids. Downy mildew is a major disease caused by the fungus *Plasmoparahalstedii* in sunflower cultivation. The objective of the study was the molecular screening of selected Sri Lankan sunflower accessions for high oleic acid content and downy mildew resistance. The genetic characterization of fifteen sunflower accessions was carried out using four molecular markers (HA77, ORS610, F13-R5, and Fsp-b-R1). These markers were aimed to identify accessions with genes for downy mildew resistance (*Plarg and Pl13*) and high oleic acid content (FAD2-1D and FAD2-1). The DNA from these accessions was extracted using an optimized CTAB method. The obtained band patterns were analyzed using R software to create a dendrogram. The optimized DNA extraction protocol gave a DNA concentration of 200–700 ng μL^{-1}. The selected four molecular markers were recommended as promising for screening of the future sunflower inbred lines for high oleic acid content and downy mildew resistance. According to the dendrogram, three accessions (ACC#005967, ACC#005955, and ACC#005957) had all the markers. The ten accessions (ACC#005949, ACC#005951, ACC#005953, ACC#005955, ACC#005957, ACC#005967, ACC#005970, ACC#14055, ACC#005971, and ACC#005946) showing at least one gene for downy mildew resistance were identified. Thirteen accessions (ACC#005949, ACC#005951, ACC#005953, ACC#005955, ACC#005957, ACC#005960, ACC#005967, ACC#005970, ACC#14055, ACC#005959, ACC#005950, ACC#005946, and ACC#005958) were identified as harbouring at least one gene associated with high oleic acid content. The seed yields of three accessions (ACC#005967, ACC#005955, and ACC#005957) with all the markers for high oleic acid content and downy mildew resistance were significantly higher with 1674.1 kg/ha, 1362.9 kg/ha, and 1630 kg/ha respectively. These three accessions (ACC#005967, ACC#005955, and ACC#005957) were selected as superior for high yield, high oleic acid content, and downy mildew resistance.

Keywords: *Sunflower (Helianthus annuus L.), Downy Mildew Resistance, High Oleic Acid Content, Molecular Markers, Sunflower Accessions*

Effect of Parental Sex Ratio of Genetically Improved Farm Tilapia (GIFT) on Growth and Reproductive Performance in Cage Culture

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The research aimed to investigate the impact of parental sex ratio on the growth and performance of genetically improved farm tilapia (GIFT) (*Oreochromis niloticus*) in cage culture. A total of 330 fish (80 males and 250 females) were randomly assigned to four separate treatment groups according to the female: male ratio of the brood fishes (T1=2:1, T2= 4:1, T3=5:1, Control=3:1) respectively with completely randomized design. Each treatment was run simultaneously in triplicate with 60 fish per tank at a density of 2 fish/m^2. Fish were held in 9 rectangular tanks of 30 m^3 each (10×3×1 m) and half-filled. Brood-stock fish were fed a commercial diet containing 35% protein at a feeding rate of 3% of their body weight twice daily. The length and weight of female fish in centimeters and grams were recorded until spawning. The eggs were collected and counted every two weeks after stocking up to day 63 using a counting spoon, where one spoonful is equivalent to 1000 eggs. Reproductive events were detected with the observation of viable fries emerging from the water surface to breathe. The hatchability percentage was calculated. Data were analysed by one-way analysis of variance (ANOVA) using SAS software. The 3:1 ratio exhibited the highest average length and weight among female fish, although the differences were not statistically significant compared to the other ratios. Among the tested ratios, the 4:1 ratio showed the highest egg production and hatchability percentage compared to other ratios. However, these differences were not statistically significant compared to the other ratios. The research highlighted the importance of optimizing parental sex ratios to improve reproductive output in GIFT tilapia. Using a 3:1 ratio as a control, the study found that the 4:1 female-to-male ratio achieved the highest breeding efficiency. This suggested that maintaining a 4:1 ratio is key to maximizing egg production, providing valuable insights for enhancing local GIFT tilapia breeding practices in aquaculture.

Keywords: *Oreochromis niloticus (GIFT Thilapia), Parental Sex Ratio, Growth, Reproductive Performance, Cage Culture*

The Development of a Feeding Protocol for Climbing Perch (*Anabas testudineus*) Larval Stage under Induced Captive Breeding

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This study aimed to develop a feeding protocol for the Climbing Perch (*Anabas testudineus*) larval stage under induced captive breeding. The selected brood fishes were fed with a high-protein supplementary diet (38-42% crude protein) 3-4% of the fish biomass per day until they reached sexual maturity, managed over one and a half months. The matured brood fishes were selected based on secondary sexual characteristics, with a sex ratio of 2 females to 1 male to enhance fertility. Gonadotropin-Releasing hormone (GnRH) was injected intramuscularly to induce spawning. Fertilized eggs, transparent and floating on the water surface, were collected for analysis. The fertilized eggs were incubated in stagnant water in glass tanks for 12-15 hours at 26-28 ºC water temperature. Embryo development was monitored hourly using a light microscope from the moment the eggs were laid. The regular water exchange, feeding, and thinning of hatchlings were done. In 15 days of rearing the spawn attained a size range of 12-16 mm. Up to that stage, all the larvae were fed with chicken eggs for 2 weeks. Two-week-old larvae were divided into two groups according to the feeding protocols. The feeding trial was carried out for one (01) month. Feeding Protocol 01 (treatment group), the larvae were fed chicken eggs for the initial two weeks followed by one week of artemia and one week of daphnia. Subsequently, from this stage until reaching the fingerlings stage, the larvae were fed Formulated Feed Pellet No 00. Feeding Protocol 02 (Control) involved exclusively feeding Formulated Feed Pellet No 00 to the 2-week-old larvae for a duration extending up to 6 weeks. Water quality parameters, including temperatures of 26.66°C and 27.62°C and pH levels of 8.05 and 7.8 maintained within acceptable limits for both groups during feeding trial. The number of fertile and infertile eggs, and fingerlings counts were sampled with a 100ml beaker of water and counted using a counting cup for accurate measurement. Data were statistically analyzed using two-sample t-tests in SAS software. Results showed that the treatment group had significantly higher fingerlings ($p < 0.05$) than the control group. Although the number of eggs laid and infertile eggs was higher in the treatment group, the difference was not statistically significant. These findings suggest that Feeding Protocol 01 can enhance larval survival in the critical larval stage, offering valuable insights for improving aquaculture practices for Climbing Perch.

Keywords: *Anabas testudineus, Feeding Protocol, Larval Stage, Induced Captive Breeding*

Evaluation of Heat Tolerance in Tomato (*Solanum lycopersicum L.*) Breeding Lines under Protected House and Open Field Conditions

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Tomato (*Solanum lycopersicum L.*) holds significant economic value as a cash crop for farmers globally, cultivated in both open-field and greenhouse conditions. High temperature develops heat stress in tomatoes adversely affects vegetative growth as well as the reproductive stage and it may cause a reduction in yield and fruit quality. Therefore, the objective of this study was to assess the adaptability and heat tolerance of 26 advanced breeding lines of tomato developed by the Asian Vegetable Research and Development Center (AVRDC) in Taiwan. The study was conducted as two experiments viz., elevated temperatures (32 - 43 °C) under the polytunnel (experiment 1) and open field (27 - 34 °C) conditions (experiment 2) at the research and development farm of Onesh Agri (Pvt) Ltd, Giriulla. Based on the experiment 1 (Completely Randomized Design) the observed yield under elevated temperatures, the nine breeding lines with the highest fruit yield were selected for further evaluation. The HTO20 demonstrated the highest yield (66.59±8.58 t/ha), and no significant difference was observed with HTO18, HTO25, HTO7, HTO9, HTO24, HTO17, HTO8, and HTO23. However, all these nine lines showed significant differences with a heat-tolerance variety KC-1 recommended by the Department of Agriculture which yielded 11.31±2.76 t/ha. In terms of morphological traits, HTO7 exhibited the tallest-grown among others and the highest new leaf formation among all other breeding lines tested. The control variety KC-1 recorded the lowest flower-to-fruit ratio (44.1±8.12), while HTO18 reported the significantly highest ratio (97.7±1.43). Furthermore, HTO18 (196.4±11.26), recorded with the highest number of fruits per plant, and HTO8 (71.8±16.57 g) produced the heaviest fruits. Therefore, it can be concluded that these identified nine promising breeding lines will be used in the future as parental materials for the development of heat tolerance tomato varieties adaptable to Sri Lankan farming conditions.

Keywords: *Breeding Line, Heat Resistance, Tomato*

Design and Development of a Machine for Paddy Bubble Tray Seedling Transplanting

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Appropriate crop establishment bears a significant impact on the yield and overall productivity of paddy cultivation. Transplanting is recognized as the highest-yielding method, while seed broadcasting, which is the most common practice in Sri Lanka, engenders the lowest yield. Bubble tray (Parachute) seedling broadcasting facilitates rapid root establishment, and reduces the transplanting shock, though skilled labour is required for uniform seedling broadcasting. In this study an attempt has been made to design and fabricate a simple machine for transplanting bubble tray seeded paddy seedlings in row arrangement, supporting mechanised cultural practices and potentially enhancing productivity. The machine's design and development involved a combination of conceptualising, 3D Computer-Aided Design modelling, and a trial-and-error approach. The machine consists of a tray holder (matches the size of a standard bubble tray), conveyors, a seedling lifting, and conveying unit, a robust support frame, a buoyant element connected with a propulsion unit, and electrical power transmission accessories. The seedling lifting and conveying system was designed to facilitate the smooth pickup and delivery of seedlings from the bubble tray to the delivery tube. An electrically powered (12 V battery) customizable control system was developed to optimise the speed of plant lifting and conveying using pulse width modulation. The machine was designed to cover the standard width of six rows, and customizable inter-row (0.15-0.20 m), and intra-row spacing is controlled by the moving speed. The developed prototype was tested indoors at 0.65 ms^{-1} nominal speed using 10-day-old bubble tray seedlings. The machine is capable of transplanting a hectare within 8 hours at the expense of 16 hours of supportive labour. Upgrading of the machine is presently being undertaken including material optimization and other technical refinements, together with field trials. The developed machine offers precise plant spacing, and is suited for small land holdings, and can be driven by clean energy.

Keywords: *Bubble Tray Seedlings, Computer-Aided Design (CAD), Paddy, Transplanting*

Predicting Soil Erosion and Sediment Yield in the Kelani River Basin, Sri Lanka: A SWAT Model Approach

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The study uses the Soil and Water Assessment Tool (SWAT) to evaluate sedimentation and soil erosion in the flood-prone Kelani River Basin in Sri Lanka, focusing on the Hanwella Meegoda sub-basin. Five strategic sampling locations—Galagedara, Artigala, Habarakada, Liyanwela, and Weliyakadawata—were chosen, and water samples were collected bi-weekly for analysis. Sedimentation rates were determined using the gravimetric method. The SWAT model was employed and integrated with ArcGIS 10.4.1. A Digital Elevation Model (DEM) with a resolution of 30×30 meters was used for watershed delineation, and thematic maps for soil (30 m), land use (30 m), and slope (30 m) were created. Weather data from the nearby Hanwella weather station was incorporated into the model. Calibration and validation were performed using SWAT-CUP (2012). Sedimentation rates were ranged from 0.007 to 0.080 g/L. SWAT effectively simulated continuous monthly streamflow and sedimentation patterns in the Kelani River Basin. Statistical measures for model performance showed an R^2 value of 0.77 for calibration and 0.78 for validation. The SWAT model demonstrated strength in catchment modeling, with R^2 values above 0.5 considered acceptable. The R^2 values were 0.75 for calibration and 0.79 for validation, respectively. Therefore, the overall performance of the model in terms of PBIAS and RSR is satisfactory, and the calibration for R^2 is acceptable for the Hanwella station. The study encountered challenges due to data unavailability, limitations of the SWAT plant database, and potential shortcomings in simulating urban stormwater. By addressing these challenges, the study aims to improve the accuracy and reliability of hydrological modeling in urban environments.

Keywords: *GIS, Sedimentation, Soil Erosion, SWAT Model, Watershed Management*

Development of Lichen-based Bio-indicator Method to Determine the Air Pollution Level in Sri Lanka

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Monitoring air quality using lichens as bioindicators, based on their diversity and frequency, is crucial in tropical regions with varying pollution levels, as it provides essential insights into environmental health. This study attempts to assess and correlate the use of corticolous lichens with atmospheric NO_2 and SO_2 in Colombo, Kalutara, Gampaha, and Kandy districts in Sri Lanka. Fifteen sampling locations, each having five sub-locations, were selected. The coverage and frequency of lichens found on randomly selected trees were recorded by 169 cm^2 grids and were identified using hand lens (10x) and a stereo microscope based on morphological characteristics. Data of lichen diversity were formulated the index of atmospheric purity (IAP). The mapping of the spatial distribution of lichens and air pollutants was done using inverse distance weighting (IDW) surface interpolation of geographical information system (GIS) based on IAP values and environmental pollutants. The genera *Dirinaria, Graphis*, and *Cryptothecia* were the dominant lichen species followed by the family *Caliciaceae*, *Graphidaceae*, and *Arthoniaceae* respectively. The Shannon-Wiener index (1.1568 to 0.5538) and Pielou's evenness index (2.7081 to 1.0000) values expressed a decreasing pattern from low to high polluted locations. The genus *Dirinaria* presence was identified as a reliable pollutant-tolerant indicator. IAP did not show a correlation (IAP with NO_2 is -0.409 and IAP with SO_2 is -0.256) with levels of both pollutants. Some locations previously identified as having low and moderate pollutant levels were recognized as high-pollution areas by this study. Principal component analysis (PCA) showed all locations, except for one location (94.82) were atmospherically highly polluted. Some locations were identified as critically polluted, with two locations falling under the category of moderate polluted. This study concludes that corticolous lichens are effective bioindicators for monitoring air quality in tropics.

Keywords: *Air Pollution, Lichen Diversity, Bioindicator, Index of Atmospheric Purity, Principal Component Analysis*

Exploring Youth Perception and Response to Climate Change: A Study of Kalutara District, Sri Lanka

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Youth engaged in climate actions are important multi-disciplinary actors who play the biggest role in sustainable change by coming up with new solutions and fresh perspectives. Prominent global frameworks such as Action for Climate Empowerment (ACE) and the Geneva Charter advocate for active youth participation in dealing with environmental challenges like climate change. However, the extent of Sri Lankan youth's understanding and participation in climate action remains unclear, with limited local research on the topic. This study aims to assess climate change awareness among Sri Lankan youth, identify their involvement in climate actions, analyze engagement barriers and motivators, and provide recommendations for enhancing their participation in decision-making processes. The research was conducted in the climate-vulnerable Kalutara district, employing a mixed-methods approach. Data was collected from 100 young individuals aged 15-24 through online questionnaires and face-to-face interviews, with quantitative and qualitative data analyzed using SPSS and NVivo software, respectively. Findings reveal that 73% of youth were familiar with climate change, primarily through social media rather than formal education. They associate climate change with increased temperatures, altered rainfall patterns, and more frequent natural disasters. While family and friends influenced youth engagement, 71% were not involved in climate action. Youth showed greater concern for mitigation than adaptation, despite the latter's importance in the Sri Lankan context. From their perspective, frequent natural disasters and biodiversity degradation were the most impacted areas, with 76% believing human interventions significantly contributed to climate change. Although organizations are addressing climate change in Sri Lanka, 71% of youth felt these efforts were insufficient. Most youth believed that government policies and support could help overcome climate change-related barriers and suggest integrating climate change into the education curriculum to foster initiatives. The study's relatively small sample size and convenience sampling method may limit the generalizability of the findings. This research enhances the understanding of youth engagement in climate action, providing insights to strengthen climate resilience and sustainability in Sri Lanka.

Keywords: *Climate Change, Youth, Perception, Response, Sri Lanka, Youth Perspectives*

Development of Automated Water Sampler for Microplastic Analysis in Aquatic Environment

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Microplastic contamination is becoming a critical environmental issue, affecting the aquatic ecosystem and human health. Traditional manual sampling techniques are time-consuming labour-intensive. This research presents an automated water sampler for the microplastic analysis, which offer greater efficiently and high reliability for microplastic analysis in different environments. The sampler is a customized cylindrical steel unit equipped with dual sieves (0.3 mm and 5 mm) to capture a range of microplastic particles. The thrusters assembled using the mecanum wheel technique provides superior manoeuvrability with a total of six thrusters assembled. Advanced electronics, including pressure sensors, gyroscopes, compasses, and other sensors, ensure robustness and accuracy. The control system is programmed by the Arduino, which facilitates the precise vertical and horizontal movement of the sampler which is optimizing the sampling process. Three extensive field trials conducted in aquatic environments clearly show that the sampler significantly surpasses manual methods. It detects 67% more plastic than manual methods, allowing continuous and consistent sampling that effectively reduces labor intensity and minimizes human errors. The combination of advanced electronics and sensors, coupled with standardized sampling protocols, resulted in increased accuracy and confidence levels of nearly 95%. The sampler was notably more effective, with detection limit as low as 0.3 mm for microplastic particles compared to traditional methods. This system is revolutionizing microplastic monitoring, demonstrating its capability to operate in various environments, such as freshwater and coastal marine waters, which can significantly contribute to environmental policy and conservation strategies.

Keywords: *Automated Sampler, Microplastic Pollution, Microplastic Sampler*

Evaluating the Efficiency of Chromium (VI) Removal Using Iron Oxide-Coated Super Sand for Tannery

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The study aimed to indicate the concern by assessing its effectiveness in removing Chromium (VI) from tanning wastewater. Tannery industries utilize trivalent chromium in the tanning process to treat animal hides. However, under certain conditions, this trivalent chromium can undergo a transformation into hexavalent chromium, which poses health risks to humans. The batch adsorption was conducted by varying dosages and time interval. To study the adsorption isotherm, the optimum conditions found in optimization dosage of 15 g/L was used for isotherm studies. The experiments were conducted by setting Cr (VI) concentration, pH, adsorbent dosage, and agitation speed constant to determine the kinetics. Various techniques such as furrier transfer infra-red (FTIR) spectroscopy, scanning electron microscope (SEM), and Raman spectroscopy analysis were employed to characterize the removal of chromium from an aqueous solution using iron oxide-coated super sand (IOCS). The statement suggests that the combination of SEM and energy-dispersive X-ray analyser (EDX) analyses provided visual and elemental evidence that the sand underwent a successful coating process with iron oxide (FeO). SEM showed changes in surface morphology. Batch mode adsorption experiments were conducted to investigate the impact of different operating factors, including contact time, dose, and initial Cr (VI) concentration. With an initial concentration of 2 mg/l, the maximum percentage removal of Cr (VI) was determined to be 99%. The optimal pH for Cr (VI) removal was identified as being in the range of 5-6, and the dosage test suggested using 0.3 g of IOCS in 20 ml of solution. Adsorption kinetics studies indicated rapid sorption within the initial 10 minutes, where 99% of adsorption occurred. The pseudo-second-order kinetics model was the best fit, confirming chemisorption as the primary adsorption mechanism. The Freundlich adsorption isotherm model was found to be the best fit for the adsorption isotherm.

Keywords: *Iron Oxide Coated Sand, Chromium (VI), Adsorption, Isotherm, Batch Experiment*

Sustainable Production of Reinforcement Concrete Slabs Utilizing Waste Tire Steel Fibers

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An industrial facility in Puttalam, Sri Lanka, produces oil from waste tires using the pyrolysis method, generating steel fibers as a byproduct and improper handling of these fibers can have negative effects on the environment and human health. A comprehensive plan has been developed to tackle this challenge and transform steel fibers into a sustainable opportunity. The plan entails the integration of waste tire steel fibers into the concrete slab manufacturing process intended for residential structures. This novel approach aims to dispose of waste material in an efficient manner while lowering the construction industry's dependency on virgin materials, thus augmenting sustainability. Various studies have explored the incorporation of fiber pieces into concrete production, but this study differentiates itself by focusing on a unique application of steel fibers and this study takes a novel stance by employing waste tire steel fibers as reinforcement bars. When the three reinforcing techniques were evaluated, Model 1, which used the conventional method, demonstrated a high flexural strength of 3.845 N/mm². Model 2 showed the maximum flexural strength of 3.92 N/mm², making it the most effective strategy and a better option for reinforcing concrete panels. In contrast, Model 3 was considered a failure, producing a lower flexural strength of 2.224 N/mm², suggesting faults in the tire steel fiber distribution. Additionally, elongation was lower in Models 2 and 3 when compared to Model 1. This thorough analysis indicates that using the reinforcement strategy used in Model 2 is advised for best outcomes.

Keywords: *Conventional, Comprehensive, Elongation, Reinforcement, Steel Fibers.*

Removal of Nitrate and Phosphate in Municipal Landfill Leachate through Phytoremediation Technique using *Heliconia psittacorum*

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Municipal landfill leachate is a significant environmental concern in Sri Lanka, contaminating surface and groundwater due to unregulated dumpsites. Nitrate and phosphate substances in landfill leachate contribute to eutrophication, harming aquatic ecosystems. Proper treatment of these leachates before discharge into the environment is crucial. This study aims to investigate the effectiveness of *Heliconia psittacorum* in removing nitrate and phosphate from leachate and its practical applicability as a sustainable and eco-friendly treatment option for landfill leachate management. In the present study, the effectiveness of *Heliconia psittacorum* was tested for the phytoremediation of landfill leachate for 28 days. Fifteen plastic containers were used in the experimental setup where *Heliconia psittacorum* plants were fitted as a floating bed with the help of bamboo rafts. Nitrate concentrations were determined using APHA standard 4500-NO_3- -B-UV spectrophotometric screening method, while phosphate concentrations were determined using APHA standard 4500-P C-Vanadomolybdophosphoric acid colourimetric method. *Heliconia psittacorum* plants significantly ($p < 0.05$) reduce the nitrate from landfill leachate. The maximum reduction (59.94±1.19%) in nitrate concentration was obtained with 25% landfill leachate treatment, and the removal rate gradually increased throughout the experiment period of 28 days. A dose-response relationship was suggested, with lower treatment concentrations (25% treatment) being more effective. However, phosphate concentrations did not show significant reductions ($p > 0.05$) across the studied concentrations. The highest removal rate of phosphate was observed in 25% treatment (91.35±0.09). The study indicated that *Heliconia psittacorum* effectively removes nitrate and phosphate pollution from landfill leachate. The research recommends further investigation into seasonal variations in the phytoremediation potential of *Heliconia psittacorum* using landfill leachate and considering climatic variables. It advocates for long-term studies to assess the adaptability of *Heliconia psittacorum* and other suitable plants under high leachate concentrations.

Keywords: *Landfill Leachate, Phytoremediation, Heliconia psittacorum, Nitrate and Phosphate Concentration*

The Assessment of Surface Water Quality in Kerawalapitiya Waste Management Park, and its Vicinity, Sri Lanka

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Ground and surface waters can be contaminated by landfill leachate, which is considered a major environmental concern. The research aims to evaluate the chemical composition of the leachate produced at the Kerawalapitiya Waste Management Park (KWMP) and assess the surface water quality in its vicinity. Twelve sampling points were identified, and coordinates were recorded. Surface water samples were collected monthly during the year 2023 from surface water bodies surrounding KWMP at various distances using acid-washed polypropylene bottles. Samples were transported in ice boxes at 0 to 5 °C for laboratory analysis, while some parameters were tested in the field. Parameters tested included pH, electrical conductivity, dissolved oxygen, total dissolved solids, turbidity, ammonia, nitrate, phosphate, chloride, sulphate, chemical oxygen demand, biological oxygen demand, and various metals (i.e., chromium, manganese, cadmium, zinc, copper). The Water Quality Index (WQI) for the surface water samples was calculated using nine parameters: pH, dissolved oxygen, nitrate, chromium, manganese, cadmium, zinc, arsenic, and copper. Each parameter's weight was assigned based on its importance to water quality, and the WQI was computed following the standard methodology. All sampling points had WQI values ranging from 141.74 to 660.01, all classified as "very poor" according to the standard method. The findings indicate that the KWMP significantly impacts the water quality of its surrounding surface water bodies. The negative correlation between WQI and distance indicates that pollution levels decrease as the distance from the KWMP increases.

Keywords: *Dutch Canal, Hamilton Canal, Kerawalapitiya Waste Management Park, Leachate Pollution, WQI*

Design and Development of a Cost-Effective and Versatile 6 DoF Robotic Manipulator for Small and Medium Enterprises

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To compete with well-established and reputed large-scale business organizations in the rapidly growing global market, there is a significant demand in small and medium enterprises (SMEs) to improve their operations with highly automated systems, especially with robotic systems to enhance the quality of products, and production rate while reducing the cost of the product. This research study focuses on developing an affordable robotic manipulator (RM) capable of executing various industrial tasks such as welding, material handling, and assembling. Manufacturability and serviceability were considered during the conceptualizing stage and Computer-Aided Design (CAD) stage. The geometric model of the system was developed and optimized using SOLIDWORKS software. Comprehensive simulations were done to validate the RM's structural strength, load capacity, and range of motion while maintaining a lower weight for the system. The results demonstrate that the RM meets essential performance requirements for SMEs, such as simplicity in design and versatility while maintaining cost efficiency that is affordable for SMEs. At the same time, the RM's repeatability was tested through repeated assessments within predetermined spatial coordinates using a dial gauge setup. The system was capable enough to maintain a maximum deviation from +0.5 mm to -0.5 mm for 100 repetitions showing a cumulative average error in the range of 0 to -0.25 mm, which is applicable for industrial automation applications. By providing a cost-effective alternative to expensive robotic systems, this research facilitates the use of relevant automation improvements for SMEs, enabling them to enhance their operational efficiency and productivity through automation. In conclusion, the study highlights the potential of a well-designed, cost-effective 6 DoF RM to meet the demands of modern SMEs.

Keywords: *Robotic Manipulator (RM), Small and Medium Enterprises (SME), Cost-Effectiveness, Design and Simulation*

Engineering Novel Cu_2O Nanowire-based Shish-Kebab Structures with Controlled Morphologies for Enhanced Photocatalytic Applications

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Cuprous oxide (Cu_2O) micro/nanostructures of different forms can be fabricated using varying techniques under controlled growth conditions. Such conditions can be employed to obtain structures in the form of needles, wires, cubes, spheres, hexagons, and hollow tubes, etc. having p-type or n-type conductivity. The present study shows the fabrication of novel Cu_2O based nanowires having shish-kebab type structures suitable for potential applications in photocatalysis. These nanowires were grown on Ti/Cu substrates using anodization followed by annealing in a nitrogen environment at 400 °C for 30 minutes in a tube furnace. Subsequently, Cu_2O grains were electrodeposited onto the nanowires using an aqueous solution of 0.1 M sodium acetate (CH_3COONa) and 0.01 M copper acetate ($Cu(CH_3COO)_2$) for 20 minutes to form the shish-kebab structures. The crystalline morphologies were changed by maintaining the electrodeposition potentials at -200 mV, -250 mV, and -300 mV respectively. The structure and morphology of the fabricated materials were characterized using X-ray diffraction and scanning electron microscopy techniques. The results showed that the subsequent electrodeposition potential was critical in forming the Cu_2O nanostructures having distinct shish-kebab morphology observed at a deposition potential of -250 mV. These Cu_2O nanostructures have a significant potential to enhance photocatalytic activity due to the formation of additional active sites arising from the increased effective surface area compared to microcrystalline Cu_2O thin films.

Keywords: *Cu_2O Thin Films, Shish-Kebab Nanostructures, Photocatalytic Activity, Electrodeposition*

Optimization of Elephant Tranquilizer Dart Shooting Performance with 3D Printed Aerodynamic Modifications

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Remote drug delivery methods such as dart shooting play an important role in the medical treatments of wild elephants worldwide. According to the current limitations of the rifles, the person who shoots should be within the effective range of the gun, at the same time keeping a proper distance between the animal and the medical officer is essential to ensure the safety of the person to minimize the life-threatening situations. Enhancing the effective range of the dart shooting is significantly demanding and that can be done by improving the performance of both the gun and the dart. Several factors such as the power of the explosives, weight of the darts, the shooter's ability control recoil, environmental conditions, and drag forces play key roles in the performance of the dart shooting. This study discusses reducing the drag coefficient by analyzing the aerodynamic behaviour of the dart computationally and proposing the 3D-printed aerodynamic modifications to increase the effective range of dart shooting. Aluminum alloy darts used in powder-charged rifles which are widely used in the treatment of wild elephant were taken into the analysis. The Computer-Aided Design (CAD) model of the dart was created using SOLIDWORKS software and the Computational Fluid Dynamics (CFD) analysis was done using ANSYS to evaluate the pressure distribution, drag force, and drag coefficient of the object. By analyzing the pressure distribution under the moving conditions of the dart, four aerodynamic modifications with varying taper angles and surface types were proposed. The modified dart with each modification reduced both the drag coefficient and drag force by 8.5% to 9.3% compared to the original dart's performance, significantly improving the effective range of the dart shooting process.

Keywords: *Remote Drug Delivery, Drag Coefficient, 3D Printing, Computer-Aided Design, Computational Fluid Dynamics*

Underwater Rover to Monitor Marine Environment around Corals

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This research focuses on the design and development of Aquabot as an Autonomous Underwater Vehicle (AUV) customized for surveying corals and acquiring information on the surrounding environment of the corals. The developed Aquabot comprises the underwater robot, the control dashboard, and the Human-Machine Interface (HMI). Aquabot includes a sensor unit, a propulsion system, and a data processing system to assist in discovering underwater environments. It also consists of sensors such as pH sensor and conductivity sensor to measure marine water parameters around the corals. The Aquabot also has IoT-based commands using a PS-4 controller console as a controlling unit. The maximum depth that can be handled is four meters while the included sensors detect important characteristics like temperature and pH of the water. After the calibration, the temperature sensor reading, and pH sensor readings were the same as the actual readings and they were transmitted to the dashboard in real-time. The communication media used in this system are cable and cloud in a blended manner. The principal controller is a Raspberry Pi 3, and two Arduino Nanos are connected to the Raspberry Pi 3 working as slaves. The field tests were carried out on an artificial water body to establish the performance, reliability, and accuracy of the Aquabot data collection. The calculated density of 1.155 g/cm^3 is close to that of water, ensuring buoyancy and allowing the robot to float back to the surface if there is a fault. Finite element analysis (FEA) of the shell, done in SOLIDWORKS, focused on the lightweight stainless-steel structure, which is 1mm thick. Simulations showed that the total mass was 3611.2 g, with yield strength of 480 MPa and elastic modulus between 190-210 GPa. Anti-collision performance simulations were carried out on the design, which denoted that arc-shaped front and rear ends reduce resistance, while flat sides increased lateral resistance.

Keywords: *Autonomous Underwater Vehicle, Coral Growth Monitoring, Marine Environment Monitoring*

IoT-based Intelligent System for Irrigation and Application of Plant Nutrients

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Conventional methods of irrigation and fertilization often lead to application inefficiencies, suboptimal crop yields, and environmental degradation. This project aims to develop an IoT-based intelligent system for irrigation and nutrient application to improve efficiency, enhance crop yields, and promote sustainable farming practices. This system utilizes IoT technology to monitor real-time meteorological data, soil nutrient content, and soil moisture levels to make precise decisions on irrigation and fertilization. The system comprises sensors that measure temperature, humidity, wind speed, light intensity, atmospheric pressure, soil moisture, and soil nutrients. The sensors were well calibrated and the collected real-time data were integrated with the Penman method for evapotranspiration calculations, enabling more responsive and accurate irrigation scheduling. The OpenWeather application (an online service) has been used to collect supportive data for evapotranspiration analysis. Subsequently, a fuzzy logic-based algorithm has been developed for a comprehensive understanding of soil moisture content based on five distinct levels: very dry, permanent wilting point, 50% allowable depletion, field capacity, and saturated soil moisture for intelligent irrigation. Soil water requirement and plant nutrient uptake of two widely cultivated crops, chilli (Capsicum frutescens) and tomato (Solanum lycopersicum), were used as the basal data for sensor calibration and system development. The physical system comprised a real-time meteorological data collection unit (mini-weather station) and a portable device to monitor soil nutrients (NPK sensor) and soil moisture. The algorithms developed provide evapotranspiration and irrigation needs based on the sensor inputs. The decision on the soil nutrient application was made by comparing the real-time data against the recommended nutrient requirement of the different growth stages. The study reveals that integration of the localized real-time sensor data with the Penman method estimates the crop water requirement accurately and ensures timely and precise irrigation schedules. Upon systematic validation, the developed system would offer a scalable solution to various agricultural settings (crop and agro-climatic conditions).

Keywords: *Fuzzy-Logic, Intelligent System, IoT, Irrigation, Plant Nutrients*

Light Intensity to Optimize the Growth of Aquatic Macrophyte *Hydrilla verticellata*

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This study examined the impact of light intensity on the growth of aquatic plants selecting Hydrilla verticelata as the experimental plant. Hydrilla can serve as a valuable food source for aquaculture species. Optimizing its growth through light management can enhance aquaculture productivity and reduce feed costs. This experiment was done at an indoor aquarium (capacity = 30 L) as the experimental unit. There were three treatments according to light intensity, viz 1500, 2000 and 2500 lux while the control group was set under natural sunlight (1700-2200 lux). Each treatment consisted of five experimental plants and each plant was considered a replicate. All treatments were randomly allocated in a complete randomized design and the experiment was conducted for four weeks. Room temperature and pH (pH = 8) were maintained at constant levels throughout the experiment. Plant height, shoot biomass, and number of nodes were compared at the end of the experiment after five weeks to compare the growth, while those parameters were statistically compared using one-way ANOVA. The shoot biomass, shoot length, and the number of nodes were significantly different among treatments where the highest growth was found in plants exposed to 2500 lux while positive significant correlations were observed for light intensity and growth parameters. Our findings highlighted the significance of optimizing light conditions for the growth of aquatic plants. Our study confirmed that 2500 lux is the optimal light intensity among the other two treatments to augment the growth of *Hydrilla verticillata*. These insights contribute to our understanding of macrophyte responses to light and highlight the potential for optimizing aquatic plant cultivation through controlled light exposure.

Keywords: *Aquatic Plant, Hydrilla, Macrophyte, Temperature, Light Intensity, pH*

Development of a Copper-PVP-based Triboelectric Nanogenerator

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Triboelectric nanogenerators (TENGs) have gained significant attention as a promising renewable energy technology where mechanical vibrations are converted into electrical energy through triboelectrification and electrostatic induction. Recently, TENG has been developed using polymer composites containing mostly silver and gold nanoparticles. Copper (Cu) is a highly conductive material and integrating Cu particles into polymer materials boosts static charge generation, increasing output voltage, and current in the TENG. This work reports enhanced TENG performance with electrodes made using commercially available Cu powder (particle size ~4 µm) and polyvinylpyrrolidone (PVP) dissolved in 3 ml of ethanol. The Cu layer of the printed circuit board was used as the conducting electrode of TENG. Spin-coated PVP thin films prepared on Cu electrode (4 cm × 5 cm) using 1 ml of PVP/ethanol solution were used as the positive electrode. Another set of electrodes prepared with different Cu powder concentrations dispersed in a 0.35 g PVP ethanol solution and Kapton, used as positive and negative electrodes were hand-tapped in the vertical contact separation mode, maintaining a frequency of 4 Hz. The maximum reproducible average peak-to-peak voltage (V_{pp}) with an oscilloscope was 188±0.01 V with 0.35 g of PVP. The electrode with 0.06 g of Cu mixed with PVP and ethanol produced the highest Vpp of 200±0.01 V. Scanning electron microscopic images showed that the electrode with 0.06 g of Cu had a larger effective surface area compared to other electrodes. Moreover, the 10 cm × 10 cm electrode made using PVP 0.35 g and Cu 0.06 g electrodes consistently produced ~450±0.01 V showing high reproducibility and stability even after 15 days of testing. A mylar capacitor rated 3.3 µF, 250 V, was charged to 148 V within 10 minutes and used to power 49 LEDs for 08 seconds. The energy density and the power density of the 10 cm × 10 cm TENG at a tapping frequency of 4 Hz were 150.59 nJ cm^{-2} and 602.36 nW cm^{-2} respectively. This cost-effective TENG-based energy harvester can be utilized in self-powered electronic devices, wearable electronics, and wireless communication applications.

Keywords: *Copper, Polyvinylpyrrolidone, Kapton, Triboelectric Nanogenerator, Energy Harvesting*

Wireless Control and Monitoring System for Variable Frequency Drives

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In the modern era, industries must meet higher demands to achieve corporate financial goals, comply with environmental standards, and improve operational efficiencies in a competitive market. Hence, creative and affordable industrial automation technologies are needed to increase the efficiency and throughput of industrial processes. This work proposes an affordable universal solution for the wireless control of Variable Frequency Drives (VFDs), as the prevailing studies show a need to investigate the application of inexpensive microcontrollers for controlling VFDs wirelessly. In this work, we have designed and developed a wireless communication system for controlling Delta E-series VFD using energy and cost-efficient ESP-32 microcontrollers. Operator-end and machine-end circuitry were developed using affordable and ubiquitous electronic equipment. The operator-end control unit consists of a Human Machine Interface unit, which shows VFD parameters and can also provide control commands. Machine-end circuitry interacts with the VFD to send and receive control and monitoring data. The selected Delta E-series VFD supports the RS-485 interface-based Modbus protocol. Hence, a Max485 Transistor-Transistor Logic (TTL) converter establishes communication between the machine-end microcontroller and the VFD. It converts TTL logic signals from ESP-32 to the RS-485 interface. The developed system can facilitate motor controls such as start, stop, forward rotation, reverse rotation, and speed variation. The proposed wireless communication system can control a VFD with a delay of less than a second. This is facilitated by using four separate microcontrollers for data sending and receiving via Hypertext Transfer Protocol (HTTP). The maximum distance between the machine and operator ends is nearly 5 m, which can be extended using additional antennas. The system costs approximately 30,000 LKR and features an HMI, which is not included in similar solutions on the market, which, on average, costs over 50,000 LKR. Moreover, the proposed control system can be used with any VFD consisting of communication interfaces.

Keywords: *AC Motor Control, Microcontrollers, Variable Frequency Drives, Wireless Communication*

Analyzing Thermal Performance in Quonset Polytunnels for Sustainable Agriculture in Sri Lanka Using CFD Simulation

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The Sri Lankan agricultural sector is struggling with recent climatic variability, which is affecting food productivity and resource utilization. Thus, innovative solutions are required to safeguard agricultural sustainability for future development to meet the growing demand for food requirements. The Protected Agriculture (PA) system is one of the main solutions to address this issue. PA systems characterized by their structure and covering materials, help mitigate unpredictable weather conditions by providing optimum conditions for plant growth. They also enhance food quality by preventing pest and disease infections. This research mainly focuses on the simulation and analysis of thermal distribution in Quonset-type polytunnels, which are widely used in Sri Lanka to enhance microclimatic conditions for plant growth. ANSYS Fluent, a Computational Fluid Dynamics (CFD) tool, was used for the simulation, while SOLIDWORKS 2017 was used to create a model of the polytunnel (200 cm x 100 cm x 50 cm). A fine mesh was generated to ensure highly accurate results. A broad spectrum of environmental parameters was considered during the simulation, providing a detailed understanding of the thermal behavior within the polytunnel. After simulation, the results revealed a clear temperature gradient, with cooler temperatures (~300K) near the bottom of the polytunnel and progressively higher temperatures (~330K) toward the top. Proper temperature management is crucial within PA systems for maximizing productivity in the face of climate variability. Understanding this temperature variation helps in making informed decisions to optimize and improve the microclimatic conditions within the polytunnel, leading to higher yields and more efficient resource utilization. These findings can serve as a benchmark for future analyses and the development of other polytunnel systems in the agricultural sector.

Keywords: *Thermal Performance, Quonset Polytunnels, CFD Simulation, Protected Agriculture, Sustainable Agriculture*

Development of a Parallel Arm Robot for Seed Handling Applications in Agriculture

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Removal of non-viable seeds is a labor-intensive and time-consuming step in commercial seed production. In this research, a double SCARA (Selective Compliance Assembly Robot Arm) robot with a pneumatic end-effector was developed for seed handling. The robot was then connected to a previously developed imaging system capable of detecting the viability of MICH-HY F1 chilli seeds. The developed robot has two arms, each equipped with a shoulder joint, an upper-arm link, an elbow joint, and a lower-arm link. The double SCARA architecture allows the end-effector to be moved to any location in the 2-dimensional workspace by actuating the shoulder joints of the two arms. In this robot, NEMA 23 stepper motors are used to actuate the shoulder joints, and TB6600 motor drivers with micro-step control were used to drive the stepper motors in an open-loop configuration. A limit switch was used with each arm to determine the home position. SOLIDWORKS based simulations were carried out on aluminium and acrylic-based robot arm links. According to the simulations, under the same applied force, the displacement of aluminium-based arm links was lower. However, since the payload of a seed-handling robot was negligible, and considering the forces acting on joints, cost, and machinability, 10 mm acrylic sheets were used to fabricate the links of the arms. For picking seeds, an end-effector with a suction cup and a level compensator cylinder was developed. A HS-285B servomotor was used to lower the end-effector toward the seeds, and a vacuum pump actuated the suction cup. Once the seeds were placed on a back-lit seed bed and the imaging system was activated, the coordinates of the non-viable seeds were sent to the robot via serial communication for automatic removal. The positional repeatability of the robot was less than 0.8 mm, and the success rate of the end-effector in picking up seeds was greater than 99%.

Keywords: *Precision Agriculture, Agricultural Automation, Automated Seed Handling*

Detection of *in vitro* Derived Glycated Proteins via Fluorescence Quenching Properties of Graphene Oxide and Reduced Graphene Oxide

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Diabetes mellitus is a rapidly increasing chronic metabolic disease worldwide, including in Sri Lanka. At present, Sri Lankan population has over 10% of diabetes and overall dysglycaemia of around 21.8%. Hence, fast detection of glycated proteins (GPs) is vital for the prevention and management of diabetes and its complications. This study explored, the fluorescence quenching properties of graphene oxide (GO) and reduced graphene (rGO) against the *in vitro* derived GPs for GP detection. GO and rGO were prepared using the Improved Hummers method and chemical reduction with ascorbic acid respectively. The prepared samples were analyzed using XRD spectroscopy. The BSA-glucose model was used to produce the GPs in vitro. A reaction volume of 300 µL containing 100 µL of GO (1.0 mg mL^{-1}) or rGO (1.0 mg mL^{-1}), varying concentrations of glycated proteins (7.5, 15.0, 22.5, 30.0, and 37.5 µL mL^{-1}), phosphate buffer (pH 7.4), and distilled water in 96-well microplates (n=3 each) were used in studying fluorescence emission (370 nm) and excitation (440 nm) characteristics. Reaction volumes in the absence of GO or rGO and GP were served as controls (n=3 each) and the sample blank (n=3) respectively. To investigate the fluorescence quenching mechanism, the fluorescence emission spectra (230 nm) of GO (0.2 mg mL^{-1}, 1.0 mg mL^{-1}) and rGO (1.0 mg mL^{-1}) were obtained. Additionally, the excitation (440 nm) and emission (220 nm) spectra for the 7.5 and 37.5 µL mL^{-1} concentrations of GPs with GO were acquired. Further, the solution phase Raman spectra of GO (0.2 mg mL^{-1}, 1.0 mg mL^{-1}) were studied. The XRD patterns illustrate the successful synthesis of GO and rGO. Fluorescence studies reveal that the GO and rGO contribute to quenching the fluorescence properties of the GPs and, GO shows a higher fluorescence quenching over rGO while exhibiting a great potential for its use as a sensing material in detection of *in vitro* derived GPs. Furthermore, the study explains the energy level positioning of GO, rGO, and GP which appears to be the fundamental principle underlying the fluorescence quenching of GPs in the presence of GO which depicts enhanced sensitivity to fluorescence quenching compared to rGO.

Keywords: *Glycated Proteins, Fluorescence Quenching, Graphene Oxide, Reduced Graphene Oxide*

Development of an Artificial Lighting System for Controlled Environment Agriculture

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Providing optimal lighting levels for crops is a critical requirement that needs to be fulfilled in controlled environment agriculture (CEA). Due to their ability to generate both broad-spectrum and wavelength-specific light with high efficiency, Light Emitting Diodes (LEDs) are widely used for the illumination crops grown in controlled environments. In this work, a complete and scalable LED based lighting system suitable for CEA was developed. The system consists of multiple LED light units (LUs), a light unit controller (UC) and a mobile application. Each LU consists of red (631 nm), blue (449 nm) and white (full-spectrum) LEDs. Each LU is designed to illuminate approximately 90 cm by 90 cm area, and a conical reflector is used with each LU to improve the uniformity of illumination. Pulse width modulated (PWM) signals generated by an on-board microcontroller (ATmega328P) controls the intensity of red, blue, and white LEDs on each LU separately. Modbus protocol, which supports up to 247 slaves, is used to establish communication between the UC (master) and LUs (slaves). Furthermore, RS485 modules are used to ensure robust communication between the UC and the LUs. An ESP32 System-on-Chip (SoC), a real-time clock (DS1307), and an ambient light sensor (BH1750) are housed in the UC. The UC communicates with the mobile application via Bluetooth and distributes the instructions to the LUs. The LUs connected to the UC can be fully controlled using the mobile application. The intensity as well as the ON/OFF times of red, blue, and white LEDs of each LU can be controlled independently. However, if needed, multiple LUs can be updated with the same set of instructions as well. Additionally, to compensate for fluctuations of ambient light levels, the intensity of white LEDs on the LUs can be adjusted automatically based on the readings from the ambient light sensor.

Keywords: *Agricultural Automation, Controlled Environment Agriculture, Artificial Lighting*

Stock Management and Data Extraction for Prediction of Sales Using Point of Sales

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Sales prediction is an essential component of operations and supply chain management that connects producers and retailers. The retail industry faces challenges in stock management and sales prediction due to outdated manual procedures. One of the most essential parts of retail is sales prediction, which facilitates a wide range of decision-making procedures such as customer service, inventory management, and marketing strategies. Therefore, the goal of this research is to develop a model that can predict sales and provide an optimal stock management method presented in an easy-to-understand format with graphs and charts, using machine-learning techniques to analyse point of sales (POS) data. POS systems provide transaction data, including product details, purchase quantities, customer demographics, and timestamps. By extracting and analysing this data, businesses can better understand customer's behaviour, buying trends, and hidden patterns that affect sales. This study used one-year data from a retail store which is already using a POS system. The sales prediction model was built and evaluated using different machine learning techniques, regression models, and time series methodologies, such as Linear Regression Model, Random Forest regression, and Gradient Boosting Regression, ARIMA (Autoregressive Integrated Moving Average), and LSTM (Long-Short-Term Memory). The focus was on handling multi-attribute variables and seasonal trends to improve inventory management and minimize stock mishandling and overstocking. This study provides evidence that machine learning based algorithms, are working well for sales prediction with POS data. By comparing with existing research projects, this research project uses a hybrid machine learning model and that combines multiple models such as Linear Regression and time series methodologies for better performance accuracy and adaptability. For example, Linear Regression analysis showed an RMSE (Root-mean-square deviation) of 0.96849 and an MAE (Mean absolute error) of 0.82136 outpeforming ARIMA and LSTM. Additionally the model integrates more data sources than other systems, offering a more comprehensive view on customer behaviour and purchasing patterns, leading to more effective stock management.

Keywords: *Linear Regression, Random Forest Regression, Gradient Boosting Regression, LSTM, ARIMA*

PepperMate: Enhancing Ceylon Black Pepper Cultivation through Artificial Intelligence and Mobile Application Development Technologies

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PepperMate is an initiative aimed at enhancing Ceylon Black Pepper cultivation through AI (Artificial Intelligence) and mobile application development technologies. Black Pepper is a crucial export for Sri Lanka. Furthermore, Black Pepper faces significant challenges including disease management, quality grading, and market price volatility. This research addresses these challenges through a comprehensive mobile application designed to support Black Pepper farmers. The primary objectives of PepperMate are, to develop an AI-based system for early detection and identification of black pepper diseases, to create an automated quality grading system using image processing and AI, and to design a predictive model for forecasting Black Pepper prices. The disease detection module employs advanced computer vision technology and Convolutional Neural Networks (CNNs) to identify common diseases such as Pepper Yellow Mottle Virus, Quick Wilt, and Slow Wilt from leaf images. Furthermore, this system provides a high detection accuracy of 99.67%. For quality grading, CNNs are used to assess black pepper samples against Sri Lanka Standards (SLS) quality metrics, achieving an identification accuracy of 98.5%. The price prediction module utilizes Long Short-Term Memory (LSTM) neural networks to forecast market prices, with a mean absolute percentage error (MAPE) of 0.012 and an overall accuracy of 97%. Furthermore, existing research on black pepper diseases, quality and price prediction has not focused on Sri Lanka. This study aims to develop a system for real-time disease detection, quality grading, and price forecasting by helping farmers. PepperMate represents a significant advancement in the use of AI for agricultural applications, offering a robust tool for disease prevention, quality assurance, and market strategy optimization. The research project exhibits the transformative potential of AI in agriculture, particularly for black pepper cultivation in Sri Lanka. Future developments will focus on expanding the dataset for more comprehensive model training and incorporating additional features such as pest identification and solution recommendations.

Keywords: *Ceylon Black Pepper, AI, Disease Detection, Price Prediction, Agriculture, CNN, LSTM*

Deep Learning-Based Railway Crossing Detection System for Vehicles

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According to Sri Lanka Railways, approximately 200 people died from train-related accidents in 2023. The statistics covered deaths from trespassing rail tracks, suicide, and collisions at level crossings. Additionally, more than 400 people sustained injuries ranging from minor to severe. With vehicle transportation becoming increasingly essential, automobile manufacturers must prioritize safety features eabling automobiles they are manufacturing. Despite various strategies, there has been no reduction in the number of deaths caused by vehicle–train collisions in Sri Lanka. No matter how advanced the technology, no effective strategy has been implemented in vehicles to prevent such collisions. This research paper aims to develop a Railway Crossing Detection System for Vehicles. Accidents often occur due to lack of signage, lack of attention, listening to loud music and other distractions while driving. The new system identifies rail crossing signs, rail hazard lights, rails across the road, and rail gates using a camera module. Using the Google Maps API, the system accurately detects if the vehicle is near a rail crossing. A train tracking system is used to identify whether a train is approaching the respective rail crossing or not. The system identifies the sound of a rail bell and an approaching train using a microphone module. If any of the aforementioned conditions are detected, a small notification is triggered. If all conditions are detected simultaneously, the system indicates that there is a very serious danger ahead. By implementing this system, the number of accidents ccould be reduced significantly.

Keywords: *Railway Detection, Vehicle-Train Collision, Vehicle Safety, Deep Learning, Machine Learning, GPS, Rail Crossing Detection*

CardoAnalyzer: Artificial Intelligence–based Electrocardiogram Analyzer for Heart Disease Diagnosis

M.B.C.N. Bandara, R. Samarasinghe, H. Perera

Department of Information and Communication Technology, Faculty of Technology, University of Colombo, Sri Lanka

Electrocardiograms (ECGs) are indispensable tools for diagnosing heart diseases, yet accurate interpretation often requires significant expertise. CardoAnalyzer, an AI-based web application, aims to bridge this expertise gap by providing precise ECG analysis through Bluetooth/Com port or soft copy uploads. By leveraging advanced deep learning algorithms, CardoAnalyzer processes ECG data to predict heart disease diagnoses with an impressive 92% accuracy. This tool is designed to assist medical professionals, particularly those with less experience, in making accurate and timely diagnosis, enhancing patient care. The core technology behind CardoAnalyzer involves a deep neural network (DNN) trained on the PTB-XL dataset, a comprehensive collection of annotated ECG recordings. The application preprocesses ECG signals to remove noise and artifacts, ensuring high-quality input for the AI model. Initial testing and validation on a subset of the PTB-XL dataset demonstrate the model's high diagnostic accuracy, significantly outperforming traditional computer vision-based methods. This robust performance underscores the potential of AI in enhancing ECG analysis and diagnostic precision in clinical settings. Future work will focus on expanding the dataset to include region-specific ECG data, further enhancing the model's applicability and reliability across diverse clinical environments. By integrating AI with ECG analysis, CardoAnalyzer represents a significant advancement in clinical decision support, offering a reliable tool for improving the quality and efficiency of heart disease diagnosis.

Keywords: *Electrocardiogram (ECG), Artificial Intelligence (AI), Heart Disease Diagnosis, Deep Learning, Clinical Decision Support*

INSTITUTE OF BIOCHEMISTRY, MOLECULAR BIOLOGY, AND BIOTECHNOLOGY

Beyond the Blueprint of Life

26th and 27th of September 2024

MESSAGE FROM THE DIRECTOR

Professor Prasanna Galhena

Director
Institute of Biochemistry, Molecular Biology, and Biotechnology
University of Colombo, Sri Lanka

It is a distinct honor and a profound privilege to share my thoughts for the Fourth International Conference on Frontiers in Molecular Life Sciences (ICFMLS 2024) in my capacity as the Director, Institute of Biochemistry, Molecular Biology, and Biotechnology (IBMBB), University of Colombo.

"Beyond the Blueprint of Life" being the conference theme, ICFMLS 2024 takes the challenge in integrating different facets of Life Sciences. This is well evident by the vibrant themes; Climate Change and Environmental Management, Population Genetics and Peopling of South Asia, Natural Products and Medical Chemistry, Omics Science and Precision Medicine, Molecular Biology and Biotechnology, Immunology and Infectious Diseases, Biochemistry and Clinical Chemistry, Plant and Agricultural Sciences, Bioentrepreneurship, Cancer Biology and so forth, lined up during the two full day sessions.

We are privileged to have the presence of Prof. Erik Bongcam-Rudloff, Professor of Bioinformatics, Swedish University of Agricultural Sciences, Sweden as the keynote speaker to share his wealth of expertise and experience in the field of Advanced Bioinformatics. Several international and local expertise will also grace this occasion as symposium speakers, and I believe ICFMLS-2024 provides a comprehensive platform for scientists, researchers, scholars, academics, and students to explore and share the advances in Life Sciences. I take this opportunity to place my appreciation to the Vice Chancellor, University of Colombo, Senior Professor H. D. Karunaratne for his guidance and assistance in making ICFMLS-2024 a success.

Without the dedication, commitment and motivation of the IBMBB family; encouragement, guidance and assistance of many, and the generous support of sponsors, it would not have been possible to witness an event of this nature. The success of this event belongs to all of them.

I sincerely hope that all of you will find ICFMLS 2024 intellectually stimulating and rewarding.

MESSAGE FROM THE CO-CHAIRPERSONS

Dr. Sumadee De Silva

Institute of Biochemistry, Molecular Biology, and Biotechnology
University of Colombo, Sri Lanka

Dr. Narmada Fernando

Institute of Biochemistry, Molecular Biology, and Biotechnology
University of Colombo, Sri Lanka

With great pleasure and pride, we welcome you to the Fourth International Conference on Frontiers in Molecular Life Sciences (ICFMLS) on the 26th and 27th of September 2024. This event holds special significance as we celebrate the 20th anniversary of IBMBB under the theme "Beyond the Blueprint of Life." Over the past two decades, IBMBB has been a leader in pioneering research, driving innovation, and fostering collaboration across diverse scientific disciplines. Our institute's journey is marked by remarkable milestones, reflecting the dedication of our faculty, researchers, students, and collaborators. As we gather here, we reflect on the incredible progress made since IBMBB's inception, from decoding the human genome to unravelling cellular mechanisms. This conference brings together brilliant minds worldwide, each contributing unique perspectives and groundbreaking research. The seven symposia at the 4th ICFMLS cover critical themes such as Cancer Genes, Drug Discovery, Tropical Diseases, Population Genetics, Bioentrepreneurship, and Climate Change Solutions. Additionally, four Pre- and Post-Conference Workshops will provide in-depth exploration of cutting-edge areas like Metagenomics, Lichens, QSAR Modeling for Drug Discovery, and Immunobiotechnology for Diagnostics and Therapeutics.

We extend our heartfelt gratitude to the keynote speaker, plenary lecturers, symposia speakers, chairpersons, judges, reviewers, presenters, sponsors, and sub-committee members whose contributions have made this event a success. We are confident that the discussions, presentations, and exchanges here will inspire new ideas, partnerships, and breakthroughs that will shape the future of our field. Thank you for joining us in this celebration of science and collaboration. We wish you a fruitful and inspiring conference.

ORGANIZING COMMITTEE

Co-Chairs of the Conference
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Dr. Narmada Fernando

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Ms. W.L. Damayanthi

PROGRAMME OF THE INAUGURATION CEREMONY

Time	Programme
08.30 am - 09.00 am	**Registration**
09.00 am - 09.05 am	**Lighting of the Oil Lamp**
09.05 am - 09.15 am	**Welcome Address** Professor Prasanna Galhena Director Institute of Biochemistry, Molecular Biology and Biotechnology
09.15 am - 09.25 am	**Address by the Chief Guest** Senior Professor (Chair) H. D. Karunaratne Vice Chancellor, University of Colombo
09.25 am - 09.35 am	**Address by the Guest of Honour**
09.35 am - 09.55 am	**Presenting Awards for Teaching and Research Excellence**
09.55 am - 10.55 am	**Keynote Address** Professor Erik-Bongcam-Rudloff Professor in Bioinformatics Swedish University of Agricultural Sciencs Uppsala, Sweden
10.55 am - 11.00 am	**Vote of Thanks**

INTRODUCTION TO THE KEYNOTE SPEAKER

Professor Erik-Bongcam-Rudloff

Professor in Bioinformatics
Faculty of Veterinary Medicine and Animal Science
Swedish University of Agricultural Sciences
Uppsala, Sweden

Erik Bongcam-Rudloff's work concerns Bioinformatics, the analysis of large amounts of biological and genetic data. His research mainly deals with the development of bioinformatics solutions for the life sciences community. Applications are found within research areas such as animal breeding, computing in mathematics, natural science, engineering and medicine. He develops and manages complex multidisciplinary network projects both in and outside Europe. He is the Swedish representative at the European Union's COST Action ML4Microbiome "Statistical and machine learning techniques in human microbiome studies", Board member of the Uppsala Multidisciplinary Center for Advanced Computational Science (UPPMAX), Chair of EMBnet, the Bioinformatics Global Network created 1988, Board Member International Society for Computational Biology, ISCB, (2012-2014), and Board Member of "Global Organisation for Bioinformatics Learning, Education and Training" GOBLET, (2014-2016). He is also a Member of the Scientific Advisory Board on the European Union's H2020 Programme, Human Exposome Assessment Platform (HEAP) (2020- 2023), Scientific Advisory Board of the EU H2020's project Panelfit, (2019 – 2022), International Advisory Board of the Slovakian Academy of Sciences (2018 – 2022), and the Advisory Board of the Eastern Africa Network for Bioinformatics Training - (EANBiT) (2017 – 2022).

ABSTRACT OF THE KEYNOTE ADDRESS

Bioinformatics in the 21st Century: Transforming Agriculture and Human Health Together

Professor Erik-Bongcam-Rudloff

Faculty of Veterinary Medicine and Animal Science, Swedish University of Agricultural Sciences, Sweden

In the 21st century, bioinformatics has become a pivotal force in transforming both agriculture and human health. This talk will explore the latest advances in genomics, highlighting how precision agriculture leverages genomic data to enhance crop yields and sustainability. He will delve into the study of microbiomes, revealing their crucial role in soil health and human gut health. The exposome concept will be discussed, emphasizing how environmental exposures impact both plant and human biology. Advances in understanding and combating antibiotic resistance will be covered, demonstrating bioinformatics' role in addressing this global challenge. The session will also explore personalized medicine, showcasing how genomic data tailor medical treatments to individual needs. Finally, he will talk about innovations in food production, ensuring food safety and nutrition through bioinformatics. The talk will discuss how bioinformatics is bridging the gap between agriculture and human health, driving advancements that benefit society as a whole.

INSTITUTE OF BIOCHEMISTRY, MOLECULAR BIOLOGY, AND BIOTECHNOLOGY
List of Abstracts

Identification of Genetic Variants Associated with Deep Vein Thrombosis (DVT) in a Cohort of the Patients Affected with DVT in Sri Lanka

K.L.J. Hasaranga, N. Noordeen, T.K. Wetthasinghe, V.H.W. Dissanayake

Human Genetics Unit, Faculty of Medicine, University of Colombo, Sri Lanka

Multiple factors contribute to the development of hypercoagulability within human blood circulation. Genetic thrombophilias can be inherited and lead to vascular blood-clot formation. Deep Vein Thrombosis (DVT) is a similar thromboembolic manifestation that occurs due to various genetic and non-genetic etiologies. The aim of this study was to design and implement a molecular assay to identify genetic variants suggestive of causing DVT in a cohort of patients affected with DVT in Sri Lanka. A comprehensive literature review was conducted to identify genetic variants, which were associated with DVT. Using online tools, two Tetra-Amplification-Refractory-Mutation-System Polymerase Chain Reaction (T-ARMS-PCR) protocols were designed, developed, and optimized to genotype the extracted DNA samples of the study population with prior informed consent. Assay results were validated for accuracy by gold standard Sanger sequencing before genotyping. Total of 110 subjects comprising 62 (56.4%) females and 48 (43.6%) males ranging 2 to 73 years of age were genotyped. There were 14 (12.7%) normal for the variant (CC), 39 (35.5%) heterozygotes (CA), and 57 (51.8%) homozygotes (AA) for *CYP4V2* c.775C>A (rs13146272) variant, with an ancestral (C) allele frequency of 0.3045 and variant (A) allele frequency of 0.6955 at Hardy Weinberg's equilibrium. Similarly, for F5 c.2573A>G (rs4524) variant 37 (33.6%) were normal for the variant (AA) while 73 (66.4%) heterozygotes (AG) and nil homozygotes (GG) were detected with a calculated allele frequency of 0.6651 and 0.3349 for both ancestral (A) allele and variant (G) allele respectively. In conclusion, the optimized T-ARMS-PCR assay developed in this study can be implemented to screen the *CYP4V2* c.775C>A (rs13146272) variant in patients diagnosed with DVT. Allele frequencies of both *CYP4V2* and F5 variants were consistent with South Asian population allele frequencies suggesting the reliability of our finding.

Keywords: *Deep Vein Thrombosis, Sri Lankan Population, T-ARMS PCR, CYP4V2, Factor 5*

Acknowledgements: This project was funded by the Center for Genetics and Genomics (formerly Human Genetics Unit), Faculty of Medicine, University of Colombo, Sri Lanka.

Detection of Selected Variants in the *MTR* and *MTRR* Genes in a Cohort of Children with Homocystinuria in Sri Lanka

D.S.C. Jayakody[1], S. De Silva[1], A.S. Hewage[1], P.A.N. Punyasiri[1], E. Jasinge[2], H.W. Dilanthi[3], K.D. Rammuthupura[2]

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Homocystinuria is a rare metabolic disorder with a global prevalence of 1 in 200,000-335,000 individuals. It is caused by disruptions in homocysteine metabolism pathways and is characterised by elevated homocysteine levels in blood. The disease poses severe health risks, including ocular, skeletal, central nervous system, and vascular complications. The current study was conducted to detect selected disease-associated variants in the *MTR* and *MTRR* genes in a cohort of children (*N*=14) with Homocystinuria. Potential associations of selected variants with homocystinuria and its clinical presentations were identified based on literature. During the study, the c.66 A>G variant of the *MTRR* gene was identified in nine patients, along with five heterozygous carriers within the healthy control group, underscoring its prevalence in the studied cohort. Similarly, the study unveiled the presence of the c.524C>T variant in the *MTRR* gene among eight patients, with one occurrence in the healthy cohort. The presence of these variants in the healthy cohort highlights a complex genetic interplay, warranting further investigation into their functional significance and contribution to disease pathology. Contrastingly, the c.3518C>T variant in the *MTR* gene was absent in the study cohorts. Furthermore, the study aimed to establish an HPLC-based method for quantifying serum vitamin B6 levels, recognising its vital role as a cofactor in the metabolic pathway. Utilising a reverse-phase HPLC approach, elevated serum vitamin B6 levels were successfully detected, likely due to ongoing vitamin B6 supplementation as part of patient treatment regimens.

Keywords: *Homocystinuria, MTR, MTRR, Vitamin B6, HPLC*

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Embarking on a Genetic Journey to 'Simhapura': Unravelling the Ancestral Homeland of the Sinhalese through Genetics

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The origins of the Sinhalese population, traditionally linked to the tale of Prince Vijaya as narrated in the Mahavamsa, remain a subject of debate due to the lack of definitive geographical evidence and inconclusive linguistic analyses. Therefore, to provide greater clarity, a genetic study was conducted focusing on maternal lineages using mitochondrial DNA (mtDNA) from a cohort of Sinhalese (N=151). mtDNA was sequenced using either Sanger sequencing or next-generation sequencing and haplogroups were assigned based on their sequence variations using Haplogrep version 3. Finally, the results were compared against the haplogroups obtained from globally published sequences (N=5,190). The genetic analysis revealed that 13.97% of the Sinhalese cohort is associated with the maternal haplogroup M65a+@16311, a marker prevalent in various Pakistani populations, including Gulmit, Gilgit (2.53%), Azad Jammu and Kashmir (3.5%), Kalash (1%), Shin (2.4%) and Punjabis (1.1%) as well as in ancient DNA from the Swat Valley (3%) [~2,850 years before present (YBP)]. Moreover, ~25.73% of the Sinhalese population manifest haplogroups (U2b2, U2c1a, U3b1a1, M30c, M4, M30, M5a, M52a, R5a2, H13a2a) that are consistent with ancient DNA haplogroups identified in the Swat and Peshawar Valleys as well as in contemporary populations in extreme North and Northwestern populations of India and Pakistan. The majority of these maternal haplogroups exhibit coalescence times ranging from approximately 10,000 to 1,000 YBP. This timeframe coincides with significant historical events and population dynamics in these regions. These findings suggest a strong genetic link between the Sinhalese and populations from the northern regions identified as 'Simhapura' in the Mahavamsa, indicating that the migration of founder populations from these areas may have played a critical role in shaping the genetic makeup of the Sinhalese. This connection provides valuable insights into the maternal ancestry and historical migration patterns that have influenced the development of the Sinhalese people.

Keywords: *Origin of Sinhalese, Geographical Regions, Mitochondrial DNA, M65a+@16311 Haplogroup, Founder Populations*

Acknowledgements: This work constitutes a part of the PhD studies of the author, Welikala A.H.J.

Investigation of the Termite Nest-Derived Fungus *Pseudopestalotiopsis chinensis* for the Presence of Biologically Active Secondary Metabolites

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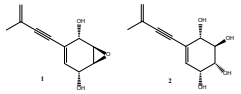
Fungi are known to biosynthesise a remarkable variety of biologically active secondary metabolites. Termites perform an important role in nutrient recycling by consuming decaying plant material. Termites of the family *Termitidae* have lost the capacity to produce wood–digesting enzymes and depend on symbiotic fungi for such enzymes. So far there have been relatively few investigations, worldwide, to investigate biologically active secondary metabolites of termite-derived fungi. This study is the first in Sri Lanka to investigate the potential of a termite-derived fungus to produce biologically active metabolites. The fungal species isolated from fungal nodules of a termite mound in Ingiriya, Sri Lanka was cultured on potato dextrose agar for 14 days at room temperature and was extracted with ethyl acetate to yield 270 mg of crude extract. Chromatographic fractionations including preparative HPLC of the extract resulted in the isolation of the two major compounds 1 (2 mg) and 2 (0.2 mg).



Morphological and molecular analysis established the fungus as *Pseudopestalotiopsis chinensis*. The termite was identified as *Hypotermes obscuriceps* by its anatomical features. Analysis of the NMR spectra including 2D data established the chemical identities of 1 and 2. Compound 1 proved to be the known fungal metabolite asperpentyn originally isolated from *Aspergillus duricaulis*. However, this is the first report of compound 2 as a natural product. Asperpentyn exhibits a range of biological activities including specific enzyme inhibitory activity. Biological activities of 2 are, so far, unknown. Our findings have highlighted that termite-derived fungi of Sri Lanka, a hitherto unexplored resource, are a valuable resource for the discovery of biologically active natural products. With up to 40 species of *Termitidae* termites reported to be present in Sri Lanka, investigation of the biologically active secondary metabolites produced by termite-derived fungi from different climatic regions of Sri Lanka could be expected to yield exciting results.

Keywords: *Pseudopestalotiopsis Chinensis, Hypotermes Obscuriceps, Biologically-Active Secondary Metabolites*

Acknowledgements: This work was supported by the IBMBB and the University of the British Columbia and constitutes a part of MSc studies of Rexon S. S.

Determination of Camptothecin Levels in Stress Induced *Ophiorrhiza pumila* Plant

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Camptothecin (CPT) is a quinoline alkaloid crucial in cancer therapy which is effective against ovarian, colorectal, cervical, and lung cancers by inhibiting DNA topoisomerase I. *Ophiorrhiza pumila* belongs to the family Rubiaceae is well-known for its high camptothecin (CPT) content. However, limited number of studies have been conducted on the effects of stress induction on CPT levels in *O. pumila*. This study aims to quantify the levels of CPT in *O. pumila* leaves and flowers under both treated (stress-induced) and non-treated conditions using Thin Layer Chromatography (TLC) and High-Performance Liquid Chromatography (HPLC). Stress induction of *O. pumila* was done at 12 hrs, 24 hrs, and 36 hrs by introducing 10 mM salicylic acid as the optimum concentration at each time. Then treated and non-treated samples were air-dried, ground, and CPT was extracted using ultrasound-assisted methanol extraction method. Two TLC experiments were conducted using ethyl acetate: methanol (1:1) for silica and (3:2) for C18 stationary phases, confirming the presence of CPT with Rf values of 0.65 for silica and 0.58 for C18 by comparing with standard CPT. Then, CPT content in methanolic extracts was quantified using HPLC with an Agilent 1260 Infinity II system. A reverse phase C-18 column with an isocratic acetonitrile: Methanol (30:70) mobile phase, 1 mL/min flow rate and 20 µL injection volume detected CPT at 254 nm. The HPLC analysis showed that untreated leaves had 0.0018% CPT (dry weight), whereas treated leaves had 0.0024% CPT (dry weight). For flower samples, untreated flowers contained 0.0151% CPT (dry weight), while treated flowers had 0.0386% CPT (dry weight). These findings showed increased levels of CPT in both leaves and flowers while flowers showing the highest after stress induction. This highlights the potential for further research into the relationship between stress signalling and secondary metabolism to enhance CPT biosynthesis.

Keywords: *Stress-induced O. pumila, Methanol Extracts, HPLC, TLC*

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Screening of Microsatellites Present in *Phlebotomus argentipes* (Sand Fly) by Enriched Libraries

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Microsatellites have been considered as very small sequence of DNA with a high degree of ubiquity, co-dominance, and high level of individual variation in number. Because of these reasons, they are widely used as one of the most prevalent classes of genetic markers and frequently exhibit significant degrees of polymorphism in terms of repeat number. The main objective of this project is to identify microsatellite markers present in *Phlebotomus argentipes* (sand fly) genome which is the most prevalent vector of Leishmaniasis in Sri Lanka. The present study was carried out by enrichment protocol by using synthesized two biotinylated microsatellite probes namely: $(GT)_{12}$ and $(GAA)_8$. Approximately 40 sand flies were used from laboratory colony for initial DNA extraction. Then, samples were digested with restriction enzymes, adaptors were ligated, and size selection was performed. Captured microsatellite containing DNA fragments with streptavidin coated magnetic beads were amplified by PCR and cloned into a T vector. Next, positive clones were selected, and qualitative analysis via agarose gel electrophoresis was conducted to observe for the presence of double banded PCR products. Finally, Sanger sequencing was performed to confirm the presence of the microsatellites. According to the results obtained, it was obvious to see that out of 90 positive colonies for $(GAA)_8$ repeat containing fragments, 12.22% showed double bands on the gel. However, after bioinformatics analyses, it was shown that there was no expected $(GAA)_8$ repeat sequences on the sequenced data. This situation could be due to the presence of higher amounts of false positives. Carrying out repeated experimentations may reduce the chance of having false positives while increasing the accuracy of the results. Due to the limited time, analysis of $(GT)_{12}$ probe could not proceed.

Keywords: *Microsatellites, Sandfly, Leishmaniasis, $(GAA)_8$, $(GT)_{12}$*

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Does Ferritin-Mediated Folate Catabolism Play a Role in Modulating 5-Formyl-Tetrahydrofolate Levels in Pregnant Women Supplemented with Iron-Folic Acid? – A Case Study

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In a recent clinic-based study conducted among Sri Lankan pregnant women, unusually high levels of serum 5-formyl-tetrahydrofolate were noted. Furthermore, ferritin has previously been suggested to have a role in folate catabolism besides its iron storage function. This case study was conducted to explore if ferritin mediated folate catabolism plays a role in maintaining 5-formyl-THF levels in pregnant women supplemented with iron-folic acid, and to derive a hypothesis. The 5-formyl-THF and serum ferritin (SF) levels were analyzed at three different time points: Baseline-prior to nutritional supplements (< 12 weeks of gestation), early pregnancy (12-17 weeks of gestation) and late pregnancy (≥ 34 weeks of gestation) using available data of 50 pregnant women, who attended antenatal clinics in Colombo. Then, subjects were categorized into two groups according to their SF levels at each time point. Women with SF below 30 µg/L were considered as "low ferritin" while SF above 30 µg/L was considered as "high ferritin". While scatterplots were drawn to observe trends, Pearson correlation, Cross tabulation, ANOVA-post hoc tests were used for statistical analysis. According to the trends observed between SF and 5-formyl-THF levels, when ferritin level rises, 5-formyl-THF levels decrease at both early and late pregnancy in "High ferritin" group. Notably, similar trend could be observed in the "low ferritin" group which included 76% (38/50) of the total participants at early pregnancy. However, this trend was unseen at late pregnancy in "low ferritin" group as the SF could be a limiting factor to the low ferritin group to facilitate the 5-formyl-THF catabolism. The results of the Pearson correlation, regression analysis, and ANOVA were not statistically significant, possibly due to an inadequate sample size. The case study derived the hypothesis, "under high concentrations, ferritin may catalyse the breakdown of 5-formyl-THF in pregnant women supplemented with iron-folic acid". Further studies will prove or refuse the hypothesis.

Keywords: *5-Formyl-Tetrahydrofolate, Ferritin, Folate Catabolism*

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In silico Investigation of Potential Inhibitor Molecules against Caseinolytic Peptidase B (ClpB) Protein

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Proteins are the most versatile and intricately structured macromolecules among all biologically active systems. Molecular chaperones are distinct proteins that have evolved within cells to facilitate protein folding and prevent protein aggregation. Caseinolytic Peptidase B (ClpB) is a bacterial chaperone that utilizes the energy from adenosine triphosphate (ATP) hydrolysis to thread out linear polypeptides from protein aggregates. Computational methods are being utilized to develop new ways to discover and develop drug candidates to address the increased demand for antimicrobial agents. An *in-silico* investigation was carried out to evaluate the inhibitory effect of Guanidine hydrochloride (GuHCl), D-Arginine, and L-Arginine on ClpB protein (PDB ID:1QVR). Docking results from AutoDock Vina suggested -5.9 kcal/mol binding affinity for both D-Arginine and L-Arginine to Nucleotide Binding Domain-1 (NBD-1), and -3.5 kcal/mol affinity of GuHCl to NBD-2 of 1QVR. Molecular dynamic (MD) simulations performed with GROMACS showed that all three molecules induce conformational changes in the NBD-1, consistent with the docking findings. Trajectory data revealed a stable Root-Mean-Square Deviation (RMSD) confirming the equilibrated yet altered NDB-1 domain of the protein as supported by Solvent-Accessible Surface Area (SASA), Radius of gyration (Rg), and Root-Mean-Square Fluctuation (RMSF) data. Steeper peeks in SASA of the entire protein observed with GuHCl, L-Arginine, and D-Arginine binding suggested the hydrophobic core of ClpB becoming more accessible to the surrounding aqueous environment. Cluster analysis confirmed the visible conformational changes after 100 ns of simulation. The binding of GuHCl, L-Arginine, and D-Arginine induces conformational changes in the NBD-1, resulting in the depletion of ATP turnover, which is crucial for the reactivation of protein aggregates, as suggested by previous experimental data. However, further *in vitro* investigations are suggested to validate these findings.

Keywords: *ClpB, GuHCl, L-Arginine and D-Arginine, Molecular Docking, Molecular Dynamics*

Comparing Mitochondrial and Genome-wide Demographic Signals in the Sinhalese, Sri Lankan Tamils, and Ratugala Adivasi

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Single nucleotide polymorphisms in the uni-parentally inherited mitochondrial DNA (mtDNA) and bi-parentally inherited autosomal DNA are commonly used genetic markers to study population genetics. Previous studies focused on mitochondrial genetic variation illustrate that Sinhalese and Sri Lankan Tamils (SLT) are genetically closer to each other, while Adivasi clans are distinct from the rest of the Sri Lankan ethnic groups. In this study, we compared the genetic signals from mtDNA and genome-wide markers in Sinhalese, SLT, and Ratugala Adivasi (RA) groups. DNA from Sinhalese (N=23), SLT (N=5), and RA (N=5) individuals was extracted using the Qiagen Genomic DNA Extraction kit and was sequenced on the Illumina Infinium Diversity Array to obtain genome-wide data. This genotyped data was filtered for standard quality control measures. The current study data was then merged with recently published genome-wide data from the Sinhalese (N = 9) and SLT (N=2) and the 1000 Genomes Phase 3 (1KGP3) data to investigate the genetic distance between Sinhalese, SLT, and RA and worldwide populations. MtDNA generated for the same samples for analysis was also merged with 1KGP3 data. Principal Component Analysis (PCA) was performed using EIGENSOFT and R studio packages on both the genotyping data and mitochondrial haplogroup frequencies. In the plot based on genome-wide data, Sinhalese, SLT, and RA individuals generally clustered with other South Asian groups. Moreover, while close mtDNA affinity between Sinhalese and SLT was evident in the data, the separation of RA individuals with respect to mitochondrial variation was not observed in the autosomal data. The observed discrepancy between autosomal and mitochondrial variation in the RA could have resulted due to reasons such as long-term genetic drift and/or male-biased admixture. However, a larger sample number is needed to confirm or refute this. Our study shows the use of both mitochondrial and autosomal data in gaining valuable insights into sex-specific admixture patterns.

Keywords: *Genome-wide Variations, Mitochondrial DNA, Sinhalese, Sri Lankan Tamil, Ratugala Adivasi*

Acknowledgements: This work was supported by the National Research Council (NRC: 17-042) and start-up funds to the Raghavan Lab from the University of Chicago, and constitutes a part of the PhD studies of Fernando A.S.

Comparison of the Production of Oxidants Induced by *Leptospira interrogans* Lipopolysaccharides and *Escherichia coli* Lipopolysaccharides in Mouse Macrophages (RAW 264.7)

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The bacterial cell wall component lipopolysaccharide (LPS) plays a pivotal role in activating immune cells, resulting in a series of innate immune responses including the production of oxidants; reactive nitrogen species (RNS) and reactive oxygen species (ROS). Although enhanced production of RNS and ROS is essential to combat the infections, unregulated production could lead to deleterious outcomes. This study compared the production of oxidants induced by the LPS of *Leptospira interrogans* serovar Pyrogenes with commercially available LPS of *Escherichia coli* (E. coli) 0111: B4 in cultured RAW 264.7 mouse macrophage cells by determining cellular production of nitrite (NO_2^-; as RNS) and superoxide (O_2^-; as ROS). *L. interrogans* was cultured, LPS was extracted using a LPS extraction kit (iNtRON Biotech) and quantified against a standard series of *E. coli* LPS. Extracted LPS was found free of protein contaminants by SDS-PAGE, and Coomassie brilliant blue staining. RAW 264.7 cells were stimulated with a concentration series (1-1000 ng/mL) of LPS from *L. interrogans* and *E. coli* separately. NO_2^- levels were assessed by Griess assay. RAW 264.7 cells stimulated with *L. interrogans* LPS produced NO_2^- levels in a range of 1.908 – 2.766 µM, whereas cells stimulated with *E. coli* LPS resulted in levels of 13.624 – 24.781 µM ($p < 0.05$). Furthermore, O_2^- levels produced by cells stimulated with 1000 ng/mL of *L. interrogans* and *E. coli* LPS were determined by NBT assay. The highest O_2^- levels were observed in LPS from *L. interrogans* (63 ± 1.095 pM) while levels in *E. coli* were 45.50 ± 4.072 pM ($p < 0.05$). Similarly, the optimum inducible concentration for each bacterial LPS, based on nitrite levels, was verified as 1000 ng/mL and *E. coli* 0111: B4 LPS resulted in higher nitrite levels whereas *L. interrogans* LPS resulted in higher O_2^- levels in stimulated RAW 264.7 macrophages. This establishes that nitrite and superoxide production differ in each bacterial LPS. The expression of higher nitrite levels in *E. Coli* is may be due to the TLR- 4 internalization in activation of TRIF dependent signal transduction pathways whereas *L. interrogans* LPS shows low endotoxicity, due to the evasion of TLR-4 internalization.

Keywords: *Lipopolysaccharide, Nitric Oxide, Superoxide, Macrophages, Leptospira interrogans*

Acknowledgements: This work was supported by the Institute of Biochemistry, Molecular Biology and Biotechnology, University of Colombo and constitutes a part of MSc studies of the author, Gunawardane I.S.

Detection of Large Deletions/Duplications and SNPs in Selected Human Sex Determination Genes in a Cohort of 46, XY DSD Children in Sri Lanka

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46, XY disorders of sex development (DSD) are congenital conditions marked by atypical development of chromosomal, gonadal, or anatomical sex. This study aimed to identify genetic variations, including large deletions, duplications, and single nucleotide polymorphisms (SNPs), in key sex determination genes (*NR5A1*, *SRY*, *SOX9*, *NR0B1*, and *WNT4*) in Sri Lankan children diagnosed with 46, XY DSD. We analyzed 12 patients and 4 healthy controls using multiple ligation probe amplification (MLPA) and direct sequencing. One patient showed ambiguous heterozygous duplications in exon 3 of *WNT4* and exons 4 and 6 of *NR5A1*, while another exhibited ambiguous heterozygous duplication within exon 3 of *NR5A1*. Two Novel SNPs were identified in the *SRY* gene: c.568A>C (p.S190R) in 4 patients, and c.(-33T>A) in the 5' untranslated region in 7 patients and all 4 healthy controls, deemed benign. Additionally, a silent variant c.393G>A (p.P131P) in exon 4 of *NR5A1* was found in 5 patients but not in controls. A missense variant c.437G>C (p.G146A; rs1110061) in exon 4 of *NR5A1* was identified in one patient and predicted to be benign. The findings highlight the genetic diversity underlying 46, XY DSD, expanding the mutation spectra of *SRY* and *NR5A1* genes. Detecting large duplications and novel SNPs provides insights into the genetic mechanisms involved in sex development disorders. This study emphasizes the importance of comprehensive genetic screening for early diagnosis and management of 46, XY DSD, which can mitigate the social and psychological impacts on affected children and their families. These results form a foundational step toward establishing mutation spectra in the Sri Lankan population, with further research recommended to validate findings and explore additional genetic contributors to 46, XY DSD.

Keywords: *46, XY DSD, NR5A1, SRY, SOX9, NR0B1, WNT4, MLPA, SNP, Sex Development Disorders, Sequencing*

Bioactive Potential of Termite Nest-Derived *Corynespora torulosa* Extract Isolated from *Hypotermes obscuriceps* Nest in Sri Lanka

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The present study investigates the bioactivity of extracts of termite nest-derived *Corynespora torulosa* that was isolated from *Hypotermes obscuriceps* termite nest in the Western province of Sri Lanka. The fungus, *C. torulosa* was identified with microscopic and morphological characterization, and internal transcribed spacer (ITS)1-5.8S-ITS2 ribosomal DNA region was sequenced for validating the molecular identification of the fungus. Extracts A1 and A2 were obtained from 03-days and 10-days old cultures of *C. torulosa* by culturing in potato dextrose agar and then extracted with ethyl acetate, respectively. Normal phase and reverse phase thin layer chromatography examinations showed that the compound spectrum of extracts A1 was different from A2. With preliminary investigation using agar plug diffusion assay, it was observed that 3 days old mycelia of *C. torulosa* was active against *Pseudomonas aeruginosa* (ATCC 25353). Antimicrobial activity of the extracts was examined by disc diffusion assay. Extract A1 was observed to be active against *P. aeruginosa* (ATCC 25353) and *Staphylococcus aureus* (ATCC 25923). There were no antagonistic activities observed on *Escherichia coli* (ATCC 8739), *Candida albicans* (ATCC 10231), *Candida glabrata* (ATCC 90030), *Candida tropicalis* (ATCC 13803), and *Candida parapsilosis* (ATCC 22019). Antioxidant property of the extracts was examined with 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay. Extract A1 demonstrated higher free-radical scavenging activity than extract A2 with the EC50 values of 1729 µg/mL and 399295 µg/mL, respectively. Cytotoxic property of the extracts on MCF7 cells (ATCC HTB-22) was assessed by using Sulforhodamine B assay, where extract A1 exerted higher anti-proliferative effect than extract A2 with the IC50 values of 259.6 µg/mL and 1448 µg/mL, respectively.In conclusion, *C. torulosa* is a good source of bioactive compounds that could be beneficial in therapeutics. The production of the bioactive compounds in *C. torulosa* is stage-specific, where the bioactive potentials are greater at the early stages of the fungal growth.

Keywords: *Termites Nest-Derived; Corynespora torulosa; Secondary Metabolites; Bio-Activity; Stage Specific*

Transcriptome Analysis of *Ophiorrhiza pumila* to Identify Camptothecin Biosynthetic Pathway

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Camptothecin (CPT) is a monoterpene indole alkaloid with a remarkable inhibitory impact on the DNA-replicating enzyme Topoisomerase-I, attributed to its anticancer properties. *Ophiorrhiza pumila* is a herbaceous medicinal model plant, with high CPT content and short generation time, making it an ideal organism for studying CPT biosynthetic pathway. CPT biosynthesis employs intermediates from the iridoid and shikimate pathways, which combine to form strictosidine and subsequently form CPT. The biosynthesis of strictosidine has been extensively explored. However, further stages in CPT production from strictosidine are still unknown. To identify the genes encoding enzymes for the biosynthesis of CPT from strictosidine, the *O. pumila* transcriptome was analyzed. RNA-Seq was conducted for the samples of leaf and flower of *O. pumila*. Leaf and flower transcriptomes of *O. pumila* were assembled using both reference-based and *de novo*-based transcriptome assembly methods. RNA-Seq generated 46,432,054 total reads for the leaf sample and 31,150,284 total reads for the flower sample. From the assembled transcript file which contained 98,886 sequences, 52,369 complete open read frames were identified. *O. pumila* genome annotation file was created which included 60,208 entries and out of that, 33,215 sequences were identified as Gene Ontology annotated entries. The assembled transcriptomes and the annotation file are to be used for a differential expression analysis and a pathway enrichment analysis to identify the genes that are responsible for the production of CPT in the plant *O. pumila.*

Keywords: *Camptothecin, Transcriptomics, Biosynthetic Pathway, Omics Sciences, Natural Products*

Investigation of the Antibacterial, Anticancer, and Antioxidant Properties of *Bambusa vulgaris* Shoot Extract and Identification of Major Components

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Bambusa vulgaris (*variety vittata*) commonly known as yellow bamboo belongs to the family Poaceae and is well-known for its role as a medicinal plant across various traditional systems. The present study aimed to determine the antimicrobial activity, anticancer activity, antioxidant activity, and the major components present in the shoot extract of *B. vulgaris* through phytochemical screening analysis and spectroscopic methods such as FTIR spectroscopy and Raman spectroscopy. The antibacterial and anticancer activities of *B. vulgaris* were studied using the MTT assay and determination of IC50. The autoclaved shoot extract expressed antibacterial activity against Gram-negative bacteria such as *Escherichia coli*, *Proteus vulgaris*, and *Pseudomonas aeuroginosa* and Gram-positive bacteria such as *Bacillus subtilis*, *Enterococcus faecalis*, and *Staphylococcus aureus*. The shoot extract also expressed anticancer activity against MCF-7 breast cancer cells with an IC50 value of 33.56 µg/ml. The antioxidant activity of the autoclaved shoot extract of *Bambusa vulgaris* was evaluated using the DPPH radical scavenging assay. The extract showed significant antioxidant activity with an EC50 value of 0.285 mg/ml. The results of the phytochemical screening indicated the presence of alkaloids, flavonoids, quinones, resins, phytosterols, and saponins in the autoclaved bamboo shoot extract. The spectroscopic investigations indicated the presence of functional groups pertaining to alcohols, ethers, esters, carboxylic acids, anhydrides, deoxyribose, amino acids, alkenes, nitrates, organic halogen compounds, carbohydrates, lipids, proteins, and nucleic acids in addition to secondary metabolites such as carotenoids and flavonoids. The results indicated that the autoclaved shoot extract of *Bambusa vulgaris* possesses significant antibacterial, anticancer, and antioxidant properties and has the potential to be an important source of natural compounds for the development of new drugs.

Keywords: *Bambusa vulgaris, Antibacterial Activity, Antioxidant Activity, Anticancer Activity, Spectroscopic Analysis*

A Study on the Diversity of Pharmacogenomics Variants Affecting Dapsone Hypersensitivity Comparing South Asians with Other World Populations

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Dapsone is a vital drug for leprosy. Recent data from Sri Lanka indicates an increasing prevalence of leprosy cases, emphasizing the necessity of dapsone in the management. However, its effectiveness is accompanied by a serious clinical problem called dapsone hypersensitivity syndrome (DHS). DHS occurrence varies among populations, which poses a challenge for medical practitioners in prescribing drugs for leprosy. We postulate that these variations are due to significant differences between SNP frequencies in HLA-B*13:01, CYP2C9*3, rs701829, rs17211071, and rs201929247 in human population. No comparative study has been done on DHS and related genes between South Asians (SAS) and other world populations. For this study, we utilized PharmGKB and dbSNP curated data to compare the allele frequencies of SNPs from world populations against SAS using χ^2 tests. SAS sample sizes for CYP2C9*3, HLA-B*13:01, rs701829, rs17211071, and rs201929247 respectively were 4834, 92, 2866, 2170, and 2938. For CYP2C9*3 and rs701829; Americans, Africans, Amish, Ashkenazi Jews, East Asians (EAS), Finns, and Non-Finnish Europeans (NFE) demonstrated significantly different allele frequencies to SAS. For HLA-B*13:01; Europeans, Africans, African others, and African Americans demonstrated significant differences, and Asians, EAS, Other Asians, and Latin Americans showed no significant differences. For rs17211071, Africans, Amish, Americans, East Asians, Finns, and NFE demonstrated no significant difference, and ASJ showed a significant difference. For rs201929247, Africans and Finns had no significant differences, whereas Americans, Amish, ASJ, EAS, and NFE demonstrated significantly lower. These findings demonstrate that compared with other populations, allele frequencies of some studied SNPs were significantly different in SAS. Hence, prescribing dapsone for leprosy treatment should change to avoid DHS in the SAS population. Further clinical research is needed to determine the optimal dapsone dose alterations, considering environmental and other factors behind DHS.

Keywords: *Pharmacogenomics, Personalized Medicine, Leprosy, DHS, Dapsone*

Design of CRISPR/Cas9-based Therapeutic Tool to Attenuate Cancer Progression

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Cancer is a leading cause of global mortality and requires novel, effective strategies to arrest its growth and metastasis. The altered energy metabolism in cancer cells leads to higher proliferation, and modern cancer treatments primarily focus on the metabolic targeting of cancer cells. The overexpression of 6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 3 (PFKFB3), an isozyme of the phosphofructokinase-2 (PFK-2), leads to metabolic reprogramming, causing abnormal proliferation of cancer cells. PFKFB3 is a potent regulator of glycolysis in tumor cells, and high expression of *PFKFB3* is significantly associated with the invasion and metastasis of several tumors. PFK-2 produces fructose-2,6-bisphosphate (F2,6BP), which activates phosphofructokinase-1 (PFK-1), the key regulatory enzyme in glycolysis. Therefore, silencing the *PFKFB3* enzyme can substantially reduce the glucose metabolism rate in cancer cells, making it an important strategy for controlling cancer progression. This study aims to exploit the CRISPR/Cas9 tool to knockout *PFKFB3* and slow down breast cancer progression. A specific gRNA was designed using bioinformatics tools to specifically target exon 2 of the PFKFB3 for knockout experiments. To facilitate repair through the HDR pathway, a donor template containing *Eco*RI and a 6XHis tag was designed using bioinformatics tools to minimize off-target effects. The designed donor template, along with recombinant pSpCas9(BB)-2A-Puro plasmid, was transfected into MCF-7 cells, followed by a puromycin selection to identify transfected cells. The transfected cells can be subjected to clonal expansion and downstream assays to confirm and validate the CRISPR-mediated silencing of the *PFKFB3*, followed by cell proliferation assays to examine the effect of the modified gene. As rapidly proliferating cancer cells depend on aerobic glycolysis for energy, silencing *PFKFB3* could significantly hinder cancer cell growth and spread, making it a safe and highly effective therapeutic approach.

Keywords: *CRISPR/Cas9, Cancer, PFK-2, PFKFB3, Gene silencing*

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Evaluation of the Diversity of *DPYD* Gene Variants Affecting Fluoropyrimidine Toxicity, Comparing South Asians with Other World Populations

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Fluoropyrimidine (FP), a chemotherapy drug, is utilised as a treatment for colon cancer, head and neck cancer, and breast cancer. Apart from the effectiveness, toxicity is a limitation. The DPYD gene produces the DPD enzyme, which aids in the FP metabolism in the human body. Mutations in the gene cause the deficiency or non-functionality of the DPD enzyme. The DPYD gene exhibits high polymorphism, with its distribution varying among different populations. This research aims to compare frequencies of more common DPYD gene variants of South Asians (SAS) such as DPYD*2A(rs3918290), DPYD*9(rs1801265), DPYD*5, rs2297595, DPYD*6, rs17376848, rs56038477, DPYD*4(rs1801158), rs67376798, and rs75017182 with global populations such as Africans (AFR), Amish (AMI), Latin Americans (AMR), Ashkenazi Jewish (ASJ), East Asians (EAS), Finnish (FIN), and Non-Finnish (NFE). Allele frequencies of different DPYD variants were obtained from the PharmGKB database. Populations were compared using X^2 analysis. $p<0.05$, deemed to be statistically significant. This study found a significant difference between the SAS population and AFR, AMR, ASJ, EAS, FIN, and NFE populations for the DPYD*9A gene variant, except for the AMI population. The distribution of the DPYD*2A gene variant of SAS significantly differs from AFR, ASJ, FIN, and NFE populations, except for AMR and AMI. The prevalence of DPYD*5, DPYD*6, rs17376848, and rs56038477 in the SAS significantly differs from all the above-mentioned populations. The distribution of the rs75017182 gene variant in SAS has shown significant differences with AFR, AMR, ASJ, and EAS individuals, except for NFE and FIN. No significant difference was found in the rs67376798 gene variant distribution of SAS compared to all the populations. This study elucidates the importance of pharmacogenomic data specific to different populations guides personalized medicine and the advantages of DPYD genotyping before cancer treatment, especially in SAS communities where clinically significant genetic variations and haplotypes occur.

Keywords: *Pharmacogenomics, Personalized Medicine, Fluoropyrimidine, Fluoropyrimidine Toxicity, South Asians*

Application of Machine Learning to Predict Gallstone-Related Disease Susceptibility via Routine Blood Tests

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Typical diagnosis of gallstone disease relies on medical imaging supplemented by biochemical testing. We propose the development of a machine learning based predictive model using routine blood tests; alanine transaminase (ALT), high-density lipoprotein (HDL), triglycerides (TG), total cholesterol (TC), and fasting blood sugar (FBS) for diagnosis of gallstones. Data from 500 patients with and without gallstones and bile duct stones were processed using four algorithms; K-Nearest Neighbour, Random Forest, Decision Tree, and Naive Bayes, with performance of each algorithm compared based on parameters; accuracy, precision, recall, and F1 score. The Random Forest algorithm was optimal for predicting susceptibility to both gallstones and bile duct stones. An accuracy of 98% and a precision of above 97% indicated the model's ability to correctly classify positive cases. The model was robust yielding only one false positive result even with a training data set of 105 patients, and the rest used for validation and testing. This study highlights the ability of machine learning algorithms combined with routine blood tests for cost-effective and rapid risk assessment of individuals preemptively, enabling timely interventions and preventive measures to improve patient outcomes and quality of life. Training the machine learning model with more patient data will enable the application of results to a more generalizable and wider population.

Keywords: *Gallstone Disease, Machine Learning, Alanine Transaminase High-Density Lipoprotein, Triglycerides*

Report of Driver Mutations Landscape Associated with *JAK2, CALR,* and *MPL* Mutations in a Cohort of Patients Diagnosed with Myeloproliferative Neoplasms

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Myeloproliferative neoplasms (MPN) are hematological disorders characterized by clonal expansion of the myeloid stem cells, including red blood cells, white blood cells, and platelets. MPN encompasses several subtypes, however, the classic Philadelphia chromosome (Ph)-negative MPNs; polycythemia vera (PV), essential thrombocythemia (ET), and primary myelofibrosis (PMF), are the focus of the current research. In the present study, *JAK2* exon 14, *CALR* exon 9, and *MPL* exon 10 driver mutations were considered as part of the diagnostic workup in fulfilling the requirement of the WHO diagnostic criteria for MPN, 2022. Detection of the driver mutations was carried out by an in-house developed allele-specific polymerase chain reaction (AS-PCR) with subsequent amplicon sequencing. The study consisted of 20 previously diagnosed patients with Ph-negative MPNs. Genomic DNA was extracted from peripheral blood samples using column-based extraction, and AS-PCR was performed. Suspected mutation-positive amplicons were subjected to Sanger sequencing to confirm the targeted mutations. Of the 20 MPN patients, 7 (35%) were diagnosed as PV, 3 (15%) as ET, 6 (30%) as PMF, and 4 (20%) were categorized as MPN-Unclassified. *JAK2* V617F mutations were identified in 13 (65%) of the cases, *CALR* type II mutations (c.1154_1155insTTGTC) in 3 (15%), and *MPL* W515K mutations in 2 (10%). However, no statistical correlation was observed in the frequency of mutations among the different MPN subtypes. There was a significant difference, however, in hemoglobin (13.1 ± 3.7, 10.5 ± 1.8, 7.4 ± 0.8 g/dL; $p < 0.05$) and platelet counts (445 ± 297, 1079 ± 343, 89 ± 25 x10^3/µL; $p < 0.05$) amongst *JAK2*, *CALR* and *MPL* mutation-positive patients, respectively. The identification of these driver mutations in 90% of the patient cohort underscores its clinical relevance and inclusion in diagnostic panels for MPN, thus making the developed AS-PCR-sequencing assay a valuable tool for routine molecular diagnostic workup.

Keywords: *Myeloproliferative neoplasms, JAK2, CALR, MPL, AS-PCR.*

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Exploring Genetic Origin of Sinhalese with *Alu* Polymorphisms

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Sri Lanka is an island of a multi ethnic population of which majority (74.9%) comprises of Sinhalese. The exact origin of Sinhalese is still controversial. The present study was carried out to determine the genetic affinity of Sinhalese population using allele frequencies on few common *Alu* polymorphisms (TPA 25, PV92, F13B, APO, APOA1, D1, A25, B65 loci and Y *Alu* polymorphism (YAP)). These *Alu* are commonly reported among Indians and several other populations in Northwest region of India. DNA was extracted from blood samples of 20 males and 20 females, and amplified by polymerase chain reaction (PCR). The presence or absences of respective *Alu* polymorphisms were observed in agarose gel electrophoresis. Chi-square test and Principal Components (PC) were used for data analysis. All markers except D1 and YAP were in Hardy-Weinberg equilibrium and YAP was not found among males. PC analysis (based on pairwise FST) showed that Sinhalese are closely related to the Pakistan Tribal populations, while absence of YAP supports admixture with Indian and South East Asian populations. Further comprehensive studies are needed to ascertain the genetic origin of Sinhalese.

Keywords: *Common Alu Elements, YAP, Sinhalese, Sri Lanka*

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Serum Inducible Nitric Oxide Synthase and NF-κB Levels among Long-Term Skilled Meditators

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Meditation has proven to alter nitric oxide (NO), which is produced by three isoforms of NO synthase (NOS): Neuronal NOS (nNOS), inducible NOS (iNOS), and endothelial NOS (eNOS). NF-κB activation upregulates iNOS leading to enhanced nitric oxide production during an inflammatory response. The study's objective was to assess nNOS, iNOS, eNOS, and NF-κB expression in skilled meditators and to compare them in age, gender, and education level matched non-meditating group. In this cross-sectional, case-control study, long-term, skilled healthy meditators (n=18) were recruited from Buddhist meditation centers using a validated interview, and age, gender, BMI, and educational / occupational level matched healthy subjects (n=18) who had never practiced meditation were recruited as the control group. The serum levels of nNOS, iNOS, eNOS, and NF-κB in both groups were assessed using commercially available ELISA kits. Serum levels of nNOS, iNOS, eNOS, and NF-κB of meditators and controls were compared using Mann-Whitney U test and Independent Samples t-test. The mean age of the meditator and control groups were 42.77±9.51 and 42.54±10.43 years respectively and 67% were males. The mean duration of the meditation practice was 6.46±2.89 years. In the meditator group, the iNOS (1154.99 ± 51.68 pg/ml) (Mean ±SEM) and NF-κB (1.73±0.02 ng/ml) levels were significantly lower compared to the control group (iNOS ;1287.52±18.00 pg/ml; p=0.025 and NF-κB; 1.83±0.03 ng/ml; p=0.035). In contrast, eNOS (1041.23±20.80 pg/ml) and nNOS levels (2.09 ± 0.03 ng/ml) were higher in the meditator group but not significant compared to eNOS (975.90±18.93 pg/ml; p=0.060) and nNOS levels (1.97±0.06 ng/ml; p=0.098) in the control group. The study suggests that meditation is associated with lowering NF-κB which could lower the production of iNOS through NF-κB-p65 pathway subsequently lowering the production of iNOS mediated NO production.

Keywords: *Meditation, Nitric Oxide Synthase, iNOS, NF-κB, eNOS, nNOS*

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Comparison of Genomic DNA Extraction Methods: Assessing High-Yield and High-Purity Approaches for Selected Aquatic Plants

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The success of molecular biology techniques relies on the high quantity and quality of the extracted DNA. DNA extraction from plants is more challenging due to rigid cell walls and secondary metabolites that can interfere with the extraction. Although extracting DNA from aquatic plants is less common than terrestrial plants, it is important for conservation efforts, ecological research, and biotechnological applications. Therefore, we comparatively assessed the efficiency of DNA extraction protocols for four selected invasive aquatic plant species in Sri Lanka: Water hyacinth (*Eichhornia crassipes*), Salvinia (*Salvinia molesta*), Water lettuce (*Pistia stratiotes*), and Hydrilla (*Hydrilla verticillata*) in terms of yield and purity. We applied four DNA extraction protocols: cetyltrimethylammonium bromide (CTAB), CTAB with beta-mercaptoethanol (CTAB_β-ME), CTAB with liquid nitrogen (CTAB_N_2), and sodium dodecyl sulfate (SDS), and the concentration and purity of extracted DNA were assessed using the spectrophotometric method and 1% agarose gel electrophoresis. Accordingly, CTAB_N_2 yielded the highest quantity of DNA from *E. crassipes* (1598.2 ng μl^{-1}) with relative purity (A260/A280: ~2.0). For *S. molesta* and *P. stratiotes*, CTAB_*β*-ME method was more effective while *S. molesta* yielded 965 ng μl^{-1} DNA (A260/A280: 1.8), and *P. stratiotes* yielded 1666.7 ng μl^{-1} (A260/A280: ~2.0). *H. verticillata* yielded the highest DNA concentration (723.7 ng μl^{-1}) with comparatively pure DNA (A260/A280: 1.7) from the CTAB_N_2 extraction method. The results showed that the most effective methods for DNA extraction for examined aquatic plants were CTAB_β-ME and CTAB_N_2, considering both quality and quantity. However, further purifications are necessary to improve the quantity and quality of DNA from these plants. The study also addressed modifications to optimize extraction methods for dried samples in future research. This work collectively enhances our comprehension of the various DNA extraction methods utilized for aquatic plants, contributing to both scientific knowledge and environmental advancements.

Keywords: *Aquatic Plants, DNA Extraction, High-Yield, High-Purity, Invasive Species*

Oxidative Stress and Anti-Oxidant Parameters in Patients with Resistant Hypertension, Controlled Hypertension, and Age-Gender Matched Healthy Controls—Extended APPROPRIATE Trial

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Resistant hypertension (RHTN) is defined as uncontrolled blood pressure despite treatment (>140 /90 mmHg) with concurrent use of three antihypertensive agents of different classes, one of which should be a diuretic. A comparative analysis of the extended APPROPRIATE trial was conducted on measures of reactive nitrogen species (NO_2- and NO_x) and antioxidant capacity (AOC) in patients having RHTN with controlled hypertension and healthy controls. Thirty-eight consecutive patients with controlled hypertension were recruited from medical clinics of the National Hospital of Sri Lanka and 38 healthy volunteers, without hypertension and other chronic illnesses were also recruited for comparison. Both groups were age and gender matched to existing recruits with RHTN enrolled for the APPROPRIATE trial (n=40). Blood samples collected from all study participants, prior to their breakfast and were assessed for serum AOC, NO_2- and NO_x levels using ABTS and Griess assay respectively. Mean serum NO_2- and NO_x levels were significantly lower and mean AOC was significantly higher in patients with controlled hypertension (n=38) and healthy controls (HC, n=38) compared to RHTN patients (n=40) at the pre-intervention stage (p<0.001).Serum NO_2-, NO_x and AOC levels of both controlled hypertension and HC were comparable to those of the RHTN patients following treatment for 3 months with propranolol (n=18). Significant, positive correlations between NO_2- levels with systolic blood pressure (SBP) and diastolic blood pressure (DBP) (r=0.396and r=0.292respectively; p<0.001) as well as total NO_x levels with SBP and DBP (r=0.636and r=0.480 respectively; p<0.001) were noted. Conversely, there was a significant negative correlation between AOC levels with SBP and DBP (r=-0.846 and r=-0.626 respectively; p<0.001).In conclusion, these findings showing higher AOC and lower NO_x/NO_2- in HC and in controlled hypertensives compared to RHTN. Further, trends of these metrics show correlation with level of SBP and DBP. Further studies are recommended to elucidate a mechanistic understanding of oxidative-antioxidant balance with alteration of blood pressure and treatment resistance.

Keywords: *Oxidative Stress, Reactive Nitrogen Species, Anti-Oxidant Capacity, Resistant Hypertension, Sri Lanka*

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In Vitro Effects of *Vernonia zeylanica* on Degranulation of Human Basophil Derived from KU812 Cells

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KU812 cell line is an immature pre-basophilic cell that has the potential to differentiate into mature basophils. Allergy reactions occur due to various factors such as food, insect stings, pollen, and medicines. Basophils respond to allergens through interactions with surface receptors such as FcεRI and undergo IgE-dependent or other receptors such as MRGPRX2 leading to non-IgE mediated activation resulting in the release of preformed mediators and pro-inflammatory cytokines. *Vernonia zeylanica* is a medicinal plant used as an external application for boils, bone fractures, eczema, and internally for asthma in traditional medicine in Sri Lanka. The aim of this study was to determine the effect of different extracts of *Vernonia zeylanica* on non-IgE mediated degranulation of mature KU812 derived basophils, prepared using a 25–28-day maturation process. By day 25-28, there were 77% granulated, mature basophils. Mature basophils were distinguished morphologically using Wright-Giemsa and Toluidine Blue stain. The effects of extracts of *V. zeylanica* on Compound 48/80-induced degranulation, histamine release, production of superoxide, and IL-8 were assessed. Of the five different extracts tested, ie., methanol/dichloromethane extract (MDE), hexane, chloroform, ethyl acetate, and methanol sequential extracts, all extracts showed significant and a dose-dependent inhibition of degranulation (r=0.456-0.886; p<0.05) in the Toluidine Blue assay. Significant inhibition of histamine release was observed at 500 µg/m for chloroform, 250µg/ml for hexane, and 62.5µg/ml for methanol and MDE respectively (p<0.05). Although KU812 derived mature basophils produced superoxide radicals upon stimulation, inhibition by *V. zeylanica* extracts was not significant. IL-8, a cytokine involved in allergy was completely inhibited by 500 µg/ml of MDE, chloroform, and methanol extracts. In conclusion, findings of this study validate the use of *V. zeylanica* for preventing pseudo-allergies mediated via non-IgE dependent degranulation of basophils and highlights the need for further investigations on fractions/components purified from *V. zeylanica*.

Keywords: *Vernonia zeylanica, KU812 Cells, Mature basophils, Degranulation, Histamine, IL-8*

Acknowledgements: This work was supported by the Cellular and Molecular Immunology MSc Programme, IBMBB and constitutes a part of the MSc studies of the author, Jiffry F.H.

Detection of *Leptospira kirschneri* and *L. borgpetersenii* in Urine Samples of Cattle and Buffaloes in the Kurunegala District of Sri Lanka

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Leptospirosis has emerged infectious disease caused by spirochetes of the genus *Leptospira*. A variety of wild, domestic, and livestock animals serve as the reservoir for pathogenic *Leptospira* which is transmitted to humans via direct contact with the urine of infected animals or exposure to water or soil contaminated with such urine. In Sri Lanka, about 350,000 dairy farmers manage large numbers of cattle and buffaloes for their livelihood and agricultural purposes, which, therefore, serve as two important reservoir animals in Leptospira transmission among farmers. Urine samples (200 ml from each) collected from 57 cattle and 30 buffaloes from randomly selected farms in Kurunegala district were processed and DNA was extracted using CEYGEN BactoSpin D™ genomic DNA kit. Single-tube nested PCR was performed to amplify a 547 bp fragment of 16S rRNA (rrs) gene segment specific for 9 pathogenic and 5 intermediate *Leptospira* species (and 74 serovars in total). The expected amplicon size of 547 bp was observed in one cattle and four buffalo samples tested indicating that the prevalence of leptospiral carriage was 1.8% (1/57) and 13.3% (4/30) in cattle and buffaloes respectively. It is noteworthy that all four PCR positive buffalos were asymptomatic whereas the PCR positive cow had a history of a miscarriage and a birth of a low birth weight calf. PCR positive cattle sample and two buffalo samples that gave strong PCR bands were subjected to bi-directional Sanger Dideoxy Sequencing (Genelabs Medical Ltd, Sri Lanka) and sequences were analyzed using BioEdit software. Sequences of the cattle sample and one buffalo sample had 100% alignment with *L. borgpetersenii* while the other buffalo sample had 100% alignment with *L. kirschneri*. These findings highlight the usefulness of screening livestock urine samples for detection of leptospirosis, using a single-tube nested PCR. Further investigations with a larger sample would provide stronger evidence to determine asymptomatic carrier prevalence as well as confirming diagnosis of leptospirosis in livestock farm animals.

Keywords: *Leptospirosis, Leptospira kirschneri, Leptospira borgpetersenii, Single Tube Nested PCR, 16S rRNA, Sri Lanka*

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Inhibition of IgE-Independent Basophil (RBL-2H3) Degranulation by the Aqueous Seed and Fruit Peel Extracts of *Punica granatum*

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Suppression of the release of mediators due to basophil and mast cell degranulation is a key event in relieving allergy symptoms. Natural compounds play an important role as inhibitors of degranulation due to their lesser side effects, low cost, and ease of access. *Punica granatum* fruits comprise of natural compounds with anti-inflammatory, anti-oxidative, and anti-cancer properties having a high total phenolic content compared to many other fruits. This study investigated the *in vitro* effect of aqueous seed and fruit peel extracts of *P. granatum* on IgE-independent degranulation of rat basophils (RBL-2H3 cells). Aqueous extracts of fresh seeds (50% w/v) and air-dried peels (20% w/v) of ripe fruits (ASE and APE respectively) of *P. granatum* were prepared and lyophilized. Degranulation in RBL-2H3 cells was activated by compound 48/80. Inhibitory effects of ASE and APE were determined by quantitative histamine release assay using a standard fluorometric method established with o-phthalaldehyde (OPT) and percent degranulation of basophils was calculated using Toluidine Blue assay. Quercetin was used as positive control. Both ASE and APE induced dose-dependent inhibitory effects on histamine release (r=0.445 & r=0.669 respectively; $p<0.0001$) with histamine release IC_{50} values of >1000 µg/ml and 225 µg/ml respectively ($p<0.05$). Normalized, histamine release inhibition suggests that APE is more effective than ASE in suppressing degranulation of basophils ($p<0.05$). Interestingly, the degranulation inhibitory effect of APE was similar to that of quercetin ($p>0.05$). These results were confirmed by Toluidine Blue assay results indicating the same trend of degranulation. Compound 48/80 (62.5 µg/ml) had induced 71% degranulation. ASE and APE (2000 µg/ml) treated cells showed 34-36% reduction in degranulation. In conclusion, *P. granatum* peels that are considered as waste is potent in basophil stabilizing activity and emphasize the need for further studies to understand the underlying mechanisms of stabilizing activity and release of other mediators in basophils.

Keywords: *Punica granatum, Basophils, IgE-Independent Degranulation, Histamine, RBL-2H3*

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Diagnosis of Leptospirosis Using Urine Samples in Sri Lankan Patients

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Leptospirosis is a neglected zoonotic disease caused by bacteria *Leptospira*, affecting more than one million people annually worldwide, with 58,900 deaths in tropical countries. For effective management of leptospirosis, prompt and reliable diagnosis is required. In this study, we assessed the usefulness of urine, a non-invasive sample for diagnosis of leptospirosis suspected patients using a single-tube nested PCR. A total of 50 patients with clinical symptoms consistent with leptospirosis were enrolled on day 5 to 13 of illness from two hospitals in the Colombo district, the National Hospital of Sri Lanka, and Base Hospital, Homagama. A 60 ml urine sample was collected from each patient, DNA was extracted using CEYGEN bacterial DNA extraction kit and the single-tube nested PCR was employed to amplify a 547 bp fragment of 16srRNA (rrs) gene segment specific for 9 pathogenic and 5 intermediate *Leptospira* species (and 74 serovars in total). Out of the 50 patient urine samples, 4 samples gave positive PCR with a 547 bp PCR fragments. These four patients had 5, 6, 8, and 9 days of illness at the time of recruitment. Two samples that gave strong PCR bands underwent bi-directional Sanger dideoxy sequencing (Genelabs Medical Ltd). The resulted sequences were used to generate the final sequence through contig-assembly in Bio-edit software. The partial rrs sequence had an identity of 99.3% & 100% *Leptospira interrogans* serovars Copenhageni and Canicola respectively. These findings underscore the value of screening urine samples for early leptospirosis diagnosis. Additionally, the data align with prior research identifying *L. interrogans* as the predominant species in Sri Lankan patients. This study thus emphasizes the utility of urine samples and single-tube nested PCR for diagnosis confirmation and *Leptospira* species identification, which are crucial for understanding transmission dynamics and crafting effective public health interventions.

Keywords: *Leptospirosis, Leptospira interrogans, Molecular Diagnosis, Single-Tube Nested PCR, Sri Lanka*

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Effect of Extracts of *Artocarpus nobilis* on Inhibition of Compound 48/80 Induced Degranulation and Histamine Release by Rat (RBL-2H3) Basophils

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Artocarpus nobilis is a Sri Lankan endemic plant used in traditional medicine to treat abscesses, blisters, and fractures. Previous studies have shown diverse bioactivities including anti-oxidant and anti-inflammatory activities which would be beneficial to treat allergies. This study aimed to investigate the potential of roots extracts of *A. nobilis* to inhibit histamine release in Ig-E-independent degranulation of rat basophils, RBL-2H3. RBL-2H3 cells from the culture were pre-treated for 30 minutes with a range of concentrations (31-500 µg/mL) of *A. nobilis* methyl/dichloromethane extract (MDE) and ethyl acetate extract (EAE) and then the IgE-independent degranulation was induced with 62.5 µg/mL Compound 48/80 (C48/80) for 30 minutes. Amount of histamine released by basophils was assessed in supernatant using O-phthaldialdehyde fluorometric assay and percentage of degranulated cells was assessed by Toluidine Blue assay. A mast cell stabilizer, Sodium cromoglycate was used as a positive control. MDE treated cells had a significantly lower histamine levels compared to the control without the extract showing a total inhibition, at concentrations of 125 - 500 µg/mL ($p< 0.001$) whereas EAE had 91.85% and total inhibition at 250 and 500 µg/mL ($p< 0.05$) respectively. Assay using Toluidine Blue staining showed that exposure to MDE had inhibited degranulation by 31.0%, 41.6%, and 41.9% at respective concentrations whereas EAE showed 21.7%, 25.4%, and 31.1% inhibition compared to the control. Exposure to both MDE and EAE (before stimulating RBL-2H3 cells with C48/80), resulted in a dose-dependent inhibition of histamine release (r=0.851, p=0.032 for MDE and r= 0.943, p=0.016 for EAE). These results indicate that roots of *A. nobilis* have the potential for inhibiting histamine release in the IgE-independent degranulation pathway of basophils. *In vivo* studies will further validate these findings.

Keywords: *Artocarpus nobilis, RBL-2H3, Non-IgE Mediated-allergy, Histamine, Fluorometric Assay*

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Assessing the Effectiveness of RT-LAMP Assay for Detecting Dengue Virus in Pooled Samples of *Aedes aegypti* Mosquitoes

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Dengue is one of the leading health problems in Sri Lanka. As there are currently no effective vaccinations or drugs available for dengue, implementation of *Aedes* vector surveillance and control programmes are crucial in predicting epidemics to mitigate human infections. Developing a reliable test to identify DENV in the infected vector will greatly enhance the effectiveness of surveillance to plan proactive vector control interventions. Detecting infected adult vector from a pool of vectors collected will be crucial for surveillance programs, as processing individual mosquitoes is costly. Therefore, current study employed the RT-LAMP assay to detect efficacy of DENV in pooled mosquito samples. RT-LAMP was optimized using RNA extracted from viral cultures (C6/36 *Aedes albopictus*) of all four dengue serotypes. Further the assay was used to detect DENV using single mosquitos of artificially infected female *Aedes aegypti*. Then female *Ae. aegypti* mosquitoes were artificially inoculated with dengue virus 2 and collected on day 7 for this study. The infected mosquitoes were mixed with un-infected mosquitoes to the ratios of 1:1, 1:5, 1:10, 1:20, and 1:25. Homogenized mosquito extractions from those pooled samples were tested by RT-LAMP (dengue 2 specific (D_2P) primers and primers to detect all four serovars (D_{all}) using WarmStart Colorimetric LAMP 2X Master mix with UDG and Syto 9 green fluorescence dye. Positive color changes and peak amplifications were observed for mosquito pools ranging from 1:1 to 1:25. The D_2P primer showed positive results in 40 minutes while the D_{all} primer showed positive results in 35 minutes. Analytical effectiveness of the method was evaluated through standard graphs by plotting mean cq against dilutions, with R^2 values of 0.9866 for D_2P primer and 0.9999 for D_{all} primer. The RT-LAMP assay could detect infection in an *Ae. aegypti* mosquito in a pool of up to 24 uninfected mosquitoes.

Keywords: *Dengue, Aedes aegypti, Mosquito Pool, RT-LAMP*

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Leucas zeylanica Suppresses the Proliferation of Cancer Stem Cell-Like NTERA-2 cl.D1 Cells

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Cancer is the second leading cause of death, worldwide. Cancer stem cells (CSCs) are a rare-type cell population of a tumour, having self-renewal and differentiation potentials, and resistance to cancer therapy. CSC-targeted therapy restricts cancer progression and recurrence. Leucas zeylanica (Ceylon slitwort) is a medicinal plant used in natural remedies to treat bowel-disorders in southeast Asia. The present study aimed to investigate the anticancer potentials of L. zeylanica in cancer stem cell-like NTERA-2-cl.D1 cells (ATCC–CRL–1973; human embryonal carcinoma). Initially, the whole plant was air-dried and ground to powder, and extracted sequentially with hexane, dichloromethane, ethyl-acetate, and methanol using ultra-sonication. Anticancer potentials of the extracts were assessed using sulforhodamine-B, free-radical scavenging, glutathione s-transferase activity (GST), colony formation efficiency, cell migration, caspase activation, DNA fragmentation, and apoptotic body formation assays. Among all extracts, dichloromethane extract showed the highest anti-proliferative effects with IC_{50} 33.23, 21.11 and 8.09 µg/ml at 24, 48 and 72 h post-treatments. Whereas, hexane extract (86.11, 71.28 and 17.75 µg/ml) showed higher activity than ethyl-acetate, and methanol extracts. Hexane and dichloromethane extracts showed the highest free-radical scavenging activity with EC_{50} 87.5±3.53 and 84.45±3.23 µg/ml, respectively. At 25 µg/ml, ethyl-acetate extract exerted the highest GST activity (0.0226 U/ml). In comparison to the other extracts, dichloromethane extract resulted in the lowest colony formation efficiency at 400 µg/ml after 14 days of treatment and demonstrated the highest cell migration inhibition rate (0.0780mm2/h) after 72 h treatment in time and dose-dependent manner. Induction of apoptosis in NTERA-2-cl.D1 cells treated with dichloromethane extract, was confirmed by caspase 3/7 activation, DNA fragmentation assay and apoptotic body formation. The study shows that the dichloromethane extract of L. zeylanica exerts anticancer activity in cancer stem cell-like cells by causing apoptosis, thus it can be utilized in the development of drug leads to target and eradicate CSCs.

Keywords: *Anticancer Activity, Leucas zeylanica, Cancer Stem Cell-Like Cells, NTERA-2-cl.D1, Colony Formation*

Effect of Graphene Oxide and Reduced Graphene Oxide on Glycolysis In Cancer Stem-Like Cells

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Cancer stem cells (CSCs) are tumor cells that resist treatment, self-renew, and cause metastasis and cancer recurrence. Graphene oxide (GO) and reduced graphene oxide (rGO) have demonstrated promising biomedical applications by impeding CSCs. Understanding the interaction between graphene materials and CSCs will advance cancer treatments. The present study investigates the effects of GO and rGO on glycolysis inhibition and cytotoxicity in NTERA-2-cl.D1 cells. The cells were treated with varying concentrations of GO and rGO at different treatment intervals. Cytotoxicity was assessed using SRB assay. Scratch, and colony formation assays evaluated treated NTERA-2-cl.D1 cells' ability to metastasize and form colonies, respectively. rGO showed noticeable cytotoxicity towards NTERA-2-cl.D1 cells in a dose and time-dependent manner (IC_{50} was 55.84, 24.73, and 14.25 µg/mL, at 24, 48, and 72 h, respectively). Meanwhile, GO did not show any cytotoxic effects (IC_{50} > 1000 µg/mL). The cells exposed to 12.5 to 50 µg/mL of rGO for 24 to 48 h had reduced migration rates from 1.2 to 0.8 %/h and 1.9 to 0.0 %/h, respectively. Whereas GO did not exert any considerable effects on the migration rates of NTERA-2-cl.D1 cells. rGO reduced colony formation efficiency of the cells from 12.5 to 4.4 % after 4 days, with rates dropping to 0 % after 7 days of treatments at 12.5 to 100 µg/mL. However, GO-treated NTERA-2-cl.D1 cells exhibited a slight decrease in colony formation efficiency from 12.0 to 6.3 % at 0 to 100 µg/mL after 4 days, dropping below 7 % after 7 days. The study showed that rGO effectively inhibits proliferation, migration, and colony formation of cancer stem-like NTERA-2-cl.D1 cells, accentuating its potential as a therapeutic agent, but glycolysis inhibition and its underlying mechanisms remain unexplored. Furthermore, the inconsistent cytotoxicity observed with GO indicates a need for further studies to understand its interactions with cancer cells.

Keywords: *Cancer Stem Cell, Cytotoxicity, Glycolysis, Graphene Oxide, Reduced Graphene Oxide*

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Assessment of Piscicidal Activity of *Catunaregam spinosa* Seeds Using Adult *Danio rerio*

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Fishing industry, one of the oldest industries in the world, ensures the economic survival of people from household to commercial scales, with fish serving as a primary protein source in human diets. Among the diverse fishing techniques, the ancient method of throwing crushed parts of piscicidal plants into water bodies is notable. *Catunaregam spinosa* (family Rubiaceae) is a well-known fish stupefying plant in this long-held belief as the present study investigated the potential of piscicidal activity by calculating the lethal concentrations. Both *Danio rerio* rearing and assay were conducted according to the guidelines by OECD 203, 2019. Healthy *D. rerio* fish were obtained from an aquarium in Piliyandala and seeds were collected from fresh, mature fruits at the Ayurveda Herbal Garden in Haldumulla. The seeds were air dried for three days and pulverized using an electric grinder. A stock aqueous seed extract (20.0 mg/L) was diluted to 1.25, 2.5, 5.0, and 20.0 mg/L. Mortality and the behavioral changes of fish were observed for 96 h. Each concentration was replicated with seven healthy fish per tank, containing 2.0 L of test solution at 26 ˚C. Distilled water and 3,4-Dichloroaniline (4.0 mg/L) served as the negative and positive controls respectively. Lethal concentrations were calculated using regression analysis in SPSS software. The aqueous seed extract of *C. spinosa* showed concentration and time-dependent mortalities, demonstrating high piscicidal activity (LC_{50}; 1.952 and LC_{90}; 7.807 mg/L). Physico-chemical parameters showed no significant on the mortality of *D. rerio* ($p > 0.05$). Observed behavioral changes ranged from mild to severe. *C. spinosa* will ensure sustainable and environmentally friendly fishing, and further exploring of causing agents and mechanisms will lead in developing biodegradable piscicides.

Keywords: *Catunaregam spinosa, Danio rerio, Piscicide, Seeds, Neurotoxicants*

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Novel *fla*B Gene Variants of *Leptospira interrogans* Detected in Leptospirosis Patient Samples Collected from Western Province of Sri Lanka

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Leptospirosis is a neglected, re-emerging, zoonotic, tropical disease caused by pathogenic spirochetes of *Leptospira spp*. Clinical status in leptospirosis patients vary from asymptomatic, mild, and severe/fatal outcomes. The objective of this study was to determine the species/genotypes of Leptospira that cause mild or severe infections using patient samples obtained from the Western Province in Sri Lanka and to determine possible changes in *fla*B protein compared to wild type protein structure. DNA extracted from previously collected blood samples from acute, mild (n=30) and severe (n=30) confirmed leptospirosis patients were used to perform nested PCR with primers designed from *fla*B gene sequence. Of the 45 samples that gave a 725 bp fragment in *fla*B nested PCR, 24 and 21 were from severe and mild leptospirosis patients respectively. Of these *fla*B PCR positive samples, 16 which exhibited strong bands (9 severe cases and 7 mild) were selected for Sanger's dideoxy sequencing. Those partial *fla*B gene sequences showed highest similarity with *L. interrogans* sequences available in GenBank database. Phylogenetic analysis was performed with 82 other Leptospira *fla*B gene sequences (from the GenBank) by Neighbor Joining method using MEGA 11. According to dendrogram, 16 partial *fla*B gene sequences obtained in this study clustered together with *L. interrogans*. Three sequences, one from a severe leptospirosis patient and two from mild leptospirosis patients exhibited novel mutations. Computational prediction of the structural changes of protein associated with those mutations revealed that AA substitutions in these three mutant sequences were likely to destabilize the *fla*B protein in the flagellum. These findings highlight the need for further studies and analysis of such mutations that may change protein structure and thereby affect the pathogenicity/virulence of the different isolates of *Leptospiria* which may have implications on target species/serovars for development of vaccine(s) and diagnostics.

Keywords: *Letospirosis, Leptospira interrogans, FlaB Gene, Single Nucleotide Mutation, Sri Lanka*

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Construction of an In Silico Ligand Energy Minimization Pipeline and Structure-Based Identification of Potential Human Gamma Secretase Inhibitor Ligands for Alzheimer's Disease

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Alzheimer's disease (AD) is a common form of dementia. In compliance with the amyloid cascade hypothesis, the accumulation and deposition of amyloid beta (Aβ) peptide in the brain is the primary cause of AD. Aberrant catalytic activity of gamma secretase (GSEC) on amyloid precursor protein (APP) mediates formation of Aβ peptide that plays a pivotal role in the pathogenesis of AD. Therefore, GSEC is considered as a potential target for AD treatments. However, there is no clinically approved GSEC inhibitor available to date. The objective of this study was to identify potential GSEC inhibitors from the compounds of lipids map database. A python script base pipeline was created for conversion of 2D molecular structure of the database to 3D structures and geometry optimization. Molecular docking of 47500 geometry optimized lipid like molecules and five known GSEC inhibitors (L685,458, DAPT, Ganoderic Acid, Rutin and Semagastat) was performed against the active site of the GSEC using Autodock vina program. Molecules that exhibited binding affinity better than the best binding affinity value of known inhibitors (<-10.2 Kcal/mol) were further screened for the drug like properties. Top 5 most drug like compounds were selected for further analysis. For these compounds, 100 ns molecular dynamic (MD) simulation was performed in their natural membrane environment using Desmond (Schrodinger 2020.1). Stability of the complexes was assessed by evaluating root mean square deviation, root mean square fluctuation, and protein-ligand contacts during the simulation period. Molecular mechanics with generalized born and surface area solvation (MMGBSA) calculation was executed for three most stable complexes using 100 frames of each MD trajectory. The average binding free energy for GSEC+Euchrenone a12 -76.9 kcal/mol, GSEC+Euchrenone a14 -68.5 kcal/mol, and GSEC+Euchrenone a15 -65.1 kcal/mol. Results indicated that Euchrenon a12, Euchrenon a14, and Euchrenon a15 are potential inhibitors of GSEC.

Keywords: *Alzheimer, Gamma Secretase, Lipids, MMGBSA, Pipeline*

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Modelling of pH-dependent Structural Changes of Dengue Virus Non-Structural Protein 1 Hexamer

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Dengue virus (DENV) is a prevalent arboviral disease among humans, primarily transmitted by the *Aedes aegypti* mosquito. Belonging to the Flaviviridae family, DENV comprises structural and non-structural proteins. Notably, Non-structural protein 1 (NS1) is a predominant protein found in the serum of infected individuals, existing in a hexameric form upon secretion. NS1 undergoes a complex secretion pathway through the ER, Golgi network, and Endosomes, encountering pHs of 7.2, 6.7-6.3, and 5.5 respectively. We retrieved and repaired the CryoEM structure of DENV NS1 hexamer from the Protein Data Bank (PDB ID=7WUV) to investigate structural changes in response to pH. The repaired structure was solvated in solvents mimicking the cellular pH values to determine protonation or deprotonation of amino acids. Each structure was assigned to these protonation states to model their respective pH environments for 50 ns Molecular Dynamics (MD) simulations, employing AMBER ff99SB-ILDN force field, as implemented in the GROMACS software. Analysis of Root Mean Square Deviation (RMSD), Radius of Gyration, and Solvent Accessible Surface Area (SASA) confirmed the stability of the structures. The stable 50 ns trajectory was then subjected to secondary structure analysis using the DSSP (Define Secondary Structure of Proteins) algorithm. Our results indicated minor dengue NS1 hexamer structure alterations at 6.3 and 6.7 pH values, affecting the distribution of 3-10 helices and isolated β bridges. Overall, these findings highlight the robust pH stability of the DENV NS1 hexamer structure.

Keywords: *DENV NS1, pH Stability, MD Simulation, Secondary Structure Analysis*

Gut Microbiome of *Apis dorsata* (Giant Honeybee) in Sri Lanka

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The giant honeybee, *Apis dorsata* is capable of pollinating diverse plant species thus important in ecosystem functioning. Despite its importance, the gut microbiome of *A. dorsata* remains unexplored compared to the largely studied *Apis mellifera*. Therefore, this study aims to characterize the gut bacterial composition isolated from the gut of adult worker bees of *A. dorsata*. Adult worker bees of *A. dorsata* (*n*=30) were collected and intact guts were dissected under aseptic conditions. Genomic DNA extracted using the phenol-chloroform isolation method was subjected to 16S ribosomal RNA gene amplicon sequencing targeting the V3-V4 regions. Data was analyzed using the 16S database in Kraken 2.0 and the 16S alignment workflow in the EPI2ME platform. A total of 570 bacterial genera were identified during this analysis. The gut microbiome of *A. dorsata* revealed a unique consortium of bacteria, including a previously unreported genus *Labrys*, *Chitinophaga* which has been previously reported in solitary bees and an infectious bacterial genus *Arsenophonus*. Commonly found bacterial species in the honeybee gut microbiome such as *Gilliamella*, *Frischella*, and *Bifidobacterium* were also identified in this study. Notably, *Lactobacillus* strains dominant in other honeybee species were less common in *A. dorsata* gut microbiome. These findings suggest that the once-assumed uniform honeybee gut microbiome can vary in different honeybee species. The observed variations in the gut bacterial community may have been influenced by habitat size or ecological adaptation. This study provides the first comprehensive analysis of the gut microbiome of *A. dorsata* in Sri Lanka revealing a diverse and unique bacterial community. The findings of this study would help to improve the knowledge of honeybee gut symbionts and their effect on honeybee health.

Keywords: *Apis dorsata, Gut Microbiome, Honeybee, Metagenomics, Sri Lanka*

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Dynamics of Neutralizing Antibodies in a Selected Cohort of SARS-CoV-2 Infected Patients and Vaccine Recipients in Sri Lanka

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The spike protein-specific antibodies in SARS-CoV-2 infection are important as neutralizing antibodies (NAbs) which block the interactions of SARS-CoV-2 virus with host cells. It is critical to understand variation of the NAbs of a patient or vaccinee to predict protection against SARS-CoV-2. We studied NAb levels of six groups (G1-G6) of participants using a Genescript surrogate virus neutralization assay kit, China. G1 comprised 47 SARS-CoV-2 infected individuals within one month from the onset of symptoms. G2 comprised 17 follow-up individuals of G1 after 6 months from the onset of symptoms (16/17 had 1-2 doses of Sinopharm, 4/17 had a third dose of Pfizer). G3 consisted 23 individuals who received one dose of Sinopharm recruited one month after the first vaccination. G4 comprised of 23 individuals who had two doses of Sinopharm (13/20 had Pfizer as third dose, and 4/20 were diagnosed with natural infection at least two weeks before) and whose sera were obtained six months after first dose. G5 and G6 had AstraZeneca vaccinees (30 in each) recruited three and six months respectively after the first dose. G6 have had 2 doses of AstraZeneca. Results showed that the NAbs increased in 52.9% and declined in 23.5% of patients from G1 to G6. Moreover, during six months follow up, a majority of Sinopharm vaccinees (69.5% from G3 to G4) had increasing NAbs while a majority of AztraZeneca vaccinees (86.7% from G5 to G6) had declining NAbs. These results were consistent with the results obtained for anti-SARS-CoV-2 spike protein-RBD antibodies assessed using an ELISA developed in-house by same authors as reported previously. According to ELISA, there was a significant increase of antibodies in G2 compared to G1. G4 had a significantly higher antibody level compared to G6. Therefore, the current study implied importance of the vaccination programs and booster vaccinations.

Keywords: *SARS-CoV-2, Spike Protein, Neutralizing Antibodies, SVNT Assay, Vaccination*

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In Vitro Anti-Cancer Effect of *Annona reticulata* L. on Cancer Stem-Like (NTERA-2 cl.D1) Cells

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Cancer is the second most common cause of death globally. Existing treatments for cancer cause unpleasant side effects, including organ damage, adverse reactions, and resistance to drugs after long-term exposure. The use of phytochemicals, containing anticancer activity is identified as a safe and sustainable method of controlling cancer. The fruit of *Annona reticulata* L., known as custard apple, has not been proven to have anticancer activity against cancer stem-like (NTERA-2 cl.D1) cells. Therefore, the present study aimed to investigate the anticancer potential of *A. reticulata L.* fruit on NTERA-2 cl.D1 cells, a cancer stem cell model. Fruit pulp of *A. reticulata L.* was freeze-dried and dissolved in water to treat NTERA-2 cl.D1 cells with different concentrations ranging from 6.25 to 100 µg/mL at 24, 48, and 72 h treatment intervals. The cytotoxic effect of *A. reticulata L. fruit* extract was compared with the positive control paclitaxel by performing the Sulphorhodamine-B assay. Cyto-morphological changes and caspase activation were assessed using acridine orange and ethidium bromide staining under fluorescent microscopy and the caspase 3/7 assay, respectively. *A. reticulata L.* fruit extract exerted a remarkable decrease in the percentage cell viability of NTERA-2 cl.D1 cells with IC_{50} values at 32.3, 15.3, and 1.0 µg/mL for 24, 48, and 72 h post-incubation periods, respectively. The expression level of caspases 3 and 7 in *A. reticulata L.* fruit treated NTERA-2 cl.D1 cells increased by 45% at the maximum treatment concentration of 30 µg/mL within 24 hours. Observation of apoptotic body formation further confirmed the caspase-mediated apoptosis induction in cells. In summary, the present study revealed that the *A. reticulata* L. fruit retards the growth of cancer stem-like cells by inducing apoptosis, which indicates its therapeutic potential against cancer.

Keywords: *Annona reticulata L., NTERA-2 cl.D1, Cytotoxicity, Apoptosis, Caspase*

Are Gibberellic Acid Biosynthesis Genes Associated with the Short Pseudo Stem Height of 'Bim Kesel'?

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Commercially cultivated banana (*Musa spp*.) varieties typically grow over 2m tall and often face challenges with lodging and pseudo-stem damage during typhoons and storms, leading to significant economic losses. Therefore, studying and breeding dwarf banana varieties with high yield and quality is essential for modern farming to enhance lodging resistance and improve harvest efficiency. Numerous studies demonstrate that plant height is regulated by genes involved in the biosynthesis and signal transduction of phytohormones such as gibberellic acid (GA). Among these, GA20ox, GA3ox, and GA2ox are three enzymes that catalyse the later reactions in the GA biosynthesis pathway. Loss of function in the GA20ox, GA2ox, and GA3ox genes can result in a dwarf phenotype, by decreasing the levels of active GAs in plants. In this study, we aimed to identify gibberellic acid oxidase genes associated with the height of the Sri Lankan dwarf banana variety "Bim Kesel". Gene-specific primers were designed for four gibberellic acid oxidase genes, *MaGA20ox5*, *MaGA20ox7*, *MaGA2ox7*, and *MaGA2ox12* using *Musa acuminata* genome sequence. These primers were used to amplify the genes using extracted DNA from Bim Kesel, Rath Kesel, and Anamalu. The sequences of the amplified polymerase chain reaction products showed significant differences in these gibberellic acid oxidase genes in Bim Kesel compared to the other two varieties. The results revealed that the complete absence of *MaGA20ox7* gene in Bim Kesel may alter the GA biosynthesis pathway leading to reduced levels of bioactive GA and contributing to the short pseudo-stem height of Bim Kesel. This gene is likely a significant contributor to banana dwarfism. Additionally, the findings suggested that mutations observed in the *MaGA2ox7* and *MaGA2ox12* gene sequences may alter the GA regulation pathway, also resulting in a short pseudo-stem height in Bim Kesel. Future research on *MaGA20ox7* is crucial to further identify its association with banana dwarfism in Bim Kesel.

Keywords: *Dwarf Banana, Bim Kesel, Gibberellic Acid, GA-oxidase Genes, Dwarfism*

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Serum MicroRNA-122 as a Predictive Biomarker for Non-Alcoholic Steatohepatitis (NASH)-Related Hepatocellular Carcinoma (HCC)

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Micro RNAs (miRNA) play an essential role as an important biomarker in human carcinogenesis. miRNA -122 is liver-specific and is the most commonly expressed miRNA in the human liver. miRNA-122 has shown implications with fatty acid metabolism and cholesterol metabolism in the adult liver suggesting a role in HCC-related risk conditions. The current study examined the relative expression level of miRNA-122 in a Sri Lankan NASH related HCC patient cohort and investigated the relationship of mi-RNA 122 expression level with some common single nucleotide polymorphisms (SNPs) (*PNPLA3* rs738409, *PNPLA3* rs2281135, *PNPLA3* rs2294918, *TM6SF2* rs58542926, and *MBOAT7* rs641738) that are previously reported to be associated with NASH-HCC. Real time quantitative PCR technique was used to detect and quantify the serum miR-122 expression levels of NASH HCC patient cohort (n=25) compared to age, BMI and gender matched cirrhosis control cohort (n=25).One-way ANOVA test and independent t-test were performed to analyze associations between the tested SNPs and miR-122 expression levels of NASH HCC patients. Relative expression of serum miRNA-122 was significantly high in the NASH-HCC group compared to the cirrhosis control group (p=0.027). Also, *PNPLA3* rs2281135 and *PNPLA3* rs2294918 variants were significantly associated with miR-122 expression levels of NASH-HCC patients. Rapid loss of hepatocytes due to hepatocyte injury in hepatocarcinogenesis, miR-122 could get leaked to the circulation, giving rise to its serum levels suggesting a potential biomarker role for serum miRNA-122 expression in liver injury associated with NASH-HCC. Associations between pathogenic variants and dysregulated miRNA expression could lead towards further understanding of the NASH HCC pathogenicity in developing early diagnosis approaches. Future studies with larger sample sizes are anticipated in order to generalize our study findings.

Keywords: *Micro RNA, Hepatocellular Carcinoma, Non-Alcoholic Steatohepatitis, PNPLA3, Sri Lanka*

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Inhibition of IgE-Dependent degranulation of Rat Basophils-RBL-2H3 by Root Extracts of *Artocarpus nobilis*

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Artocarpus nobilis is a Sri Lankan endemic plant used in traditional medicine to treat abscesses, blisters, and fractures. Previous studies have shown diverse bioactivities including anti-oxidant and anti-inflammatory activities. Immunoglobulin E (IgE)-dependent mast cell and basophil degranulation and release of mediators are responsible for the allergic reactions. The present study investigated the inhibitory activity of root extracts of *A. nobilis* on IgE dependent basophil degranulation by rat basophils (RBL-2H3 cells). RBL-2H3 cells were cultured using *Eagle's minimum essential medium* (EMEM) with 10% fetal bovine serum in TC 96-well plates. Non-toxic concentrations of root extracts (methanol/dichloromethane extract-MDE and ethyl acetate extract-EAE) of *A. nobilis* were determined by MTT assay. 15.6-500 µg/mL of MDE and 3.9-125 µg/mL of EAE were tested. In the optimized assay on inhibition of IgE-dependent basophil degranulation, cells were first sensitized with 1 µg/mL of anti-dinitrophenyl IgE (anti-DNP IgE) for 36 hours followed by 1 h incubation with non-toxic concentrations of root extrats of *A. nobilis*. Cells were then stimulated with 100 ng/mL of DNP-labeled bovine serum albumin for 1.5 hours at 37 °C. The culture supernatants were tested to quantify the amount of β-hexosaminidase released by incubating with 1 mM p-nitrophenyl N-acetyl-β-D-glucosamide. *A. nobilis* showed significant effect on IgE-dependent basophil degranulation with IC_{50} values for MDE at 252.3±1.34 µg/mL and EAE at 11.60±1.3 µg/mL ($p<0.001$) compared to the control. Further, inhibition of degranulation by EAE of *A. nobilis* was dose-dependent ($r=0.987$; $p<0.001$). Sodium Cromoglycate which was used as the reference standard at 100 µg/mL showed a high inhibitory activity (92.9 ± 0.11%). In conclusion, the ethyl acetate extract of *A. nobilis* roots had significant potent effect in *in vitro* inhibition of IgE-dependent basophil degranulation, hence may have potent anti-allergy activity.

Keywords: *Allergy, IgE-Dependent Basophil Degranulation, Artocarpus nobilis, RBL-2H3, Anti-Dinitrophenyl IgE*

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Antioxidant Capacity of Methanol/Dichloromethane Extracts of *Artocarpus nobilis* and *Vernonia zeylanica*

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Artocarpus nobilis and *Vernonia zeylanica* are two medicinal plants traditionally used for treating Asthma, wound healing, and diarrhea. Previous studies on *A. nobilis* and *V. zeylanica* have shown anti-inflammatory, antibacterial, and antidiabetic activities. This study investigated the antioxidant capacity of methanol/dichloromethane extracts (MDE) of *A. nobilis*, and *V. zeylanica* using 2,2-diphenyl-1β-picrylhydrazyl (DPPH) free radical scavenging assay, 2,2-azinobis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay, the ferric-reducing antioxidant power (FRAP) assay, and the oxygen radical absorbance capacity (ORAC) assay. the total polyphenols and flavonoid content (TPC and TFC) were analyzed as well. IC_{50} values were compared with the reference standard Trolox. MDE of *A. nobilis* showed high DPPH radical scavenging activity (IC_{50} 56.79 ± 0.11 µg/mL) compared to the Trolox value (6.8 ± 0.03 µg/mL), ABTS radical scavenging activity (IC_{50} 31.81 ± 0.31 µg/mL) with a significant difference with Trolox value (5.81± 0.30 µg/mL) and low capacities in FRAP assay (61.18 ± 4.71 mg TE/g), and ORAC assay (67.41 ± 0.45 mg TE/g). MDE of *V. zeylanica* showed low antioxidant capacity in all four assays. DPPH radical scavenging activity (IC_{50} 338.47 ± 1.77 µg/mL), ABTS radical scavenging activity (IC_{50} 107.25 ± 0.35 µg/mL), FRAP (22.24 ± 0.72 mg TE/g), and ORAC (68.48 ± 0.51 mg TE/g). Similarly, the MDE of *A. nobilis* had a higher TPC (280.78 ± 74.76 mg GAE/g) compared to that of *V. zeylanica* (166.82 ± 15.83 mg GAE/g) ($p<0.05$) The TFC of MDE of *A. nobilis* was also higher (144.58 ± 6.34 mg QE/g) compared to that of *V. zeylanica* (51.24 ± 0.77 mg QE/g) ($p<0.05$) Accordingly, the higher TPC and TFC of MDE of *A. nobilis* MDE contributed to the higher ferric reducing power having a positive correlation with TPC ($r=0.754$ $p<0.05$), TFC ($r=0.809$ $p<0.05$). Therefore, *A. nobilis* is a good source of antioxidants.

Keywords: *Antioxidant Capacity, Artocarpus nobilis, Vernonia zeylanica, Methanol/Dichloromethane Extracts, Polyphenols*

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Initial Identification of Pathogenic *Leptospira* in Bat Populations in Wavulgalge Cave, Sri Lanka

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Leptospirosis is a bacterial infection caused by spirochaetes of the genus *Leptospira*. Bats have been identified as potential reservoir hosts for *Leptospira* species in several countries. In Sri Lanka, leptospirosis causes annual outbreaks, particularly during the monsoon season. This study investigated the presence and diversity of *Leptospira* in bats inhabiting the Wavulgalge cave in Sri Lanka. A total of 148 urine samples were collected from four bat species (*Miniopterus fuliginosus*, *Hipposideros speoris*, *Rhinolophus rouxii*,and *Rousettus leschenaultii*) occupying the study site in March and July 2018, and January 2019. DNA was extracted from the urine swabs, using the QIAamp Viral RNA Mini kit (Qiagen, Hilden, Germany) excluding any DNA digestion procedures in accordance with the manufacturer's recommendations. The extracted DNA was then subjected to PCR amplification with a specific assay, using the 45F and 286R primers targeting the *lipL32* gene as previously described. Each PCR run included *L. interrogans* DNA as the positive control and nuclease-free water as the negative control. A newly designed reverse primer *lipL32* 659R was used to obtain a longer sequence for sequence analysis. Among the samples tested, 16 (9.5%) yielded positive results via real-time PCR, indicating the presence of *Leptospira* in the Wavulgalge bat population. The limit of detection of the assay is 20 genomic equivalents per reaction with a 95% cutoff value. The PCR positive samples were identified from *M. fuliginosus* (14/117), *H. speoris* (1/8), and *R. leschenaultii* (1/10). Sanger sequence analysis revealed *Leptospira spp*. related to *L. borgpetersenii* (98.9% ID) in *Miniopterus* bats and *L. kirschneri* (95.1% ID) in *Rousettus* bats. The correlation between *L. borgpetersenii* in bats and human leptospirosis in Sri Lanka highlights the interconnected transmission cycle. These findings suggest that Sri Lankan bats can play a crucial role as key reservoir hosts, maintaining the sylvatic cycle of *Leptospira* bacteria.

Keywords: *Leptospira, Bat Borne Pathogens, Zoonoses, Wavulgalge*

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Development of Duplex PCR to Detect Adulteration of *Saraca asoca* (Roxb.) Wild. (Ashoka) with *Polyalthia longifolia* (Sonn.) Thw. in the Herbal Medicine Industry

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Saraca asoca (Roxb.) Wild. (Ashoka), is a plant widely used in traditional medicine. However, due to scarcity of the plant, adulteration of the plant material with *Polyalthia longifolia* (Sonn.) Thw (False Ashoka) is a common practice in the herbal raw material market. Presently adulteration is detected by chemical methods which are expensive. Thus, the objective of this study was to develop a method, for specific detection of adulteration in processed samples of *S. asoca* with *P. longifolia*. DNA was extracted from the leaves of both plants using Phytospin D™ plant genomic DNA extraction kit (Ceygen Biotech). Specific PCR primers were designed from the genomic barcoding regions (psbA-trnH and ITS2) of *P. longifolia* sequences obtained from GenBank database using bioinformatics tools. The primers for psbA trnH were forward PL-psbA trnH- F 5'CTTCCCTCTAGACCTAGCTGCTG 3' and reverse PL-psbA trnH-R - 5'CTCTATAAAATTAGAGATAGAAAGGC 3' primers. The primers for ITS2 were forward PL-ITS2 - F 5' ATTGGTTGACCGTGCTCCT 3' and reverse PL-psbA-tnrH-R 5' GGAATCCTCCTCATAAGTTTC 3'. PCR was optimized for specific amplification of each region from *P. longifolia* using 0.2 mM dNTPs, 2.5 mM $MgCl_2$, 0.3 µM forward and reverse primers, 1U of ThermoRead™ Taq Polymerase (CeyGen biotech) and 1x buffer. The primers i.e. psbA trnH and ITS2, that annealed at 54°C, were then combined to develop a duplex PCR assay. The PCR resulted in 327 bp and 249 bp amplicons for psbA-trnH and ITS2 respectively. No amplicons were seen for *Saraca asoca* DNA, which was used as the negative control. The developed duplex PCR assay detected *P. longifolia* DNA extracted from 1% adulterated samples, demonstrating the high specificity and sensitivity of the PCR.

Keywords: *Adulteration, PsbA-trnH, ITS2, Duplex PCR, Specificity*

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Development and Validation of a Novel Pathogen Detection Panel for Aetiological Diagnosis of Encephalitis: NeuroViroDetect Encephalitis Array

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Encephalitis causes a significant public health concern globally. Various pathogens have been identified as infectious agents causing encephalitis. While real-time PCRs have been crucial in diagnosing encephalitis, they often come with targeting few pathogens only. This emphasises the need for a comprehensive diagnostic tool in diagnosing encephalitis effectively, warranting the development and validation of the NeuroViroDetect encephalitis array. In this study the primers were manually designed to specifically target 40 different encephalitis causing pathogens. In-silico evaluation of the primers was conducted using the Geneious Prime application before the laboratory testing of the assay. The assay was established using the Platinum Taq DNA Polymerase kit. The performance of the panel was tested using various viruses, including CHIKV, DENV, JEV, MVEV, SLEV, FSME, VZV, YFV, Enterovirus A, Betacoronavirus, Influenza Virus A. After PCR amplification, products were visualized on agarose gel followed by MinION sequencing with the SQK-LSK109 kit. This sequencing method allowed for high throughput analysis and detailed identification of multiple pathogens within a single run. Quality assessment and bioinformatics analysis were performed using the Geneious Prime application. Consensus sequences were mapped to reference sequences with a classification threshold of 0.5% total reads to distinguish positive samples from background. This rigorous approach ensured the accuracy and reliability of the diagnostic results. The sensitivity of the assay ranges from RNA copies numbers between 10 to 10^5 with the both JEV and CHIK V. Such sensitivity is crucial for detecting low abundance pathogens, enhancing early diagnosis and treatment possibilities. This nanopore sequencing panel thus enhances diagnostic capabilities for encephalitis cases, demonstrating potential for clinical application.

Keywords: *Neurotropic Viruses, Viral Encephalitis, Encephalitis Aetiologies, Diagnostic Tool, Nanopore Sequencing.*

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Autoimmune Encephalitis Among Encephalitis Patients in Sri Lanka

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A transformative shift in encephalitis diagnostic paradigms has occurred with the recognition that certain encephalitis cases arise due to autoantibodies targeting neuronal cell surface and synaptic proteins. Recent comprehensive research carried out in England has highlighted the autoimmune-mediated origins in 21% of encephalitis cases, with 38% of these cases involving neuronal antibodies. Among these antibody-mediated encephalitides, N-methyl D-aspartate receptor encephalitis (NMDARE) assumes a prominent position exceeding the viral aetiology, with 65% of cases. Investigations into autoimmune encephalitis in Sri Lanka have identified both NMDAR encephalitis and limbic encephalitis. Thus, this study focuses on the detection of autoimmune encephalitis in encephalitis patients from Sri Lanka. Thirty CSF samples were collected from clinically diagnosed encephalitis patients admitted to the Colombo North Teaching Hospital, Ragama, Sri Lanka from July 2019 to July 2020. To identify autoantibodies, a transfected cell-based indirect immunofluorescence (IIFA) BIOCHIP assay from Euroimmun, Lübeck, Germany (Autoimmune Encephalitis Mosaic 6, FC 112d-2010-6) was employed according to the manufacturer's instructions. Among the 30 CSF samples that were examined, 2 samples (6.6%) tested positive for the presence of autoantibodies against NMDAR neuronal cell surface antigens. Notably, both patients were females, exhibiting psychiatric symptoms such as altered behaviour, and seizures. Recognizing that routine CSF findings do not rule out NMDARE but are common in the disease, these findings highlight the importance of employing comprehensive immunological approaches, such as IIFA, to elucidate the autoimmune origin of these symptoms. This study aligns with and contributes to enhancing the collective understanding of autoimmune encephalitis in the Sri Lankan context.

Keywords: *Encephalitis, Encephalitis aetiologies, NMDAR Encephalitis, Autoimmune Encephalitis, Sri Lanka*

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Cytotoxic Effects of *Caesalpinia pulcherrima* Methanol Extract and Its Fractions on Pluripotent Human Embryonal Carcinoma Cancer Stem-Like Cells

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Cancer remains a global health challenge. Despite advances in cancer therapy, patient prognosis remains poor due to drug resistance caused by cancer stem cells (CSCs). *Caesalpinia pulcherrima* is a medicinal plant, used in traditional medicine for treating various cancers. DC3B, is a diterpene, previously identified by IBMBB researchers, as a Wnt/β-Catenin signaling pathway inhibitor through *in-silico* docking, has shown potent cytotoxicity on 17 different cancer cell lines *in-vitro*. This study aimed to investigate the presence of potential compounds/fractions of *C. pulcherrima* that possess anti-CSC activity. A methanol extract of *C. pulcherrima* roots was dissolved in methanol-water mixture (F1) and subjected to sequential-solvent partitioning with hexane (F2), chloroform (F3) and ethyl-acetate (F4), respectively. Free-radical scavenging and cytotoxic properties were evaluated using 2,2-Diphenyl-1-picrylhydrazyl assay and Sulforhodamine-B assay, respectively. Using bioactivity-guided column chromatography fractionation, the most active fraction F3 was fractionated to yield DC3B. By comparing thin layer chromatography profiles of the column fractions, the remaining column fractions were pooled together (F5). Methanol extract of *C. pulcherrima* exerted noticeable free-radical scavenging activity with EC50 of 56.06 µg/mL. Among partitioned fractions of methanol extract, F1 demonstrated the highest free-radical scavenging property (23.80 µg/mL) followed by F4 (33.31 µg/mL). Methanol extract of *C. pulcherrima* exhibited remarkable cytotoxic effect on NTERA-2-cl.D1 cells (ATCC: CRL-1973) with IC_{50} of 24.40 µg/mL at 24 h post-treatment. Among the tested fractions, F3 (12.91 µg/mL) exerted the highest cytotoxicity followed by fractions F2 (35.03 µg/mL) and F4 (82.85 µg/mL). Although DC3B exhibited the highest cytotoxicity (IC_{50} = 4.07 µg/mL), F5 (23.55 µg/mL) also showed higher activity. Hence, this study evidence for the presence of other active compounds with anti-cancer potentials in the fractions obtained by solvent-partitioning and column chromatography. Further investigations are required to identify and isolate the active compounds which will lead to the development of cancer therapeutics.

Keywords: *Caesalpinia pulcherrima, Cancer Stem Cells, Cytotoxicity, NTERA-2-cl.D1*

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In Vitro Effect of Aqueous Leaf Extract of *Andrographis paniculata* on DENV-2 Induced Endothelial Damage in Human Macro-Vascular Endothelial Cells (EAhy.926 Cell Line)

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In dengue, pathogenic immune response by host induces endothelial damage. *Andrographis paniculata* is a well-known medicinal plant that has been reported in cancer studies and possess the ability to induce recovery of endothelial damage. However, its involvement in dengue induced endothelial damage has not been studied yet. Therefore the objective of this study was to assess the effect of aqueous leaf extract (ALE) of *A. paniculata* on endothelial damage induced by DENV-2 in human macro-vascular endothelial cells (EAhy.926 cell line). ALE was prepared using leaves from authenticated *A. paniculata* plants collected from Herbal Garden, Navakiri, Jaffna. Exposure of EAhy.926 cells (EC) with ALE concentrations from 7.8 to 1000 µg/mL for 24 hours was used to determine non-toxic concentrations. As 1000 µg/mL was detected as non-toxic and selected to conduct further experiments. ALE of *A. paniculata* was used for either pre- or post-treatment for 6 hours on EC induced with DENV-2 (cytopathic effect at 22%) for 48 hours, and the viability and overall function of EC were detected by sulforhodamine B and 3-(4, 5-dimethylthiazolyl-2)-2, 5-diphenyltetrazolium bromide assays respectively. EC exposed to DENV-2 without ALE pre-treatment showed a viability of 84.0±0.01% and overall cell function was 79.7±0.03%. Following pre-treatment, viability and overall cell function were further reduced to 76.3±0.01% and 68.8±0.04% respectively (ANOVA, $p<0.05$). When cells were exposed to DENV-2 without ALE post-treatment and after 6 hour incubation with culture medium, the viability was increased to 107±0.01% and overall cell function was 86.2±0.02%. With ALE post-treatment, viability was similar (105.9±0.01%, ANOVA, $p>0.05$), but the overall EC function was significantly increased (89.8±0.01%, ANOVA, $p<0.05$). Present study suggests that ALE post-treatment could induce recovery of damage to the endothelial cells compared to pre-treatment. Microscopic morphological analysis also supported the reduction in endothelial cell deformities and damage. Further studies are needed to determine the mechanisms through which post-treatment of ALE of *A. paniculata* prevents endothelial cell damage and plasma leakage.

Keywords: *Andrographis paniculata, Dengue, Endothelial Damage, EAhy.926 cells, Cell Function*

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Preliminary Study on the Effect of Vitamin E Supplementation on Serum Antioxidant Capacity and Nitrogen Intermediates Levels in Children with Dengue

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Dengue, is a major health issue in tropical regions. Oxidative stress from excessive reactive oxygen (ROS) and nitrogen species (RNS) may contribute to dengue pathology. This study aimed to determine the effect of vitamin E supplementation on clinical outcomes, in relation to oxidative stress parameters in 5–14-year-old children with dengue in Colombo, Sri Lanka. Confirmed dengue patients (n=16), aged 5-14 years and with 84 hours onset of fever, were recruited from Lady Ridgeway Hospital for children. Patients were divided into two arms: One receiving vitamin E supplementation and the other undergoing standard management (control group). Trolox equivalent antioxidant capacity (TEAC) levels in patient sera were measured using ABTS assay to determine serum antioxidant levels in all patients until discharge (up to day 7). TEAC levels in vitamin E-supplemented group was consistently higher than that in the control group, however was significantly higher only on day 6 (758.11±2.80 µM; p<0.001) and day 7 (755.71±5.96 µM; p=0.003). Serum RNS levels were measured using the Griess (for nitrite) and modified Griess assays (for nitrite and nitrate; NOx). By day 7, compared to control group, NO_X levels were lower in vitamin E-supplemented group (3.2700±0.650 vs 4.636±1.459, p=0.658) and nitrite levels were higher (1.640±0.028 vs 1.106±0.3t60, p=0.351). Even though these differences were not significant, the trends suggest a potential role of vitamin E in regulating RNS production during dengue infection. The vitamin E-supplemented group also showed a lower occurrence of plasma leakage (25%) and significantly higher mean leukocyte and neutrophil counts on day 6. In conclusion, the vitamin E-treated group had higher TEAC levels and lower reactive RNS levels, compared to standard treatment group. The inability to enroll a sufficient number of patients during the study period was a major drawback and it is being continued, to enroll adequate patient number to validate these preliminary findings.

Keywords: *Dengue Fever, Aedes Mosquito, Oxidative Stress, Vitamin E, Antioxidant Levels, Nitrite Levels, NO_X, Sri Lankan Children*

Acknowledgements: This work was supported jointly by the MSc program in Cellular and Molecular Immunology, IBMBB, University of Colombo and authors, Duraisamy S.R.W. and Rodrigo M.

† Equal contribution as first authors

Determination of Anti-Aging Properties of Mangiferin

N.D. Hennadige, N.H.K.S. Senathilake, S.R. Samarakoon, B.P. Galhena, U. Rajagopalan, P.T.M. Cooray

Institute of Biochemistry, Molecular Biology, and Biotechnology, University of Colombo, Sri Lanka

Population ageing is poised to become one of the significant transformations of the twenty-first century with implications in nearly all sectors of the society. Plant secondary metabolites provide a good source of diverse natural compounds for anti-aging compound discovery. In the current study, mangiferin, a glucosylxanthone isolated from *Mangifera indica*, was investigated for its anti-aging potential. Initially, the non or least cytotoxic concentrations of mangiferin were identified based on the results of Sulforhodamine B (SRB) assay conducted after exposing different concentrations of mangiferin to foreskin fibroblast cells (BJ cell line) in vitro. The anti-oxidant potential of mangiferin was investigated by α-diphenyl-β-picrylhydrazyl (DPPH) assay, with ascorbic acid as the positive control. Wound healing ability of mangiferin was evaluated based on scratch assay conducted using in vitro cultured BJ cells exposed to non or least cytotoxic concentrations. After exposing BJ cells to mangiferin for 24 h, real time quantitative PCR (RT-qPCR) assay was conducted to analyze the expression of *MMP2* gene, a downstream target of SIRT1 mediated anti-aging pathway. Results indicated that the cell viability was greater than 98 % at 1.25 µg/mL concentration and 80 % at the highest concentration (20 µg/mL) after 72 h exposure. The phase-contrast microscopic observations further supported the results of SRB assay. Mangiferin exhibited moderate antioxidant activity (EC_{50} = 43.95 µg/mL). Wound healing assay results indicated a strong wound healing percentage of 61 % at 1.25, 2.5 and 5 µg/mL concentrations in comparison to the untreated control after 24 h exposure. Mangiferin mediated a significant dose dependent inhibition of *MMP2* expression at 10 µg/mL and 5 µg/mL concentrations respectively. Overall results of the present study indicate that mangiferin may possess significant anti-aging potential. However, further in vitro and in vivo studies are required to elucidate the potential of mangiferin to modulate diverse aging pathways.

Keywords: *Anti-Aging, Mangifera indica, In vitro, Wound Healing, MMP2*

Acknowledgements: This work was supported by IBMBB and constitutes part of the MSc Studies of Hennadige N.D.

Stability and 28-Day Repeated Dose *In Vivo* Toxicity Evaluation of an Anticancer Diterpene Isolated from *Caesalpinia pulcherrima*

P.K.S.K. Wijerathne, R.M.N.T.R. Rathnayake, N.H.K.S. Senathilake, U. Rajagopalan, S.R. Samarakoon

Institute of Biochemistry, Molecular Biology, and Biotechnology, University of Colombo, Sri Lanka

Caesalpinia pulcherrima (L.) Sw., known as peacock flower, is a tropical plant used in traditional and Ayurveda medicine for treating various cancers. In a previous study, a diterpene (DC3B) isolated from the roots of *C. pulcherrima* has been reported to inhibit the proliferation in 17 different cancer cell types with no acute oral toxicity up to 300 mg/kg dose in rat models. DC3B also eliminates cancer stem cells (CSCs), a subpopulation of cancer cell mass that contributes to drug resistance, metastasis, and recurrence. In the present study 2.615 g of pure DC3B was isolated from the methanol extract of the root bark using solvent partitioning and column chromatography. The structure of DC3B was validated using ^{1}H and ^{13}C NMR spectra. Anticancer activity was confirmed by Sulforhodamine-B (SRB) assay conducted after exposing different concentrations of DC3B to in vitro cultured MCF-7 cells (IC_{50} = 46.43 µg/ml (24 h) & 27.13 µg/ml (48 h)). A preliminary investigation of the stability of DC3B under various conditions (90^0 C and ultrasonic frequency for 3 h, ambient room temperature, 4^0 C, -20^0 C, and direct outdoor sun exposure for 12 months), was conducted using the TLC method. DC3B remained stable for 12 months under the mentioned conditions except under long-term direct sun exposure, after which multiple spots and streaking were observed on the TLC plate. Toxicity of daily repeated doses (60, 30, 15 mg/kg) of DC3B was assessed in Wistar rats (*Rattus norvegicus*) according to OECD guideline 407. DC3B was non-toxic up to 60 mg/kg daily for 28 days as assessed in terms of clinical and functional observations, changes in organ weights, blood chemistry, hematology, and histological parameters compared to control groups. The study's findings suggest that DC3B is a promising candidate for further development as a CSC-targeted cancer therapy.

Keywords: *Caselpenia pulcherrima, DC3B Diterpene, Cancer Stem Cells, Anticancer Activity, Toxicity Assessment*

Linkage Analysis of Variants Associated with Sporadic Breast Cancer in Patients of Three Sri Lankan Ethnic Groups

J.T. Kotelawala[1], H.A.C.I.K. Rodrigo[1], W.A.H.A. Perera[2], N. Yoganathan[2], M.R.S. Manatunga[2], D.M.A.S. Dissanayake[3,4], N. Joseph[3,4], C. Rajasooriyar[3,4], K. Indranath[3,4], G.K.S. De Silva[5], R. Ranasinghe[1], K.H. Tennekoon[1]

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Breast cancer is the leading cancer affecting women, accounting for 26% of all cancers diagnosed in women in Sri Lanka. Sporadic breast cancer accounts for 90-95% of all breast cancers and has no known diagnostic tests and individuals are only directed for testing if they experience any physical symptoms. Prior studies have proposed mitochondrial DNA as a suitable biomarker for prediction of disease and disease prognosis. This study enrolled a total of 63 patients and their matched controls from the Sinhalese ethnicity: 31 patients and 30 controls of the Sri Lankan Moor ethnicity and 35 patients and 30 healthy controls of Sri Lankan Tamil ethnicity. Total genomic DNA was extracted from peripheral blood. The non-coding region of mtDNA was amplified using mitochondrial specific primers. The sequence was obtained using Sanger sequencing. Linkage disequilibrium for mtDNA variations displaying significant association with disease status was analysed using Haploview. The occurrence of variants T146C; T480C; T489C; G16129A; T16189C; C16223T was significantly higher in patients of Sri Lankan Tamil ethnicity, while only the variant T480C was significantly associated with patients of Sri Lankan Moor ethnicity. These variants did not show significance of association with breast cancer amongst the Sinhalese patient group. The variants T489C showed linkage disequilibrium with both C16223T and T16189C amongst patients of Sri Lankan Tamil ethnicity. The variants T489C and C16223T previously reported to occur simultaneously in cancer cells are associated with a higher respiration rate, a hallmark of cancer. Further, variant T16189C also results in a poly-C region that destabilises of the mtDNA. These variants displaying linkage disequilibrium have the potential to be established as biomarkers and requires further validation along with the type and stage of breast cancer as well as response to treatment.

Keywords: *mtDNA, Breast Cancer, Linkage Disequilibrium*

Acknowledgements: This research was funded by the National Science Foundation of Sri Lanka (NSF/SCH/2016/004).

Cannabis sativa L. Extracts Suppress the Stemness in Cancer Stem-Like Cells (NTERA-2 cl.D1)

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Institute of Biochemistry, Molecular Biology, and Biotechnology, University of Colombo, Sri Lanka

Cannabis sativa L. is known for its potential therapeutic effects, including tumor regression. Thus, the present study aimed to evaluate the potentials of organic solvent-based extracts (hexane, chloroform, ethyl acetate, and methanol) of *C. sativa* L. to mediate anti-proliferative effects on cancer stem-like cells (NTERA-2-cl.D1). Cytomorphological changes of were assessed by phase contrast light microscopy. Effects of organic solvents of *C. sativa* L. extracts were evaluated on NTERA-2-cl.D1 cells using Sulforhodamine-B assay, colony formation and cell migration assays. The hexane extract of *C. sativa* L. exerted the highest antiproliferative effects with IC50 values of 98.5, 21.59 and 5.63 µg/mL at 24, 48 and 72 h of post-treatment periods, respectively. The cytomorphological observations confirmed that the hexane extract treated NTERA-2-cl.D1 cells displayed characteristic features of apoptosis, including cell shrinkage, cell membrane blebbing and apoptotic bodies formation. Further, these cells demonstrated lowest migration rate with the range of 18430.16 – 1490.35 µm^2/h at all the concentrations treated (25, 50, 100, 200 and 400 µg/mL), which was lower than the migration rate of untreated control cells having minimum rate of 30047.98 µm^2/h. Among all the treatments with the four different extracts, NTERA-2-cl.D1 cells exposed to hexane extract exhibited lowest efficiencies in forming primary (50 - 4 %) and secondary colonies (49 – 4%) at all treatment durations of 04, 07, 10, and 14 days in dose-dependent manner. Overall, hexane extract exerted an anti-proliferative effect, induced apoptosis and decreased cell migration in a dose- and time-dependent manner, while potentially reducing the colony formation properties and stem-like cell properties. Therefore, apoptosis appears to be possible mechanisms by which *C. sativa* L. extracts mediates anticancer effects in a cancer stem-like cell model.

Keywords: *Anticancer, Cancer Stem Cells, Apoptosis, Cannabis sativa L*

Screening, Isolation, and Characterization of Cellulase-Producing Fungi from the Natural Environment

M.P.H.S. Jayasinghe[1,2], D.J.D.T. Deemantha[1,2], H.H.W. Jayathilaka[1,2], S. Thileepan[1,2], N.V. Chandrasekharan[1], M.B.C.L. Somarathne[1]

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Cellulolytic enzymes play a major role in various industrial applications, including textile, laundry, paper and pulp, agriculture, medicine, and the food and feed industries. Given their extensive use in Sri Lanka and the potential for import substitution, local production of these enzymes would be economically advantageous. This study focused on isolating fungal strains capable of producing high levels of cellulase for industrial applications. For cost-effective industrial production, hyper- productive variants are to be developed through successive mutagenesis and genetic engineering. Samples (decaying organic matter and upper soil) were collected from different environmental sites, including forest floors, haystacks, agro-waste dumps, and so forth. These samples were then screened to identify cellulase-producing fungi by plating them out on selective CMC-Czapek medium. Colonies (n=117) were initially isolated and then rescreened separately by staining with Congo red and Gram's Iodine. Clear zones around isolated growing colonies indicated cellulase production. Based on the diameter of the clear zones, the 20 highest cellulase-producing fungal strains (Enzyme Index ranges from 2.300 to 0.031) were selected. DNA was extracted from 7 of these fungal strains for molecular characterization based on the sequence of the ITS 1 and ITS 4 regions of the rRNA gene cluster. BLAST analysis of the sequences revealed the strains to be Aspergillus flavus (A2), Aspergillus niger (D25, D27), Fusarium falciform (D28), Penicillium citrinum (F8, G10), and Fusarium oxysporum (G4). The cellulase activity of these fungal strains was also determined by the dinitrosalicylic acid (DNS)-based method for endoglucanase activity and using the filter paper assay for total cellulase activity. The endoglucanase activities ranged from 0.07 to 0.2 U/ml and total cellulase activities ranged from 0.2 to 0.3 U/ml. Further biochemical characterization is in progress to identify and develop hyper-productive variants for the industrial production of cellulase.

Keywords: *Cellulase, Fungi, Mutagenesis, Genetic Engineering*

INSTITUTE OF HUMAN RESOURCE ADVANCEMENT

Emerging Trends in Management and Employee Education

18th December 2024

MESSAGE FROM THE DIRECTOR

Professor W. S. Chandrasekara

Director
Institute of Human Resource Advancement
University of Colombo, Sri Lanka

The rapid technological advancements worldwide have significantly impacted various aspects of management and expanded opportunities for employee education. These innovations have transformed the way organizations manage their operations, engage with employees, and approach workforce development. As a result, the integration of technology has not only optimized management practices but also introduced new learning platforms, tools, and techniques for employee training and development.

Management is an essential aspect of every sector, and emerging trends in the 21st century have brought significant changes to the education system, employment, workforce demand, business operations, governance, and various economic, social, cultural, health, and environmental aspects of human resource development, particularly in employee education. Therefore, it is necessary to organize an International Conference on this topic to explore and identify the emerging trends in management.

The Institute of Human Resource Advancement (IHRA) of the University of Colombo has attempted to create and disseminate scientific knowledge on this theme through this 5th International Conference of IHRA. It was a privilege and honour for me to serve as the Director of the Institute and the Conference Chair for IC5-IHRAUOC held on 18th December 2024. IC5-IHRAUOC is designed to address the Emerging Trends in Management and Employee Education in six relevant fields of study to IHRA-UOC activities as Business and Public Management, Service Management, Social Sciences, Disaster Management including Science and Technology, Library and Information Science and Language and Literature. Most importantly a renowned Professor Vishalachchi Balasubramaniyam contributes as Keynote Speaker for this International Conference. I wish to congratulate all authors and presenters of the conference and highly appreciate the interactive contribution made by the organizing committee. I hope the findings of these researchers and the policy alternatives proposed by them will be important to influence the betterment of Human Resource Development and Management in Sri Lanka.

I wish to thank the organizing committee, abstract reviewers, academic staff members and supportive staff members of the IHRA-UOC for their generous contribution to successfully conduct this international conference. My special thanks go to Senior Professor H.D. Karunarathne, Vice Chancellor of the University of Colombo for his kind assistance to us and the keynote Speaker. Finally, I wish to express my thanks to the coordinator and organizing team of the Conference.

MESSAGE FROM THE CONFERENCE COORDINATOR

Ms. K. P. S. Sandamali

Lecturer
Institute of Human Resource Advancement
University of Colombo, Sri Lanka

It is my great privilege to serve as the conference coordinator for this prestigious event, centered on the theme of "Emerging Trends in Management and Employee Education". What makes this research conference particularly significant is its unique ability to bring together researchers from a variety of disciplines. Though diverse in their fields—ranging from business and public management, service management, and social sciences to disaster management, science and technology, library and information science, language, and literature—all are united by a common pursuit of knowledge and growth.

This gathering serves as a platform for dynamic discussions and debates, where researchers can share insights, exchange ideas, and deepen their understanding across disciplines. I believe the conference will play a pivotal role in the Sri Lankan research landscape, fostering collaboration and innovation by uniting experts under one roof.

This conference has been made possible through the hard work and dedication of many individuals, and while I may not be able to thank each one personally, I would like to extend my sincere appreciation to a few key contributors. First, I express my deepest gratitude to Senior Professor H.D. Karunarathne, Vice Chancellor of the University of Colombo for his invaluable support, and Professor W.S. Chandrasekara, Director of the Institute of Human Resource Advancement, University of Colombo for his guidance and leadership. In addition, I extend my heartfelt thanks to the authors, track chairs, reviewers, session chairs, organizing committee, and the staff members of the Institute of Human Resource Advancement, University of Colombo.

In conclusion, this event is a testament to the collaborative spirit of all involved, and I am deeply thankful to everyone who has made it possible. Thank you.

ORGANIZING COMMITTEE

Conference Chair
Prof. W.S. Chandrasekara

Conference Coordinator
Ms. K.P. S. Sandamali

Track Chairs

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Prof. P. Dharmadasa

Service Management
Dr. Vijayantha Ukwaththa

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Mr. K.D.N. Hewage

Library and Information Science
Ms. R.M.S. Ratnayake

Language and Literature
Ms. K.P.S. Sandamali

SYMPOSIUM PROGRAMME

Time	Programme
10. 00 am – 10.05 am	**Commencement of the Inauguration**
10. 05 am – 10.15 am	**Welcome Speech by the Conference Chair**
10. 15 am – 10.30 am	**Speech of the Chief Guest**
10. 30 am – 11.30 am	**Keynote Speaker's Address**
11. 30 am – 11.45 am	**Speech of the Conference Coordinator**
11. 45 am – 12.30 pm	**Tea Break**
12. 30 pm – 01.30 pm	**Sessions 01 and 02**
01.30 pm – 02.30 pm	**Lunch**
02.30 pm – 03.30 pm	**Session 03**
03. 30 pm – 04.00 pm	**Tea Break**
04. 00 pm – 04.30 pm	**Award for the Best Paper**
04. 30 pm	**Closing Remarks for the Conference**

NATIONAL INSTITUTE OF LIBRARY AND INFORMATION SCIENCES

Envisioning Tomorrow's Libraries: Integrating Emerging Trends through Impactful Research

24th of October 2024

MESSAGE FROM THE ACTING DIRECTOR

Dr. Prasanna Ranaweera

Acting Director
National Institute of Library and Information Sciences
University of Colombo, Sri Lanka

The Annual Research Symposium of NILIS is a key component of the University of Colombo's series of annual symposia. This year, our theme, "Envisioning Tomorrow's Libraries: Integrating Emerging Trends Through Impactful Research" aligns with the university's main theme, "Building a Sustainable Future Through Impactful Research". We believe this event will foster a timely and essential discourse on contemporary issues and challenges in Library and Information Science (LIS) research in Sri Lanka.

As per the tradition, this publication includes selected abstracts from the NILIS Academic Staff, while the full volume will encompass all national and international abstracts presented at the symposium. I extend my heartfelt thanks to our Chief Guest, Vice-Chancellor of the University of Colombo, Senior Professor H.D. Karunaratne, for his invaluable leadership and support. I also express my gratitude to the Keynote Speakers, Professor Sampath Punchihewa, Dean of the Faculty of Law, and Senior Professor K.P. Hewagamage, Chairman of the Board of Management of NILIS, for honouring us with their presence. Additionally, I would like to thank Dr. Faiza Bashir, Assistant Professor and Head of the Department in the Higher Education Department of the Government of the Punjab, Pakistan; Dr. Pu Yan, Assistant Professor at Peking University, China; and Dr. Manika Lamba, Assistant Professor at the University of Oklahoma, USA, for their insightful invited speeches at the NILIS Research Symposium 2024.

My sincere appreciation goes to Professor Dilshani Dissanayake, Chairperson of ARS 2024, for her constructive guidance. I also thank all the invited international and national speakers, the presenters, and NILIS Graduate Student presenters for their outstanding contributions. Special thanks to Librarian Dr. (Mrs.) Pradeepa Wijetunge, Prof. Ruwan Gamage, the Chair of the NILIS Research Symposium, and all the academic staff of NILIS and the university library for their extensive support. I am equally grateful to the visiting staff of NILIS, the reviewers, editorial and program committee members, and other staff, led by Deputy Registrar Mr. M.N.Thalgahagoda, and Acting Senior Assistant Bursar Mr. Charitha Bandara, for their continuous dedication and commitment to NILIS. I wish everyone a very successful symposium.

MESSAGE FROM THE SYMPOSIUM CHAIR

Professor Ruwan Gamage

National Institute of Library and Information Sciences
University of Colombo, Sri Lanka

I am honored to welcome you to the 7th NILIS International Research Symposium (NRS2024), hosted by the National Institute of Library and Information Sciences (NILIS), University of Colombo. This year too, we continue the tradition of holding the symposium online, providing an invaluable platform for showcasing the research achievements of our faculty and graduate students, as well as engaging local and international researchers with an interest in our annual theme. Centered on "Envisioning Tomorrow's Libraries: Integrating Emerging Trends Through Impactful Research," the symposium aligns with the University of Colombo ARS theme. It offers a unique opportunity to exchange insights, foster collaboration, and explore innovative approaches that will drive our discipline forward. Held on October 24th, 2024, the symposium followed a rigorous blind peer review process involving over 20 reviewers and stringent plagiarism checks. In addition to more than 15 studies, the symposium featured one keynote speech, three invited speeches, a panel discussion, and a graduate session featuring postgraduate studies completed at NILIS, encouraging out-of-the-box thinking for impactful research in Library and Information Science. We believe that this event generated a timely and essential discourse on the contemporary challenges and opportunities in Library Information Science (LIS) research in Sri Lanka.

ORGANIZING COMMITTEE

Chair of the Symposium
Prof. R.C.G. Gamage

Program Committee

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Mr. U.P. Alahakoon	– NILIS, University of Colombo
Dr. C. Wijesundara	– Library, University of Colombo

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SYMPOSIUM PROGRAMME

Time	Programme
09.00 am – 09.10 am	**Inauguration of the NILIS International Research Symposium 2024**
09.10 am – 09.15 am	**Welcome Address** Dr. Prasanna Ranaweera, Acting Director, NILIS, University of Colombo
09.15 am – 09.30 am	**Address by the Chief Guest** Senior Professor (Chair) H.D. Karunaratne Vice Chancellor of University of Colombo
09.30 am – 10.00 am	**Keynote Address on '*Copyright and Fair Use in Higher Education: A Sri Lankan Perspective*'** Professor N.S. Punchihewa Dean, Faculty of Law University of Colombo
10:00 am – 10.15 am	**Vote of Thanks** Symposium Chair, Professor Ruwan Gamage
10.15 am – 02.00 pm	**Technical Sessions and the Graduate Research Session**
02.00 pm – 02.45 pm	**Panel Discussion**
02.45 pm – 03.00 pm	**Vote of Thanks**
03.00 pm	**End of the Symposium**

INTRODUCTION TO THE KEYNOTE SPEAKER

Professor Sampath Punchihewa

Dean
Faculty of Law
University of Colombo
Sri Lanka

Prof. (Dr.) Nishantha Sampath Punchihewa is a Professor in Commercial Law and the current Dean of the Faculty of Law, University of Colombo. He is a reputed scholar and legal researcher with nearly two decades of experience, after starting his academic career as an Assistant Lecturer in the same Faculty. His expertise lies in Intellectual Property Law. One significant contribution of his academic career is publishing two books with internationally renowned publishers titled "Promoting a Second-Tier Protection Regime for Innovation of Small and Medium Enterprises in South Asia: The Case of Sri Lanka" published by NOMOS, Baden-Baden, Germany; and "Intellectual Property in Tourism and Culture in Sri Lanka" published by the World Intellectual Property Organization (WIPO). In addition, he secured the Senate Award for Research Excellence by the University of Colombo in 2018. He is currently a Senior Research Fellow of the University of Münster's Centre for Advanced Study on the project titled "The Legal Frameworks for Digital Access to Library Content: A Comparative Study between Germany and Sri Lanka." Prof. Punchihewa has an outstanding academic track record. He obtained his LL.B. (Hons) from the Faculty of Law of the University of Colombo, considered to be the premier seat of legal education in the country. He pursued his postgraduate studies in Germany where he obtained his LL.M. in Intellectual Property and Competition Law from the Munich Intellectual Property Law Center (MIPLC) and a PhD in IP Law (magna cum laude) from Ludwig-Maximilians-University of Munich /Max Planck Institute for Innovation and Competition, the highest ranked University in Germany. He is also an Attorney-at-Law of the Supreme Court of Sri Lanka and was called to the Bar in 2001. Prof. Punchihewa has not only excelled as a renowned academic but also as an accomplished administrator, holding key positions such as the Director of University Business Linkage (UBL) Cell of University of Colombo as well as the Coordinator of the MPhil-PhD Programme of the Faculty of Law, University of Colombo. Additionally, he has contributed his expertise at both the international and national levels by serving as a Consultant to the WIPO and a National Legal Specialist in Intellectual Property Rights and Sri Lankan Law to the Food and Agricultural Organization (FAO) of the United Nations. He is a Member of the Board of Management, National Science Foundation of Sri Lanka.

ABSTRACT OF THE KEYNOTE ADDRESS

Copyright and Fair Use in Higher Education: A Sri Lankan Perspective

Professor Sampath Punchihewa

Faculty of Law, University of Colombo, Sri Lanka

In recent years, the interface between copyright and fair use in higher education has created a considerable tension and academic discourse among the libraries and universities in Sri Lanka. It is evident that copyright issues triggered by unauthorised exploitation of copyrighted material causes reputational damages and liabilities. Copyright law aims to protect the rights of the individual authors primarily to incentivise them to invest in new creative works. This certainly holds true for the European authors' right and Anglo-American copyright regime. The Berne Convention for the Protection of Literary and Artistic Works of 1886 articulates the three-step test to be used in the fair use analysis. From a practical standpoint, section 11 of the Intellectual Property Act, No. 36 of 2003 has embraced the concept of fair use in accordance with the international standards. Therefore, this keynote address attempts to shed light on how to navigate copyright infringement allegations through the fair use mechanism in Sri Lanka. The university community creates and develops all types of works using a variety of materials and resources available to them, including textbooks, journal articles, dissertations, and other materials. In such situations, it is prudent to conduct the fair use analysis embedded in the intellectual property law regime. It goes without saying that the less the work is used, the greater the likelihood of finding of fair use. In the eyes of the copyright law, the concept of fair use is a defence that can be raised against the copyright infringement claims. In effect, the fair use permits a university or library to use a copyrighted work without the copyright owner's permission for purposes such as criticism, comment, teaching, scholarship, and research. Therefore, it is crucial that higher educational entities comply with the copyright law and develop institutional policies and procedures governing the use of copyrighted works in their respective institutions. Even more importantly, the copyright policies should clearly spell out the interests of the institution as well as the interests copyright owners bearing in mind the three-step test sets out in the Berne Convention.

NATIONAL INSTITUTE OF LIBRARY AND INFORMATION SCIENCES
List of Abstracts

Contribution of Public Libraries for Promoting Traditional Knowledge in the Western Province, Sri Lanka

U.D. Alahakoon[1], R.D. Ananda Tissa[2], R.C.G. Gamage[1]

[1]*National Institute of Library and Information Sciences, University of Colombo, Sri Lanka*
[2]*Library, Gampaha Wickramarachchi University of Indigenous Medicine, Sri Lanka*

Traditional knowledge is a vital component of the cultural identity of indigenous and local communities, developed over time through tradition, culture, spiritual identity, and heritage. This knowledge system is characterized by its sustainability and environmental friendliness. Guidelines of the International Federation of Library Associations and Institutions (IFLA) emphasizes the importance of public libraries in developing collections on traditional or indigenous knowledge and promoting this knowledge within the community. This study aimed to evaluate how public libraries in the Western Province have actively contributed to preserving and promoting traditional knowledge. The research focused on all Grade I public libraries in the province, utilizing observation and interviews methods to collect data. There are 12 Grade I Public Libraries within the province. Findings show that 10 libraries have taken steps to gather information on traditional knowledge, with 90% of them focusing on knowledge on agriculture and medicinal plants. These libraries have also developed collections related to their local history, society, and notable individuals. A few libraries (4) have gone beyond collection development by creating exhibits featuring replicas and models that highlight aspects of traditional life, such as traditional villages, local varieties of rice, and tools used in traditional cooking and handicraft. Despite these efforts, the study reveals that public libraries primarily emphasize collection development rather than actively disseminating traditional knowledge to enhance community living standards. Only one library has attempted to dedicate a specific section of the building to traditional knowledge. To strengthen the role of public libraries in this area, the study recommends seeking expert guidance and providing education and training for staff. Additionally, more space should be allocated for displaying traditional tools, instruments, and materials, possibly by utilizing unutilized areas in the reference section. Also, creating dedicated sections for traditional knowledge will enhance their role in improving cultural literacy within the community.

Keywords: *Traditional Knowledge, Public Libraries, Cultural Literacy, Indigenous Knowledge*

Developing Information Literacy Skills among University Students: A Critical Review

Prasanna Ranaweera

National Institute of Library and Information Sciences, University of Colombo, Sri Lanka

This study critically examines the importance of developing information literacy (IL) skills among university students. Information literacy, recognized by UNESCO as a basic human right in the digital world, encompasses a range of competencies including recognizing information needs, effective searching, critical evaluation of sources, and the ethical use of information. Key skills such as reading, searching, writing, evaluating, and synthesizing form the foundation for information literacy, which in turn supports critical thinking, problem-solving, and lifelong learning. This research is based on a comprehensive review of literature and the author's teaching experience, leading to the hypothesis that many university students lack adequate IL skills required for successful academic performance. The paper identifies several factors contributing to the varying levels of IL proficiency and emphasizes the long-term benefits of fostering strong IL skills to promote independent learning and decision-making. This study highlights the critical role of information literacy in higher education and lifelong learning.

Keywords: *Information Literacy, University Students, Information Literacy Skills, Higher Education*

University Students' Awareness on Geospatial Data Standards

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[2]*Main Library, University of Colombo, Sri Lanka*

Sri Lankan universities are showing considerable use of geospatial data for teaching, learning, and research purposes. Adhering of standards of geospatial data facilitate seamless data exchange, and creating of complex data sets with proper consistency, interoperability, and high accuracy. Nevertheless, most of the students at the University of Peradeniya are not showing considerable awareness on geospatial data standards; although, it could significantly impact on their research quality. This research identified the current level of awareness on geospatial data standards among the university students, barriers related to learning geospatial standards and librarians potential on educating students on these standards. The study utilized a questionnaire survey with a focus on quantitative method and out of 350 student population who are currently studying in geospatial disciplines at the university of Peradeniya, 230 responses were collected. Additionally, perceptions were collected from 16 out of 17 librarians at the same university to identify potentials of getting their assistance in educating. The results have been statistically and thematically presented. Accordingly 51% (*n*=117) of students have awareness on geospatial data standards. Among them, 22% (*n*=26) have identified standards correctly, while 64 % (*n*=75) did not provide any answer. More than eighty per cent (87.5%) (*n*=14) of librarians are aware of geospatial data standards. Both groups' views indicate that students' lack of awareness about geospatial standards is due to lack of proper data (31%), curriculum gaps (22%), guidance (24%), insufficient training (13%), and lower knowledge on concepts and theoretical aspects (10%). Based on the results, it is obvious that librarians are frequently involved in data standards and they have the potential to educate students on geospatial data standards at universities. This study can be extended to identify the awareness on geospatial data standards in other universities in Sri Lanka and to identify the librarians' involvement in the domain.

Keywords: *Student Awareness, Geospatial Data, Data Standards, Sri Lanka, Universities*

Building a Legacy: Exploring the Demand for an Inclusive Archive at the University of Ruhuna

K.A.I.M. Amarasekara[1, 2], R.C.G. Gamage[2]

[1]*Library, University of Ruhuna, Sri Lanka*
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Preserving historical documents and artifacts is crucial for safeguarding cultural legacy and ensuring that future generations can access invaluable knowledge and insights from the past. The "Ruhuna Heritage Nexus" project aims to create an extensive and accessible digital archive at the University of Ruhuna Library. This initiative envisions a modern center for historical study and preservation, enhancing public and researcher access to historical documents and artifacts through digitization, cataloging, and preservation. To assess the needs and expectations for the "Ruhuna Heritage Nexus," a survey was conducted among academic staff, students, and administrative staff at the university. Using a stratified random sampling method, 100 responses were collected, with 25 from academic staff, 50 from students, and 25 from administrative staff. The findings reveal that 85% of respondents indicated a strong demand for a digital archive, particularly with the highest interest among academic and administrative staff. The most desired materials for archiving were scholarly materials and it is 95%. Multimedia resources and historical documents were also highly favored, with 70% and 60% of respondents respectively supporting their inclusion. While open access is widely supported, there is recognition of the need for restricted access to certain materials. Adequate resource allocation, including the appointment of dedicated staff and regular updates, is considered essential for archiveing long-term success. This research provides a foundational framework for the potential development and implementation of the "Ruhuna Heritage Nexus," which promises to significantly enhance the university's academic infrastructure and promote knowledge sharing and preservation.

Keywords: *Cultural Preservation, Digital Archive, Knowledge Preservation, Ruhuna Heritage Nexus, University of Ruhuna*

POSTGRADUATE INSTITUTE OF INDIGENOUS MEDICINE

Preserving Heritage through Quality Research

18th of October 2024

MESSAGE FROM THE DIRECTOR

Professor S.M.S. Samarakoon

Director
Postgraduate Institute of Indigenous Medicine
University of Colombo, Sri Lanka

It is with great pleasure and anticipation that I welcome you to the 1st Annual Research Symposium of Postgraduate Institute of Indigenous Medicine (PGIIM) which is scheduled to take place on October 18, 2024, at the PGIIM, which marks a significant milestone in our journey to advance and celebrate the rich heritage of traditional medical systems in Sri Lanka.

This symposium provides a unique platform for researchers, practitioners, and students from various institutions to share their insights, explore new advancements, and collaborate on future research. It is an honor to host such distinguished guests, including our Chief Guest Vice Chancellor of the University of Colombo, Senior Professor (Chair) H.D. Karunarathne, and our Guest of Honor, Emeritus Prof. Jayantha Jayawardane, former Director of PGIM and PGIIM. We are also privileged to have renowned keynote speakers, Prof. Anup Thakar, former Vice Chancellor of the Gujarat Ayurveda University and Director of Institute of Teaching and Research in Ayurveda, India and Dr. B.K. Ashok, Senior Manager and Researcher of the Himalaya Company Limited India, who will undoubtedly enrich our discussions with their expertise.

As we embark on this inaugural symposium, I am confident that the knowledge exchanged, and connections made will pave the way for significant advancements in our field. Thank you for your participation and dedication to the advancement of traditional medicine.

MESSAGE FROM THE SYMPOSIUM CHAIR

Professor (Mrs.) K. Priyani P. Peiris

Professor in Shalakya
Chairperson
Specialty Board in Shalakya
Postgraduate Institute of Indigenous Medicine
University of Colombo, Sri Lanka

It is my utmost pleasure as the symposium chair, to express my views at yet another crucial juncture where the Postgraduate Institute of Indigenous Medicine (PGIIM) hosting its first Annual Research Symposium on "Preserving Heritage through Quality Research (ARS – 2024)".

Scientific validation is crucial to preserving this valuable indigenous medical heritage. However, the indigenous medical system has many gaps that require high-quality evidence to address them effectively. As such PGIIM ARS - 2024 is a critical and unique step in doing so together with established sciences for paving the way for its global recognition. Therefore, this symposium not only provides a wider platform for the exchange of ideas, research, and knowledge but also offers a gateway to a wider network and research ecosystem for fostering further collaborations too.

To hold a symposium of this magnitude is not a small task. In this regard, I wish to offer my sincere thanks to the Chief Guest, Senior Professor H.D.Karunarathna, Vice-Chancellor, University of Colombo, Guest of Honor Professor Anup Takar, former Director, Institute of Training and Research in Ayurveda, Jamnagar, India and two keynote speakers, Emeritus Professor Jayantha Jayewardene, Founder Director of PGIIM and Dr. B.K. Ashok, Research and Senior Manager - Ayush and Scientific Affairs, Himalaya Wellness Company, India, Director PGIIM Professor S.M.S. Samarakoon, PGIIM administrative officers and the staff, the Board of study and the Specialty board Chairpersons, secretaries, members, trainers, and trainees. Further, I would like to extend my thanks to all the sponsoring organizations for providing their generous financial support. Finally, I thank all the participants of the conference for their contribution, which is the foundation of this significant event. I hope you find the 1st PGIIM ARS interesting and thought provoking.

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SYMPOSIUM PROGRAMME

Time	Programme
08.45 am – 09.00 am	**Arrival of Guests and Participants**
09.00 am – 09.10 am	**Lighting of the Oil Lamp**
09.10 am – 90.20 am	**Cultural Performance**
09.20 am – 09.30 am	**Video Presentation Introducing the Institute**
09.30 am – 09.40 am	**Welcome Address** Professor S.M.S. Samarakoon Director, Postgradaute Institute of Indigenous Medicine University of Colombo
09.40 am – 09.50 am	**Address by the Chief Guest** Senior Professor (Chair) H. D. Karunaratne Vice-Chancellor, University of Colombo
09.50 am – 10.10 am	**Address by Guest of Honor** Professor Anup Takar Former Vice Chancellor, Gujarat Ayurveda University and Former Director, Institute of Training and Research in Ayurveda, Jamnagar, India
10.10 am- 10.30 am	**Launch of Electronic Proceeding and Presenting Symposium Proceedings to the Chief Guest, the Guest of Honor, and Keynote Speakers**
10.30 am -10.50 am	**Keynote Address** Emeritus Professor Jayantha Jayewardene Former Director, Postgraduate Institute of Indigenous Medicine University of Colombo
10.50 am – 11.00 am	**Vote of Thanks** Conference Chair Professor K. Priyani P. Peiris Chairperson, Specialty Board of Shalakya Thantra Postgraduate Institute of Indigenous Medicine
11.00 am – 11.30 am	**Refreshments**

INTRODUCTION TO THE KEYNOTE SPEAKER

Emeritus Professor Jayantha Jayawardene

Former Director, Postgraduate Institute of Medicine,
University of Colombo, Sri Lanka
Former Founding Director, Postgraduate Institute of
Indigenous Medicine, University of Colombo, Sri Lanka

Emeritus Professor Jayantha Jayawardene, the keynote speaker for the 2024 Annual Research Symposium at the Postgraduate Institute of Indigenous Medicine (ARS PGIIM), is a distinguished leader in medical education. He earned his MBBS degree from the University of Ceylon in 1975, graduating with Second Class Honours, and has consistently exemplified a commitment to excellence throughout his career. He furthered his expertise by obtaining the membership of the Royal College of Obstetricians and Gynaecologists (MRCOG) and a Master of Surgery (OG) from the University of Colombo in 1984.

Professor Jayawardene's leadership journey is marked by pivotal roles, including serving as the Director of the Teaching Hospital, Peradeniya, and holding significant positions at the Postgraduate Institute of Medicine, University of Colombo.

His contributions extend beyond academia, as he has held prominent positions in professional organizations such as the Sri Lanka College of Obstetricians and Gynaecologists and served as a Council Member of both the South Asian Federation of Obstetrics and Gynaecology and the Asia Oceania Federation of Obstetrician and Gynaecologists. His leadership at the Sri Lanka Medical Council, particularly in shaping accreditation guidelines for medical faculties, further underscores his dedication to advancing medical standards.

During his brief tenure as the founding Director of the PGIIM in 2019, Professor Jayawardene's visionary leadership initated transformative initiatives, fostering a culture of academic excellence and innovation in the field of indigenous medicine.

ABSTRACT OF THE KEYNOTE ADDRESS

Understanding Research Culture

Emeritus Professor Jayantha Jayawardana

Former Director, Postgraduate Institute of Medicine, University of Colombo, Sri Lanka
Former Founding Director, Postgraduate Institute of Indigenous Medicine,
University of Colombo, Sri Lanka

Culture encompasses a broad range of intangible social aspects, including language, religion, clothing, and technology. Research is the process of gathering and analyzing data to gain knowledge and validate information, particularly important in fields like Ayurveda. Research in Ayurveda aims to confirm the efficacy of treatments, support societal and organizational benefits, and ensure adherence to national and international standards. Such research can drive policy changes that enhance public health.

Research culture is the collective set of values, behaviors, and practices that define how research is conducted within institutions or fields. It includes norms that shape research activities and the environment. This culture is composed of three key components: academic, personal, and social. Academic Component focuses on ethics, methodology, technology, data management, and related areas, whereas Personal Component involves teamwork, communication, mentorship, leadership, feedback, and fund distribution. Most importantly, social component concerns societal issues such as policy development, integration with modern medicine, and respect for traditional knowledge, particularly relevant to Sri Lankan culture.

A positive research culture promotes integrity, collaboration, and innovation, allowing researchers to explore ideas, learn from mistakes, and share best practices. Conversely, a negative culture can result in unethical behavior, isolation, and stagnation.

For Ayurveda to gain national and international recognition and to serve society effectively, practitioners and researchers must adhere to scientific standards and cultivate a positive research culture. This approach ensures that research is conducted ethically and contributes meaningfully to the field and society.

INTRODUCTION TO THE GUEST OF HONOUR

Professor Anup Takar

Former Vice Chancellor, Gujarat Ayurveda University, India
Former Director, Institute of Training and Research in Ayurveda
Jamnagar, India

Professor Anup Thakar has been working as an eminent expert in Ayurveda Panchakarma.

He obtained academic qualifications; BAMS, MD (Ayu), and PhD in Panchakarma and has served as Professor and Head of the Department of Panchakarma, Institute for Postgraduate Training and Research in Ayurveda (IPGT and RA), Gujarat Ayurveda University, Jamnagar, India.

Professor Thakar assumed the role of the Vice-Chancellor of the Gujarat Ayurveda University, Jamnagar from 13th September, 2019. He had also served as the former Director of the Institute of Teaching and Research in Ayurveda (ITRA). Professor Anup Thakar has 23 years of teaching experience. He has guided more than 60 MD and PhD scholars.

ABSTRACT OF THE ADDRESS BY THE GUEST OF HONOUR

Research on Effective Management of NCD through Ayurveda

Professor Anup Takar

Institute of Training and Research in Ayurveda, Jamnagar, India

The incidence of Non-Communicable Diseases (NCDs) is on constant rise and is currently the leading cause of death worldwide. According to a WHO report, 74% of the deaths are due to non-communicable diseases globally, 77% of which are from low and middle income countries. The top five reasons of these deaths are cardiovascular diseases, cancer, stroke, respiratory diseases, and diabetes mellitus. The key components for management of NCDs are detection, screening, treatment as well as palliative care. Ayurveda has always aimed at prevention of diseases at every level, along with management if any disease occurs, by daily regimen, seasonal regimes, and Panchakarma (bio-purification) for the ailed as well as healthy. Few palliative care studies on NCDs include use of Rasayana Avaleha, as protective agent against Radiotherapy and chemotherapy in a randomized controlled trial (RCT), and Rasayana effect of Guduchi Churna on increasing life span of Drosophila melanogaster. By RCTs, role of Virechana has been validated in various skin diseases, like- Ekakushtha (psoriasis), Shvitra (vitiligo), Vicharchika (eczema). A case report of successful management of epilepsy by Virechana procedure and Nasya is noted. Use of Vasti in Diabetes mellitus to improve microalbuminuria compared to Enalpril, Vasti and the same medicine by oral route for Grirdhrasi (Sciatica) has been compared, with Vasti providing better result. Use of Majja Vasti (buffalo bone marrow) in 12 registered osteoporosis patients is noted significantly. Siravedha, a type of bloodletting and Vasti both provided relief in sciatica. Fall in blood pressure was studied after Virechana. RCTs prove both Virechana and Vasti to be lowering down LDL-VLDL, with rise in HDL. Triglycerides were significantly reduced by Vasti, while total cholesterol was also reduced by Virechana. The effect on serum electrolytes was studied after Panchakarma procedures. Such Ayurveda research has been carried out on subjective and objective parameters of NCDs, on palliative care, and treatment as well.

POSTGRADUATE INSTITUTE OF INDIGENOUS MEDICINE
List of Abstracts

Ayurveda Management of Uterine Fibroids with Subfertility: A Case Study

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Uterine fibroids are the most common solid pelvic tumours that affect women during their reproductive age. According to Ayurveda, fibroids are known as *Arbuda*, a disease characterized by a mass of growth of *Mamsa*. Specific Ayurveda drug regimens were tested, and the results were obtained through clinical trials. This case report explores the successful Ayurvedic treatment of a 34-year-old married woman who has experienced subfertility for five and a half years, has 5.2 cm^3 size submucosal and 2.07 cm^3 size sub-serosal uterine fibroids diagnosed by USS, and exhibits moderate dysmenorrhea (visual analogue scale score of 7). She was treated with a scientifically proven Ayurveda formula consisting of *Punarnavashtaka* decoction, *Kanchanara guggulu*, and *Shatapushpa churn* for 3-months with seven days of *Nirgundyadi* oil treatment and *Pattra Pottali Sweda* after cessation of menstruation. The pain was assessed using a visual analogous scale, and the volume of the menstrual blood was assessed using a pictorial menstrual assessment chart. Biochemical data such as FSH, Estradiol, Serum creatinine, GFR, FBC, UFR, AST, ALT, Urine HCG, and ultrasound scan reports were taken before and after the intervention. After three months of treatment, the volume of the fibroids was reduced with the submucosal fibroid measuring 2.5 cm^3, and the sub-serosal uterine fibroids measuring 0.5 cm^3. Further, the visual analogue scale score for dysmenorrhea was reduced to two from seven. During the follow-up period, she was conceived and did not develop any adverse effects. It can be concluded that the Ayurveda formulation gives relief to uterine fibroids patients with subfertility.

Keywords: *Uterine Fibroids, Ayurveda, Visual Analogue Scale*

Management of *Amavata* with *Rasna panchaka Kwatha* with *Murungadi Lepa*: Case Series

A.M.M. Paranagama, S.M.S. Samarakoon

Postgraduate Institute of Indigenous Medicine, University of Colombo, Sri Lanka

Amavata is a generalized disease that causes severe pain with stiffness and swelling in the joints due to simultaneous production of Ama and vitiation of Vata dosha. Hence, it shows generalized features like fatigue, anorexia, thirst, laziness, body heaviness, fever, indigestion, and excessive micturition. According to clinical features of Amavata, it closely resembles with the Rheumatoid Arthritis (RA). Out of every 100,000 people, 71 are diagnosed with RA every year. Up to 14 million people around the world have RA. This study aimed to assess the effectiveness of *Rasnapanchaka Kwatha* and *Murungadi Lepa* on *Amavata*. Five patients aged between 20 – 60 years of either sex presented to the OPD, National Ayurveda Hospital were treated with *Rasnapanchaka Kwatha* with *Murungadi Lepa* for 14 days. After 14 days of treatment, it was observed that pain reduced by 90% stiffness by 80%, swelling by 90%, fatigue by 90%, anorexia by 86%, thirst by 86%, laziness by 88%, fever by 88%, and indigestion by 90%. Finally, it is concluded that selected treatment regime was effective on *Amavata*. However, larger sample sizes and further research are needed to validate these findings.

Keywords: *Amavata, Murungadi Lepa, Rasnapanchaka Kwatha, Rheumatoid Arthritis*

Effect of *Bilwadi Panchamula* in the Secondary Prevention of *Athisshaulya* (Obesity)

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[1]*Postgraduate Institute of Indigenous Medicine, University of Colombo, Sri Lanka*
[2]*Department of Dravyaguna and Swasthavritta, Faculty of Indigenous Medicine, University of Colombo, Sri Lanka*

"Athisthaulya" in modern terms, known as obesity is a global epidemic that is rapidly becoming a major public health problem. It has been identified that 8.9% of adult (aged 18 years and over) women and 3.7% of adult men are living with obesity. Sri Lanka's obesity prevalence is lower than the regional average of 10.3% for women and 7.5% for men. According to the WHO definitions, Adults' whose BMI is greater than or equal to 25 is defined as overweight and whose BMI is greater than or equal to 30 is defined as obesity. This study aimed to identify the effect of *Bilwadi Mahapasmula* on the prevention of *Athisthaulaya*. The six patients aged between 40 and 50 years of female sex presented to the OPD, National *Ayurvedic* Hospital were selected by using relevant proforma. The *Bilwadipanchamul* decoction has been given daily morning and evening for 8 weeks. It consists of roots of *Bilwa (Aegle marmelos), Agnimantha (Oroxylum indicum), Shyanaka (Gmelina arborea), Kashmari (Stereospermum suaveolens)*, and *Patala (Clerodendrum phlomidis)*. Assessment of the condition was based on the defaulted performa with patients being assessed before and after the treatments. Anthropometric measurements were used to analyze the results. The DTA of these participants was used for statistical analysis. 100% of them were female and aged between 30-50 years. Patients had significant relief in all the complaints and were remarkable in weight loss and, reduction of waist circumference, and mid-upper arm circumference in two months of treatments. *Bilwadi panchamul Kashaya* with bee honey is very effective in the secondary prevention of *Athisthuly*.

Keywords: *Athisthaulya, Bilwadhi Panchamula, BMI*

Analyzing the Relationship between Socio-Demographic Factors and Lipid Profiles in Patients with Hyperlipidaemia

A.B. Dharmarathna[1], K.C. Perera[2]

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[2]*Faculty of Indigenous Medicine, University of Colombo, Sri Lanka*

Socio-demographic characteristics reflect the demographic and social aspects of individuals within a population. These characteristics help us understand phenomena of lifestyle diseases. Hyperlipidaemia refers to high concentrations of lipids or lipoproteins in the blood. This study aimed to explore the relationship between the socio-demographic characteristics of hyperlipidemic patients and their lipid profiles. A total of 88 hyperlipidemic patients, both male and female, aged between 30 to 79 years, were randomly selected from the OPD at the National Ayurveda Hospital in Borella. Data on socio-demographic characteristics such as age, gender, religion, ethnicity, and others were gathered through a questionnaire. The lipid profile was investigated and compared with the socio-demographic data. Statistical analyses were performed using SPSS version 29.0. The mean age of the study population was 52.47 years, with 81% being females. Results showed that, TC was high in 88% of cases. HDL was near-optimal at 71%. Triglycerides were desirable in 51%. LDL was high in 60%. VLDL was desirable in 52%. The Risk Ratio was high in 74%. Age was significantly related to HDL (p=0.052), and occupation was related considerably to TC (p=0.021), triglycerides (p=0.027), HDL (p=0.007), LDL (p=0.026), and the Risk Ratio (p=0.008). Alcohol consumption was significantly associated with LDL (p=0.048) and VLDL (p=0.027). Ethnicity was significantly related to TC and LDL (p=0.002 for both), religion to TC (p=0.016), exercise to TC (p=0.009), and LDL (p=0.014), and the living environment to the Risk Ratio (p=0.027). This study demonstrated that socio-demographic factors are significantly associated with lipid profiles in hyperlipidemic patients.

Keywords: *Hyperlipidemia, Relationship, Socio-Demographic Factors*

Management of *Sandhigatavata* (Osteoarthritis) with *Koladi Lepa*: A Case Study

M.I.J. Jayakody[1], R. D. H. Kulatunga[2], E. D. T. P. Gunarathne[2]

[1]*Postgraduate Institute of Indigenous Medicine, University of Colombo, Sri Lanka*
[2]*Department of Ayurveda Medicine and Indigenous Medicine, Faculty of Indigenous Medicine, University of Colombo, Sri Lanka*

Sandhigatavatais is a disorder in which *Vata dosha* is dominant. Clinical features of *Sandhigatavata* mostly resemble to Osteoarthritis in modern medicine. An estimated 30.8 million adults suffer from osteoarthritis. Pain, swelling, stiffness, and restriction movements lead huge impact on the quality of life. There is no satisfactory, comprehensive and time-bound treatment schedule for Osteoarthritis available at present. The objective of this study was to manage the disease with *Koladi Lepa* as *Upanaha Sweda*. A 52 years old female patient diagnosed as *Janu Sandhigatavata* was presented with pain, stiffness, and restricted movements in bilateral knee joints for two years to the National Ayurveda Hospital. The *Koladi Upanaha Sweda* was applied externally and remained for 12 hours per day for two weeks. After 14 days of treatment, it was observed that 100% relief of swelling and 90% relief of pain during extension and flexion with crepitus. Based on the above findings, it can be concluded that *Koladi Lepa* is as effective as *Upanaha Sweda* for the *Janu Sandhigatavata* successfully. Further clinical studies are recommended to evaluate the efficacy of the drug.

Keywords: *Sandhigatavata, Koladi Lepa, Upanaha*

Management of *Panduroga* (IDA) with *Pippali* and *Amurta Choorna*: A Case Series

S.K.P. Waidyarathna, S.M.S. Samarakoon

Postgraduate Institute of Indigenous Medicine, University of Colombo, Sri Lanka

Panduroga is a disease characterized by reduction of the complexion, strength, unctuousness, and *Ojas* in the body. It occurs due to degeneration of *Agni*. *Panduroga* can be correlated with iron deficiency anemia (IDA) based on its signs and symptoms, which is one of the most prevalent types of nutritional disorder in the world. The aim of this study was to assess the effectiveness of *Pippali* (*P. longum*) and *Amurta* (*T. cordifolia*) *Choorna* treatment for *Panduroga*. The five patients aged between 20 – 70 years of either sex presented to the OPD, National Ayurveda Hospital were selected for the study and data was collected by using a clinical proforma. Patients were treated with 5g of *Pippali* and *Amurta* powder with 5ml of bee honey and ghee twice a day for 30 days. Therapeutic effect was assessed through symptomatic relief of the patients and observed the Red blood cell count and Hemoglobin percentage before and after treatments. For obtaining results, the Wilcoxon signed rank test was applied to data. After 30 days of treatment, it was observed that among 5 patients dyspnea, loss of appetite and body weakness were reduced by 100% of 4 patients; fatigue was reduced by 100% of 3 patients; pallor was reduced by 100% of 1 patient. Hemoglobin % was increased above 11.5g/dl and RBC count was increased to 3.9 cells/micro L of all patients. This treatment regime is effective in treatment of Panduroga (IDA). However larger sample sizes and further research is needed to validate these findings.

Keywords: *Iron Deficiency Anemia, Panduroga, P. longum, T. cordifolia*

Evaluation of Efficacy of Specific Ayurveda Treatment Protocol for the Management of *Gridhrasi* w.s.r. to Sciatica-A Case Series

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Gridhrasi is a pain pdominant and the most prevailing health problem which has been categorized under Vata Vyadhi in authentic Ayurvedic texts. The word "*Gridhrasi*" suggests the abnormal gait of patient, similar to a vulture due to the effect of the *Gridhrasi Nadi*. Signs and symptoms of *Gridhrasi* closely enumerated with the symptoms of sciatica which is described in Allopathic Medicine. In the present era, the incidence of *Gridhrasi* (sciatica) is quite significant affecting over 75% of the world's population. Most of the conventional systems of medicines have short term pain relief treatments or surgical interventions which has more after effects. In Ayurveda, it has various treatment modalities for the *Gridhrasi* disease based on the holistic approach. Among them *Vata shamana* or Vata pacification treatment has focused on the normalization of *Gati* and *Gundhana* Kriya which help to reduce the pain as well as the abnormal gait of the patient. The present study was conducted to evaluate the efficacy of a specific Ayurveda treatment protocol for five *Gridhrasi* patients. In this study *Sinhasya danthi* decoction was given internally and with *Sahachara* oil applied externally for two weeks. The assessment was done before starting the treatment after the 7th day of treatment and at the End (after 14th day) of the treatment. Straight Leg Raising Test (SLRT), movements of the lumbar sacral region, and Visual Analog Scale (VAS) of pain were used as assessment criteria. A lumbar sacral x-ray was taken for diagnosis purposes. At the end of the treatment reduced clinical symptoms were observed, including an increased SLRT angle, improved lumbar - sacral movement of decreased VAS scale of pain and an enhanced quality of life. The results indicate a green light for future treatment strategies for *Gridhrasi*.

Keywords: *Sinhasya Danthi Decoction, Sahachara Oil, Gridrasi, Vata Shamana*

Concept of *Vataroga* and its Management in Indigenous Medicine Perspectives: A Review

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Indigenous Medicine (IM) in Sri Lanka is a unique heritage with diverse practices aimed at curing ailments and promoting the well-being of society. Sri Lanka has numerous branches of Indigenous Medicine (IM), with Vataroga being one of the most widespread. This study aimed to review the concept of Vataroga and its treatment within Sri Lankan IM. Data were collected from authentic texts such as *Deshiya Chikitsa Samgrahaya, Sara Samkeshapaya, Vatikaprakaranaya, Besajja Manjusawa, Sarartha Samgrahaya,* Ola leaves, and high-index journals. The findings showed that concepts and treatment of *Vataroga* deal with the diseases caused by the disturbance of *Vata Dosha*, punitive influence of gods (*deva dosa*), bad influence of spirits (*yaksa* and *preta dosa*), bad influences of planets (*graha dosa*), fate or sin (*karma dosa*), supernatural danger (*vas*), personal inauspiciousness (*dos*), the evil eye (*es-vaha*), evil words (*kata-vaha*), evil thoughts (*ho-vaha*), intangible order for causing diseases (*ana*), enchantment (*vina*), and witchery (*huniam*) and so forth. Classification of *Vataroga* includes *Gatavata, Nanatamja Vataroga,* and *Sanni*. IM described various formulations including *Kashaya, Anupana, Dalu Anupana, Kwatha, Kshira Kwatha, Churna, Guli, Kalka, Tel, Swarasa, Dalu Anupana, Grita, Bashma, Wedu, Alepa, Basna, Pathmana, Kulambu, Kayam, Thambumhodi, Arka, Arakkau, Kavum, Kenda, Nasya,* and *Pottana* and so forth for treating various stages of such types of conditions and they vary from family lines. This review concludes the uniqueness of the concepts of *Vataroga* and their treatments in IM in Sri Lanka.

Keywords: *Indigenous Medicine, Vataroga, Formulations, Sanni*

Clinical Effect of *Shirovasti* with *Granthikadi* Oil in the Management of *Pakshaghata* (Hemiplegia): A Case Study

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Pakshagata or hemiplegia is the commonest manifestation of a stroke with a neurological deficit affecting face, limbs, and trunk on one side or either side of the body. This greatly impacts the quality of life of the patient. The study has been focused on managing the *Pakshaghata* based on the treatment principles mentioned in Ayurveda. A fifty-eight-year-old male patient of *Pakshaghata* presented with weakness, numbness, and heaviness in the right upper and lower limbs for 3 years and was reported to the I.P.D, Department of *Kayachikitsa*, National Ayurveda Hospital, Rajagiriya. The patient was treated with *Snehana, Swedana,* and *Mridu Virechana* along with *Shirovasti* for 21 days. *Dantimuladi* decoction and *Mashabala shukashimbi* decoction were given along with *Narayana* oil *abhyanga* and *Granthikadi* oil *Shirovasti*. The assessment was made according to the National Institute of Health Stroke Scale (NIH-SS). Sensory functions were increased from grade 1 to 0, visual field from grade 1 to 0, and range of movements from grade 1 to 0. Overall, NIH-SS decreased from grade 4 to 0. Based on the above results, it is concluded that *Shirovasti* with *Granthikadi* oil is effective on *Pakshagata*, and further clinical studies with larger samples are needed for generalizing findings.

Keywords: *Pakshaghata, Shirovasti, Granthikadi Oil, Hemiplegia*

Evidence Based Management of *Janu Sandhigatavata* through *Dashamooladee Gritha*: Case Series

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Kjanu Sandigata Vata (JSV) is a condition in Ayurveda that closely correlates with Knee Joint Osteoarthritis (KOA), primarily caused by an imbalance in the *Vata dosha*. KOA affects approximately 16% to 23% of the global population, and if not managed properly, it can lead to severe deformities, significantly impacting the quality of life worldwide. According to Ayurvedic principles, JSV is classified as a *Vata Vyadhi*, characterized by symptoms such as *Sandhi Shula* (joint pain), *Sandhi Shotha* (joint swelling), *Vatapurna Druti Sparsha* (joint crepitation), and *Prasarana Akunchana Vedana* (pain during extension and flexion) Conventional treatments for OA are often limited by side effects and the potential for adverse effects on other bodily systems. In contrast, Ayurvedic interventions, as described in classical texts, offer alternative approaches that may be more effective with fewer side effects. One such treatment is *Dashamooladee Gritha*, an herbal formulation detailed in Chapter 28 of *Chikitsa Sthana* in the *Charaka Samhita*, which is indicated for the management of *Vata Vyadhi*. This study aimed to evaluate the efficacy of oral administration (*Pana*) and external application (*Abhyanga*) of *Dashamooladee Gritha* in the management of *Janu Sandigata Vata*. A total of ten patients, aged 30 to 60 years, of both sexes, were selected using purposive sampling from the Outpatient Department of the National Ayurveda Hospital. The treatment regimen included 30 ml of *Dashamooladee Gritha* taken orally in the morning on an empty stomach, and 30 ml applied externally through *Abhyanga* once daily for a period of two weeks. Assessment of the patients was conducted before and after the treatment using a standardized preform. Data analysis was performed using the Wilcoxon signed-rank test. After 14 days of treatment, results indicated a 100% reduction in joint swelling, a 90% decrease in pain during extension and flexion, 100% relief in tenderness, and a 70% reduction in joint crepitation. The findings suggest that the combined Pana and *Abhyanga* administration of *Dashamooladee Gritha* is effective in managing *Janu Sandigata Vata*. However, further research with larger sample sizes is necessary to validate these preliminary findings.

Keywords:*Janu Sandigata Vata, Dashamooladee Gritha, Knee Joint Osteo Arthritis*

Psychedelic Experience of *Kameshwari Modakaya* Measured by Mystical Experience Questionnaire 30 (MEQ30) among Individuals Living in Colombo District: An Online Survey

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Kameshwari Modakaya (KM) is an Ayurvedic drug traditionally used for aphrodisiac treatments, nevertheless it has recently been misused as an illicit substance in Sri Lanka, especially among younger people seeking ecstasy-like effects. This study aims to reveal the psychedelic effects of KM using the Mystical Experience Questionnaire 30 (MEQ30). An online cross-sectional survey was conducted with 102 participants in the Colombo district (average age: 28.59 years; 96% male, 4% female), who completed the MEQ30 and additional questions about KM usage. Results showed that KM induces mild mystical experiences, with a mean MEQ30 score of 28.91%. This score is significantly higher than the estimated 5% upper bound observed in a comparable placebo group from a previous study (t (98) = 7.49, ($p < 0.05$)). There was also a statistically significant increase in positive mood compared to mystical experience ($p < 0.05$). However, limitations such as recall bias, underreporting, dosage, and body constitution must be considered. Beyond its aphrodisiac effects, high doses of KM can induce psychedelic effects, likely due to its high cannabis content. Chronic use and overdosing can lead to acute psychosis and mental health issues. Regulatory measures are necessary to control the misuse of KM among younger populations. Further clinical studies are required to validate these findings and elucidate the pharmacological mechanisms and psychoactive ingredients of KM. In conclusion, the study reveals that KM induces mild mystical experiences and increases positive mood, highlighting the importance of regulation and mitigate potential risks associated with its misuse.

Keywords: *Kameshwari Modakaya, MEQ30, Mystical, Psychedelic*

Clinical Study on the Efficacy of *Shreshtanimbadi* Decoction in the Management of *Kaphaja Shirsha Shoola*

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Shirsha shoola (Headache) is a very common condition in current society. *Ayurveda* Acharyas have explained *shirsha shoola* as a type of *Shiro Roga* (a disease in the head). *Kaphaja shirsha shoolais* a common type of 07 *Shirsha shoola* types. *Kaphaja Shirsha Shoola* occurs mainly due to the vitiation of *Kapha Dosha* and *Vata Dosha*. With signs and symptoms, this condition can be correlated with chronic sinusitis. Shreshtanimbadi decoction consist of ten ingredients; *Thriphala (Emblica officinalis, Terminalia bellirica, Terminalia chebula), Nimba Tvak (Azadirachta indica), Patola (Trichosanthes cucumerina L.), Megha (Cyperus rotundus), Rajini (Curcuma Longa), Thrayanthi (Baccopa Monneiri), Hema (Coscinium Fenertratum), Amrita (Tinospora ordifolia)*. These herbs, which pacify vitiated Vata Dosha and Kapha Dosha to treat *Kaphaja Shirsha Shoola*. 40 selected patients were randomly divided into two groups of 20 for each treatment arm and controlled arm. The treatment group was treated with 120 ml of decoction of *Shreshtanimbadi* twice a day for 14 days. The second group was treated with 120 ml of placebo twice a day for 14 days. All patients were advised to follow *Pathya* (Wholesome food and behaviors). Assessment was done before and after treatments. After treatment, most patients in the treatment group experienced complete or partial relief of symptoms compared to the control group ($p<0.001$), such as headache at 76.91%, heaviness of the head at 87.9%, loss of appetite at 78.67%, peri-orbital edema at 73.20%, and ear itching at 70.00%. After the treatment, nine patients were completely cured and all patients showed a reduction of symptoms. It is observed that the *Shreshta nimbadi* decoction is beneficial for *Kaphaja Shirsha Shoola* (chronic sinusitis) Management.

Keywords: *Shirsha Shoola, Headache, Sinusitis, Shiroroga*

Impact of Social Media on Health Seeking Behaviour: An Exploratory Study Based on Traditional Medicine

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This study was conducted among social media users by using a purposive sampling method from July to November 2023. *Facebook* users were selected as it is the most popular and widely used social media in Sri Lanka. The main objective of the study is to analyze the factors that attract people to social media for health advice and what type of health-related information is sought through social media. An Internet-based close-ended questionnaire and in-depth interviews were used for collecting data. Quantitative and qualitative data were collected from 96 Facebook users and five (05) in-depth interviews respectively. Descriptive content analysis was used to analyze qualitative data. The quantitative data were analyzed by independent sample t-test and chi-square test using SPSS statistical software. The majority of the respondents were female (56.3%) and there was no significant relationship between sex on health-seeking behaviour on traditional medicine. It was found a significant association with age and health-seeking behaviour (F=3.815, p=0. 007 < 0.05). Young people (49%) are more likely to seek traditional medicine through social media, with this tendency gradually declining with age. The majority of individuals who find social media-based traditional medicine are the post-graduated (25%) and the graduated (42.7%), indicating that higher education is a determinant factor in health-seeking behaviour on social media. It was also found that distance to the health facility (79.2%) and family income (86.5%) affect the selection of health sources. It was also found that people rely on social media to find traditional medicine for cancer (41.7%) and joint disorders (22.9%), while accepting that unproven traditional drugs might aggravate existing diseases (31.2%). Some Social media users questioned about authenticity, safety, and efficacy of traditional medicine circulated on social media.

Keywords: *Social Media, Health-Seeking Behavior, Traditional Medicine*

A Review on *Shatapushpa Choorna* in the Management of Follicular Maturity

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Infertility is defined as the inability to achieve pregnancy after 365 days of regular unprotected sexual intercourse. The prevalence of subfertility among Sri Lankan couples is around 15%. Amongst the causes of female infertility, ovarian dysfunction contributes about 40% which includes anovulation. In Ayurveda, many herbs are described for their potential to enhance fertility with Shatapushpa (*Anethum sowa*) specifically highlighted in the *Kashyapa Samhita* for its utility in ovulatory dysfunction. This review is intended to find out the benefits of *Shatpushpa* is the single drug of choice that is helpful in female reproductive disorders. Indication of *Shatpushpa* includes amenorrhea, oligomenorrhoea, and menopausal syndrome. Due to *ushna* and *tikshna guna* it possesses *kaphavata shamaka* effect. It has *deepana, pachana*, and *anulomana* properties and acts as *artavajanana* and *stnayajanana* in the female reproductive system with good effect on *rajorodha, yonishoola, kastartava, prasuta*, and *stanyanasha*. Experimental studies reveal its uterine stimulant activity, *kosthavatahara*, and *artavajanana*. *Shatpushpa* has a direct impact on ovarian function. This may be due to specific modes of action based on the administrative route. *Shatapushpa* mainly contains phytoestrogens that have mixed estrogenic and anti-estrogenic action, affect selective estrogen receptor modulators (SERM) and inhibit the enzymatic conversion of endogenous estrogen to oestradiol, and possess intrinsic estrogen activity. Its phytoestrogen properties bring down the levels of insulin resistance in the body and restore the cellular imbalance that is a major cause of PCOS. According to the above-revealed literature, *Shatapushpa* is effective in the management of follicular maturity.

Keywords: *Shatpushpa, Anethum sowa, Infertility*

A Clinical Study on the Effect of *Agnimantha shilajith Yoga* on *Atisthaulya* w.s.r. to Overweight and Obesity

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The dramatic increase in the prevalence of overweight and obesity in most countries has been of great concern globally. This is estimated to be the cause of more than 3.4 million deaths, 4% of years of life lost and at least 4% of disability-adjusted life all around the world. However, despite the urgency of this problem, there are some noticeable gaps in what is known about the subject. Obesity is referred to as "*Sthaulya*" and is considered to be a disease of "*Medodhatu*" meaning a disorder of lipid metabolism. A variety of different types have been detailed in the Ayurveda classics along with the treatment for the same. *Agnimantha-shilajith* yoga is one of treatment method, mentioned by *Charaka Acharya* of his protocol in *Charaka Suthrasthana*. Present study was planned to assess the role of *Agnimantha Shilajith* yoga in the management of obesity. 33 patients were selected according to inclusion and exclusion criteria and 30 patients were treated and 03 patients were dropout. 500mg of medicine were given two times per day with lukewarm water for 03 months with 03 months of follow-up. After completing the treatment, an analysis of overall effecst showed a marked reduction of the weight, BMI, and other clinical features was reduced.

Keywords: *Obesity, Overweight, Atistaulya, Agnimantha, Shilajith*

Exploring the Nutritional and Health Benefits of Traditional Kandyan Rice Varieties and Selected Grains

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In pursuit of understanding traditional dietary practices and their nutritional implications, this research delves into the rich history of rice varieties from the Kandyan era, as narrated by 17 key informants spanning three consecutive generations. The study focuses on seven specific cooked rice varieties: Diyabath, Sunusal Bath, Irigu Bath, Thanahal Bath, Kurakkan Kiribath, Meneri Bath, and Meneri Kiribath. Alongside these traditional rice varieties, the research also examines the nutritional profiles and health benefits of various grains, including finger millet, proso millet, foxtail millet, maize, and *Oryza sativa*. The primary objectives of this study were to evaluate the nutritional content, proteins, dietary fibre, vitamins, and minerals of these grains, analyse their health benefits, and assess their effects on blood sugar levels, antioxidant capacity, and dietary fibre content. Articles for this research were sourced from Google Scholar and PubMed, focusing on peer-reviewed publications from 2014-2024. Finger millet offers antioxidant, antimicrobial, antidiabetic, nephroprotective, wound healing, and anti-cataractogenesis properties. Foxtail millet, rich in crude fibre, aids digestion, promotes bowel movements, and provides hypoglycaemic and hypolipidemic effects. Proso millet helps against heart disease, hypercholesterolemia, breast cancer, diabetes, and infections. Maize supports blood pressure regulation, liver function, and bile production. Overall, the findings reveal that the traditional rice varieties and selected grains offer distinctive nutritional and health benefits, which can significantly contribute to dietary recommendations and public health strategies, emerging through consecutive traditions.

Keywords: *Health Benefits, Kandyan Rice Varieties, Millets and Grains, Nutritional Profiles, Traditional Dietary Practices.*

Development and Evaluation of an Anti-inflammatory Gel formulated with *Navahandi Telkira*

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Navahandi (Rhipsalis baccifera), an epiphytic member of the Cactaceae family holds a revered position in Ayurvedic medicine for its efficacy in treating bone fractures, bruises, and rheumatism. The traditional formulation *Navahandi Telkira*, is meticulously prepared by blending equal parts of *Navahandi* and scraped coconut following the classical *Bhaanu paaka* method. Historically, this preparation has been employed in managing orthopedic conditions, particularly those characterized by inflammatory processes. This study aimed to evaluate the anti-inflammatory properties and phytochemical profile of *Navahandi Telkira*, and to develop it into a topical anti-inflammatory gel and assess the gel's organoleptic attributes. The investigation utilized two critical assays; the Nitric Oxide (NO) Scavenging Assay and the Human Red Blood Cell (HRBC) Membrane Stabilization Assay (heat-induced) to assess the anti-inflammatory effects. These assays were compared with established standards using Gallic Acid for the NO Scavenging Assay and Aspirin for the HRBC Membrane Stabilization Assay. Additionally, phytochemical analysis was conducted to identify the preparation's bioactive compounds. The results revealed that *Navahandi Telkira* exhibits significant anti-inflammatory activity with NO scavenging capabilities superior to Gallic acid at specific concentrations. The HRBC Membrane Stabilization Assay indicated that the anti-inflammatory effects of *Navahandi Telkira* are comparable to those of Aspirin, albeit with slightly reduced potency. The phytochemical analysis confirmed the presence of key bioactive constituents including reducing sugars, proteins, alkaloids, flavonoids, phenols, tannins, saponins, and fats and oils. The gel showed favorable organoleptic properties, consistency, and pH stability. These findings indicate that *Navahandi Telkira* offers significant potential as a natural anti-inflammatory agent, especially in traditional *kadum bidum* therapy. Further research and clinical trials are needed to validate its therapeutic efficacy.

Keywords: *Navahandi Telkira, Traditional Medicine, Anti-Inflammatory, Phytochemicals, Topical Gel*

Efficacy of *Bilvadi Panchamula Churna* in the Management of *Sthaulya*

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Sthaulya (Obesity) is a global health concern with far- reaching implication for both physical and mental well-being. While there are various approaches to manage this issue, many individuals are increasingly turning to alternative healing systems including Ayurveda. Clinical features of *Sthaulya* according to *Charaka Samhita* are pendulous buttocks, abdomen, and breasts due to excess deposition of *Meda* and *Mamsa*. This clinical study designed to investigate the impact of *Bilvadi Panchmula Churna* (BPC) on *pruposive* sample of 30 patients who had BMI between 30 - 40 kg/m^2 treated at the OPD of National Ayurveda Hospital. Patients who were included in this study were subjected to clinical examination and laboratory investigations to rule out underlying diseases. After confirming that they were free from any occult disease based on the normal laboratory results, they were treated with BPC 6g twice daily before meals with bee honey (5g) for a period of 8 weeks. Both subjective and objective assessment criteria were evaluated. Data were analyzed by SPSS statistical software. BPC reduced BMI (33.55±0.59 to 31.12±0.59), skin fold thickness (Biceps) (27.44±1.60 to 24.26±1.60), serum cholesterol (200.9±19.64 to 186.16±19.64), and fasting blood sugar (106.26±7.75 to 97.95±7.75) significantly (p<0.01) whereas the improvement of pendulous buttocks, abdomen and breasts (2.37±0.49 to 1.33±0.48) is statistically significant (p <0.01). Overall effects showed that BPC has significant effect on Sthaulya.

Keywords: *Bilvadi Panchmula Churna, Sthaulya, Obesity, Lipid Profile, Fasting Blood Sugar*

Effectiveness of Mud Therapy in the Management of *Yuvana pidaka* with Special Reference to *Acne vulgaris* - A Case Study

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Yuwana pidaka is a dermatological disorder observable on the face with disfiguration. The symptoms are explained in Ayurveda textbooks and are correlated with Acne *vulgaris*. This common inflammatory skin disease affecting adolescents identifies with a wide range of morbidities including physical, social, psychological, and emotional distress. The estimated affection is 9.4% of the global population and approximately the eighth most prevalent disorder in the world. Adolescents seek modern emollients and lotions with an expeditious effect to overcome their various personal ergo, especially concerning their outward appearance. According to the Ayurveda concept, administration of mud therapy on *Yuwana pidaka* is quite interesting and proved from an ancient time that the reaction of inflammation can be relieved and upgrading immune levels. The research objective is to study the efficacy of mud therapy in the management of *Yuwana Pidaka*. After giving *Mrudu-shodana* treatment for 7 days, a processed mud pack will be applied on the face, kept until it dry and washed off with water, and subsequently ice water applied as a toner. A mud pack was applied once every two days for 6 days in the morning. This case study is of a 17-year-old female patient who visited complaining of eruptions over her face with mild pain, itching, discharge, discoloration, and disfiguration for 2 years. The patient was successfully improved without any complication proving that mud therapy is an easy, safe, and cost-effective treatment method for *Yuwana pidaka.*

Keywords: *Yuwana pidaka, Acne vulgaris, Mud Therapy*

Application of *Irsal e Alaq* (Hirudotherapy) in the Management of *Varm e Ghudad e Darqiyyah* (Swelling of the Thyroid Gland): A Case Report

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Varm e Ghudad e Darqiyyah (swelling of the thyroid gland) is a broad term that corresponds with goitre in modern medicine. Iodine deficiency is the most prevalent cause of goitre, which is a thyroid gland that is enlarged. Goitre is caused by hypothyroidism, hyperthyroidism, thyroid nodules, thyroid inflammation, and malignancy as well. Thyroid palpable focal lesions occur 3-7% of adults, with women encountering them more frequently than men. The primary causes of pathological alterations in the glands are fluid imbalances and *mawaad-e-faasida* buildup. This case study is aimed at highlighting the potential of Unani therapy in the management of thyroid swelling. It was conducted in the outpatient department of Ayurveda Teaching Hospital, Borella. This study described a 56-year-old female who presented with swelling of the neck for 6 years with a recent enlargement in size. She also reported hand tremor, palpitations, and breathing difficulty on exertion. Ultrasound scan neck revealed for Multi Nodular Goitre (MNG). She was administered Itrifal Ghududi orally with the application of *Irsal e Alaq* over the gland for 6 weeks. Parameters were assessed at baseline and after the treatment. It was observed that a reduction of the size of neck circumference by around 3-4 cm from the baseline. Changes in thyroid profile were observed, and TSH level improved from low (0.226 mIU/L) to normal (0.720 mIU/L) after treatment. The results of the present study were in complete accordance with the statements provided by Rabban Tabri, Ibn Sina, and Abu Bakr Zakaria Razi. Therefore, it is concluded that further clinical trials should be done in large samples to evaluate the efficacy and safety of Unani medicines in the management of MNG.

Keywords: *Varm e Ghudad e Darqiyyah, Irsal e Alaq, Hirudotherapy, Multi Nodular Goitre*

Management of *Iltihaab e Tajaveef e Anf Haad* Using *Dalak* Therapy: A Case Report

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The term *Iltihaab Tajaveef Anf* has not been mentioned in the Unani classical texts, clinical features of *Nazla Baarid* resemble *Iltihaab Tajaveef Anf*, which occurs with the involvement of various factors. Individuals with *Baarid mizaj* (cold temperament) and exposed to cold environments or cold consumption are more prone to develop this condition as the *maaddaah* (matter) infiltrates from the anterior part of the brain towards the nose or throat. This condition corresponds with sinusitis in modern medicine and is the inflammatory condition of the paranasal sinuses. It is one of the most common reasons for an antibiotic prescription. The study aimed to evaluate the therapeutic effect of *Dalak* (massage) with *Roghan e Sambahlu* in managing *Iltihaab e Tajaveef* e Anf. It was conducted in the outpatient department of the National Teaching Hospital of Ayurveda, Borella. In this study, a 60-year-old male presented with a two-week history of severe headache, facial tenderness, nasal discharge, nasal congestion, and anosmia bilaterally. Based on the characteristic features, the condition was diagnosed as *Iltihaab Tajaveef Anf* and he was treated by *Dalak* therapy using 3 mL of *Roghan e Sambahlu*, applied over the areas of frontal and maxillary sinuses for 5 days. Before the intervention, the Visual Analogue Score (VAS) was 08 and the Total Nasal Symptom Severity (TNSS) was 13. Following *the treatment*, the VAS was 02 and TNSS was 03. This case study demonstrates that *Dalak* can be valuable in reducing symptoms of sinusitis. However, to make the study more comprehensive, it could be conducted in large sample sizes on various parameters.

Keywords: *Iltihaab e Tajaveef e Anf, Sinusitis, Dalak, Nazla Baarid, Roghan e Sambahlu*

Wajaul Mafasil and its Correlation with Osteoarthritis in Unani Medicine: A Review

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Wajaul Mafasil is a general term for arthritis or joint pain. Osteoarthritis (OA) is a degenerative joint condition that is characterized by cartilage degeneration, joint stiffness, oedema, and reduced mobility. The objective of this review is to investigate the Unani concepts of *Wajaul Mafasil* and its relationship with Osteoarthritis. A search of the literature was done, focusing on works published between 1990 and 2023 from databases such as PubMed, Google Scholar, and traditional Unani manuscripts. The inclusion criteria comprised research addressing the efficacy of Unani treatments as well as studies outlining the Unani approach to joint diseases, particularly the terms *"Wajaul Mafasil", "Wajaul Mafasil Barid", "Wajaul Rakba"* and their relationship to osteoarthritis. After a thorough review, 16 of the 150 articles satisfied the inclusion criteria. The accumulation of hot or cold humour in the joints tends to be related to this illness, which can cause symptoms such as joint deformities, restricted movement, stiffness in the morning, and persistent pain that are comparable to the clinical presentation of osteoarthritis. The degeneration of joint tissues can be attributed to the cold humor, which therefore seems to be an apparent connection between *Wajaul Mafasil* and Osteoarthritis. The literature also emphasizes *Wajaul Mafasil* treatment employing Unani medicine. Herbal treatments with anti-inflammatory, analgesic, and chondroprotective qualities include *Boswellia serrata* (Kundur), *Withania somnifera* (Ashwagandha), and *Azadirachta indica* (Neem). Whilst traditional remedies have immense potential, more clinical research and scientific evidence are necessary before Unani methods can be fully integrated into modern medical practices.

Keywords: *Wajaul Mafasil, Osteoarthritis, Wajaul Mafasil Barid, Humour*

Concept and Management of *Waja-ul-mafasil* (Arthritis) from the Purview of Unani System of Medicine (Special Reference to Osteoarthritis)

B.M. Rishad[1], M. Shiffa[2], N. Fahamiya[3]

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[3]*Department of Ilmul Advia, Faculty of Indigenous Medicine, University of Colombo, Sri Lanka*

Waja-ul-Mafasil is a comprehensive term in the Unani system of medicine that encompasses various joint diseases, including inflammatory, non-inflammatory, infectious, metabolic, and other musculoskeletal disorders. This literature survey aims to explore traditional Unani perspectives on Waja-ul-Mafasil, particularly in relation to osteoarthritis, in order to provide insights that could enhance clinical practice. The study employed a systematic literature review to gather authentic information on Waja-ul-Mafasil and arthritis. Data were sourced from classical Unani texts, peer-reviewed scientific journals, research papers, and reputable websites using electronic databases like Google Scholar, PubMed, and Scopus. The inclusion criteria focused on Unani research conducted within the past 15 years, clinical trials, case studies, animal studies, and classical Unani literature. Excluded were literature reviews, research older than 15 years, and laboratory-based research. Renowned Unani scholars have categorized Waja-ul-Mafasil based on factors such as the severity of the disease, presence of inflammation, etiology, involved morbid substances (Madda), swelling, accumulation of abnormal fluids (Akhlat-e-fasidah), and the specific joints involved. A close examination of Unani literature reveals that arthritis, particularly osteoarthritis, can be correlated with Waja-ul-Mafasil Barid, as both share similar clinical features. According to Unani medicine, the pathological changes in joints are primarily due to a disruption in humoural temperament (Su-e-Mizaj Madda) and the accumulation of morbid material (Fasid madda) in joint spaces. Therefore, the treatment of Waja-ul-Mafasil in Unani involves restoring the normal temperament and correcting the humoural imbalance. This is achieved through a multidimensional approach, including Ilaj Bil Ghiza (dietary therapy), Ilaj Bit Tadbeer (regimenal therapy), and Ilaj Bid Dawa (pharmacotherapy), which collectively aim to divert (Imala) and evacuate (Istifraagh) the morbid material from the joints.

Keywords: *Waja-ul-mafasil, Arthritis, Akhlat, Unani Medicine*

Ustukhuddus (*Lavandula Stoechas Linn.*) in the Management of Malankholia (Melancholia) : A Systematic Review

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Unani medicine, an ancient system of traditional medicine, promotes human wellness through various methods, with herbs playing a vital role in managing numerous disorders. *Ustukhuddus* (UK), also known as lavender, is a prominent herb in Unani medicine, widely used to treat neurological and psychological conditions. These include anxiety disorders (*Infiyalat e nafsaniya*), convulsions (*Daf-e-tasannuj*), paralysis (*Falij*), headaches (*Suda*), epilepsy (*Sara*), tremors (*Rasha*), dementia (*Nisyan*), and melancholia (*Malankholia*). Despite its extensive use, research on *Ustukhuddus*, particularly concerning its effects on psychological disorders, remains limited. Therefore, this study aims to gather authentic information about UK and its medicinal properties, with a special focus on its role in treating melancholia. A systematic literature review was conducted, gathering data from digital databases such as Google Scholar, PubMed, ResearchGate, and Web of Science, as well as from classical Unani texts. The review included Unani research from the past 15 years, clinical trials, case studies, animal studies, and classical Unani literature. Excluded were literature reviews, research older than 15 years, and laboratory-based studies. In Unani pharmacodynamics, *Ustukhuddus* is used to pacify and evacuate vitiated Phlegmatic and Black bile humors, which are primarily responsible for neurological disorders. The herb is employed in treating various neurological conditions such as epilepsy, melancholia, paralysis, and anxiety. It exhibits neuroprotective, anticonvulsant, anxiolytic, sedative, and analgesic activities. Notably, lavender oil, derived from UK, has been found to improve associated symptoms of melancholia, including restlessness, disturbed sleep, and somatic complaints. Based on the available data, it is hypothesized that *Ustukhuddus* may be effective in managing melancholia. However, this hypothesis requires validation through comprehensive clinical trials to confirm its efficacy in treating this psychological disorder.

Keywords: *Unani, Ustukhuddus, Malankholia, Herbs*

POSTGRADUATE INSTITUTE OF MEDICINE

Building a Sustainable Medical Workforce in Sri Lanka

25th of October 2024

MESSAGE FROM THE DIRECTOR

Professor Senaka Rajapakse

Director
Postgraduate Institute of Medicine
University of Colombo, Sri Lanka

The Postgraduate Institute of Medicine (PGIM) is the only institution in Sri Lanka that trains and accredits specialists from medical and dental specialties. Every year PGIM produces more than 400 Board Certified consultants and each of these graduates complete a research study as part of their training programme. In addition, many other medical and dental practitioners complete training programmes at Masters and diploma level, which may also include a research project.

In PGIM training programmes, we recognize research as an important component in the development of competent and evidence-based practitioners, who will have the capacity to apply research findings into their daily patient care practices and clinical decision-making. We strive towards improving the quality of the research studies done by our trainees through several initiatives, including conducting regular research methodology workshops. We have also provided more opportunities for the trainees to publish their research and gain recognition for their efforts in their examinations.

I hope that the Annual Research Symposium of the PGIM would be another opportunity for the trainees, trainers, and for any researcher focusing on areas related to medical sciences to disseminate their research findings. The symposium will also be an opportunity for both trainees and trainers to share their experiences as well as to learn together transforming the future postgraduate medical education in the country.

I take this opportunity to thank all the participants for spending their valuable time and the organizing committee for their effort and wish all the participants a memorable academic experience.

MESSAGE FROM THE SYMPOSIUM CHAIR

Dr. G. Amodini Rajakaruna

Senior Lecturer
Postgraduate Institute of Medicine
University of Colombo, Sri Lanka

On behalf of the Organizing Committee for the Annual Research Symposium 2024 of the PGIM, I would like to express my warm welcome to all of you. I am delighted and honoured to present this message as the Chair of the Annual Research Symposium 2024 of the PGIM under the theme 'Building a Sustainable Medical Workforce in Sri Lanka'. PGIM as the only national institution that trains medical and dental specialists in Sri Lanka is always focused on producing specialists of the highest quality, competence, and dedication in order to provide optimum health care to the citizens of Sri Lanka. We also understand that the PGIM has a wider responsibility to the country by ensuring the sustainability of the postgraduate training programs that will produce medical and dental specialists of such quality. The theme that we have chosen this year is of critical importance with the current challenges in health sector due to brain drain and the socio-economic challenges that the health care workers of current day are facing. We believe that bringing in such a topic to the discussion table is vital as it will give an opportunity for the trainees and trainers of the PGIM to share their views and deliberate on the future path.

This symposium will provide a platform for the trainees and trainers to share their research findings and engage in a critical discussion as to how these findings may be used to uplift the healthcare system and academic training in medical education. We hope that the Annual Research Symposium 2024 of the PGIM will initiate and contribute to the process of building a sustainable future for the postgraduate trainees and trainers in health sector and further uplift the health care system in Sri Lanka where evidence based practice and research go hand in hand.

I want to express my sincere gratitude to all those who contributed to the Annual Research Symposium 2024 of the PGIM and wish everyone fruitful deliberations.

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Mr. Udara Bandara – Library Attendant, Library, PGIM
Mr. A. Alexander – Library Attendant, Library, PGIM

SYMPOSIUM PROGRAMME

Time	Programme
08.45 am – 09.10 am	**Commencement - National Anthem** **Lighting of the Oil Lamp**
09.10 am – 09.20 am	**Welcome Address** Senior Professor Senaka Rajapaksha Director, PGIM, University of Colombo
09.20 am – 09.30 am	**Address by the Chief Guest** Senior Professor (Chair) H. D. Karunaratne Vice-Chancellor, University of Colombo
09.30 am – 10.05 am	**Keynote Address** Dr. Palitha Mahipala Secretary Ministry of Health, Sri Lanka
10.05 am – 10.10 am	**Introduction of the Orator**
10.10 am – 10.40 am	**PGIM Oration**
10.40 am – 10.45 am	**Vote of Thanks**
10.45 am – 11.15 am	**Refreshments/ Poster Presentations**
11.15 am – 13.15 pm	**15 Best Oral Presentations**
13.15 pm – 13.30 pm	**Awards for Best Oral and Poster Presentations**
03.30 pm – 14.30 pm	**Lunch**

INTRODUCTION TO THE KEYNOTE SPEAKER

Dr. P.G. Mahipala

Secretary of Health
Ministry of Health
Sri Lanka

Dr. Palitha Gunarathna Mahipala, a Board-Certified consultant in Medical Administration, is the Secretary to the Ministry of Health, Sri Lanka. He is a distinguished figure in the Sri Lankan health sector and has dedicated his career to improving healthcare access and outcomes. Dr. Mahipala has held numerous leadership positions at both national and international levels. Educated at Ananda College, Colombo, Dr. Mahipala pursued a rigorous academic path which commenced with the MBBS degree from the Faculty of Medicine, University of Peradeniya and then MD in Medical Administration, MSc in Community Medicine, MBA from the University of Rajarata, PG diplomas in Management, Buddhist Studies, Economic Development, Public Management, and Diplomacy and World Affairs.

Throughout his career, Dr. Mahipala has held key positions in the Ministry of Health as Additional Secretary (Medical Services), Director General of Health Services, Deputy Director General (Public Health Services), Director of Public Health Services, Medical Services, Tertiary Care Services, and Regional Director of Health Services, Hambantota District. In addition, he has also been an active member of numerous local and international organizations, and advisory committees. He was a Past President and a Fellow of the College of Medical Administrators of Sri Lanka. He has made several publications in reputed national and international journals.

Dr. Mahipala has also played a significant role in international public health initiatives as the WHO Representative/Head of Mission Pakistan, and the Coordinator for Non-Communicable Diseases and Environmental Health. He has worked tirelessly to address global health challenges and promote sustainable development. Dr. Mahipala has been honoured with the Padma Vibhushana Venkataraman Award from the Association of Community Ophthalmologists India for the outstanding work done for the prevention of blindness in Sri Lanka and the Global Ambassador Award 2022 for the outstanding work done for well-being of people in Pakistan.

ABSTRACT OF THE KEYNOTE ADDRESS

Building a Sustainable Medical Workforce

Dr. P.G. Mahipala

Ministry of Health, Sri Lanka

Sri Lanka holds a commendable position in relation to macro-level health indicators and the sustainability of these successes is heavily reliant on Human Resource for Health (HRH). We need to accelerate the health service performance with a robust, skillful, and equitable health workforce to deliver quality healthcare services to achieve SDG targets and beyond. There are about 150,000 healthcare workers employed in government healthcare institutions, of which about 2100 are medical specialists and about 20,860 are other medical officers. In the context of current human resource challenges, the theme of the Annual Research Symposium of the Postgraduate Institute of Medicine-2024, "Building Sustainable Medical Workforce in Sri Lanka" signifies the key interventions to achieve a sustainable workforce. The World Health Organization estimates that by 2030, there will be a global shortage of 18 million healthcare workers, primarily in low and middle-income countries. Sri Lanka has faced the issue of brain drain to a certain extent in the recent years. It has partially contributed to the maldistribution of the skilled medical workforce in some provinces of the country. Addressing these challenges requires a strategic and data-driven approach to workforce planning. Proper demand forecasting and supply analysis will help us to identify potential gaps for which we need to develop targeted interventions.

The challenge of the brain drain is complex and multifaceted. We must reach out to enhance the working conditions and create career pathways for our workforce. Engaging in bilateral agreements with other countries will pave the way for our specialists to get international exposure, while allowing them temporary migration opportunities with guaranteed return options to serve the nation. Equity in workforce distribution is another imperative necessity to achieve Universal Health Coverage. Incentivizing rural practice, and implementing online training programs will enable us to have a positive motivated workforce at the regional level. Furthermore, leveraging telemedicine will enable specialists to remain in regional centers while supporting grassroots-level primary healthcare services. By 2030, we project a need for a 30% increase in the health workforce to meet the demands of an aging population and the growing prevalence of non-communicable diseases. To achieve this, revision of the cadre norms and aligning them with best global practices, expanding continuous professional development programs, and revising curricula, particularly at the postgraduate level of medical education, is of utmost importance.

POSTGRADUATE INSTITUTE OF MEDICINE
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R.M.M.K.N. Rathnayaka[1,2,3], P.E.A.N. Ranathunga[3]

[1]Department of Pharmacology, Faculty of Medicine, Sabaragamuwa University of Sri Lanka
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J.I. Abeynayake[1,2], B. Samaraweera[1], D.V.R.G. Ruwan[1], W.D.C.U. Dias[3], I. Samaraweera[1]

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J.I. Abeynayake[1,2], B. Samaraweera [1], W.D.C.U. Dias[3], M.A.Y. Fernando[4], D.Edirisinghe[5]

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[4]Department of Medical Microbiology and Immunology, Faculty of Medicine, University of Colombo, Sri Lanka
[5]Department of Virology, Medical Research Institute, Colombo, Sri Lanka

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S. Kumaran[1,2], T. Hamsha[2], T. Mithusha[2]

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[2]Ministry of Health, Sri Lanka

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D.M.A.K. Dissanayake[1], S.C. Wickramasinghe[2], G.S.K. Dharmaratne[1], M. S. Samarawickrama[1]

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H.S. Liyanarachchi

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Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

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Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

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G.G.A.K. Kulatunga[1,2], R.H. Hewapathirana[3], R.B. Marasinghe[4], V.H.W. Dissanayake[3]

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SRI PALEE CAMPUS

Media and Liberal Arts for Sustainable Development

20th of November 2024

MESSAGE FROM THE RECTOR

Dr. Prathibha Mahanamahewa

Rector
Sri Palee Campus
University of Colombo, Sri Lanka

It gives me immense pleasure to extend a warm welcome to all of you to the Annual International Research Symposium 2024 (AIRS) hosted at the Sri Palee Campus, University of Colombo. This year's symposium centers on the theme of "Media and Liberal Arts for Sustainable Development". We are honored to have Professor Mark Pearson from the School of Humanities, Languages, and Social Science at Griffith University, Queensland, Australia, as our esteemed Keynote Speaker.

I extend my deepest appreciation to the Chairperson, Secretary, and the entire symposium organizing committee for their unwavering support and encouragement. My gratitude also goes to the dedicated members of the Organizing Committee, both within and outside Sri Palee Campus, for their tireless efforts in ensuring the success of this symposium. Their commitment to achieving our ambitious goals has been truly commendable.

One of the primary objectives of this symposium is to facilitate the exchange of knowledge and experiences by inviting distinguished speakers, both from within and outside Sri Palee Campus. I am confident that this conference will yield fruitful outcomes and lay a solid foundation for the future development of the media and liberal arts fields.

We eagerly anticipate your presence at the Sri Palee Campus on 20th November, 2024, and look forward to a memorable and enriching experience.

MESSAGE FROM THE SYMPOSIUM CHAIR

Dr. D. M. Udari Poornima Abeyratne

Head
Department of Languages
Sri Palee Campus, University of Colombo, Sri Lanka

Success is not a mere destination but a constant journey, which requires ebullient and preserving pursuit. On this momentous occasion, as the Chair of this remarkable conference, I humbly extend my sincere and heartfelt congratulations on the Annual Research Symposium (AIRS 2024). This gathering of brilliant minds from around the world promises to be an extraordinary opportunity for knowledge exchange, intellectual growth, and the exploration of innovative ideas.

This symposium will be a convergence of leading minds in the fields of media and liberal arts at a platform for insightful discussions, knowledge sharing, and collaboration opportunities, as well as encouraging interdisciplinary research among researchers in different disciplines. With steadfast dedication to research since the outset, I am elated to announce that Sri Palee Campus, University of Colombo, has secured a commendable position among global universities and stands at the forefront in the Sri Lankan context.

I am honored, as the Chair of the conference, to extend my heartfelt gratitude to the organizers, presenters, and all participants for their invaluable contributions in making this conference possible. As we gather at the Annual International Research Symposium, let us celebrate the power of research and reaffirm our commitment to advancing knowledge, inspiring new ideas, and making a lasting difference in our world.

May this event be a catalyst for transformative ideas and lasting impact.

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Ms. Nilusha Wimalasena	–	Department of Performing Arts
Mr. Dilan Sulalith	–	Department of Performing Arts
Mr. Imal Rangana	–	Department of Performing Arts
Mr. Ruvan Priyashantha	–	Department of Performing Arts
Mr. Bimsara Kanchana	–	Department of Mass Media

Refreshment Committee

Ms. Nayana Suraweera (Chair)	–	Department of Mass Media
Ms. Sanjula Dharmarathne	–	Department of Languages

SYMPOSIUM PROGRAMME

Time	Programme
09.00 am – 09.05 am	**Arrival of Guests and Participants**
09.05 am – 09.10 am	**Lighting of the Oil Lamp and National Anthem**
09.10 am – 09.20 am	**Introduction to Annual International Research Symposium 2024** Dr. Prathibha Mahanamahewa Rector, Sri Palee Campus, University of Colombo
09.20 am – 09.30 am	**Address by the Chief Guest** Senior Professor (Chair) H. D. Karunaratne Vice Chancellor, University of Colombo
09.30 am – 09.35 am	**Introduction of the Keynote Speaker**
09.35 am – 09.55 am	**Keynote Address** Professor Mark Pearson School of Humanities, Languages, and Social Science Griffith University, Australia
09.55 am – 10.00 am	**Concluding Remarks of Inauguration Ceremony** Dr Udari Abeyratne Symposium Chair 2024
10.00 am – 10.25 am	**Tea Break**
10.30 am – 12.30 am	**Technical Sessions 01**
12.30 pm – 01.30 pm	**Lunch Break**
01.30 pm – 03.30 pm	**Technical Sessions 02 and 03**
03.30 pm – 04.00 pm	**Symposium Closing Remarks and Vote of Thanks**

INTRODUCTION TO THE KEYNOTE SPEAKER

Professor Mark Pearson

Professor of Journalism and Social Media
School of Humanities, Languages and Social Science
Griffith University, Australia

Mark Pearson is a Professor of journalism and social media in the School of Humanities, Languages, and Social Science at Griffith University, Queensland, Australia. He is also a member of the Griffith Centre for Social and Cultural Research within the Arts, Education, and Law Group.

Professor Pearson, previously, served as a section editor of Australia's national daily newspaper, *The Australian*. Since then, he has contributed freelance journalism to various publications, including *The Australian*, the Far Eastern Economic Review, the *Wall Street Journal*, the *Otago Daily Times*, *Crikey.com.au*, the *Sydney Morning Herald*, and the *Gold Coast Bulletin*.

His areas of expertise include media and social media law and regulation, journalism ethics, media freedom, and mindful journalism. He co-authored *The Journalist's Guide to Media Law* (6th ed., Allen and Unwin, 2019) with Mark Polden. Additionally, he authored Blogging and *Tweeting Without Getting Sued* (Allen & Unwin, 2012) and co-edited *Mindful Journalism and News Ethics in the Digital Era* (with Shelton A. Gunaratne and Sugath Senarath, Routledge, NY, 2015).

He is a collaborative academic researcher who has worked on a range of projects, including mindful journalism, reporting Islam, the impact of the law upon journalists, restrictions on mental health reporting, the interaction of journalists with vulnerable sources, censorship and the media, government spin, and the impact of new technologies on journalism.

ABSTRACT OF THE KEYNOTE ADDRESS

Strategies for Building Mindful Reflection into Communication and Education

Professor Mark Pearson

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This paper introduces some strategies for enabling students and colleagues to reflect mindfully when engaging in their communication and education. In doing so, it attempts to lay some foundation stones for proposing such strategies – offering the intellectual narrative of their conception and development. This paper aims to establish mindful reflection as an important component of tertiary pedagogy in communication, with potential applications in other areas including law and education. It starts by defining and establishing mindfulness in a modern educational context, before offering a way that students and colleagues might explore their own moral compasses. It then reviews some important interconnections between mindfulness-based meditation (MBM) and mental health, particularly resilience to post-traumatic stress. It explores MBM as a tool for ethical decision making. Finally, it summarizes a recent pilot project where students related their experiences with mindfulness-based meditation in the media law curriculum. This research set out to explain how mindful reflection could constitute an important component of tertiary pedagogy in communication, with potential applications in other areas including law and education. The researcher has journeyed through definitions of mindfulness in its modern educational context having established its roots in Buddhism and philosophy. The researcher has learned how we might map our own moral compasses. The researcher has looked at the relationship between MBM and mental health, and its potential for offering resilience to post-traumatic stress for journalists reporting tragic and gruesome stories. The researcher has outlined MBM as a tool for ethical decision making. And we have reviewed a recent pilot project where students reported the pros and cons of engaging in MBM in the media law curriculum. Much is still to be explored in the application of these two millennia-old practices to tertiary education and communication and educational practice. The researcher hope that future researchers are interested enough to undertake research to shed further light on this enlightening path with so many potential benefits.

SRI PALEE CAMPUS
List of Abstracts

The Potential of Children's Cinema as a Tool for Conflict Resolution: A Case Study of Three Selected Films

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A child is just a blank slate (Duschinsky. R.2012). He gets guidance to build his life through his family, society, and people around him. Accordingly, he develops his attitudes, behaviors, and thoughts. Everyone encounters conflicts due to changing societal attitudes. Accordingly, conflicts arise in various forms. There may be conflicts with oneself, with others, with society, and so forth. Multiple conflicts can arise for the child in the future. However, the child does not have proper understanding of how to face such situations. In such cases, the opinions of children, parents or elders can be seen to be ignored. In the face of such a situation, it is suggested that the visual media is suitable to provide the strength and guidance to face the conflicts that the child may have to face in the future. The reason for this is that visual media quickly captures the child's attention and imagination. Among the visual media, children's cinema is an art genre that can be used meaningfully by the child and it can easily restructure the child's mind. The research objective of this study was, to identify how children's movies provide mediation to resolve conflict situations among the children in the future. Qualitative research methods were used to accomplish the objective. Under that, pictorial and textual elements were analyzed in selected movies. Interviews with the subject expertise were also conducted. Through the analysis of the selected movies, "Siri Raja Siri" (Dissanayake S. 2008), "Vidu" (Handagama A. 2010), and "Ho Gana Pokuna" (Ferdinando I. 2015) several conflict resolution techniques were identified. Generally, all three movies depicted conflict situations involving the self, society, and others. Simultaneously, all three movies brought suggestions to solve the aroused problems. Hence, children who watch movies can learn about conflict situations, and resolutions before experiencing them in real life. It is more beneficial for children to successfully confront such situations in real life.

Keywords: *Child, Conflicts, Cinema, Resolution, Mind*

Parental Responsibility of Children after a Divorce or Separation: A Comparative Study of United Kingdom Law

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Parents hold the utmost responsibility for the maintenance, education, and growth of their children. However, when parents are divorced or separated, their children become vulnerable and are exposed to potential harm, often lacking adequate protection or care. The objective of this research is to investigate the detrimental effects of parental separation or divorce on children and to examine how parental responsibility is determined in such circumstances. Although courts can take custody arrangements, these decisions are often influenced by the family's cultural and religious background and other societal factors. Employing a qualitative research approach, this paper reviews existing literature, case studies, and legislation related to the subject. In addition, the paper analyses various models of parental responsibility for children after divorce or separation from different countries to identify a standard model that can be applied in the Sri Lankan context to ensure the best interests of the children. The findings of this study will assist policymakers in developing guidelines to ensure a safe and protected future for children securing their best interests.

Keywords: *Parental Responsibility, Divorce, Law, Children*

Leveraging AI for Green Media Production: Reducing Carbon Footprints

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The media industry, encompassing film, television, and digital content creation, is a significant contributor to global carbon emissions. Traditional production processes are resource-intensive, often involving high energy consumption, extensive travel, and large-scale use of materials. This paper explores the transformative potential of Artificial Intelligence (AI) in revolutionizing media production practices to achieve sustainability goals and reduce carbon footprints. The primary objectives are to identify AI technologies that can enhance sustainability in media production, evaluate their effectiveness in reducing environmental impact, and develop a framework for integrating these technologies into existing practices. This study employed a mixed-methods approach, combining a literature review, case studies, and expert interviews. The literature review identified current AI applications in media production, while case studies of companies using AI provided real-world data on carbon emission reductions. Interviews with industry experts offered insights into the challenges and opportunities of AI adoption. Moreover, the central research problem addressed how AI could be effectively leveraged to make media production more sustainable, and what specific challenges and opportunities existed in implementing AI-driven solutions. The study revealed that AI can significantly reduce the environmental impact of media production through predictive analytics, virtual production techniques, and energy management systems. These technologies streamline operations, reduce waste, and lower energy consumption. However, challenges such as high initial costs and the need for specialized skills must be overcome. The findings suggest that AI offers a promising pathway to a more sustainable media industry, with a framework proposed for its adoption.

Keywords: *Artificial Intelligence, Carbon Footprint, Green Media Production, Energy Management, Environmental Impact*

A Study on the Usability of Mobile Phone Applications in Reading Printed Newspapers in Sri Lanka

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The advancement of information and communication technology (ICT) and digitization have led to new practices for reading print newspapers through mobile applications. The purpose of this study was to explore the usability of mobile phone applications for reading printed newspapers in Sri Lanka. This study employed a survey methodology, distributing an online questionnaire to 350 newspaper readers aged 10 to 60 from various demographics. SPSS version 22 was used for factor analysis. In this research, the age group of 10-20 years was considered 'Generation Z', the age groups of 21-30 and 31-40 was considered 'Generation Y', the age group of 41-50 was considered 'Generation X', and the age group of 51-60 and over 60 was considered 'Baby Boomers'. The study revealed distinct generational preferences in newspaper consumption: Baby Boomers favor printed newspapers, while Generation Z and Generation Y predominantly prefer online publications. Younger generations tend to access news via mobile applications, whereas Baby Boomers exhibit minimal interest due to technological unfamiliarity and a strong preference for printed formats. This preference highlights Baby Boomers' reluctance to transition to digital platforms. The findings suggest that Generations Z and Y are more receptive to digital formats. It is also evident that newspapers will continue to be printed for Baby Boomer readers. Thus, further research into the usability of e-book applications for reading in Sri Lanka is recommended.

Keywords: *Newspaper, Mobile apps, Reading, Digitization, Information*

Usage of the English Language in Different Courts in Sri Lanka

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The importance of English in the field of law, particularly in a globalized context, is undeniable. In Sri Lanka, while preserving its identity and legal traditions, the integration of English within the legal framework offers several advantages. While it is crucial to maintain the nation's linguistic heritage and promote Sinhala and Tamil within the legal system, the strategic use of English can significantly bolster Sri Lanka's legal system and development.

To determine the extent of English language usage in various courts within Sri Lanka, a study was conducted involving five judges and twenty-five lawyers. The research employed a combination of interviews, questionnaires, and direct observations. The results revealed distinct patterns in the use of English across different levels of the judiciary in Sri Lanka. In the Supreme Court, judicial activities are conducted exclusively in English. English is prioritized in all legal proceedings, documentation, and communication. Similarly, English predominates in the Court of Appeal, reflecting the same usage patterns as the Supreme Court. In the High Courts, a mixture of English and Sinhala is observed. However, in the High Courts located in the Northern and other districts with a predominantly Tamil-speaking population, Tamil is predominantly used. In the lower courts, there is a significant deviation from the higher courts' practice. In these courts, Sinhala is more frequently used than English, highlighting a localized preference for the native language over English. This analysis shows that while higher courts maintain a strong emphasis on English, reflecting its importance in legal proceedings and documentation, lower courts tend to operate more in the native languages, catering to the linguistic preferences of the local population.

Keywords: *Courts, English Language, Judges, Judiciary, Lawyers*

Enhancing Critical Thinking and Engagement in History Education through Theatre Games

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This study explores the impact of theatre games on enhancing critical thinking in history education for grade 10 students. In this research, five theatre games were developed based on Sri Lankan folk traditions and tailored to specific history lessons. Two workshop sessions were conducted with six history teachers, six grade 10 students, and six theatre practitioners. Data were collected through focus group discussions and a structured questionnaire. The results of the focus group discussions and the questionnaire indicated that the created theatre games significantly improved students' comprehension of historical content more effectively than traditional teaching methods. This method enhanced critical thinking and promoted self-expression. The integration of Theatre in Education (TIE) with edutainment emerged as an effective pedagogical approach to teaching history. The students gained a deeper understanding of history through embodied knowledge obtained from the theatre games, leading to enhanced critical thinking and self-expression. The study suggests that theatre games can be adapted for various educational contexts, highlighting their potential to enhance knowledge retention and student engagement. This research underscores the value of combining traditional educational content with interactive and engaging theatre activities to create a more dynamic and effective learning environment.

Keywords: *Edutainment, Theatre in Education, History, Theatre Games, Pedagogy*

An Analysis on the Influence of Algorithmic Updates on Digital Perception and the Digital Humanities

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The digital age has been significantly transforming human perception, self-conception, and cognition, giving rise to the concepts of digital perception, digital self, and digital mind. Recent algorithm changes have altered the ways in which information is disseminated and consumed, leading to an immediate impact on digital perception. These changes have been affecting individual behaviour and also the collective behavioural patterns of society. This shift has been paving the way for the development of satellite culture, computer culture, and algorithmic cultures, ultimately creating a screen generation deeply embedded in convergence media. The digital humanities landscape exemplifies this transformation, particularly under the influence of Google's algorithm updates. The research investigated the impact of these algorithm updates on the field's SEO culture, characterized by a constant influx of content tailored to user preferences. This phenomenon is a direct result of humanity's evolving modes of communication, progressing from oral traditions to written formats and now to the contemporary digital realm. The digitalized human is thus inundated with a perpetual stream of information, raising significant social concerns. These social concerns require an immediate addressing. A mixed-methods approach was employed in this empirical research. This comprehensive methodology illuminates the intricate relationship between algorithmic updates, SEO culture, and their social implications. The findings indicated that algorithm-driven SEO practices contribute substantially to information overload, which can lead to social isolation and digital alienation. The research underscores the necessity of addressing these concerns to advocate for a more balanced digital humanities ecology. This involves reevaluating SEO strategies to priorities quality over quantity and encouraging critical engagement with information. This research contributes to the ongoing dialogue about the evolving digital humanities landscape and its social ramifications. It paves the way for a better understanding of the increasingly digitalized world and highlights the need for strategies to mitigate the adverse effects of digital culture on societal well-being.

Keywords: *Digital Perception, Algorithmic Updates, SEO Culture, Digital Humanities*

A Historical Study of Contemporary Newspaper Film Critics' Utility on Lester James Peries Cinema in the 60s'

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Lester James Peries, a prominent filmmaker who actively presented a major role in the golden era of Sri Lankan cinema, had released five films in 60s which are well-known as *'Sandeshaya', 'Gamperaliya', 'Delovak Athare', 'Ransalu'* and *'Golu Hadawatha'*, were able to rise up to local cinema criticism with positive involvement of film critics. Although Sri Lankan film criticism has developed over many decades, an experimental practice has not been established concurrently. This research was conducted to study the usage of contemporary newspaper film critiques related to Lester's cinema in the 1960s. The objectives of this study included examining the theoretical and conceptual framework of film criticism in Sri Lanka, identifying the significant features of newspaper critiques, assessing the landscape of Sri Lankan film criticism, and analyzing the contemporary perspectives and values articulated by Sri Lankan film critics. Utilizing a historical methodology with purposive data, this investigation primarily focuses on contemporary movie reviews published in newspapers at the time the films were released. Film observations served as the primary source, while documents regarding the history of Sri Lankan film criticism were used as secondary data. Interviews were conducted based on both primary and secondary resources relevant to the timeline of the study. Employing content analysis and narrative analysis, the data revealed qualitative insights and identified Lester's cinema as being a rational movement towards Sri Lankan film criticism. Specially *'Gamperaliya'* and *'Delovak Athare'* films created new atmospheres to criticize cinema from aesthetic approaches. Compared to English film critics who tried to appreciate Lester's cinema, there was not much admiration from some of contemporary Sinhala critics because Lester's cinema was led to aristocracy. The study concluded that along with cinema's uniqueness, distinctive elements were highlighted in film criticism, Lester's rational cinema controversially caused to bring out the salient features to film criticism qualitatively.

Keywords: *Film Criticism, Lester James Peries Cinema, Newspapers, Sri Lankan Film Criticism*

A Communicative Study on Post-Disaster Communication for Social Recovery (With Special Reference to Broadcasting relating to Floods Affecting Matara District 2016 to 2023)

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This paper investigates the role of television media in enhancing social recovery following flood disasters in the Matara District, Sri Lanka, from 2016 to 2023. The study is grounded in the need for effective communication strategies in post-disaster scenarios, where timely information dissemination and psychological support are critical for community resilience. The research specifically addresses the problem of how television broadcasts can be optimized to support disaster-affected communities during the recovery phase. The primary objectives of this study were to evaluate the impact of television media on community recovery, identify gaps in current broadcasting practices, and propose enhancements for more effective post-disaster communication. The research employs a mixed-method approach, combining qualitative interviews, and quantitative questionnaires with a content analysis of relevant television broadcasts. This methodology allows for a comprehensive assessment of both viewer perceptions and the actual content delivered during disaster recovery efforts. Key findings reveal that while television serves as a vital tool for disseminating critical information and fostering social cohesion, there are significant areas for improvement, particularly in accessibility and content localization. The results are interpreted in light of existing theories on disaster communication, and the discussion highlights the importance of tailored programming and enhanced collaboration between media outlets and disaster management authorities. The study concludes with recommendations to strengthen the role of television in post-disaster recovery, including the need for investment in local media infrastructure and the development of community-specific content.

Keywords: *Post-Disaster Communication, Disaster, Television Media, Recovery, Floods*

An Analysis of Women's Voices in Modern Sri Lankan Tamil Poetry (1980-2000)

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Poetry is a powerful literary tool, and Sri Lankan modern Tamil poetry often reflects identities and socio-political contexts. Women's voices in literature have been marginalized by patriarchy. This study analyzes themes of 'otherness' in modern Tamil poems written by Sri Lankan female poets using 'otherness' theory from feminism and critical theory. Poets such as Kala, Sanmarkka, Ranga, Urvasee, Sulfica, Sivaramani, and Selvi were analyzed, focusing on the period from 1980 to 2000. 'Otherness' explores how perceiving individuals or groups as 'other' leads to marginalization, discrimination, and exclusion. This can manifest through stereotypes, prejudices, and unequal power dynamics. In critical theory, 'otherness' is analyzed through 'double consciousness,' which examines the internal conflict faced by marginalized groups in a racist society. Urvasee's poem "An Application to the Jailer" addresses the oppression of a prisoner labeled as a 'terrorist.' Selvi's "Times that Never Come" delves into the emotions of those affected by war, capturing the silence and fear in the northern regions. Sulfica's "Scenes from the Nights of War" explores ethnic discrimination and its impact on minority women. Sanmarkka's "A Mother's Lament" portrays a mother's grief over her murdered son, reflecting victimization and identity struggles during the war. Sivaramani's "Initiative" critiques nationalism and violence, advocating for freedom of expression. Kala's "Koneshwarikal" recounts the gang rape and murder of Koneshwary by security forces in 1997, illustrating brutal oppression due to her minority identity. Ranga's "Truly and Truthfully" discusses patriarchal culture and its impact on women, showcasing how male ideology commodifies women's bodies and subordinates them. The study concludes that male domination restricted women's participation in Tamil poetry, with ethnic conflict often overshadowing other issues. Social, political, and cultural factors further marginalized female poets, making them feel 'othered.'

Keywords: *Women's Poetry, Sri Lankan Literature, Tamil Poetry, Otherness in Tamil Poetry*

A Study on the Television Sign Language News and Its Impact on the Special Needs (Deaf) Audience

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Sign language interpretation in news broadcasts is vital for the hearing-impaired audience, as it is their primary source of information. Despite its importance, Sri Lanka lacks standardized practices and dedicated formats for sign language news. This study addresses the inadequacy of current sign language news programs, which fail to fully meet the needs of hearing-impaired viewers. The research objectives were to gain a conceptual and theoretical understanding of television and sign language news, examine the role of sign language interpreters in serving the needs of broadcasters, and assess the representation of hearing-impaired students in Sri Lankan sign language news. The study also investigated how current sign language news broadcasts meet their communication objectives for the deaf audience and identified gaps in interpretation practices. A mixed-methods approach was employed to gather comprehensive data. Qualitative data were collected through semi-structured interviews with key stakeholders, including sign language interpreters, television producers, and members of the hearing-impaired community. These interviews provided insights into the challenges and best practices in sign language news broadcasting. Quantitative data were obtained via structured questionnaires distributed to a sample of 100 individuals from institutional and domestic settings in the Colombo and Kandy districts. The questionnaires assessed viewers' satisfaction with current sign language news programs, their perceived gaps, and suggestions for improvement. Data analysis, conducted using SPSS software, applied descriptive and inferential statistics to interpret the findings. The results reveal that current television sign language news programs do not adequately meet the information needs of hearing-impaired viewers. This research highlights the need for standardized sign language interpretation practices and dedicated sign language news formats, and it advocates for increased awareness among news producers and technicians about the critical role of sign language news.

Keywords: *Sign Language, Signed Television News, Hearing-Impaired Television Audience*

Influence of Japanese Language Education for Sustainable Development in the Sri Lankan Educational System

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Sri Lankan education can be identified as a unique situation where changes in the education system occur over time with the introduction of innovative subject units and the development of education practices. Integrating foreign languages into national educational systems has been recognized as a significant factor in promoting sustainable development. As globalization continues to shape educational paradigms, proficiency in Japanese not only opens avenues for international cooperation but also fosters a deeper understanding of Japan's innovative approaches to sustainability. This research investigates the influence of Japanese language education on sustainable development within the Sri Lankan educational framework. The study aims to explore how learning Japanese can contribute to various aspects of sustainability, including economic growth, cultural exchange, and environmental awareness. A mixed-methods approach was employed, combining quantitative surveys and qualitative interviews with educators, students, and policymakers involved in Japanese language programs across Sri Lanka. Data were collected from multiple educational institutions that offer Japanese language courses, focusing on their curriculum content, teaching methodologies, and perceived outcomes. The findings indicate that Japanese language education fosters critical skills such as communication, collaboration, and problem-solving among students. These skills are essential for addressing local and global challenges associated with sustainable development. In conclusion, this study illustrates that Japanese language education not only enriches individual learners but also contributes significantly to national efforts toward sustainable development. Future research should focus on longitudinal studies to assess long-term impacts and explore the roles of other foreign languages in achieving sustainability goals.

Keywords: *Sri Lankan Education System, Sustainable Development, Japanese Language Education*

A Study of Communication Styles and Effectiveness of Counseling Services for Sri Lankan School Students: Specific to Selected Schools in the North Central Province

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Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka

Children are the driving force behind a nation's future, yet they face numerous challenges today. School counselling has been introduced as a critical component of the educational system to address these issues. One of the main factors affecting the success of counselling is the effectiveness of the communication used. The increasing mental health challenges faced by adolescents necessitate a comprehensive understanding of how communication impacts counselling outcomes. Accordingly, this study investigates the communication styles and effectiveness of counselling services provided to school students in selected schools within the North Central Province of Sri Lanka. A mixed-methods approach was employed, combining quantitative surveys and qualitative interviews. A sample of 300 students from five schools was surveyed to assess their perceptions of counselling services, while in-depth interviews with 15 counsellors provided insights into their communication strategies. Data were analysed using statistical software for quantitative data and thematic analysis for qualitative data. Findings indicate that effective communication styles, characterized by empathy, active listening, and clarity, significantly enhance the perceived effectiveness of counselling services. Students reported higher satisfaction levels when counsellors employed these styles. Conversely, authoritarian communication approaches were linked to lower satisfaction and engagement rates among students. The results underscore the importance of tailored communication strategies in counselling practices. Counsellors who adapt their communication styles to meet the diverse needs of students can foster a more supportive environment conducive to mental health discussions. The study highlights the necessity for training programs that equip counsellors with skills in effective communication. This research contributes valuable insights into the dynamics of counsellor-student interactions within Sri Lankan schools. It emphasizes the need for on-going professional development focused on enhancing communication skills among counsellors to improve service delivery and student outcomes.

Keywords: *Children, School Counseling, Communication Styles*

UNIVERSITY OF COLOMBO INSTITUTE FOR AGRO-TECHNOLOGY AND RURAL SCIENCES

Sustainable Development through Innovative and Resilient Agriculture

28th of June 2024

MESSAGE FROM THE DIRECTOR

Professor D.M.C. Champathi Gunathilake

Director
University of Colombo Institute for Agro-Technology
and Rural Sciences
Weligatta, Hambantota, Sri Lanka

As the Director of the University of Colombo Institute for Agro-Technology and Rural Sciences (UCIARS), I am delighted and honored to address the Virtual Fifth National Symposium on Agro-Technology and Rural Sciences 2024 (NSATRS 2024). This year's theme, "Sustainable development through innovative and resilient agriculture," is both timely and crucial.

Recent research indicates a concerning stagnation in agricultural production growth. Major grain crop yields are increasing by merely about 1 percent annually, which is insufficient compared to the global population growth rate. With the rising global population requiring more land for settlement, expanding the cultivated area to meet food demands is not feasible. Additionally, factors like climate change are contributing to reduced agricultural output. Therefore, enhancing agricultural productivity is essential to boost food production. This symposium aims to facilitate the exchange of expertise, experiences, and research findings, providing a forum for young researchers to discuss challenges and future directions in various agricultural research fields to improve Sri Lanka's agricultural productivity.

Furthermore, NSATRS 2024 offers a valuable platform for young academics, researchers, and students to share new discoveries, innovative ideas, and showcase their talents. UCIARS plays a pivotal role in knowledge dissemination, technology generation, product development, patenting, and fostering agro-entrepreneurs, all of which directly contribute to the advancement of Sri Lanka's agricultural sector. I extend my heartfelt appreciation and congratulations to the organizing committee, keynote speakers, paper presenters, and participants of this symposium. I wish everyone great success.

MESSAGE FROM THE SYMPOSIUM COORDINATOR

Ms. Nelka Sriwarnasinghe

Department of Agro-Technology
Institute for Agro-Technology and Rural Sciences
University of Colombo ,Weligatta, Hambantota

It is with great honor and pride to forward this message as the Coordinator of the 5th National Symposium of Agro-Technology and Rural Sciences (NSATRS 2024) conducted by the University of Colombo Institute for Agro-Technology and Rural Sciences.

NSATRS 2024 provides a distinguished platform for researchers, scientists, academics, and students to exchange ideas and present recent research findings under the theme "Sustainable Development through Innovative and Resilient Agriculture." The symposium encompasses five thematic areas: Technical advancement for sustainable agriculture, Crop production and protection technologies, Food, nutrient and post-harvest technologies, Sustainable livestock farming and aquatic production, and Entrepreneurship and rural development. As a virtual symposium, this event brings eminent scientists from a wide array of agricultural research disciplines to a common platform, marking a significant initiative by a leading university institution in providing a stepping stone for achieving career goals and advancing both Sri Lankan and global agriculture.

I wish to express my sincere gratitude to the keynote speakers, guests of honor, and chief guests for their inspiring involvement and valuable support in making the event a great success. I wish to convey my sincere gratitude to our reviewers, session chairs, panel members and editorial board who have generously contributed their time and insights. Their critical evaluations and constructive feedback have been invaluable in shaping this symposium and maintaining the integrity and quality of our proceedings.

ORGANIZING COMMITTEE

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Secretary of the Symposium

Mr. A.J.M.C.M. Siriwardana – Department of Agro-Technology

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SYMPOSIUM PROGRAMME

Time	Programme
08.00 am – 08.05 am	**Lighting of the Oil Lamp**
08.05 am – 08.10 am	**Welcome Address** Ms. Nelka Sriwarnasinghe Symposium Coordinator
08.10 am – 08.15 am	**Inauguration Address** Prof. D.M.C.C. Gunathilake Symposium Chairman and the Director, UCIARS
08.15 am – 08.25 am	**Address by the Chief Guest** Senior Professor (Chair) H. D. Karunaratne Vice-Chancellor, University of Colombo
08.25 am – 08.55 am	**Keynote Address I** Prof. Ranjith Senarathne Chairman, National Science Foundation, Sri Lanka Professor Emeritus, Department of Crop Science Faculty of Agriculture University of Ruhuna
08.55 am – 09.00 am	**The Journey of UCIARS – A Short Video**
09.00 am – 09.30 am	**Keynote Address II** Dr. Wijitha Senadeera Senior Lecturer, School of Engineering University of Southern Queensland, Australia
09.30 am – 09.45 am	**Address by the Guest of Honour** Shri Harvinder Singh Consul General of India, Hambantota, Sri Lanka
09.45 am – 09.50 am	**Vote of Thanks** Mr. A.J.M.C.M. Siriwardana / Symposium Secretary
10.30 am – 04.00 pm	**Technical Sessions**

INTRODUCTION TO THE KEYNOTE SPEAKER I

Professor Ranjith Senarathne

Chairman, National Science Foundation, Sri Lanka
Professor Emeritus, Department of Crop Science
Faculty of Agriculture, University of Ruhuna, Sri Lanka

Prof. Ranjith Senaratne, former Senior Professor of Crop Science, Faculty of Agriculture, University of Ruhuna, possesses over 40 years of experience in higher education, including teaching, research, administration, and community development. He has held several senior administrative positions with distinction for a period of over 20 years, as the Dean, Faculty of Agriculture, Vice-Chancellor, University of Ruhuna, Chairman of the Committee of Vice-Chancellors and Directors, Chairman of the Ocean University, Vice Chairman, University Grants Commission and General President of the Sri Lanka Association for the Advancement of Science - 2023. Presently, he serves as the Chairman of the National Science Foundation. As the Vice Chancellor, University of Ruhuna, he was strongly committed to promoting academic excellence, high impact research, creative enterprise, strategic partnership with industry, community development, and international cooperation. In recognition of his outstanding contribution in education, science, community development and international cooperation, the University of Durham, UK conferred an honorary Doctorate (honoris causa) on him in 2007. Prof. Senaratne has been the recipient of several internationally competitive and prestigious research grants, from the Board on Science and Technology for International Development (BOSTID) of the National Research Council of the USA and has held several coveted fellowships, including the Andre Mayer Fellowship of the FAO and the Marie Curie Fellowship of the European Community. He is a Fellow of the National Academy of Sciences and has over 100 research communications and papers to his credit. In addition, he has written and edited over 10 books related to agriculture, higher education, science and technology and national development. Prof. Senaratne has provided strategic, inspirational and operational leadership to higher educational institutions, and he is a visionary leader and an institution builder.

ABSTRACT OF THE KEYNOTE ADDRESS I

Sustainable Agriculture through Innovation and Resilience

Professor Ranjith Senarathne

National Science Foundation, Sri Lanka

Seventy-five years post-independence, Sri Lanka's agriculture sector faces a paradox. Despite abundant natural resources, including a favorable climate, rich soils, and a sophisticated hydraulic civilization, the nation still imports significant quantities of food, costing $1.5 to $2 billion annually. Meanwhile, countries like the Netherlands and Israel, with less favorable conditions, have excelled in agriculture. The Netherlands, with only 60% of Sri Lanka's land area and a colder climate, is the world's second-largest exporter of agricultural produce, generating over $100 billion annually. Israel, with less than 600mm of annual rainfall, achieves the highest global milk yields; 30 liters per cow per day, compared to just 4 liters in Sri Lanka's Dry Zone. Sri Lanka's agriculture, which occupies 40% of the land area and consumes 80% of its freshwater resources, employs 25% of the national workforce but contributes only 7% to the GDP. The sector is dominated by smallholders, with over 80% of production in the hands of low-productivity farmers. The situation is exacerbated by fragmented land holdings, low resource use efficiency, and high levels of risk, and uncertainty. There is an urgent need for transformative change in Sri Lanka's agriculture, highlighting the inefficiencies, excess labor, and stagnant yields that hold the sector back. In an era of rapid technological advancement and increasing global competition, innovation, smart agriculture, and resilience is important in addressing these challenges. By leveraging AI precision agriculture, and controlled environment agriculture, Sri Lanka can optimize its resource use, improve productivity, and build a more sustainable and resilient agricultural system. Additionally, the unique role of the University of Colombo Institute for Agro-Technology and Rural Sciences is highlighted as a model for producing graduates who are not only technically proficient but also deeply connected to the realities of agriculture, thus driving innovation and entrepreneurship in the sector. This keynote offers a vision for the future of Sri Lankan agriculture, one that embraces innovation and resilience to secure food security, economic growth, and environmental sustainability.

INTRODUCTION TO THE KEYNOTE SPEAKER II

Dr. Wijitha Senadeera

Senior Lecturer
School of Engineering
University of Southern Queensland, Australia

Dr. Wijitha Senadeera is a highly accomplished professional with extensive experience in the fields of Mechanical and Food Engineering. His career is characterized by a rich blend of industrial exposure, innovative research in cutting-edge technologies, and dedicated university teaching. Throughout his career, Dr. Senadeera has demonstrated a remarkable ability to bridge the gap between theory and practice, applying his expertise to solve real-world engineering challenges. In the realm of research and development, Dr. Senadeera has been involved in a wide array of successful projects that span across diverse areas. However, his most notable contributions lie in the field of Food Engineering, where his work on mathematical modeling has had a significant impact. His research in this area has provided critical insights into process optimization, product development, and the enhancement of food quality and safety. Dr. Senadeera's academic journey began at the University of Moratuwa in Sri Lanka, where he earned his Bachelor of Engineering in Mechanical Engineering. He later pursued advanced studies at the University of Queensland in Australia, where he completed his PhD. His academic pursuits have been complemented by a distinguished international career, during which he has held various academic positions across Asia and Europe. This global exposure has enriched his perspective and has enabled him to contribute to the advancement of engineering education and research on multiple continents. Currently, Dr. Senadeera is a Senior Lecturer in Engineering at the University of Southern Queensland, Australia. In this role, he continues to inspire the next generation of engineers while advancing his research in food engineering and mechanical systems. His work not only enhances our understanding of complex engineering processes but also contributes to the development of sustainable and innovative solutions in the industry. Dr. Senadeera's extensive experience, combined with his passion for research and education, makes him an asset to the engineering community.

ABSTRACT OF THE KEYNOTE ADDRESS II

Introduction to the Field of Food Engineering

Dr. Wijitha Senadeera

School of Engineering, University of Southern Queensland, Australia

Food Engineering is a dynamic and interdisciplinary field that plays a pivotal role in achieving sustainable development goals, particularly those related to zero hunger, responsible consumption, and industry innovation. Optimizing cellular-scale morphological changes is essential for improving food quality, shelf life, and safety. However, understanding the underlying transport phenomena and managing the intricate dynamics involved presents a significant challenge. The presentation explores state-of-the-art numerical models designed to simulate food drying processes, ranging from macro-scale models to more intricate single, two, and three-phase transport models, as well as multiscale approaches. Particular attention has been given to previous numerical modeling attempts focused on plant cellular structure, which have traditionally relied on FEM/FDM-based methods. While these methods have strengths, such as their suitability for studying solid content, they also present limitations in addressing multiphase phenomena, large deformations, and the incorporation of complex physics. Further discussion will focus on food dehydration and its impact on cellular structure, introducing a basic 3D single-cell model and an improved 3D SPH-CG plant cell model. The improved model's sensitivity analysis on water content and cell boundaries, detected through a microstructural approach, highlights the advancement in accurately predicting cellular drying behavior. Additionally, the speech covers the design of a mechanical system for the classification of poultry by weight, showcasing the generation of innovative design ideas. The keynote is concluded by presenting some of our recent publications that contribute to these advanced modeling efforts, demonstrating the significant progress being made in the field of food engineering.

UNIVERSITY OF COLOMBO INSTITUTE FOR AGRO-TECHNOLOGY AND RURAL SCIENCES
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TRACK 1: CROP PRODUCTION AND PROTECTION TECHNOLOGIES

Enhancing Germination and Early Growth of *Passiflora foetida* through Seed Treatment and Media Optimization

B.M.K.A.P. Bamunusinghe[1], L.M. Rifnas[1], R. Vassanthini[2], N. Narmhikaa[2], A.J.M.C.M. Siriwardana[1]

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Passiflora foetida is an underutilized medicinal plant species in Sri Lanka rich in important phytochemicals. Their limited propagation techniques, the importance and use of underutilized crop species have significantly decreased and led to a critical genetic loss of their gene pools, making this crop "lost" or "neglected". Therefore, to establish a rapid propagation technique and identify the most effective germination-inducing agent and medium for seed propagation of *Passiflora foetida*, an experiment was carried out in a two-factor factorial manner at the University of Colombo Institute for Agro-Technology and Rural Sciences, Hambantota, Sri Lanka. Different types of seed treatments: Gibberellic Acid, hot water, and no any treatment (control) were tested in different potting media of sand, topsoil, sand, and topsoil at the ratio of 1:1. There were nine treatment combinations and four replications each containing 10 seeds and those were arranged in a Factorial Complete Randomized Design. Germination percentage, days taken for germination, survival percentage, and number of leaves were recorded and statistical analysis was done using SAS 9.1.3 software. A significant interaction ($p< 0.05$) of seed germinating agents and media types was observed in the survival of *P. foetida* seeds. However, there is no significant interaction ($p > 0.05$) between the tested factors in germination percentage, days taken for germination, and number of leaves. The results revealed a significant effect of germination-inducing agents and media types on germination percentage, while Gibberellic acid showing the highest percentage of 79% at 8th day. Days required for 50% germination showed a notable reduction with Gibberellic acid treatment (8 days) compared to the control (10 days), highlighting its efficiency in accelerating germination. The number of leaves during the second week varied significantly, with Gibberellic acid treatment leading to a higher leaf count of four, and topsoil and sand + topsoil media promoting superior leaf development. Survival percentage affected by a significant interaction between seed germinating agents and media types, with hot water treatment combined with topsoil media resulting in the highest survival rate of 92%. This study shows that seeds treated with gibberellic acid and hot water along with the top soil media seem to be suitable for enhancing the *Passiflora foetida* L. seed germination and survival.

Keywords: *Germination, Gibberellic acid, Hot water, Sand, Topsoil*

Effective Weed Control Method for *Cyperus rotundus* (Kalanduru) in Irrigated Land of Low Country Dry Zone, Sri Lanka

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Cyperus rotundus, commonly known as *Kalanduru* is a troublesome and economically damaging weed, widely naturalized in the tropical and subtropical regions of the world. An experiment was conducted to identify an effective weed control method for *C. rotundus* in the irrigated farmland in UCIARS, Weligatta, Hambantota, Sri Lanka. A Split Plot Design with three replicates was used for the field experiment with three main plot factor levels (primary tillage – disc plough, primary with secondary tillage - disc plough + rotavator and zero tillage) and five subplot factor levels (chemical weedicide – Glyphosate 36% SL), organic mulch - paddy straw, inorganic mulch - black polythene, herbaceous cover crop - *Cleome viscosa* L. and no weed control). Fifteen treatment combinations were used. The weed parameters such as weed density and biomass of *C. rotundus* were measured monthly in three randomly selected places using a 20 cm × 20 cm quadrant. Analysis of variance (ANOVA) was performed for all the data at the 5% probability level using SAS software and DMRT was used for mean separation. Results showed a significant interaction between different tillage and management methods on weed density of *C. rotundus* after the 1st and 2nd months. Also, significantly higher values of weed density were observed in the treatments where received primary and secondary tillage with Wal aba cover crop (633.3 plants/ m^2 in 1st and 2nd month), primary and secondary tillage with no weed control (600 plants/ m^2 in 1st month and 591.6 plants/m^2 in 2nd month), zero tillage with Wal aba cover crop (566.67 plants/m^2 in 1st month and 533.3 plants/m^2 in 2nd month), and Zero tillage with no weed control (583.33 plants/m^2 in 1st month and 666.67 plants/m^2 in 2nd month). Moreover, all other treatments showed significantly lower weed density after the 1st month. According to the results, primary tillage with glyphosate, primary tillage with paddy straw, and primary tillage with black polythene were recorded as highly effective for control of *C. rotundus* than other treatments. The lowest performance was recorded in primary and secondary tillage with Wal aba cover crop. The primary tillage with paddy straw (organic mulch) recorded the highest performance in controlling *C. rotundus*. Hence, it can be concluded that the tillage with mulching had a significant impact on management of *C. rotundus*. Furthermore, primary tillage is highly effective in suppressing *C. rotundus*.

Keywords: *Cleome viscosa, Cyperus rotundus, Glyphosate, Herbaceous Cover Crop, Paddy Straw*

Influences on Yield Performances of Chili (*Capsicum annuum*) through Intercropping with Few Grain Legumes

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Adoption of intercropping may increase crop production despite of declining trend of agricultural lands in Sri Lanka. Thus, a field experiment on influences of yield performances of chili through intercropping with few grain legumes was executed at Agriculture Research Station, Thirunelvely, Sri Lanka during August to November 2023 to find out an appropriate intercrop combination for higher productivity. The experiment was consisted of chili variety MICH HY 1 with five treatments viz., sole chili, chili + black gram, chili+ green gram, chili + cowpea and chili + DOA recommended chemical fertilizer and the experiment was laid out in Randomized Complete Block Design (RCBD) arrangement. Growth parameters, such as plant height, canopy width, Number of pods, and Leaf area index were recorded at two weeks intervals. Crop yield was measured at each harvest and cumulative yield was used for statistical analysis. Data were analyzed by SAS 9.1.3 software. Result revealed that canopy width and number of branches were significantly increased by intercropping with legumes. Intercropping with legumes was significantly influenced to double the yield of chili with comparison to the control. Considering the findings, there was a positively prompted growth and yield of chili by intercropping with few grain legumes.

Keywords: *Chili, Intercropping, Legumes, Yield*

Assessing Potential of Sugarcane Bagasse Biochar for Increasing Water Holding Capacity of Sugarcane (*Saccharum* Hybrid Spp.) Growing Soils in Sri Lanka

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In the context of sustainable agriculture, it is more important than ever to look for novel ways to improve water management and soil production. This research investigates the efficacy of biochar as a soil amendment to enhance water holding capacity (WHC) in sugarcane cultivation, focusing on three distinct soil types prevalent in Sri Lanka, (Reddish brown earth, Alluvial, and Non-calcic brown soils). The study explores the potential of sugarcane bagasse biochar, a carbon-rich material derived from biomass pyrolysis, in mitigating water scarcity challenges faced by sugarcane crops in the region. A series of laboratory experiments were conducted to assess the impact of varying biochar application rates from weight basis on soil water retention. The Keen Rackowski box method was employed in experiments, utilizing sugarcane biochar rates of 0%, 0.5%, 1%, 1.5%, 2%, 3%, 4%, and 5%, for each experiment used 100 g of soil and 3 replications. Results reveal a significant enhancement in WHC for each soil type following the application of biochar. The soil samples were saturated in the box, allowed to drain, and then weighed to determine the amount of water retained. Among the tested soils, the reddish-brown earth soil exhibited the maximum improvement in WHC. Specifically, the application of 5% biochar led to a notable reduction in moisture evaporation, directly impacting irrigation intervals. While the current findings are derived from laboratory-level studies, there is a compelling need for field trials to provide recommendations for practical applications at the farmer level. Furthermore, future research should focus on optimizing the mass production of biochar to reduce production costs before introducing this technology to farmers or the sugar industry. This study underscores the potential of sugarcane biochar as a sustainable soil amendment to enhance water retention, thereby contributing to more efficient irrigation practices. The findings lay the groundwork for practical applications in agriculture, but further research and field testing are essential for widespread adoption and successful integration into existing farming practices.

Keywords: *Biochar, Soil Amendment, Sugarcane, Water Holding Capacity*

Development of Nitrogen Fertilizer Recommendation for Hybrid Tomato (*Solanum lycopersicum* L.)

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Solanum lycopersicum L. is a widely cultivated vegetable crop in Sri Lanka. The usage of recommended fertilizer level is important to obtain high yield of hybrid tomatoes. However, a few studies have been conducted on developing a fertilizer recommendation for hybrid tomato varieties in Sri Lanka. The present study aimed on the development of nitrogen fertilizer recommendation for hybrid tomato. The experiment was conducted in the greenhouse at the Horticultural Crop Research and Development Institute, Gannoruwa, Sri Lanka. The two factor (fertilizer levels and tomato varieties) factorial completely randomized design was used for the study. There were 12 treatment combinations with two tomato varieties (Bhatiya, Maheshi) and 6 fertilizer mixtures by changing the urea amount of department fertilizer recommendation (0 Urea (F1), 30kg/ha Urea (F2), 60kg/ha Urea (F3), 90kg/ha Urea (F4), 120kg/ha Urea (F5),150kg/ha Urea (F6). Growth and yield parameters were tested after the application of treatments. The significantly highest number of fruits and shoot weights was recorded from F4 (90kg/ha Urea + DOA recommended TSP and MOP fertilizer). Compared to F1 and F2, the yield was significantly higher in F4. Further, the significantly highest root weight was recorded from Maheshi variety while significantly highest shoot weight was recorded from Bhathiya variety. It can be concluded that, the 90kg/ha Urea + DOA recommended TSP and MOP fertilizer (F4) could be verified for development of nitrogen fertilizer recommendation for hybrid tomato. Further studies are needed to confirm the findings and give a finalized fertilizer recommendation.

Keywords: *Hybrid Tomato, Nitrogen Fertilizer, Solanum lycopersicum L.*

Effect of Gamma Irradiation on Seed Germination of *Catharanthus roseus* (Madagascar Periwinkle)

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Physical mutagenesis is an effective mutational breeding method for improving various morphological characteristics of ornamental plants. The experiment was undertaken to investigate the effect of various dosages of gamma irradiation on seed germination of *Catharanthus roseus* (Madagascar periwinkle). The experiment was conducted at UCIARS, Weligatta to find out the appropriate gamma dosages for selecting planting materials for*C. roseus* with the purpose of crop improvement under gamma irradiation. Healthy matured dry seeds were exposed to ^{60}CO Gamma irradiation source at Horticultural Crops Research and Development Institute (HORDI), Gannoruwa, Sri Lanka. Treatments included six different gamma dosages such as (T0 - control) 0 Gy, (T1) 100 Gy, (T2) 200 Gy, (T3) 300 Gy, (T4) 400 Gy, and (T5) 500 Gy. A Completely Randomized Design with four replicates and twelve samples per replicate was employed under shade house conditions. Data on germination were collected daily until constant germination was observed for up to 10 days, while other management practices were maintained. Data were analyzed using Minitab 17 statistical software with one-way ANOVA. The results revealed that the higher dosages of ^{60}CO Gamma irradiation significantly decreased the germination ability of *C. roseus* seeds (p<0.05). Specifically, 400 Gy and 500 Gy treatments resulted in significant reductions in germination, whereas lower dosages less than 400 Gy did not exhibit such effects. Seed germination started on day 3 after planting for all treatments except for T5 (500 Gy). Indicating a delayed germination initiation, seeds subjected to the T5 treatment began germination on day 5 after planting and exhibited a significantly lower overall germination percentage when compared to other treatments. The highest germination rate (84%) was observed in the control seeds, which were not subjected to gamma irradiation, whereas the lowest germination rate (8%) occurred in seeds treated with 500 Gy of gamma irradiation. High doses of gamma irradiation negatively impact germination by potentially inducing oxidative stress, which leads to cellular damage and reduced germination efficiency. At higher doses, such as 400 Gy and 500 Gy (as in T4 and T5 treatments respectively) radiation can cause significant damage to the DNA and cellular membranes, leading to delayed germination initiation and reduced overall germination percentages. These findings have practical implications for the use of gamma irradiation in plant breeding and seed preservation, emphasizing the need to carefully optimize irradiation doses to avoid adverse effects on seed germination of *C. roseus.*

Keywords: *Catharanthus roseus, Dosage, Gamma Irradiation, Germination, Treatment*

The Effect of Foliar Application of Fish Amino Acid on Growth and Yield of Tomato Cultivar 'Padma'

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This research was conducted to evaluate the effect of fish amino acid (FAA) as an organic alternative fertilizer on growth and yield of tomato variety Padma. FAA was produced by fish waste and over ripen banana. A pot experiment was followed as a randomized complete block design in an open field. The treatments included the control without fertilizer, 100% inorganic fertilizer (IF), 0.5% , 1%, 2.5%, 5%, 10% FAA rates as sole foliar applications. The same FAA application rates were applied with 50% IF recommendation as integrated applications. Application of FAA was carried out at 7th, 14th, 21st, 28th, and 35th days after transplanting. The N, P, K and pH, EC contents in prepared FAA were 1.16%, 2.59% and 2.50% and 4.36, 24µs cm^{-1} respectively. The results revealed that foliar spray of FAA 1% with 50% recommended dose of IF gave the significantly highest (p<0.05) plant height (84.36 cm±1.49), chlorophyll content (820.33±14.30), Leaf Area Index (1.66 cm±0.163), number of flowers/plant (26±1.870), Number of fruits/plant (44±1.414), and total yield/plant (2800 g±2.828) among all the tested treatments. The foliar spray of FAA 1% with 50% recommended dose of IF did not have any significant difference (p<0.05) in soil pH (6.53±0.090a) compared to inorganic fertilizer application (6.18±0.037a). FAA contains various nutrients, and types of amino acids which help to both plants and rhizosphere growth. Therefore, this study concluded that the integrated application of foliar spray of FAA 1% with 50% recommended dose of IF has appreciable effects on the growth and yield of tomato variety Padma.

Keywords: *Foliar Application, Fish Amino Acid, Integrated Application, Organic Fertilizer, Yield*

TRACK 2: SUSTAINABLE LIVESTOCK FARMING AND AQUATIC PRODUCTION

Exploring Strategies for Developing and Expanding Integrated Rice-Fish Farming to Enhance Food Security in Sri Lanka

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Integrated Rice-Fish Farming (IRFF) represents a symbiotic farming system where fish are cultivated in rice fields. This review aimed to assess the relevance and role of IRFF as a strategic approach to ensuring food security in Sri Lanka. To achieve this, available information on Integrated Rice-Fish Farming has been compiled using scientific databases such as Google Scholar, PubMed, Scopus, and Science Direct. The literature indicates that IRFF significantly increases both rice and fish yields compared to their monocultures, with production variations based on geographic regions. In the Sri Lankan context, malnutrition remains a prevalent issue, especially among children under five and adults, with common forms including underweight, stunting, wasting, and micronutrient deficiencies. Thus, the development and expansion of rice-fish farming among rural communities are crucial, as this system increase the intake of protein, carbohydrates, and essential micronutrients, particularly for those in rural areas. However, well-structured strategies are necessary to promote and expand this farming system among Sri Lankan rural paddy farmers. Strong political commitment and support from both governmental and non-governmental organizations are essential for facilitating accessible credit for initial infrastructure, providing training and awareness programs for small-scale farmers, establishing effective market linkages, conducting adaptive research, and ensuring the supply of vital inputs such as quality fingerlings. The success of these strategies hinges on the active involvement of financial institutions and donor organizations, with the goal of empowering farmers and ensuring fair compensation. In conclusion, this review highlights the significance of IRFF in enhancing food security and outlines pathways for its development and expansion in Sri Lanka. Furthermore, rice-fish integration offers one of the best solutions to address malnutrition in rural communities and plays a crucial role in achieving the Sustainable Development Goals: No Poverty (SDG 1), Zero Hunger (SDG 2), and Good Health and Well-being (SDG 3).

Keywords: *Agricultural Sustainability, Development Strategies, Food Security, Rice-Fish Farming, Sri Lanka*

TRACK 3: ENTREPRENEURSHIP AND RURAL DEVELOPMENT

Enhancing Entrepreneurial Education through Blended Learning: Challenges and Strategies for Undergraduate Entrepreneurs in Agricultural Fields

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Blended learning, a dynamic educational paradigm that integrates several instructional modalities such as lectures, discussions, group activities, assignments, and evaluations across both traditional and digital platforms, has enormous potential for educational enrichment. However, its application among undergraduate entrepreneurs provides a distinct set of obstacles that require careful consideration and resolution. As a result, the primary goal of this research is to identify the major challenges that student entrepreneurs experience and provide concrete strategies to effectively overcome these obstacles. The research was conducted at the University of Colombo Institute for Agro-Technology and Rural Sciences in Weligatta, Hambantota, Sri Lanka. Participants included every undergraduate entrepreneur currently enrolled in the institution's blended learning degree programme. Data were collected using a combination of interviews and group discussions guided by a pre-tested questionnaire available in English, Tamil, and Sinhala languages. Data were analysed using the SPSS software version 26. Results revealed that undergraduate entrepreneurs identified challenges with the blended learning framework, including difficulties in facilitating practical experiences, evaluating entrepreneurial competencies, technological and resource constraints, limited networking opportunities, and concerns about increased dropout rates. In response, the undergraduates proposed a variety of solutions, including the addition of more practical modules and specialized technologies, the incorporation of small group activities and project-based assessments, improvements in technology accessibility, the facilitation of networking avenues, and the expansion of student engagement strategies. By improving these aspects, we can increase the effectiveness of the blended learning programme and the quality of blended learning encounters for undergraduate entrepreneurs at the institute, thereby contributing significantly to the ongoing evolution of entrepreneurship education in Sri Lanka. By addressing these difficulties and applying the recommended solutions, stakeholders can improve the efficacy and impact of blended learning efforts, creating an environment suitable to entrepreneurial development and innovation in the agriculture sector.

Keywords: *Blended Learning, Constraints, Educational Enrichment, Entrepreneurship Education, Undergraduate Entrepreneurs*

UNIVERSITY OF COLOMBO
SCHOOL OF COMPUTING

Empowering Digital Transformation through Innovation and Inclusivity

05th – 08th of November 2024

MESSAGE FROM THE DIRECTOR

Dr. Ajantha Atukorale

Director
University of Colombo School of Computing
University of Colombo, Sri Lanka

As the Director of the University of Colombo School of Computing (UCSC), it is my great pleasure to extend a warm welcome to all participants, researchers, and practitioners in the field of Computing at the ICTer International Conference 2024. The ICTer International Conference is a legacy that stems from the renowned International Information Technology Conference (IITC), which has been a pivotal academic conference in the landscape of Computing conferences in Sri Lanka since its inception in 1998. Building upon this rich history, ICTer now emerges as its successor, reaffirming our commitment to fostering innovation, sharing knowledge, and pushing the boundaries of technology.

In a world where the pace of technological advancement is relentless, it is vital that we create a platform for the exchange of ideas, insights, and research findings. ICTer aims to be precisely that platform. It is a unique opportunity for both seasoned researchers and emerging scholars to present their groundbreaking research results, innovative ideas, and practical deployments that are shaping the computing domains.

The ICTer offers a unique opportunity for authors. Full papers are published in a special issue of the ICTer Journal, which is the open-access companion of the ICTer International Conference. This allows authors to share their work with a wider audience and contribute to the body of knowledge that is advancing the technological landscape.

As we gather for the ICTer International Conference, I encourage all participants to take full advantage of this unique opportunity to engage in the presentations, contribute to discussions, network with your peers, and foster new collaborations. In conclusion, I look forward to witnessing the stimulating discussions, the knowledge sharing, and the collaborative spirit that will define the ICTer International Conference. Together, let us shape the future of computing technology and contribute to a world that is smarter, more connected, and better informed.

MESSAGE FROM THE SYMPOSIUM CO-CHAIRS

Dr. Kasun Gunawardana

Department of CIS
University of Colombo School of Computing
University of Colombo, Sri Lanka

Dr. (Mrs.) Lasanthi De Silva

Department of CMT
University of Colombo School of Computing
University of Colombo, Sri Lanka

We are delighted to welcome you to ICTer2024, the prestigious international conference organized and hosted by the University of Colombo School of Computing, with a proud history of 24 years. This conference is the evolution of the International Information Technology Conference (IITC) which commenced in 1998. In 2007, IITC was rebranded as the International Conference on Advances in ICT for Emerging Regions (ICTer). This year, our conference is centered around the theme "Empowering Digital Transformation through Innovation and Inclusivity," demonstrating our dedication to nurturing a digital future that is both groundbreaking and accessible to all.

ICTer2024 is not just an academic conference; it is a dynamic platform where academia and industry converge. In the computing domain, the industry is often at the forefront of innovation and research, and ICTer recognizes this by providing space within the conference venue, Innovation Studio, for industry partners to showcase their latest technologies and innovations. We hope that this blend of participants from both industry and academia will spark new ideas and collaborations that drive innovation in unique and impactful ways.

As you explore the abstracts and engage in discussions throughout the conference, we encourage you to take full advantage of the opportunities to connect with fellow researchers, share insights, and forge new collaborations. We are confident that the knowledge exchanged here will inspire future research and innovation that will shape the next generation of ICT solutions. Thank you for being a part of ICTer2024. We wish you a productive and enriching conference experience.

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SYMPOSIUM PROGRAMME

Day 01 – Wednesday 6th of November 2024

Time	Programme
07.30 am – 08.00 am	**Registration**
08.00 am – 08.30 am	**Inauguration and Introduction of ICTer 2023**
08.30 am – 08.35 am	**Welcome address by the Conference Chair**
08.35 am – 08.40 am	**Address by the UCSC Director**
08.40 am – 08.50 am	**Address by the Vice Chancellor**
08.50 am – 09.00 am	**Address by the Chief Guest**
09.00 am – 10.00 am	**Keynote Address 1**
10.00 am – 10.30 am	**Tea Break**
10.30 am – 10.50 am	**Tech Talk**
10.50 am – 12.10 pm	**Paper Presentations** (**Session 01**)
12.10 pm – 01.10 pm	**Keynote Address 2**
01.10 pm – 02.10 pm	**Lunch Break**
02.10 pm – 03.35 pm	**Paper Presentations** (**Session 02**)
03.35 pm – 04.00 pm	**Tea break**
04.00 pm – 05.00 pm	**Keynote Address 3**
05.00 pm – 06.00 pm	**Reception**

Day 02 – Thursday 7th of November 2024

Time	Programme
07.30 am – 08.00 am	**Registration**
08.00 am – 08.10 am	**Commencement**
08.10 am – 08.50 am	**Paper Presentations** (**Session 03**)
08.50 am – 09.50 am	**Keynote Address 4**
09.50 am – 10.10 am	**Tech talk**
10.10 am – 10.40 am	**Tea Break**
10.40 am – 11.20 am	**Paper Presentations** (**Session 04**)
11.20 am – 12.20 pm	**Keynote Address 5**
12.20 pm – 01.20 pm	**Lunch**
01.20 pm – 02.20 pm	**Paper Presentations** (**Session 05**)

02.20 pm – 03.20 pm	**Keynote Address 6**
03.20 pm – 04.00 pm	**Tea Break**
04.00 pm – 04.45 pm	**Paper Presentations** (**Session 06**)
04.45 pm – 06.00 pm	**Finale and Awards Ceremony**

INTRODUCTION TO THE KEYNOTE SPEAKER I

Professor Chris Bain

Faculty of IT
Monash University, Australia

Prof. Bain began his career in clinical medicine, spending 12 years across various healthcare settings from primary to quaternary care. He gained postgraduate experience in key clinical disciplines, worked in multiple public hospitals, and had broad exposure to primary care. From 1999-2001, he pursued postgraduate training in information technology, later earning a PhD in Information Systems with a focus on healthcare technology ecosystems in 2014.

Throughout his career, Prof. Bain held key positions at institutions like Melbourne Health, the Western and Central Melbourne Integrated Cancer Service, and Ambulance Victoria, where he developed and implemented information strategies supporting cancer reform and data governance. In 2011, he became the inaugural Director of Health Informatics at Alfred Health, and in 2015, the inaugural Chief Health Information Services Manager at Mercy Hospitals Victoria Ltd. Since November 2017, he has served as the inaugural Professor of Digital Health at Monash University, focusing on using technology and data to improve healthcare delivery. His work in digital health, technology usability, and EMR implementation has made him a national thought leader in health informatics. He has driven groundbreaking research, published extensively, holds a patent in hospital modelling, and has received several international awards. Prof. Bain is also a member of recognized professional groups and committees and is frequently invited to speak at global events.

ABSTRACT OF THE KEYNOTE ADDRESS I

What in Digital Health is "Free"?

Professor Chris Bain

Monash University, Australia

It is a particular challenge to deliver equity of access and equity of outcome when it comes to deploying digital health solutions into Low- and Middle-Income Countries (LMIC), with many tools and technologies designed for high income settings and representing a substantial cost. In this talk, Professor Bain will examine these challenges in more detail and provide examples from around the world where "free" or "low cost" technologies and tools have been – or could be – used to provide solutions in LMICs. These examples extend from the standards space to the end user application space.

INTRODUCTION TO THE KEYNOTE SPEAKER II

Lothar K. Becker

LibreOffice, Germany

Lothar is a dedicated advocate for open-source software and has made significant contributions to free office productivity software. He has a master's degree in Computer Science and Economics and completed one of the first master's theses in Data Mining at the German Research Center for Artificial Intelligence. He and his company were among the first service providers in the ecosystem of StarOffice and OpenOffice.org. His extensive experience includes leading migration projects for open-source software and co-developing certification activities related to LibreOffice technology. During the pandemic, he served as the Chairman of the Board of The Document Foundation (TDF), the organization behind LibreOffice. Additionally, Lothar is a Board Member of the Open Source Business Alliance (OSBA) and actively advocates for digital sovereignty in both the private sector and public affairs.

ABSTRACT OF THE KEYNOTE ADDRESS II

Is Open Source with Co-Pilots at Risk? Why LibreOffice Technology Never could be an OpenAI Case

Lothar K. Becker

LibreOffice, Germany

The use of AI-driven co-pilots is now becoming more prevalent in office productivity technology platforms. A notable player in this field is OpenAI with ChatGPT, which is the foundation for many AI pilots today. This has significant implications for the office productivity market, especially in professional applications. There is a growing focus on integrating AI-based functions with user-centric software solutions, including LibreOffice Technology. It is worth examining the potential AI-based extensions for LibreOffice and discussing the associated risks for industry organizations, particularly the potential shift from open-source to closed-source models similar to OpenAI.

INTRODUCTION TO THE KEYNOTE SPEAKER III

Professor Thambipillai Srikanthan

College of Computing and Data Science
Nanyang Technological University
Singapore

Dr. Srikanthan has been a Professor at Nanyang Technological University's College of Computing and Data Science since 2005. He founded and directed the Centre for High-Performance Embedded Systems (CHiPES) from 1998 to 2014 and served as Chair of the School of Computer Science and Engineering from 2010 to 2016. During his tenure, he restructured the undergraduate curricula and oversaw 1800 students, 80 faculty members, and 360 PhD students. Under his leadership, the School was ranked 4th globally in Computer Science by Best Global Universities and 2nd by Microsoft Academic Research in AI and Simulation.

As Executive Director of the Cyber Security Research Centre at NTU (CYSREN) from 2016 to 2024, he secured significant funding for major projects, including S$46.5M for the CREATE program on public transport systems and S$21M for future medical device security. His leadership at CYSREN also led to a partnership with INTERPOL to establish a Centre of Excellence in Dark-net and Cryptocurrencies, securing over S$15M in external funding.

His research focuses on high-productivity embedded systems, computer arithmetic, and vision-enabled systems. He has supervised 48 PhD and MEng students and published 490 papers. His work in roadway navigation led to a spin-off company, which he successfully exited in 2017 after raising S$4.6M. He later co-founded a cybersecurity company, securing S$10.5M in VC funding and serving as its scientific advisor. In 2021, Dr. Srikanthan was awarded the Public Administration Medal (Silver) by the Singapore Government for his outstanding contributions to education and research.

ABSTRACT OF THE KEYNOTE ADDRESS III

Cybersecurity of Infrastructure

Professor Thambipillai Srikanthan

College of Computing and Data Science, Nanyang Technological University, Singapore

The critical infrastructure sectors often rely on electronic systems, including Internet of Things (IoT) and operational technology (OT) devices and systems. This, coupled with increased connectivity at corporate network edges and adoption of cloud services makes securing technology infrastructure both more complex and more important than ever. The IT/OT convergence is also shaping new ways of working as businesses adapt to a shift in their organisational structure, and taking on new challenges with compliance, cybersecurity, and data and technology management. As a result, many organizations have an expanding attack surface vulnerable to threats. Moreover, threats are also getting increasingly complex, and IT security is only as good as the weakest link in the infrastructure. With cybersecurity threats on the rise, the industry is compelled to develop new levels of preparedness, and trends are showing that cybersecurity will once again be the top investment priority moving forward. This talk will discuss the major factors influencing the rapid growth in connected systems and in particular, the significance of IT and OT in convergence as technology evolves. It will introduce several in-house developed edge computing devices/systems for the fast-evolving connected systems infrastructure of Intelligent Transport Systems (ITS) and discuss the newly launched R&D program for engineering a secure connected systems infrastructure for healthcare. Ongoing research efforts and trends in software/hardware security for mitigating cyber threats in complex infrastructure will also be introduced.

INTRODUCTION TO THE KEYNOTE SPEAKER IV

Dr. Mohamed Nabeel

Principal Researcher
Palo Alto Networks
USA

Mohamed Nabeel, PhD, is the principal researcher at Palo Alto Networks where he leads the efforts on graph-based threat intelligence research in the web security team. He is passionate about building AI-powered tools and techniques to help defenders stay one step ahead of Internet miscreants. During his spare time, he teaches AI/Data Science to graduate students. He has authored and presented 20+ US patents and 25+ papers at top security conferences and journals.

ABSTRACT OF THE KEYNOTE ADDRESS IV

Securing AI: Navigating AI Risks to Build a Safe Digital World

Dr. Mohamed Nabeel

Palo Alto Networks, USA

Today, we stand on the precipice of the Fourth Industrial Revolution, a transformative era driven by unprecedented advancements in AI. At the heart of this revolution lies GenAI (e.g. ChatGPT or Gemini), a branch of AI that holds immense potential to reshape every data driven opportunity. However, like any new groundbreaking technology, with great power comes great responsibility. As we harness the capabilities of AI, we must also address the inherent risks it poses and implement robust strategies to mitigate them. Make no mistake, with mitigation techniques in place, robust AI has the potential to create a safer world bringing a new era of prosperity.

INTRODUCTION TO THE KEYNOTE SPEAKER V

Ludvig Kolmodin

Chief Technology Officer
Cambio Group, Sweden

Ludvig Kolmodin is an experienced technology executive with a proven track record of over 25 years in leading technology organizations. Currently he is serving as the Chief Technology Officer at Cambio Group, driving innovation and strategic technology initiatives. He previously held the CTO role at Trustly, where he defined a new target architecture to enhance scalability and time to market. With extensive experience, Ludvig has consistently demonstrated success in achieving industry certifications and restructuring development and operational processes. Ludvig's leadership spans across various roles, including multiple CTO assignments, Senior Vice President of Engineering, CIO, and Head of IT Operations.

ABSTRACT OF THE KEYNOTE ADDRESS V

AI in Health Care

Ludvig Kolmodin

Cambio Group, Sweden

The fourth industrial revolution has made a huge difference in healthcare and in this talk, Ludvig Kolmodin, CTO of Cambio Group, will set the scene with a short background, introducing you to what is happening right now, and provide you with a glimpse of what could be waiting in the future. The focus will be on technologies, such as IoT and AI – assets to enable more sustainable, reliable, and intelligent healthcare.

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING
List of Abstracts

Debiasing Hate Speech Classification Models for Queer Language through Keyword Analysis

Dilhara Yahathugoda, Rupika Wijesinghe, Ruvan Weerasinghe

University of Colombo School of Computing, Sri Lanka

Detecting hate speech is critical for moderating harmful content on social media and the Internet. However, existing models often struggle to accurately identify hate speech targeting queer communities due to inherent biases in training data and language usage. This paper explores debiasing techniques for hate speech classification models, with a focus on queer language via keyword analysis. By analysing established hate speech datasets and queer-specific linguistic traits, this study aims to identify words and phrases that models pay attention to the most and apply different debiasing approaches such as reweighting and adversarial debiasing to enhance the efficacy and equity of hate speech aimed at queer communities, without unfairly silencing queer voices. We found that these methods improved the accuracy of queer-specific datasets but showed a decrease in performance on more general datasets. These findings suggest that we must develop more community-specific models to safeguard them from harmful content. This research contributes to advancing the understanding of bias in hate speech detection models and provides practical guidance for devising more inclusive and fair classification systems for online content moderation.

Keywords: *Hate Speech Detection, Algorithmic Bias, LGBT, Queer*

Detecting Cryptographic Hash Functions through Electromagnetic Side-Channel Analysis

Gayan Akmeemana[1], Dharshana Kasthurirathna[2], Asanka P. Sayakkara[3]

[1]*E Gravity Solutions (Pvt.) Ltd., Sri Lanka*
[2]*Sri Lanka Institute of Information Technology, Sri Lanka*
[3]*University of Colombo School of Computing, Sri Lanka*

In the era of Industry 4.0, the Internet of Things (IoT) has emerged as a transformative force, with the proliferation of IoT devices permeating various aspects of our daily lives. However, this rapid adoption of IoT technology has also given rise to an alarming increase in cyberattacks targeting these devices. Among many avenues of cybersecurity, Electromagnetic Side Channel Analysis (EM-SCA) stands as a crucial branch of information security that enables attackers to eavesdrop on and exfiltrate sensitive information, making it a critical concern for IoT security. Among various security measures taken on IoT platforms, data integrity is ensured through cryptographic hash functions. This work explores the potential of utilising EM-SCA to detect the presence of cryptographic hash functions on IoT devices, which would play an important role at the surveillance stage of an attack. In pursuit of this objective, this study employs a set of supervised Machine Learning (ML) algorithms that are intricately crafted to automatically identify distinct patterns of EM radiation emissions associated with different hash algorithms. The results of this investigation demonstrate that the proposed methods can achieve classification accuracy rates exceeding 80%. The findings of this work highlights that an attacker can inspect an IoT device in a non-invasive manner to identify its critical data integrity mechanisms before a suitable subsequent action is taken to compromise it.

Keywords: *Electromagnetic Side-Channel Analysis, Cryptography, Hash Functions, Internet of Things*

Music Genre Classification with Multi-Modal Properties of Lyrics and Spectrograms

Janitha Senadeera, A.R. Weerasinghe

[1]*Informatics Institute of Technology, Sri Lanka*
[2]*University of Colombo School of Computing, Sri Lanka*

Music Genre classification is widely used in online music streaming platforms. Deep learning has enabled extracting musical information more effectively, and there have been various research works done to improve their accuracy with power spectrogram images and lyrical features. This paper evaluated the optimum usage of multiple modalities such as lyrics and spectrogram images based on the richness of their features. Furthermore, it proposes a hybrid-fusion-based deep learning multi-modal, multi-class classifier that employs Mel Spectrograms, Mel-Frequency Cepstral Coefficients, and Lyrics to classify musical genres more accurately. Finally, the proposed model benchmarked with 3 previous studies, with a prepossessed dataset from the Music4All dataset with country, jazz, metal, and pop genre classes and obtained the highest F1-Score of 0.72 for the proposed model.

Keywords: *Music Genre Classification, Music Information Retrieval, Lyrical Information, Audio Information, Hybrid Fusion*

Unsupervised Discovery of Salient Design Features of Websites

T. T. Kaluarachchi, D.M.S. Dissanayake, M.I.E. Wickramasinghe

University of Colombo School of Computing, Sri Lanka

Web development is one of the fastest-growing fields in the IT industry. User Interface (UI) design of a website is critical in attracting new users, which helps businesses increase sales and revenue. A unique website design will encourage user interaction among website visitors and ensure that the time and resources spent on a webpage are worthwhile. Web designers create websites using pre-existing templates or from scratch. The web designer's design skills heavily influence on the overall appearance of a website. However, such websites do not always meet the client's expectations. As a result of these challenges and the ever-changing web development trends, the automatic website generation concept has emerged, which generates websites without relying on human interaction. In this concept, it is useful to understand how to classify websites based on their appearance and how to identify design features that distinguish websites. This study aims to develop a classification system for websites on the Internet, based on their salient design features.

Keywords: *Web Designing, Automatic Website Generation, Templates, Clustering, Self-Organizing-Map*

Utilizing Association Rules in Knowledge Graphs for Enhanced News Summarization

M.V.P.T. Lakshika, H.A. Caldera

University of Colombo School of Computing, Sri Lanka

The rapid progress in web news articles has led to an abundance of text content, often than needed, and consequently, misleading readers. Recent Knowledge Graph (KG) based approaches have proven successful in abstract summary generation due to their ability to represent structured and interconnected knowledge with semantic context. The KG ranking algorithm responsible for selecting graph data for inclusion in the abstract still relies on the traditional ranking algorithms which lack the consideration for semantic relationships between graph nodes, heightened memory consumption, processing times, and increased complexity. Knowledge discovery plays a crucial role in improving the quality of summarization by uncovering hidden patterns and enhancing contextual understanding. Therefore, our study centers on introducing a novel KG ranking algorithm, aiming to achieve a statistically significant enhancement in abstract generation by combining knowledge discovery techniques. The suggested ranking algorithm considers the semantic and topological graph properties and interesting relationships, patterns, and features in text data using Association Rule Mining techniques to identify the most significant graph information for generating abstracts. The experiments conducted using the DUC-2002 dataset indicate that the suggested KG ranking algorithm is effective in producing detailed and accurate abstracts for a collection of web news articles.

Keywords: *Knowledge Graph, Association Rules, Abstract Generation, Ranking Algorithm*

Cash Valuation of Black Tea in the Nuwara Eliya District based on Sensory Quality Attributes: A Case Study

W.A.R.H. Rodrigo[1], C.H. Magalle[1], W.M.N.D. Basnayake[2]

[1]*Department of Statistics, Faculty of Science, University of Colombo, Sri Lanka*
[2]*La Trobe University, Melbourne, Australia*

The cash valuation of tea, estimated price of tea, decided prior to the auctions, is influenced by sensory assessments from tea brokers and tasters up to a certain degree, although market conditions and customer preferences decide the auction price. This study aims to predict the cash valuation of black tea using sensory quality measures and to identify the key factors that impact these valuations overall and grade specific. This information is crucial for stakeholders to maintain the quality standards of Sri Lankan Tea, supporting the export economy. While past research mainly focused on auction price prediction, few studies have modeled estimated prices using sensory quality parameters. However, using categorical sensory measures is significant in the current study as it was not previously implemented by past researchers. The study analyzed 1,119 tea samples with 13 attributes, finding that tea grade and ordinal sensory attributes are important for cash valuation. Due to the attributes being ordinal, numerical encoding was used to predict prices for the entire dataset and for each grade, using statistical and machine learning regression methods. With advanced analysis showing gradient boosting regression as the best predictive model for overall cash valuation of tea, the model achieved a minimum RMSE of 79.75. The study identified that tea grade, average weight of a tea sample and dry leaf color are essential in cash valuation, with DUST1 and BOPF being the most expensive grades. Cash valuations for these tea grades were observed to be higher when the dry tea leaves were in shades of black.

Keywords: *Tea, Sensory Quality Measures, Estimated Price, Machine Learning*

Density Based Query by Committee: Robust Active Learning Approach for Data Streams

S.M.A. Prabashwara, O. Seneweera, H.A.S.G. Dharmarathne

Department of Statistics, Faculty of Science, University of Colombo, Sri Lanka

Acquiring precise labels for continuously flowing data stream is a resource-intensive and costly. Active learning offers a potential strategy for training precise models while minimizing label requirements with minimal annotation effort. However, adapting active learning to streaming data becomes intricate due to the ever-changing data distributions, known as concept drift. Existing approaches for active learning in data streams predominantly rely on uncertainty sampling and Query by Committee (QBC) due to their simplicity and ease of implementation. This paper introduces a novel and a robust active learning approach tailored for data streams merging key elements from QBC and density-weighted sampling to effectively address the challenges posed by concept drift. Through a comprehensive analysis using benchmark datasets widely used in the literature related to data streams, we demonstrate the superior performance of our proposed method across various data stream scenarios. This includes instances with no concept drift, instances with the presence of concept drift, as well as scenarios involving severe concept drift. In addition, the results reveal that strategies based on uncertainty sampling and its variants exhibit limitations in the presence of concept drift, whereas QBC and its variants prove to be inadequate when faced with significant concept drift. In contrast, our approach, which combines the strengths of QBC and density-weighted sampling using Gower's distance as a similarity measure, exhibits remarkable adaptability to evolving data distributions.

Keywords: *Density-Based Sampling, Query by Committee, Active Learning, Evolving Data*

Algorithmic Approach to Predict Electric Taste Stimuli to Simulate Organic Sour Taste Sensations Using EEG Data

A. Perera[1], K. Karunanayaka[1], M. Wickramasinghe[1], A. Jafeer[1], C. Trenado[2], A.D. Cheok[3]

[1]*University of Colombo School of Computing, Sri Lanka*
[2]*Systems Neuroscience and Neurotechnology Unit, Saarland University, Germany*
[3]*Nanjing University of Information Science and Technology, China*

Taste perception involves complex interactions between the tongue and the brain. Simulating the tongue with electric signals rather than utilizing chemical compounds is known as electric taste. Previous studies suggest that electric signals induce mostly sour taste sensations. Although electric taste has been characterized based on participants' subjective perspectives, the neural activation associated with it remains underexplored. Therefore, this study aims to investigate the potential of simulating organic sour taste perception using electric signals by analyzing EEG data collected during experiments and utilizing machine learning models. The experiments involve approximately 30 healthy adult participants with no known taste or neurological disorders. Baseline EEG activity is recorded without any taste stimulation as the control trial. During the organic taste trials, participants receive organic sour taste solutions while their EEG responses are recorded, followed by the collection of subjective feedback. In the electric taste trials, varying electric stimuli are applied, with EEG responses and subjective feedback being collected. The data is preprocessed to remove noise and artifacts. Statistical and machine learning models are then used to analyze the EEG data and subjective taste perceptions to identify key features related to organic sour taste. These key features, along with EEG data from both experiments, are used to train a machine learning model to capture the relationship between neural firings and electric signal parameters, enabling the prediction of the electric signal when sour taste neural firings are provided. This study has the potential to enable sour taste digitization, enhancing VR, AR, and human-computer interaction by simulating taste sensations with electrical signals. The findings will deepen our understanding of the neural mechanisms underlying taste perception, benefiting computational neuroscience and neural engineering. Additionally, this research could pave the way for medical applications, helping individuals with dietary restrictions, taste disorders, or diminished taste sensations due to chemotherapy, in enjoying healthy meals.

Keywords: *Virtual Taste, Digital Taste, Taste Characterization, Electrical Stimulation of Taste*

Decoding Dyslexia: NLP Based Linguistic Analysis for Dyslexia Friendly Content Creation in Sinhala

G. Rupasinghe, K. Karunanayaka, R. Pushpananda

Mixed Reality Lab, University of Colombo School of Computing, Sri Lanka

Dyslexia is a neurodevelopmental disorder that primarily affects the skills involved in accurate and fluent word reading and spelling. Dyslexia-friendly content refers to written material specifically designed for dyslexic individuals in a way that is more accessible and understandable, helping them overcome the difficulties in navigating written communication. While there are many dyslexia-friendly content creation approaches for foreign languages like English, resources for Sinhala languages remain scarce. Linguistic patterns, such as phonetic rules, spelling patterns, and grammar structures, play a significant role in how dyslexic individuals process written language. When it comes to Sinhala language, there is a lack of research done to understand these linguistic patterns and based on the few studies already conducted, it is evident that being an alpha syllabic language, Sinhala language has language specific language characteristics that are different from English language. Hence, understanding them is crucial for creating content that caters specifically to the needs of Sinhala speaking dyslexic individuals. This research examined and analyzed the unique linguistic patterns associated with dyslexia in Sinhala language using NLP based algorithms and leverage these insights into creating more effective dyslexia friendly content, ultimately surpassing the limitations of existing methodologies and enhancing the overall accessibility, comprehension, and engagement of content for the Sinhala-speaking dyslexic population in Sri Lanka. An in-depth analysis was conducted on handwriting data samples and speech samples of dyslexic people in Sinhala language to identify language specific linguistic features focusing on phonological, morphological, and orthographic aspects using NLP algorithms. Quantitative evaluations are used to measure the effectiveness of the developed algorithms in transforming text into dyslexia-friendly formats, using metrics such as readability scores and user feedback. Qualitative evaluation will involve expert reviews as well as feedback from individuals with dyslexia for assessing the usability and appropriateness of the dyslexia friendly content. By addressing the scarcity of dyslexia-friendly resources in the Sinhala language, the study aims to create tailored content that meets the specific needs of individuals with dyslexia, thereby bridging an important gap in accessibility and support.

Keywords: *Dyslexia, Dyslexia-friendly Content, Natural Language Processing (NLP), Linguistic Analysis, Linguistic Patterns*

Enhancing User Experience for Data Visualization in Three-Dimensional Immersive Space

L.H.K.S. Lakshan, K. Azward, H.M.P.S. Anjalika, R.A.C. Ranasinghe, K.D. Sandaruwan

University of Colombo School of Computing, Sri Lanka

Data visualization in Data Science transforms complex datasets into graphical formats to facilitate analysis and decision-making. However, traditional 2D data representations can hinder comprehension of complex datasets. Virtual Reality (VR) with Head-Mounted Displays (HMDs) can enhance data visualization by offering a more intuitive and immersive way to interact with complex datasets. This study aims to improve the user experience for data visualization in 3D immersive spaces. We hypothesize that making the visualization more user-friendly and three-dimensional will enhance comprehension and decision-making in data science applications. This research addresses limitations in current VR data visualization tools, including poor user-friendliness, dataset non-neutrality, and limited 3D chart types. Our approach enhances the user experience with an intuitive interface, auditory and visual cues, advanced data manipulation tools, and gesture-based interactions. This study would significantly transform data visualization technologies, particularly in corporate and industrial settings. The study employs the Design Science Research (DSR) approach, focusing on problem identification, design, demonstration, evaluation, and refinement to identify key design principles, chart types, and user interactions for 3D immersive data visualization. These elements will be integrated into a framework for prototype development and evaluation. The research will use a mixed-method approach for evaluation. Quantitative metrics, including task completion time, error rate, and System Usability Score (SUS), will assess efficiency and user satisfaction. Qualitative insights will be gathered from user feedback, observational notes, and the think-aloud protocol to deepen the understanding of user experience. Additionally, user experience heuristic evaluation will ensure the prototype adheres to usability principles. By creating a versatile tool that utilizes HMDs and gesture-based interactions, the research aims to lay a foundation for future VR-based visualization tools. It is designed to enhance data interpretation, increase user engagement, and improve communication of complex datasets, potentially setting new standards and influencing future developments across various sectors.

Keywords: *Data Visualization, Human-computer Interaction, Immersive Space, Virtual Reality System, Head Mounted Displays*

Establishing Emotional Baseline through Multimodal Emotion Recognition

A. Sathyanjana, A. Pathirana, E. Hettiarachchi

University of Colombo School of Computing, Sri Lanka

Human emotions are dynamic and individualized, varying across lifetimes, cultures, and contexts. The same stimulus can evoke different emotional intensities among people. Emotional baseline, a relatively stable state to which an individual returns after temporary fluctuation, is crucial for accurate personalized emotional assessment. Current methods focus on identifying emotional states at specific moments, without considering baseline emotional profile, which cannot interpret emotional fluctuations in a personalized manner. This research develops a framework for emotional baseline identification with multimodal inputs, enabling the system to identify each user's emotional deviation from the baseline in a personalized manner. A framework is implemented using existing models developed for facial expressions, eye movements, and touch interaction patterns to extract arousal and valence values. These values are captured at intervals and then combined through multimodal fusion, which employs a weighted function to assign different weights to each input method based on the specific emotion. Then, fed into a reinforcement learning model to identify a user-specific emotional baseline based on observed patterns of emotional return which will be refined through iterative processes incorporating user feedback allowing for continuous adaptation over time. After establishing the baseline, the system calculates deviations by comparing current arousal and valence values from the multimodal emotional recognition system against the personalized baseline. The personalized nature of the system encourages users to provide accurate feedback for optimal customization. Initial training uses standard published datasets, followed by fine-tuning to adjust weights to the experimental context. The evaluation compares predicted baselines with self-reported emotional states using tools like PANAS and SAM. The rate of improvement across iterations is assessed to determine convergence towards a stable baseline point. This research contributes by providing a robust method for incorporating personalized emotional baselines into emotion recognition systems, offering personalized responses through a more accurate understanding of emotional states.

Keywords: *Emotion Recognition, Reinforcement Learning, Multimodal Emotion Prediction, Emotional Baseline, Machine Learning*

Leveraging Processor Electromagnetic Radiation for Radio Tomography

W.M.O.E. Wickramasinghe, Chamath Keppetiyagama, Asanka Sayakkara, K.A.K.T. Karunanayake

University of Colombo School of Computing, Sri Lanka

Sensor networks have expanded human capabilities beyond the limitations imposed by senses. One aspect that has been surpassed is observing objects and phenomena that are Non-Line of Sight with tomographic imaging techniques. Tomography refers to producing images by analysing cross sections of a subject from data gathered in different angles using reflections or transmissions. This is an emerging technology of computer vision and wireless sensing. Nevertheless, prevailing methods require a complex sensor grid built with transmitters and receivers of radio waves which should be geometrically symmetric, immobile and externally powered, detecting only the objects within the grid. Hence tomographic imaging is infeasible in circumstances where this sensor grid cannot be installed, and purpose-built transmitters are not present. This research proposes utilizing unintentional electromagnetic (EM) radiation of electronic devices to mitigate this issue. The EM emission from electronic devices is due to changing currents inside the physical system caused by current flow or switching of transistors. The proposed method consists of a far field antenna, a software defined radio and GNU radio companion for signal processing. Preliminary experiments have been conducted to capture EM emissions from an Intel Core i5 processor in which the workload of the processor was controlled by running stress-ng tool in Linux environment. stress-ng is a workload generator used in this experiment to adjust the workload thus changing the EM emission from the processor. Preliminary experiments consider a constant distance to measure the strength of EM emissions when the CPU workload is stabilized using stress-ng tool. It has been observed that the received signal strength is as high as -65 dbm from 7 feet. The feasibility of utilizing EM emissions from a targeted device for wireless sensing and tomography can be evaluated with further experiments based on this observation.

Keywords: *Tomography, Electromagnetic Emissions, Signal Processing, Far Field Antenna, GNU Radio Companion*

Machine Learning and Electroencephalography Data to Assess Attention Patterns in Children with Attention Deficit Hyperactivity Disorder

P.K.S.S. Shermila, M.S. Weerawarna, P.K.S. Thimaya, R.A.C. Ranasinghe, H.E.M.H.B. Ekanayake

University of Colombo School of Computing, Sri Lanka

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterised by recurrent patterns of hyperactivity, impulsivity, and inattention. Children with ADHD struggle to sustain attention that negatively affects their academic performance, social interactions, and overall quality of life. Traditional ADHD diagnosis and monitoring (including evaluating attention levels in ADHD) methods rely heavily on subjective assessments, such as clinical evaluations, which can be imprecise and biased, resulting in less confident decision-making. Extensive research has been undertaken to diagnose ADHD using objective methodologies that examine various data, including physiological data like eye-tracking and neuroimaging data like Electroencephalogram (EEG) and fMRI. This research aims to fill the void by developing a novel, objective machine learning-based method that assesses attention levels in children with ADHD by analysing their EEG data to be used in interactive learning environments for alerting teachers to assist in taking real-time corrective decisions. The research utilises a publicly accessible dataset comprising 44 healthy controls and 48 participants with ADHD. It contains EEG recordings from 56 channels at a 500 Hz sample rate obtained during a time estimation task across 300 trials. The methodology involves processing EEG signals, extracting key features, investigating action potential data such as ERP and evoked potentials, and using machine learning models to evaluate attention trends. The dataset is partitioned into two segments - to train the machine learning model and to simulate the real-time processing of EEG signals. The expected outcome is an analysis of attention spans and fluctuation levels intended to be graphically visualised through a mobile application to be used by interested stakeholders, including parents, teachers, and healthcare professionals. This research intends to advance knowledge of the mechanisms behind attention in children with ADHD and aid in the creation of real-time evaluation tools for therapeutic and educational contexts.

Keywords: *Attention-Deficit Hyperactivity Disorder (ADHD), Electroencephalogram (EEG), Event-Related Potential (ERP), Attention, Machine Learning*

PepperTester: A Non-Destructive Approach to Assess the Purity of Black Pepper Seed Samples

Pandula Pallewatta[1], Deepika Seneviratne[2], Gihan Seneviratne[1], Kasun Karunanayake[1], Samantha Mathara Arachchi[1]

[1]*University of Colombo School of Computing, Sri Lanka*
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The increasing need for quality assessment in agricultural products has resulted in the development of innovative tools that use technology to assist customers and traders. This research *PepperTester* application represents a significant advancement in quality assurance of agricultural products, focusing on testing the quality of *black pepper seeds* that are available in the market. *Black pepper* seeds are often mixed with impurities such as papaya seeds to *increase profits unethically*. Most customers are impacted adversely by purchasing contaminated spices for the price of genuine goods. Meanwhile, vendors are also compromised by this process when farmers sell contaminated seeds at agro-product distribution centers. Implementing a mobile application with a backend server uses image preprocessing techniques for image segmentation, enhancement and feature extraction. It uses the *YOLOv8* model to detect impurities, assesses the quality of the given black pepper sample and sends the *pepper seed purity score* to the mobile application. The training data set consists of *1000 samples of images*, and the system achieved a 94% accuracy level. In Sri Lanka, where *black pepper* is a major spice in cuisine, the use of a *PepperTester* could significantly reduce customers' purchases of contaminated black pepper seeds. The goal of this research was to develop a mobile application for the users to provide images of samples to connect to a backend server running a Machine Learning model that assesses the quality of the given samples. This research contributes to consumer protection by providing a practical tool to help customers and vendors identify black pepper seeds using digital images.

Keywords: *Agro-Products Quality Assurance, Machine Learning, Image Preprocessing, Object Detection, Impurity Detection, Black Pepper*

Task-based Optimisation Model for UAVs: Optimizing Liquid Fertiliser Application under Dynamic Wind Conditions

L.K.A. De Silva, L.N.C. De Silva, K.D. Sandaruwan, B.H.R. Pushpananda

University of Colombo School of Computing, Sri Lanka

The use of Unmanned Aerial Vehicles (UAVs) for fertilizer spraying marks a significant advancement in agricultural technology, offering precise and efficient application over traditional methods. UAVs facilitate the precise application of fertilizers, preventing both excessive and insufficient application, thereby optimizing resource use, enhancing crop yields, and supporting sustainable farming practices. However, wind-induced droplet drift poses a challenge in UAV fertilizer application. To address this, we developed a task-based optimization model that incorporates dynamic wind conditions to enhance spraying precision. We simulated a quadcopter's real-time response to wind, focusing on adjustments in spraying patterns to maintain uniform coverage. The drone follows a lawnmower path pattern, dynamically adjusting its trajectory based on wind data to minimize drift and optimize efficiency. Our model consists of several components. It includes a spray drift model to predict the movement of fertilizer droplets upon release, a simple turbulence model to account for variations in wind and a drone flying model to manage the navigation and spraying actions of the drone. The simulation field is 25m by 25m, with the spray height set at 4 meters above the ground and the spray angle set at 45 degrees relative to the vertical axis of the drone. The simulation results demonstrate that wind speed significantly influences the drone's trajectory and the step size between passes. In the absence of wind, the step size was 4.12 meters. However, with a wind vector of [5, 0, 0], the step size increased to 6.99 meters. The drone adjusts its path to maintain maximum coverage of the sprayed liquid, compensating for the drift caused by the wind. Additionally, the step size between each pass of the lawnmower pattern depends on the spray angle of the drone's nozzle. This angle influences how widely the liquid is dispersed, necessitating adjustments to ensure even coverage. This research shows that integrating real-time wind data into UAV flight models can significantly enhance the precision and efficiency of liquid fertilizer applications, reducing waste and improving sustainability in agriculture. This advancement not only supports more sustainable agricultural practices by reducing waste but also enhances the overall effectiveness of drone operations in the agricultural sector.

Keywords: *Precision Agriculture, Agricultural UAVs, Spray Simulation, Wind Dynamics, Spray Drift Control*

THE LIBRARY

Fostering Sustainable Future:
Libraries for Impactful Research

19th of November 2024

MESSAGE FROM THE LIBRARIAN

Dr. (Mrs.) Pradeepa Wijetunge

Librarian
University of Colombo, Sri Lanka

The Annual Research Symposium of the Library, University of Colombo is a significant component of the series of annual symposia of the University of Colombo. This year, we selected the theme *"Fostering a Sustainable Future: Libraries for Impactful Research"* in conformity with the main theme of the university symposium, *"Building a Sustainable Future through Impactful Research"*. The theme highlights the critical role libraries play in advancing sustainability and how libraries can support impactful research by providing access to sustainable practices, resources, and education. Libraries can underpin interdisciplinary collaborations, promote open access to information, and serve as hubs for community engagement on sustainability issues. By combining sustainable practices into their operations and services, libraries can significantly contribute to the sustainability agenda nationally and internationally and empower researchers to address the challenges effectively. Today, we will be deliberating on our contributions to the nation.

I would like to extend my heartfelt gratitude to the Vice-Chancellor, University of Colombo, Senior Prof. (Chair) H.D. Karunaratne, for his valuable leadership and gracing the occasion as the Chief Guest. I also extend my sincere gratitude to the two Keynote Speakers: Senior Prof. (Chair) Premakumara de Silva, Chairman of SCOLIS of the UGC, Sri Lanka and Senior Prof. (Chair) Nalin de Silva, Department of Chemistry, Faculty of Science, University of Colombo for gracing this occasion and their immensely inspirational addresses. I am also thankful to Prof W. D. N. Dissanayake, Chairperson of the ARS 2024 for her constructive guidance. I wish to extend my gratitude to all reviewers and presenters for their conscientious contributions, and the session chairs and discussion panelists. Last but not least, I wish to express my gratitude to the Symposium Chair, Convener, Organizing Committee, Senior Assistant Registrar, and all the library staff members for their untiring efforts to make this august event a success. Finally, I would like to thank all the participants for their presence and sharing of thoughts enriching the event. I wish a very successful symposium.

MESSAGE FROM THE SYMPOSIUM CHAIR

Mrs. Kalpana Manatunga

Senior Assistant Librarian
University of Colombo, Sri Lanka

I am delighted and honored to present this message as the Chair of the Library Research Symposium 2024 of the University of Colombo. This esteemed gathering, themed "Fostering Sustainable Future: Libraries for Impactful Research," highlights libraries' transformative role in advancing the boundaries of academic research. The Symposium promises an in-depth exploration of innovative library practices and their significant contributions to research excellence.

We are privileged to have Senior Professor H.D. Karunaratne, Vice-Chancellor of the University of Colombo, as our Chief Guest. We also welcome our distinguished keynote speakers, Senior Professor (Chair) Premakumara de Silva from the Department of Sociology and Senior Professor (Chair) Nalin de Silva from the Department of Chemistry, whose scholarly contributions have significantly impacted the academic community. I extend my utmost gratitude to Dr. (Mrs.) Pradeepa Wijetunge, our Librarian, and Dr. (Mrs.) D.C. Kuruppu, Deputy Librarian, for their visionary leadership in organizing this event. I also wish to thank our reviewers, session chairs, and authors, whose rigorous efforts have been instrumental in shaping our program. Your contributions are invaluable, and your active participation is essential to the Symposium's success. I encourage you to fully engage in rich discussions, share your insights, and foster collaborations that will elevate the role of libraries in supporting research advancements. My sincere appreciation also goes to the symposium convener, the organizing committee, and all the library staff members, whose dedication ensures the success of this Symposium.

The Library Research Symposium 2024 is not merely an event but a catalyst for change and a significant milestone in advancing a sustainable and impactful research landscape. I look forward to the inspiring outcomes and future directions that our collaborative efforts will yield, shaping the future of research profoundly.

ORGANIZING COMMITTEE

Chair of the Symposium

Mrs. Kalpana Manatunga – Senior Assistant Librarian

Convener

Dr. Neluka Karannagoda – Senior Assistant Librarian

Advisory Committee

Dr. Pradeepa Wijetunge – Librarian, University of Colombo
Dr. D.C. Kuruppu – Deputy Librarian, University of Colombo

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Mr. Chamal Abeygunawardhana – Senior Assistant Registrar

SYMPOSIUM PROGRAMME

Time	Programme
09.30 am – 09.40 am	**Inauguration**
09.40 am – 09.50 am	**Welcome Address by the Chair LRS- 2024** Mrs. P. K. S. Manatunga Senior Assistant Librarian, Main Library, University of Colombo
09.50 am – 10.00 am	**Address by the Librarian, University of Colombo** Dr. (Mrs.) P. Wijetunge
10.00 am – 10.10 am	**Address by the Chief Guest** Senior Professor (Chair) H.D. Karunaratne Vice Chancellor, University of Colombo
10.10 am – 10.15 am	**Introduction to the Keynote Speaker I**
10.15 am – 10.30 am	**Keynote Address I** Senior Professor (Chair) Premakumara de Silva Department of Sociology, University of Colombo
10.30 am – 10.35 am	**Introduction to the Keynote Speaker II**
10.35 am – 10.50 am	**Keynote Address II** Senior Professor (Chair) Nalin de Silva Department of Chemistry University of Colombo
10.50 am – 11.00 am	**Vote of Thanks by the Convener – LRS 2024** Dr N M Karannagoda Senior Assistant Librarian Main Library, University of Colombo
11.00 am – 11.20 am	**Tea Break**
11.20 am – 11.50 pm	**Panel Discussion on '*Sustainable Future of University Librarians*'**
11.50 am – 12.30 pm	**Lunch Break**
12.30 am – 01.45 pm	**Technical Session 1**
01.45 am – 03.00 pm	**Technical Session 2**
03.00 am – 03.15 pm	**Tea**

INTRODUCTION TO THE KEYNOTE SPEAKER I

Senior Professor Premakumara de Silva

Chair Professor of Sociology
Department of Sociology, University of Colombo, Sri Lanka
A Member of the University Grants Commission, Sri Lanka

Premakumara de Silva is the Chair Professor of Sociology and Anthropology in the Department of Sociology at the University of Colombo. He is also an Honorary Research Professor at Deakin University, Australia, and a Senior Research Fellow at the University of Birmingham, UK. His past roles include Deputy Vice-Chancellor, Dean and Head of Sociology, Faculty of Arts, Senior Student Counsellor at the University of Colombo, and Acting Director at the National Center for Advanced Studies on Social Sciences (NCAS). Currently, he serves as the Chairman of the UGC Standing Committees on Humanities and Social Sciences, Education, Fine Arts, Library and Information Science, and Social Reconciliation.

He has published several books, book chapters, and numerous articles in English with reputed international publishers, as well as works in local languages. His most recent publications include: "Research in the Digital Age: Adopting Digital Methods in Humanities and Social Sciences Research in Sri Lankan Universities," in *E-Learning and Digital Media*, Sage Publications (2024); "Buddhism and Science: Reconciling Science and Religion in British Colonial Sri Lanka," in *The Asian Journal of Politics and Society* (AJPS), Vol. I, Issue 03; and an invited book chapter, "South Asia: The Roots of Buddhism and Religious Tourism," in Dallen Timothy and Kiran Shinde (eds.), *Religious Heritage and Tourism in South Asia*, Routledge (2024).

He has received several prestigious international fellowships, including those from the British Academy/ESRC, the American Academy of Religion, the Sir Radcliffe-Brown and Sir Raymond Firth Fellowship of the Royal Anthropological Institute in the UK, and the Australian Research Council. In 2018, Prof. de Silva was honored with the Committee for Vice Chancellors and Directors (CVCD) Excellence Award for the most outstanding senior researcher in the field of Humanities, Aesthetics, and Social Sciences in Sri Lanka. That same year, he also won the State Literary Award for the best academic book translated in Social Sciences. He has received the Vice Chancellor's Awards and Senate Awards for best researcher as well.

ABSTRACT OF THE KEYNOTE ADDRESS I

Empowering Researchers to Attain SDGs: Bridging the Gap with Libraries and Collaborative Research

Senior Professor Premakumara de Silva

Department of Sociology, Faculty of Arts, University of Colombo, Sri Lanka
A Member of the University Grants Commission, Sri Lanka

In the pursuit of collectively attaining the United Nations (UN) Sustainable Development Goals (SDGs), the concept of empowering researchers in developing nations stands as a critical imperative, necessitating the bridging of formidable gaps through inclusive strategies. Researchers in affluent or developed regions thrive with resources and opportunities with flourishing knowledge economies that have fundamentally reshaped the landscape of economic growth by introducing new means of production, communication, and innovation. However, their counterparts in developing settings often struggle against formidable odds with fledging knowledge economies influenced by a stunted research landscape that synonymously degrades into thick modes of production, communication, and innovation. Imperative to note is the transformative power of the industrial and technological revolutions that have left a tremendous impact on the Global North research, yet researchers in the Global South struggle to level up due to limited access to resources, technological disparities, financial constraints, infrastructure challenges, capacity building needs, and policy barriers.

One of the key areas that the keynote speech will address is 'research and publications' popularly known as 'Research and Development (R&D). In countries across the income spectrum, growing investment in R&D including publications is predominantly targeted to advance the natural and health sciences, engineering, agriculture, and technology fields. By contrast, investment in the Humanities and Social Sciences is typically a small fraction of gross domestic expenditure on R&D. This scenario is also true for Sri Lanka. In the country, R&D expenditure on Humanities and Social Sciences is relatively lower compared to fields such as science, technology, and engineering. However, it appears that investment in the Humanities and Social Sciences, particularly in areas aligned with national priorities, has been somewhat limited. This is significant for evidence-based research policy, as social and human challenges are at the forefront of Sri Lanka's current and future sustainable development agenda.

INTRODUCTION TO THE KEYNOTE SPEAKER II

Professor Nalin de Silva

Chair Professor of Chemistry
Department of Chemistry, Faculty of Science
University of Colombo, Sri Lanka

K. M. Nalin de Silva is the Senior Professor (Chair) of Chemistry at the University of Colombo, Sri Lanka. He obtained his B.Sc. (Chemistry, First Class) from the University of Colombo, Sri Lanka and Ph.D. from the University of Cambridge, UK. He has gained postdoctoral experience from University of Cambridge and Louisiana State University, USA. He worked as the Science Team Leader in Sri Lanka Institute of Nanotechnology (SLINTEC) from 2012-2019. Upon completion of the assignment at SLINTEC he returned to his university position in 2017. He has over 100 SCI Indexed publications and four US patents to his credit. His present h-index is 37. He won the Presidential Research Award for ten consecutive years and a National Research Award presented by National Research Council (NRC) and National Science Foundation (NSF), Sri Lanka. He was also named 'Young Scientist of the Year' in 2004 by The World Academy of Science (TWAS) and NSF. He received the Vice Chancellor's Award for Research Excellence in 2017 & 2020. He was a member of the National Nanotechnology Committee and Chairman of the National Nanotechnology Research Panel at NSF. He was also a member of the committee at NSF for drafting the National Nanotechnology Policy of Sri Lanka. He also served as the Chairman of National Basic Sciences Research Committee and National Committee for Technology at the NSF. His main research focus areas are advanced material for healthcare, water purification, textiles and apparel, natural resources and Nanobiotechnology. His research team has brought approximately Rs. 70 million external funding to the university and established a state-of-the-art materials lab named the Center for Advanced Materials and Devices (CAMD) in 2018. He is the Chair of Chemistry and was the Head of the Department, Department of Chemistry from 2020 to 2023. Recently he was awarded with the most prestigious professional qualification, Fellow of the Royal Society of Chemistry (FRSC), United Kingdom.

ABSTRACT OF THE KEYNOTE ADDRESS II

Building a Nation's Future: The Impact of Libraries and Reading on Research for Sustainability

Professor K.M. Nalin de Silva

Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka

The pursuit of sustainable development is critical for the long-term prosperity of any nation, requiring informed and innovative research that addresses environmental, economic, and social challenges. Central to this endeavour are libraries and the practice of reading, which play a vital role in cultivating knowledgeable researchers equipped to drive sustainable progress. This abstract explores the impact of libraries and reading on the development of researchers who contribute to the development of the country.

Libraries, as repositories of vast knowledge, provide access to an array of resources that are essential for comprehensive research. They offer not only academic literature but also data, case studies, and historical records that enable researchers to build on existing knowledge and generate new insights. By fostering an environment of intellectual curiosity, libraries encourage continuous learning and the pursuit of innovative solutions to complex issues.

Reading, as a fundamental practice, enhances a researcher's ability to think critically, synthesize information, and draw connections between diverse fields of study. It nurtures a deep understanding of global and local contexts, enabling researchers to address sustainability challenges with a holistic perspective. Moreover, regular engagement with literature across disciplines broadens a researcher's worldview, fostering interdisciplinary approaches that are often crucial for tackling sustainability issues.

Together, libraries and reading form the backbone of a research ecosystem that promotes sustainable development. They empower researchers to generate knowledge that informs policy, drives technological innovation, and addresses the multifaceted challenges of sustainability. By investing in libraries and promoting a culture of reading, nations can cultivate a generation of researchers who are not only skilled but also deeply committed to building a sustainable future. This, in turn, strengthens the nation's capacity to achieve long-term development goals and enhances its global standing in sustainability efforts.

THE LIBRARY
List of Abstracts

Bibliometric Analysis of Artificial Intelligence in Academic Libraries

S. S. Johoran

Library, University of Colombo, Sri Lanka

The capability of Artificial Intelligence (AI) to identify patterns and generate predictions based on the data can be used to revolutionize the services provided by academic libraries. It is important to identify current research patterns on the use of AI in academic libraries. The study aims to map the bibliometric patterns of the research publications published in open-access journals between 2019 and 2023 on the topic of AI in Academic libraries. The objectives of the study were, to identify the publications related to AI in Academic libraries from 2019 to 2023, and their citation trends, to identify the author's contribution based on the country, to identify frequently used keywords, and to examine the authorship patterns. A bibliometric analysis was carried out on research papers on Google Scholar, Science Direct, and Taylor and Francis databases which discuss AI in academic libraries. The search was performed for research articles published between 2019 and 2023. The search string was "Artificial Intelligence" AND "Academic Libraries", and it was searched through titles and abstracts. At the screening process of the articles, 41 articles out of 52 articles were excluded as per the inclusion and exclusion criteria and 11 articles were finalized and selected for further analysis. The highly productive year was 2023 with 5 publications on the subject of AI in academic libraries. The papers published in 2019 had the highest citations. Authors from 7 countries have contributed to the research on AI in Academic Libraries. AI and Academic /University Libraries were the frequently used keywords of the selected publications. Most of the research articles were written by multiple authors. This study may further help those who wish to map the bibliometric patterns of research articles.

Keywords: *Artificial Intelligence, Academic Libraries, Bibliometric Analysis*

Fostering a Sustainable Future through Impactful Research by the Libraries: A Bibliometric Analysis based on Google Scholar

N.M. Karannagoda

Library, University of Colombo, Sri Lanka

The global discourse on sustainability has intensified, and libraries play an important role in promoting sustainable futures through impactful research. Therefore, the objective of this study was to use bibliometric analysis (BA) of the related publications available in Google Scholar (GS) to explore the vital role of libraries. The method adopted was extracting the relevant publications from GS using Publish or Perish software (PPS) without time limits on publications. The research strategy used was entering the keywords "library*", "sustainable future", and "impactful research" combined by the Boolean Operator 'AND' into the PPS to extract the data. The final extraction of the data was done on 31 July 2024, and the findings were analyzed using VOSviewer and Excel packages. A total of 198 related publications were retrieved. The analysis revealed that the first publication appeared in GS in 2000, while the latest publication was in July 2024. Among the 198 publications, journal articles represented the highest number, with 105, while books were the second highest, with 54. Between 2000 and 2012, only 3 publications were identified. Yet, a significant increase in publications was noted since 2014, and the highest number of publications per year during the period was recorded in 2023, which is 55. The analysis found 6144 citations in total and 69.13 citations per year. The average citation per year is 256, with an average of 31.03 citations per paper. The top-cited article is authored by Valerie Fournier and Chris Grey. A total of 429 authors have contributed to the publications from 59 countries. The authors from the USA contributed the highest number of publications, while the UK ranked the second. However, from Sri Lanka, there is no contribution, and this paper will become the first publication in this research domain. Out of 198 publications, 38 were single-authored, while 160 were co-authored. Among the most used terms in the title and abstract are *sustainable future, impactful research, and library*. This BA not only highlights the growing interest but also the increasing research activity on the role of libraries in fostering sustainable futures through impactful research . The growing number of publications and citations over the years underscores that libraries are pivotal in supporting and promoting sustainable and impactful research. The Sri Lankan librarians need to consider this void in the LIS literature and must attempt to fill it in the future.

Keywords: *Bibliometric Analysis, Libraries, Sustainable Future, Impactful Research*

Use of Conversational Artificial Intelligence tools in Higher Education: Perception of Science Undergraduates

M.A. Lankathilake[1], Anuja Silva[2], Sajeewanie D. Somaratna[1]

[1]*Library, Faculty of Science, University of Colombo, Sri Lanka*
[2]*Library, University of Colombo, Sri Lanka*

Conversational Artificial Intelligence (AI) tools have been significantly incorporated into Higher Education sector all over the world. However, there is a gap in research in the Sri Lankan context. Therefore, this study aims to identify the types and purposes of using AI tools; determine undergraduate perception; and find out the relationships between user context and perception of the use of AI tools. Data were purposively collected from 137 undergraduates in the Faculty of Science, University of Colombo who are using AI tools for academic activities. Data were analysed by SPSS Version 22. Most respondents are between 20 and 25 years of age (98%), whereas 54% are females. Most respondents are in Levels I and II (n=78; 57%). Respondents use 12 different AI tools. The majority of respondents use ChatGPT (n= 135; 99%) as the key AI tool. Nearly half of the respondents (n= 64; 47%) use AI tools 2-3 times per week, while 37% (n= 51) use AI tools daily. Information retrieval (72%) is the main purpose of using AI tools, whereas concept identification (46%), assignment writing (34%), and creative work (34%) are the other key purposes. They use AI tools mainly due to ease of use and to minimize the time taken to obtain a holistic view of user queries. Most believe that AI tools will make their studies easy as they respond quickly, solve problems, and explain learning theories. Undergraduates prefer to continue to use AI tools for educational aspects and would like to recommend the tools to others. A significant relationship exists between two variables used to determine user perception and the level of study. A significant relationship exists between user perception (comfortable to use; p= 0.009, customizability; p= 0.011) and level of study. Furthermore, significant relationships were observed between the subject streams and undergraduates' perceptions. This study concludes that undergraduates of the Faculty of Science use different AI tools for academic activities. Further studies could be recommended to investigate undergraduates' awareness on ethical use of AI tools for educational purposes.

Keywords: *Conversational Artificial Intelligence Tools, Science Undergraduates, Perception, Higher Education*

Apocalyptic Predictions Around the Globe: What Researchers Can Derive from Scholarly Articles?

Nadeesha Perera[1], Chiranthi Wijesundara[2]

[1]*Library, Faculty of Medicine, University of Colombo, Sri Lanka*
[2]*Library, University of Colombo, Sri Lanka*

'Apocalypse' means great destruction or significant alteration to the world, complete devastation or an extremely dire future event. End-of-the-world prophecies are a common idea in many religions and cultures. These prophecies are scattered around the globe as textual, illustrated, or oral information. This particular research aims to identify some of these written facts based on scholarly articles and journals related to apocalyptic predictions worldwide and to uncover potential themes within these predictions that might be useful for future research. The authors have identified fifty-six (56) scholarly articles published from 1990 to date, from *Google Scholar, JSTOR*, and *Connected Papers*. PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses-Scoping Reviews) checklist was used as a guidance to retrieve articles. Rayyan QCRI was used as the platform of reviewing articles. The major theme 'Religious Apocalypse' dominates with 87.5% (*n*=49) articles highlighting its profound impact and prevalence in literature. 'Environmental Disasters' (7.1%: *n*=4) and 'Social Disasters' (5.4%: *n*=3) without religious implications were least represented. The analysis of religious teachings under the theme 'Religious Apocalypse' reveals a predominant emphasis on Christianity, accounting for 100% (*n*=49) followed by Islam 14.3% (*n*=7), Buddhism and Jainism are represented minimally at 6.1% (*n*=3) and 4.0% (*n*=1). The analysis of articles categorized under the theme 'Religious Apocalypse' reveals significant variations in representing its subthemes. 'Environmental Apocalypse' emerges prominently; appearing in 40 instances (81.6%) followed by 'Social Apocalypse', discussed in 36 instances (73.4%). The analysis revealed that environmental apocalyptic predictions dominate the dataset, with a probability of 0.8 (95% CI: 0.67-0.89), followed by social predictions at 0.58 (95% CI: 0.44-0.71), highlighting the significant relevance in these areas to Apocalyptic Predictions described in various religions. This pilot study emphasizes only scholarly journal articles. As information professionals who play a key role in managing information, the authors hope this pilot study will provide insight to assist scholars in various disciplines such as theology, cultural anthropology, sociology, history, environmental science, health science, philosophy, and literature, and so forth.

Keywords: *Apocalyptic predictions, Culture, Disasters, Religion, Scoping Review*

Emerging Technologies in Academic Libraries: A Scientometric Analysis based on the Scopus Database

W.P.G.L. Perera[1], M.A. Lankathilaka[2], H.P. Koralage[3]

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[3]*Library, Sri Lanka Technological Campus, Sri Lanka*

In this digital era, libraries use many new technologies for their functions and to cater library users. This study aimed to analyze the publications on emerging technologies in academic libraries that were indexed in the SCOPUS database. Specifically, it was intended to find out the co-authorship pattern of those publications and the co-occurrence of keywords used by the researchers, to identify emerging technologies, and to find out future research directions. While applying appropriate Boolean operators to the search string and limiting this process to Title-Abstract-Keyword, 335 articles were found using the search terms 'Academic Libraries' OR 'University Libraries' AND 'Emerging Technologies'. Only journal articles published in English between 2001 and 2024 were considered as inclusion criteria for this study, and publications in the production stage or the press were excluded. Finally, 269 articles were selected for this study. Microsoft Excel and VOSviewer software applications were used to analyse bibliographic data and data visualization on keywords' co-authorship patterns and co-occurrence. The results revealed that the highest number of articles on emerging technologies in libraries were published in 2019 (11%) and 2021 (11%), while no publications in this field were recorded in 2005. Most of them (9%) were published in the journal, *Library Philosophy and Practice*. The majority were collaborative studies, with the USA showing the highest level of author collaboration (57%), followed by India (10%). Interestingly, only one author was identified as having consistently collaborated with others across multiple studies. Authors from USA shows highest collaboration where they have collaborated with authors from 11 different countries with 152 (57%) articles. There were 43 technology related keywords among selected articles and out of those 43, the most cited emerging technologies were Digital Libraries, Artificial Intelligence (AI), Internet of Things (IoT), Electronic Resources, Open Access, Metadata, and E-learning. It could be recommended that further studies are required for identification of factors on impact of the adoption of emerging technologies such as generative AI to academic libraries, re-define the role of librarians in the context of the AI era, and studies on ethical use of emerging technologies such as AI-based technologies.

Keywords: *Academic Libraries, University Libraries, Emerging Technologies, University Education*

The Research Contribution of the Undergraduates of the Faculty of Indigenous Medicine (FIM): A Bibliometric Analysis

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Ayurveda originates from the Sanskrit terms "Ayu", meaning life, and "Veda", meaning knowledge, is a holistic medical system focusing on achieving harmony between the body, mind, and spirit. By systematically organizing knowledge through logical principles, Ayurveda has gradually evolved into a complete science of life, deeply rooted in the ancient wisdom of Vedic literature. The FIM at the University of Colombo offers two bachelor's degree programs: the Bachelor of Ayurvedic Medicine and Surgery (BAMS) and the Bachelor of Unani Medicine and Surgery (BUMS). As part of their degree requirements, undergraduates in these programs must complete a research project in their fourth academic year. This study analyses the research contributions of BAMS and BUMS undergraduates, focusing on the distribution of research topics and identifying gaps in the covered areas. Data were collected from the research project title lists maintained at the FIM library, covering four academic years (2014/15-2017/18). Seven hundred sixty-six research projects were categorized into six primary fields: Treatment, Pharmaceuticals, Diseases, Gynaecology, Paediatrics, and Nutrition, with additional topics classified under "other." The analysis reveals a significant focus on treatment-related research (42%), emphasizing clinical applications within Ayurveda. Pharmaceuticals made up 32%, followed by 15% of disease-related research. However, critical areas such as gynaecology and nutrition were significantly underrepresented, comprising only 2% of the research output, while paediatrics received minimal attention at 3%. This may be due to the ethical aspect of these clinical studies pertaining to undergraduate students. Further content analysis highlighted a lack of research in broader comparative studies within alternative medical systems, which could diversify and enrich Ayurvedic practices. These findings emphasize the need for enhancing research in these fields which is essential for bridging knowledge gaps and advancing Ayurveda as a modern, global healthcare system. This study provides valuable insights for the research community, offering a framework to align future research efforts with the evolving needs. Expanding research into new areas such as surgical instruments, yoga, health tourism, and preventive medicine could further support the sustainable development and relevance of Ayurveda in the contemporary healthcare System of Sri Lanka.

Keywords: *Ayurveda, Undergraduate Research, Indigenous Medicine, Research Trends, Faculty of Indigenous Medicine, University of Colombo*

Librarians' Role in Enhancing Health Literacy: A Comprehensive Scoping Review

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Health literacy (HL) is "the skills, knowledge, motivation, and capacity of a person to access, understand, appraise, and apply information to make effective health and health care decisions and take appropriate actions". A scoping review was carried out using PRISMA guidelines to explore the roles of librarians in improving HL, the interventions they use, and identify the challenges they encounter in promoting health literacy. Two electronic databases (PubMed, CINAHL) and Google Scholar search engine were consulted using the terms "health literacy, library, and librarians". The search generated a total of 1380 articles. After removing duplicates, the publication year was limited to 2020-2024 and 284 articles were screened through Rayyan QCRI - a web and mobile app for Systematic Reviews, 51 articles were included in the final analysis. The extracted data was analyzed and synthesized using both quantitative and qualitative approaches. Majority of the research related to Librarians' Role in Enhancing HL has been conducted in the European Region (EURO) (*n*=22, 43%) and Region of the Americas (AMRO) (*n*=22, 43%) in equal amounts, followed by African region (AFRO) (*n*= 3, 6%), South-East Asia Region (SEARO) (*n*=2, 4%), Western Pacific Region (WPRO) (*n*=2, 4%). The review highlighted librarians have been involved in enhancing HL in different roles including, Collaborator with Healthcare Professionals, Research Support Specialist, Educator, Health Information Specialist, and Community Outreach Coordinator. Several implemented interventions have been explored to enhance health literacy by librarians, including health information workshops, online resources, literacy programs, community outreach programs, creation of health literacy materials, and customized information services. Challenges were identified in promoting HL through librarians, including the public's perception of libraries as general information providers rather than health resources, limited legislation and awareness about library health services, lack of involvement of library staff in decision-making, insufficient benchmarks in LIS programs for health education, and a general lack of recognition of librarians as health literacy experts. The study recommends a multifaceted approach, including increased support, resources, community awareness, targeted training, and strengthened collaboration with healthcare organizations, all of which will contribute to improved health outcomes in the communities they serve.

Keywords: *Health Literacy, Scoping Reviews, Librarians*

Application of Google Analytics to Optimize User Engagement on University Library Websites: A Case Study based on a State University in Sri Lanka

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The digital era has significantly reshaped the role of university libraries, transforming them into essential digital platforms that support academic research and learning. The library website is crucial as it serves as a central hub for accessing resources, services, and information, enhancing the library's accessibility and supporting the academic community's needs. This study examines the effectiveness of a state university library website in Sri Lanka, employing Google Analytics to track and analyse website traffic, user behaviour, and engagement metrics. In the first stage of the process, the Global Site Tag was added to the website's header section to measure site visits and other related data. The study was conducted from July 2022 to July 2024. The findings reveal that the library website attracted 46,000 visitors, with 95.7% of the new users continuously improving access. Engagement metrics were positive, with an engagement rate of 61.06% and an average session duration of 1.53 minutes. However, the site's bounce rate is 42.7%, which indicates that many visitors left after viewing only one page. The study identifies significant correlations between device type, user interactions, and engagement metrics. Correlation analysis revealed a statistically significant moderate positive correlation between device type and engagement time ($r = 0.560$, $p = 0.002$), as well as strong positive correlations between new users and sessions ($r = 0.925$, $p < 0.001$), event count and average engagement time ($r = 0.780$, $p < 0.001$), and engaged sessions and average engagement time ($r = 0.926$, $p < 0.001$). These results suggest that device type, user interactions, and session engagement are significant factors influencing the user engagement of the library website. The study concludes with several recommendations to optimize the library website. These include mobile optimization to cater to the higher percentage of mobile users, enhanced SEO strategies to increase organic traffic, and improvements in user engagement through site redesign and better navigation. Additionally, targeted marketing campaigns and ongoing assessments using Google Analytics and other tools are recommended to ensure the library remains responsive to user needs and adapts to changing user behaviours. This study emphasizes the value of web analytics in informing strategic decisions that enhance the usability and impact of library website, ultimately supporting the academic community more effectively in the digital age.

Keywords: *Google Analytics, University Library Websites, User Engagement*

Sustainable Future of Academic Libraries: Unveiling the Student Voice

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Today, academic libraries are facing unprecedented challenges due to the vast availability of online information sources. The new generations of undergraduates, who are the main user group of academic libraries are highly tech-savvy and belong to the demographic cohort of digital natives. There is a dire need for academic libraries to evolve and adapt to the needs of new generations of users to thrive in the future. The objectives of the study are to identify library usage (2013-2023), underpinning reasons, and future expectations of undergraduates of the University of Colombo. It incorporates a qualitative research methodology and a single-site case study approach. This study consists of two phases. In phase 1, annual reports and other internal documents of the Library were analysed to determine the number of books borrowed during the period. In phase 2, in-depth interviews were conducted with undergraduates representing Level 1-4 from all the faculties served by the Main and Science Libraries. Twenty-four subjects were interviewed for a total of 8 hours until data saturation and analysis was conducted using the interpretive discourse analytical approach. Data obtained through document analysis revealed a decline in book borrowings by undergraduates. In 2013, the number of books issued per user/ year was 6.6, while in 2023 it was 1.6, and the decline rate was 24.24%. Undergraduates have moved to alternative information sources such as websites, open-access e-books, e-journals, subject gateways, Generative Artificial Intelligence (AI) tools, lecturer's personal reading materials uploaded to Learning Management Systems, and social media for information retrieval. The main reasons behind this shift were easy access, availability (24/7), and saving time. Results also revealed a gap between the services provided by the library and the undergraduates' expectations. The digital transformation of library services, adopting AI tools, establishing interactive communication channels, and creating conducive learning spaces with cutting-edge technologies were among the expectations of undergraduates. In order to sustain the future, libraries should listen to the voice of the new generation and change accordingly.

Keywords: *Future Libraries, Student Voice, User Expectations, Sustainability*

Factors Associated with Using Automated Content-Generating Tools by Academics in a State University in Sri Lanka

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Adopting Automated Content-Generating Tools (ACGTs) among academic staff in selected Sri Lankan universities is a pivotal study area. These tools, which harness Artificial Intelligence (AI), have the substantial potential to transform research and teaching practices. They offer a range of capabilities, from text generation and content summarization to enhanced writing productivity and correcting language. Despite their transformative potential to revolutionize teaching methods, curriculum design, and student engagement, their integration into educational settings in Sri Lanka encounters significant challenges due to a considerable gap in local research. This study aims to bridge this gap by identifying the factors associated with using ACGTs among academic staff at a selected state university in Sri Lanka. The research examines seven independent variables: performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC), hedonic motivation (HM), habit (HB), and personal innovativeness (PI); one mediating variable: behavioural intention (BI); and one dependent variable: the actual use of ACGTs. Data were collected from 181 academics across six faculties using a stratified sampling technique, from questionnaires, and analysed using SPSS 21. The findings indicate that PE, EE, HM, HB, and PI significantly enhance behavioural intention towards ACGTs (mean p-value < 0.01 in correlation analysis and significance values < 0.05 in regression analysis). In contrast, SI and FC show no direct influence on behavioural intention. The mediating role of BI fully mediates the effect of PE, EE, and FC on the actual use of ACGTs, while other variables are partially mediated. This study fills a critical research gap by elucidating the factors influencing ACGT adoption and emphasising the significant educational enhancements that could be achieved through their practical use. This research provides valuable insights for university administrators and policymakers to foster a more conducive environment for technology adoption and advocate strategies that amplify positive influences and mitigate barriers, thereby enhancing the educational landscape in Sri Lanka. The study contributes vital empirical insights to the literature on technology adoption in academic contexts. It highlights the urgent need for further studies to expand the knowledge base and inspire future research efforts.

Keywords: *Automated Content-Generating Tools, Artificial Intelligence, Natural Language Processing*

Effectiveness of Academic Integrity in the Age of AI in Sri Lankan Higher Education Sector: Challenges and Solutions

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The rapid integration of artificial intelligence (AI) into higher education has revolutionized teaching and assessment practices, yet it has also presented significant challenges to maintaining academic integrity. The study focuses on higher education institutions in Sri Lanka. The purpose of this study is to analyse the effectiveness of academic integrity practices in the context of AI technologies within the higher education sector of Sri Lanka. Specifically, it examines AI-driven assessment methods, concerns about plagiarism detection tools, and the effectiveness of current certification methods in preserving academic integrity. A structured online questionnaire was administered to 147 participants from diverse academic backgrounds and institutions across Sri Lanka. Quantitative data were collected through extracted from Likert-scale responses and demographic data. Hypothesis tests including the chi-square test and ANOVA were used to assess the statistical significance of differences in perceptions among demographic variables. The survey findings suggest mixed views on the effectiveness of academic integrity practices in the AI age. While 64% of respondents expressed confidence in AI-driven assessment methods, they raised particular concerns about the potential for algorithmic biases to influence assessment fairness ($\chi 2\ (1) = 15.32$, $p < 0.001$). Additionally, 79% of participants highlighted the importance of increasing transparency and accountability in AI-based theft detection tools. Statistical analysis reveals notable differences in perceptions based on participants' academic discipline and years of experience in higher education. In particular, respondents from engineering disciplines showed greater confidence in AI technologies compared to those from humanities and social sciences ($F\ (2, 144) = 5.78$, $p < 0.01$). Based on the research findings, strategic recommendations are made to address these challenges and enhance academic integrity practices in AI development. This survey-method study provides empirical insights and compelling statistical evidence on the evolving landscape of academic authenticity in higher education in the context of hybrid AI technologies in Sri Lanka. It provides practical recommendations for institutions and policymakers to address ethical challenges and effectively promote honesty in educational settings.

Keywords: *Artificial Intelligence, Academic Integrity, Higher Education, Assessment Methods, Plagiarism Detection*

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