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# ANNUAL RESEARCH SYMPOSIUM 2022

**Digital Transformation and Innovative Approaches to Mitigate Challenges in the Higher Education Sector**

16th November 2022

University of Colombo

https://cmb.ac.lk/ars

# Proceedings of Annual Research Symposium 2022
# University of Colombo


**Designed by the Advanced Digital Media Technology Centre (ADMTC)**
of the University of Colombo School of Computing (UCSC)

- Dr. S. S. P. Mathara Arachchi, Coordinator of the ADMTC
- Ms. M. G. A. Srimaalee
- Mr. K. A. R. Perera
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- Ms. T. G. S. D. Gamagedara

# PROCEEDINGS OF THE ANNUAL RESEARCH SYMPOSIUM
# 2022
# UNIVERSITY OF COLOMBO, SRI LANKA



November 2022

ISSN No. 2815-0481

# UNIVERSITY OF COLOMBO, SRI LANKA

**OUR MOTTO**

'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.

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## MESSAGE FROM THE VICE CHANCELLOR

It is my utmost privilege to issue this message of felicitation for the flagship event in the University of Colombo's annual calendar: the Annual Research Symposium. Knowledge creation and active learning are fundamental components of a high-quality university in the 21st century, and it characterizes a vibrant research environment. The rich diversity of our University's research capabilities and output is reflected in the commitment of our staff and students.

The Annual Research Symposium 2022 of our university is of special significance this year as it will be held under the timely theme of "Digital Transformation and Innovative Approaches to Mitigating Challenges in the Higher Education Sector". The Sri Lankan higher education sector has been facing an unprecedented set of challenges since the beginning of the COVID-19 pandemic in early 2020. These challenges pushed everyone to shift to online education, which became the lifeline for the higher education sector in order to maintain continuity during this unprecedented period. These unforeseen challenges forced everyone to change their practices irrespective of willingness, capability, location, and resources. Furthermore, this new experience of online interaction paved the way to introducing new culture in all segments of the higher education sector.

Digital transformation in the higher education sector refers to an organizational change realized by means of digital technologies and business models with the aim of improving an institution's operational performance. Hence, digital transformation and innovative approaches are linked in a recursive evolutionary approach. Without digital transformation and innovative approaches, it is very difficult to mitigate challenges in the higher education sector. As any case would be, it is of great importance to use technology in the correct way to address issues and disruptions in education to achieve the value addition expected in online education. The focal point of this year's research symposium is aligned to the same issue.

I am delighted by the enthusiasm and support of all sectors of our university to forge ahead with the research process, despite the many challenges faced in relation to the COVID-19 pandemic, and the economic and political instability in the country. Your commitment to digital transformation has helped our university celebrate all these achievements. Our university rankings have been well sustained, with upscaling of regional and international collaborations

in research and academic partnerships. Technology transfer and commercialization have been addressed consistently with thematic research groups created to address the Sustainable Development Goals with greater interdisciplinary involvement.

I thank the Chairperson of the Annual Research Symposium 2022, Professor K. P. Hewagamage and his excellent group of academic partners and students, for giving their expertise and valuable time to ensure all arrangements progress smoothly and effectively. A big thank you to the Editor, Dr. Esther Surenthiraraj and Co-editor, Dr. Iroja Caldera, all Faculty and Institute Research Committees and representatives, Mr. S. M. Shifar and the team from the Academic Publication division, NOC, and the multitude of administrators and support staff alike for your wonderful commitment make this event a success.

May you all stay safe and well and enjoy the proceedings.

**Senior Professor H.D. Karunaratne**
Vice Chancellor, University of Colombo

## MESSAGE FROM THE CHIEF GUEST

It gives me great pleasure to send this congratulatory message and my best wishes on the occasion of the inauguration of the Annual Research Symposium (ARS) 2022 of the University of Colombo.

During the post COVID-19 period we saw that traditional education systems were unable to cope with the changes required in learning and teaching to meet the crisis. The changing demands on learners and their competencies, and the need for new ways of teaching and managing complexities required us to think out of the box.

I therefore congratulate the Vice Chancellor, the Chairman and the Organising Committee of ARS 2022 for selecting theme "Digital Transformation and Innovative Approaches to Mitigate Challenges in the Higher Education Sector" which is timely and very relevant today.

I look forward to proceedings from the ARS 2022 that will guide the digital transformation of the Higher Education sector in particular and the education ecosystem in general to meet the challenges that have arisen in the recent past. I am sure as the oldest and most recognized University in Sri Lanka, eminent researchers at the University of Colombo will propose innovative approaches to mitigate those challenges.

I wish the deliberations at the ARS 2022 all success.

**Senior Professor Malik Ranasinghe**
University of Moratuwa
Chairman, Information and Communication Technology Agency

## MESSAGE FROM THE SYMPOSIUM CHAIR

The Annual Research Symposium (ARS-2022) is a flagship event in the calendar of the University of Colombo that unifies the conferences and symposia organized by respective Faculties and Institutes of the university. Knowledge dissemination in different disciplines is a key responsibility of the university. The faculties/institutes, with the collaboration of external organizations, fulfill that responsibility with utmost care. ARS-2022 usually energizes all these events by introducing a new theme in order to promote interdisciplinary studies.

The Vice Chancellor, Senior Professor H. D. Karunaratne together with Deans and Directors of Faculties and Institutes, invited me to be the Chair of ARS-2022 following the end of my term as Director, UCSC in May 2022, and I would like to express my sincere thanks to all of them. After discussions with several key stakeholders, we selected "Digital Transformation and Innovative Approaches to Mitigate Challenges in the Higher Education Sector" as the theme of ARS-2022 since this is the best time to promote digital transformation in order to make a significant change in all divisions of higher education. During the pandemic period, the University of Colombo was able to successfully meet a multitude of challenges using online education facilities in many Faculties because of their readiness towards e-learning. However, digital transformation has a bigger scope, and in order to achieve Sustainable Development Goals, it is crucial to promote digital transformation and innovative practices in higher education.

I would like to express our appreciation to the Asian Development Bank (ADB), which has been assisting the higher education sector in Sri Lanka in different ways, for agreeing to sponsor two experienced speakers who have engaged in research studies related to challenges in education: Dr. Marito Garcia from the University of Virginia and Mr. Ryotaro Hayashi from the ADB. I would also like to thank the Sri Lanka Association for Software Services Companies (SLASSCOM) for nominating Mr. Arujna Nanaykara, CEO – GTN Technologies, to speak about digital transformation based on industry experience in Sri Lanka.

My sincere thanks go to Senior Professor Malik Ranasinghe, Chairman, ICT Agency of Sri Lanka, the former Vice Chancellor of the University of Moratuwa, for accepting our invitation to be the Chief Guest of the ARS-2022 who will bring timely insights to add value to this

important event from his experience in the field.

Organizing this type of an event is challenging. There are many to whom we should be thankful as this event would not be successful if it was not for their effort and support. Amongst those, first and foremost, I would like to extend my sincere thanks to the Vice Chancellor for his insightful guidance. Next, I would like to thank the members of the organizing committee and the administrative and supporting staff of the University of Colombo for their remarkable support. I would like to especially mention Dr. S. S. P. Mathara Arachchi (Chairperson, IT and Publicity Committee), Dr. Esther Surenthiraraj (Chief Editor), Dr. H. Iroja Upekha Caldera (Co-editor) and Dr. Harshima Wijesinghe (Chairperson, Organizing Committee) without whose dedication this event would not be a success. I also wish to thank Mr. Mohamad Shifar (Assistant Registrar of Academic Publications) and Mr. Layan Chaturanga (Network Operating Centre) for their continuous support. I would like to mention the team members of the ADMTC/UCSC, Mr. Ashintha Perera, Ms. Anjalee Srimaalee, Ms. Geethika Senarathne, Mr. Oshan Tennakoon, and Ms. Dinusha Gamagedara. Last but not least, I wish to thank the FOS Media Unit of the Faculty of Science and the Sri Palee Campus.

I hope you will enjoy the Proceedings of ARS-2022, and will contribute to disseminate the findings of research and digital transformation of the University of Colombo in the coming years.

**Professor K. Priyantha Hewagamage**
School of Computing (UCSC), University of Colombo

## PROFILES OF KEYNOTE SPEAKERS

**Ryotaro Hayashi**
Social Sector Economist
Asian Development Bank

Ryotaro Hayashi is social sector economist working for the Asian Development Bank (ADB). He has been working on mainly postsecondary education projects and knowledge products in South Asia, especially Sri Lanka, Bangladesh and Bhutan for the last 7 years. Before joining ADB, he has worked for the World Bank, Japan International Cooperation Agency (JICA) and Japan Bank for International Cooperation (JBIC). He has a MSc in Social Policy and Development with a distinction from the London School of Economics and Political Science (LSE).

**Marito Garcia,** PhD
Darden School of Business
Center for Global Initiatives
University of Virginia, USA

Dr. Marito Garcia is currently fellow and adjunct faculty at the Darden School of Business, University of Virginia, USA. He is currently senior consultant on education and digital transformation to the World Bank and Asian Development Bank. Dr. Garcia is an economist and has published several books on education, labor, and consumption economics while at the World Bank where he was a lead economist and regional manager for the education sector for the Latin America Region.

**Arjuna Nanayakkara**

Director, The Sri Lanka Association for Software Services Companies (SLASSCOM)

CEO – GTN Technologies & Head of Shared Services – GTN Group

Arjuna Nanayakkara is the CEO of GTN Technologies Sri Lanka and the Global Head of Shared Services of the GTN Group. Over the past two decades he has been a pioneer in building exceptional leadership teams and transforming organizations by formulating corporate and business strategies based on operational excellence, product engineering, business development and corporate restructuring.

He is a management accountant by profession, marketeer and qualified in computer science, design and engineering and has held strategic leadership and operational roles in the financial services, information technology, retail, leisure & hospitality and property development industries over the years.

In addition to his corporate responsibilities, Arjuna is a director of SLASSCOM and Trace Expert city, a board member of the Council for Business with Britain and an industry advisory board member of the SLTC Research University.

# KEYNOTE ABSTRACTS

## Digital Transformation Readiness of Sri Lanka Higher Education

Ryotaro Hayashi
Social Sector Economist, Asian Development Bank

Sri Lanka made a remarkable transition to online higher education soon after the COVID-19 pandemic. Providing free internet access to university web servers during the initial pandemic period was instrumental for this change. Online higher education also became a lifeline for students to continue higher education during the recent economic crisis. However, nation-wide online higher education survey results suggested challenges such as students' fatigue, poor internet connection and lack of access to digital devices. Increasing student migration requires structural higher education reforms to deliver quality courses with international recognition. The rising youth unemployment also calls for new digital approaches in higher education to align with industry demands by using high frequency data. Changing the mindsets and attitudes of all stakeholders is critical to reimagine higher education under unprecedented crisis in Sri Lanka.

## Towards a New Framework for Digital Transformation: Options for Sri Lanka's Higher Education

Marito Garcia, PhD
Darden School of Business Center for Global Initiatives, University of Virginia, USA

The keynote presentation will discuss new frameworks in addressing the challenges in higher education through digital transformation. This will unpack the meaning of new digital learning models and how these will benefit higher education in Sri Lanka in a meaningful way. The speaker will present the international experience with these new digital transformation frameworks for example from India, Indonesia, the European Union and the US. As part of this discussion the speaker will elucidate on the digital touchpoints as experienced in the journey of the learner/ student as they go through the schooling cycle, as well as the digital touchpoints in the journey experienced by teachers and faculty. Arising from the international frameworks developed, the speaker will discuss eight (8) drivers of digital transformation for higher education institutions and how these can define the digital transformation maturity in universities and colleges in the country.

**Transforming to a digital wave**

Arjuna Nanayakkara
Director, The Sri Lanka Association for Software Services Companies (SLASSCOM)
CEO – GTN Technologies & Head of Shared Services – GTN Group

The world experienced phenomenal change over the past few years, with paradigm shifts in almost every area of life due to disrupters introduced by COVID-19. Education is no exception to this change as we all experienced adaptation to new delivery models, concepts, and techniques as a choice we consciously take or with no choice due to necessity.

We have experienced a demand for new skills in multiple industries and segments. The change is seen and an upskilling and reskilling uphill challenge while shuffling the most demanded skills with a new equilibrium between humans vs machines. artificial intelligence, machine learning, and data science driven skills have enhanced in value while repetitive volume-based skills have moved to machines.

We have encountered permanent change, and digitization of education is one we need to endorse as an opportunity rather than a crisis to manage. This is a call to a rise to the occasion with intricate challenges prompting us to redefine our competencies while overcoming short and long-term challenges.

As we speak, teaching concepts are changing, interactive learning is moving to new dimensions, and new competencies are being built across nations, schools, teachers and universities to capitalize on opportunities. Online platforms have developed competencies at the global level and delivered volumes beyond physical formats. Most of the new entrants in digitized models have outperformed conventional models in leaps and bounds.

Sri Lanka has over 90% literacy rate as a nation because of free education that elevated us to a competitive platform on a global index. Is this enough for us to sustain ourselves in the modern age? How would we compare on a global scale? Can we adopt a national digitization strategy to develop education to compete with the new global competencies on content and delivery methods?

It is inevitable that we define short to long-term strategies in defining this space that will impact every single area of how education is positioned, defined, and delivered. Digitization will touch

society from rural to urban lifestyles while remodeling primary to graduate education. It will also demand upskilling and reskilling of professionals in the education sector. These are all opportunities to convert existing weaknesses towards new strengths as risk mitigation strategies for nations and educational institutes.

The keynote address attempts to highlight these opportunities available in the prevailing environment challenges to overcome and project a vision that can reposition competitiveness of education as a global brand for Sri Lanka.

## PROGRAMME OF THE INAUGURATION CEREMONY

## 16th November 2022

| Time | Programme |
|---|---|
| 01.15 pm - 01.30 pm | **Arrival of Guests** |
| 01.30 pm - 01.45 pm | **Lighting the Oil Lamp**<br>**National Anthem** |
| 01.45 pm - 02.00 pm | **Welcome Address**<br>Snr. Prof. H. D. Karunaratne<br>Vice Chancellor, University of Colombo |
| 02.00 pm - 02.05 pm | **An Introduction to the Annual Research Symposium and official Launch of the Electronic Proceedings Book** |
| 02.05 pm - 02.15 pm | **Address by the Chief Guest**<br>Snr. Prof. Malik Ranasinghe<br>Chairman, Information Communication and Technology Agency of Sri Lanka |
| 02.15 pm - 03.30 pm | **Keynote Speeches**<br><br>Dr Marito Garcia<br>Fellow, and Adjunct Faculty,<br>Darden Business School, University of Virginia<br><br>Mr Ryotaro Hayashi<br>Social Sector Economist, Human and Social Development Division,<br>South Asia Department, Asian Development Bank<br><br>Mr Arjuna Nanayakkara<br>CEO – GTN Technologies & Head of Shared Services<br>GTN Group |
| 03.30 pm - 03.40 pm | **Cultural Event - Dance**<br>Students of Sri Palee Campus, University of Colombo |

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|---|---|
| 03.40 pm - 04.00 pm | **Felicitation of University of Colombo researchers ranked among top 2% scientists in the world in 2022** |
| 04.00 pm - 04.55 pm | **Felicitation of Senate Awardees of Year 2020 and Year 2021** |
| 04.55 pm - 05.00 pm | **Vote of Thanks**<br>Prof. K. P. Hewagamage<br>Chair, Annual Research Symposium 2022 |
| 05.00 pm - 06.00 pm | **Networking and Refreshments** |

# Faculty of Arts

***From Coping to Improving: The Role of Humanities and Social Sciences in Crisis Contexts***

16th December 2022

## MESSAGE FROM THE DEAN

**Senior Professor Lasantha Manawadu**
Dean
Faculty of Arts
University of Colombo, Sri Lanka

It gives me great pleasure to write this message for the Annual International Research Conference of the Faculty of Arts (IConArts 2022), which is the flagship event in the academic calendar of the Faculty.

This year's conference, held under the theme "From Coping to Improving: The Role of Humanities and Social Sciences in Crisis Contexts", includes presentations that showcase the critical role played by the Humanities and the Social Sciences in defining the future of our country facing multiple, unprecedented challenges. Having been resilient throughout COVID-19 and the economic and social challenges that followed the pandemic, the academic community has devised innovative and ingenious strategies to ensure the continuity of education in a time of crisis. In such a context, this year's conference will become a platform to share and discuss the impacts of these personal and shared strategies of survival. In the wider context, it will produce much needed knowledge to prepare ourselves for future challenges.

This conference is the result of the contribution and commitment of numerous individuals. First of all, I would like to thank the Vice Chancellor of the University of Colombo, Senior Professor H.D. Karunaratne for his constant support and guidance to make this event a success. I would also like to express my sincere gratitude to the organising committee and the sub-committees of IConArts 2022, competently led by the co-chairpersons of the conference. I take this opportunity to thank the keynote speaker for graciously accepting our invitation. Administrative, technical, and support staff of the Faculty of Arts are thanked for their assistance in numerous ways. I also thank all those who submitted abstracts for the conference without which this event would not have been possible.

I would like to extend my best wishes to the organising committee members, presenters, and participants. I wish IConArts 2022 all success.

## MESSAGE FROM CONFERENCE CO-CHAIRPERSONS

**Dr. Darshi Thoradeniya**
Department of History
University of Colombo
Sri Lanka

**Dr. Bihimini Abeywickrama**
Department of English Language Teaching
University of Colombo
Sri Lanka

The International Conference of the Faculty of Arts of the University of Colombo (IConArts) is dedicated to the advancement of research in the Humanities and Social Sciences. This flagship event in the Faculty calendar brings together veteran scholars as well as promising young researchers who follow postgraduate programmes in the Faculty.

This year's Conference titled "From Coping to Improving: The Role of Humanities and Social Sciences in Crisis Contexts" focuses on the innovation and resilience demonstrated by the field of Humanities and Social Sciences amidst the myriad problems initiated or exacerbated by the COVID-19 pandemic and numerous other crises. The Conference will provide a platform for scholars from different academic disciplines to reflect on individual as well as shared challenges forced upon them and the strategies adopted to mitigate the impact of these challenges.

As Co-Chairpersons, we are delighted by the enthusiasm displayed by the academics as well as postgraduate students of the Faculty to participate in this seminal event. The Conference programme presents many innovative ideas and solid research results to foster interaction among researchers from the field of humanities and social sciences. In addition, the programme includes a keynote speech delivered by Professor Priyanvada Abeywickrama from San Francisco State University, USA, an illustrious alumna of the Faculty. Thus, we hope that the proceedings will serve as a valuable resource for research.

Putting together IConArts 2022 was a team effort. First of all, we extend 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. The organising committee members deserve special thanks for their effort in putting the programme together. The session chairs and abstract reviewers are commended for their invaluable contribution. We also would like to thank the non-academic staff members and numerous volunteers for their assistance on many tedious tasks.

We hope that you will find the IConArts 2022 programme interesting, thought-provoking, and enjoyable!

# ORGANIZING COMMITTEE

**Conference Advisors:**

Senior Professor H. D. Karunaratne, Vice Chancellor, University of Colombo

Senior Professor Lasantha Manawadu, Dean, Faculty of Arts, University of Colombo

**Co-Chairpersons:**

Dr. Darshi Thoradeniya, Department of History

Dr. Bihimini Abeywickrama, Department of English Language Teaching

**Conference Secretaries:**

Dr. Pavithra Jayawardena, Department of International Relations

Dr. Hasith Kandaudahewa, Department of International Relations

**Conference Assistant Secretary:**

Ms. Nadeesha Jayatunga, Department of Geography

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| Ms. Lilani Anuruddhika Dias Weerasinghe | Department of English |
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| Mr. Krishan Siriwardhana | Journalism Unit |

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| Ms. Saambaviy Sivaji | Department of English Language Teaching |

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| Ms. V. P. Nethra Senadhi | Department of Demography |

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| Ms. Charuni Gunathilaka | Department of Economics |
| Ms. Janani Perera | Department of Economics |
| Mr. H.V. Migara | Department of Demography |
| Ms. W.R.V. Wathsala | Department of Demography |
| Ms. P. Gayesha Bandara | Department of Demography |
| Ms. Upeksha Jayasuriya | Department of English Language Teaching |
| Ms. Sandaru Diwakara | Department of English Language Teaching |
| Ms. Nandula Perera | Department of English Language Teaching |

**Technical Support**

Mr. Dasun Karunanayake

Mr. Asithanjana Batuwanthudawa

Mr. Dakshina Dissanayake

# PROGRAMME
# INAUGURATION CEREMONY

| | |
|---|---|
| 9.00 am | Refreshments |
| 9.45 am | National Anthem and Lighting of the Traditional Oil Lamp |
| 9.55 am | Video Presentation |
| 10.15 am | Welcome Address by Dr. Darshi Thoradeniya<br>Co-Chairperson, IConArts 2022 |
| 10.20 am | Address by Senior Professor Lasantha Manawadu<br>Dean, Faculty of Arts, University of Colombo |
| 10.25 am | Address by Senior Professor H.D. Karunaratne<br>Vice Chancellor, University of Colombo |
| 10.30 am | Introduction of the Keynote Speaker by Dr. Bihimini Abeywickrama<br>Co-Chairperson, IConArts 2022 |
| 10.35 am | Keynote Address by Professor Priyanvada Abeywickrama<br>Department of English Language and Literature,<br>San Francisco State University, USA |
| 11.15 am | Vote of Thanks by Dr. Pavithra Jayawardena<br>Secretary, IConArts 2022 |

Parallel Technical Sessions

11.30 am – 4.00 pm

* Programme times are listed in Sri Lankan Standard Time (UTC +5:30)

# INTRODUCTION TO THE KEYNOTE SPEAKER

**Professor Priyanvada Abeywickrama**
Professor of English
Department of English Language and Literature
San Francisco State University
USA

Dr. Priyanvada Abeywickrama is Professor of English in the Department of English Language and Literature at San Francisco State University, and coordinates the TESOL MA program. She teaches graduate courses in second language listening and speaking and curriculum and assessment development. Dr. Abeywickrama also coordinates the Composition for Multilingual Students Program that serves both domestic and international multilingual learners. In addition to coordinating, she also teaches writing and oral communication to undergraduate multilingual students. Dr. Abeywickrama is also the Chair of the Graduate Council which serves as an advisory body to the Dean of Graduate Studies at SF State and other university administrators on matters related to graduate studies.

Dr. Abeywickrama's research combines language assessment with issues in second language literacy and oral skills. More recently, her interest has been on classroom-based assessments that focus on assessment *for* learning. A secondary area of research is discourse analysis; specifically, codeswitching. She frequently presents her research at the annual conferences of International TESOL, the American Association for Applied Linguistics, and the Language Testing Research Colloquium (LTRC). Dr. Abeywickrama is co-author with H. D. Brown of *Language Assessment: Principles and Classroom Practices,* 3rd ed. (Pearson, 2018).

# ABSTRACT OF THE KEYNOTE ADDRESS

## Professor Priyanvada Abeywickrama

**Teaching and Learning during COVID-19: Challenges and Opportunities**

With the spread of COVID-19 worldwide, in early 2020, most universities and many school systems around the United States and across the globe switched learning to a remote delivery format to maintain instructional continuity and ensure the safety of the community in the face of the pandemic. This abrupt transition to online education, however, created unprecedented challenges for educators, who were forced to adjust to remote learning with little to no time to prepare. This sudden remote teaching is, however, different from actual planned online teaching (Hodges et al., 2020). What teaching staff were being asked to do was not typical online teaching but what has been termed 'online triage'.

Educators across the globe relied on a variety of virtual environments for both presenting content and creating classrooms. These include Learning Management Systems (LMS), such as CANVAS, WebCT Vista, Blackboard and MOODLE; video conferencing technologies like Skype, ZOOM, Microsoft Teams, GoToMeeting and WhatsApp; and for doing collaborative work, Google Docs, Mind map, Padlet among many others. While many of us made the sudden pivot, early studies (Aristovnik et al., 2020; Marek et al., 2021; and Tang et al., 2020) suggest that both faculty and students experienced unique hardships due to the swift transition to virtual learning and online classes.

Probably what became obvious and stood out across the globe was student access to digital devices for learning and millions of families' lack of (high-speed) internet at home. These gaps in basic technology access are particularly stark along socioeconomic lines even in developed countries. Although many of us use the term online instruction, what we did was a move that represents emergency remote instruction which is different from a planned online class. Educators were forced to rethink content, pedagogy, student interaction, assessments in virtual spaces. In short, faculty's job demands increased tremendously and they had to invest more physical, mental, and psychological efforts to meet the expanded job demands. Students fared no better. Their engagement was impacted by the quality of the content, the social support for learning online and their own self-efficacy.

We are slowly recovering from the impacts of COVID-19 and now moving back to in person teaching. We have learned a lot from our experience of teaching online and also recognize that we cannot go back. What this entails is a need to look forward and reconceptualize education. The rethinking should not be about improving education, but should focus on the what, how, where, who, and when of learning. The pandemic has created a unique opportunity for educational changes that were being discussed even before COVID-19 but were never fully realized. It is incumbent upon all educators to use this crisis-driven opportunity to examine every aspect of education from curriculum to pedagogy, from teacher to learner, from learning to assessment, and from location to time.

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# Faculty of Education


## *Digital Transformation and Best Practices in Mitigating Challenges in Education*

25th November 2022

## MESSAGE FROM THE DEAN

**Dr. L. M. Kapila Bandara**
Dean,
Faculty of Education
University of Colombo, Sri Lanka

It gives me great pleasure to send this message on the Annual Research Symposium - 2022 of the University of Colombo. The Faculty of Education actively contributed towards this vital annual academic event by holding its 2nd International Research Symposium - EDIRS 2022 on 25th November 2022 under the theme of "Digital transformation and best practices in mitigating challenges in Education". Two eminent scholars from University of Strathclyde, Glasgow, UK and Beijing Normal University, China delivered keynote speeches on this theme this year.

Innovations and new scientific knowledge pertaining to digital transformation are essential for the field of education in Sri Lanka to address the unresolved issues and to move forward despite emerging challenges. The findings of more than 35 research studies which were conducted by the researchers of various educational institute in Sri Lanka as well as other countries are disseminated at this Symposium. I strongly believe that this Symposium will be a forum for creating a novel discourse on educational research. Also, it will contribute to increasing enthusiasm towards research among young researchers in Sri Lanka.

I take this opportunity to extend my sincere gratitude to the chair and co-chair of the Annual Research Symposium- 2022 of the Faculty of Education, and all those who contributed towards the success of this event to make it a reality. I congratulate all the presenters and wish them success in their future endeavours. Finally, I convey my best wishes for a successful Annual Research Symposium in 2022.

## MESSAGE FROM SYMPOSIUM CHAIR

**Dr. S. S. Dahanayake**

Symposium Chair – EDIRS 2022,

Faculty of Education

The second International Research Symposium of the Faculty of Education (EDIRS - 2022) will be held on 25th November 2022 at the Faculty of Education, University of Colombo via Zoom conferencing providing a platform to researchers of education-related disciplines to disseminate their findings, and engage in knowledge exchange and knowledge creation towards the development of education in Sri Lanka.

The theme of this International Research symposium is "Digital transformation and best practices in mitigating challenges in education", a timely theme to expand our insight into the research culture.

I am thankful to the Vice Chancellor Senior Professor H.D. Karunaratne for accepting our invitation to be the Chief Guest of EDIRS 2022. My thanks go to the Keynote speakers Dr. George R.S. Weir, University of Strathclyde, Glasgow, United Kingdom and Professor Indika Liyanage, Beijing Normal University, Hong Kong, Baptist University, United International College (UIC) in China.

I am thankful to Dr. Kapila Badara, Dean of the Faculty of Education for the guidance and support extended to make this event a success. I had an excellent team to organize the Symposium 2022 and I thank them sincerely. I especially extend my heartfelt gratitude to Ms. Jeevani Herath, the Co-chair of the Symposium and Dr. Lanka Wedikandage, the Secretary of the Symposium, for their support.

Finally, I would like to congratulate all paper presenters and wish them the very best in their future endeavors.

# ORGANIZING COMMITTEE

Dr. L. M. Kapila Bandara - Dean, Faculty of Education

Dr. S. S. Dahanayake - Symposium Chairperson/ Editor-in-Chief

Ms. Jeevani Herath - Symposium Co-chairperson

Dr. Lanka Wedikkandage - Symposium Secretary

Dr. D. V. K. P. Senevirathne - Head, Department of Science & Technology Education

Dr. H. M. Lalitha Kumari - Head, Department of Social Science Education

Mr. Chintaka Chandrakumara - Head, Department of Educational Psychology

Dr. S. Athirathan - Department of Social Science Education

Dr. E. S. Neranjani - Department of Humanities Education

Ms. E. Randeniya - Department of Educational Psychology

# PROGRAMME

| Agenda 25th November 2022 | |
|---|---|
| 9.00am-9.30am | Registration |
| 9.30am-9.45am | Inauguration of the EDIRS 2022<br>Digital Transformation and Best Practices in Mitigating Challenges in Education |
| 9.45am-9.55am | Welcome Address by the Dean of the Faculty of Education<br>Dr. Kapila Bandara |
| 9.55am-10.00am | Introduction to the Chief Guest – Dr. Lanka Wedikandage |
| 10.00am-10.15am | Address by the Vice Chancellor of the University of Colombo<br>Senior Professor H. D. Karunaratne |
| 10.15am-10.20am | Introduction to Keynote Speaker 1 – Professor Lakshman Wedikkarage |
| 10.20am-11.00am | Keynote 1<br>Digital Transformation and Best Practices in Mitigating Challenges in Education: Transforming Practice through Teacher Learning<br>Professor Indika Liyanage<br>Beijing Normal University-Hong Kong Baptist University United International College (UIC), Zhuhai, China |
| 11.00am-11.05am | Introduction to Keynote Speaker 2 – Ms. Jeevani Herath |
| 11.05am-11.45am | Keynote 2<br>A Story of Textual Analysis<br>George R. S. Weir<br>Department of Computer and Information Sciences,<br>University of Strathclyde, Glasgow, UK |
| 11.45am-11.55am | Vote of thanks - Chair – EDIRS 2022<br>Dr. S. Dahanayake |
| 11.55am-12.30pm | Break |
| 12.30pm -3.30pm | Panel Sessions |
| 3.30pm – 4.00pm | Tea Break and Conclusion |

# INTRODUCTION TO KEYNOTE SPEAKERS

**Professor Indika Liyanage**

Indika Liyanage (Ph.D) is Professor of English Language and Literature Studies at Beijing Normal University-Hong Kong Baptist University United International College (UIC), Zhuhai, China, and an honorary at Deakin University, Australia. Professor Liyanage's research and publications address issues relating to Teaching of English to Speakers of Other Languages (TESOL) and English language teacher education. He has strong established institutional and research connections that have achieved sustained socio-economic benefits for disadvantaged communities. Throughout his career he has aimed to empower students as knowledge-makers by engaging them in research and scholarly dialogue, and has been a doctoral (PhD) supervisor for many years. He has worked as an International Consultant on TESOL in the Pacific and is currently the Series Editor for Springer International's Multilingual Education Yearbook.

**Dr. George R. S. Weir**

Dr George R. S. Weir is a lecturer in Computer Science at the University of Strathclyde, where he has taught for over twenty years. He holds degrees in philosophy from the University of Glasgow and the University of Edinburgh. His academic research has focused mainly on Cybercrime, Security, Digital Forensics, Corpus Linguistics and Readability, and he has published extensively on these topics. He is General Chair for the Cyberforensics conference, held annually in the UK, and has research links to institutions in Australia, Canada, Japan and Sri Lanka.

# ABSTRACT OF KEYNOTE ADDRESSES


## Indika Liyanage

Beijing Normal University-Hong Kong Baptist University United International College (UIC), Zhuhai, China


### Digital transformation and best practices in mitigating challenges in education: Transforming practice through teacher learning

Technology is reshaping the organisational fabric of universities. This transformation of the processes of communication, recruitment, administration, teaching, and research is framed by a parallel transformation – that of education as a competitive market-oriented global industry. The digital revolution has not only facilitated the internationalisation of higher education, but it has also seen digital flexibility, responsiveness and innovation emerge as key determiners of institutional competitiveness in this market, and as benchmarks of performance. Change can also be unexpected and disruptive, and the recent/ongoing pandemic has brought into sharp relief both the limitations of more traditional models of higher education and the opportunities afforded by digital technologies.

Amidst these changes, the challenges facing the core business of higher education, teaching and learning, are many, and harnessing the opportunities of digital transformation requires a corresponding transformation of teaching practices. As educators, we know the importance of learning; and to navigate the challenges of the educational landscape we face and achieve best practice, it is imperative that individuals and institutions devote time and resources to the complex business of teacher learning.

The key to transformational teacher learning begins with understanding this complexity as an entangled process of recursive learning/practice inseparable from the complex world of a multiplicity of interactions with others, and with contexts both physical and non-physical - political, discursive, cultural, historical, and material. Learning/practice is a negotiated and collective activity, not an individual activity, and likewise agency is not exercised by the learner/practitioner alone, but distributed, not necessarily equally, among participants and throughout the context. To meet the challenges of digital transformation, institutions must pursue best practice through development and enactment of models of teacher learning based on this complexity of learning/practice as a dynamic, emergent activity that develops and transforms in unique, recursive relations with a multiplicity of factors.

**George R. S. Weir**
Department of Computer and Information Sciences,
University of Strathclyde, Glasgow, UK

**A story of textual analysis**

This is a personal tale of a computer scientist encountering and engaging with Applied Linguistics, a study area adjacent to the author's main field of teaching and research. The adopted strategy was to seek and develop techniques to explore the scope and potential for academic research and collaboration in that unfamiliar area. This initially took the form of search for suitable analytical tools, followed by relevant software development. Based upon emerging insights, textual analysis was adopted as a viable and valuable approach, with application to English language textbook analysis, readability measurement, steganography, management of explicit language, and techniques for corpus linguistics. Subsequent combining of quantitative analytical techniques with supervised machine learning exposed multiple application areas, including Extremist Web content, Web/Dark Web & Social media analysis and similar approaches in the context of Arabic textual content. An extensive publications list is testament to the value of such cross-fertilisation and the moral of this tale is that a broad research focus can enhance perspective and research potential. This case study reflects a belief that boundaries between subject disciplines are ultimately artificial. Interest in seemingly orthogonal subject areas, including engagement with academics native to otherwise alien disciplines, can generate significant research opportunities.

# ABSTRACTS

## Influential factors in interest of teachers who teach Tamil as first language towards professional responsibility

A. Paunanthie[1], T. Kalamany[2]

[1]Faculty of Education, University of Colombo, Sri Lanka

[2]Department of Education, University of Jaffna, Sri Lanka

Various factors influence the teaching of teachers as they have social bonds and personal preferences. With the development of technology, teacher roles have also changed changed. There are several factors that influence the interest of teachers' professional responsibility. This study has identified the influential factors and how they have influenced in the interest of teachers who teach Tamil as a first language towards professional responsibility in Type I and Type II schools in the Jaffna district. This is a mixed method survey study. 181 teachers and 25 principals are selected by stratified random sampling method, 5 Additional Directors - Tamil language and 5 In Service Advisors –Tamil Language are also selected by facilitative sampling to represent all five Education zones of the Jaffna district. Questionnaires with teachers, focus group discussions with principals and semi – structured interviews with Ads & ISAs are used to gather data. SPSS has facilitated analysis using t-test, ANOVA, factor analysis, mean and percentages. Accordingly, the influential factors are identified as teacher-related factors, school-related factors, peer teacher-related factors, student-related factors, department-related factors. Department-related factors and peer teacher-related factors are more influential than other factors. Teacher-related factors, student-related factors and school-related factors are influential in the medium level. Peer teacher-related factors have high influence. Student-related factors are of low influence.

Keywords: influential factors, interest, schools, teachers

**Interest of teachers towards professional responsibility who teach Tamil as first language**

A. Paunanthie[1], T. Kalamany[2]

[1]Faculty of Education, University of Colombo, Sri Lanka

[2]Department of Education, University of Jaffna, Sri Lanka

This study explores the interest of teachers who teach Tamil as first language towards professional responsibility. As the first language teaching influences the achievement of other subjects as well, it was expected that these teachers should have professional responsibility. However, a lack of this interest was reported in some forums. A mixed method approach was used in this study to explore the situation. The study sample comprised of 181 Tamil teachers who teach Tamil as a first language and 25 principals. Stratified random sampling was used to select the participants from Type I and Type II School of five educational zones in the Jaffna district. Five In-Service-Advisors (ISAs), and five Additional Directors (ADs) are also selected as convenient sampling representing all five Educational Zones. Questionnaires are used with teachers while focus group discussions are carried out with the principals. Semi-structured interviews are conducted with the ISAs and ADs for in-depth understanding of the problem. Quantitative data collected with the questionnaires are analysed using descriptive statistics, t-test, ANOVA, with the facilitation of the SPSS software. Significant differences in the interest of teachers towards professional responsibility are shown among the factors such as type of school, qualification, type of degree (internal or external), and Tamil as subject for degree. The factors gender, age group, civil status, teaching experience, residential place and mode of travelling have variation in the interest. Among the three levels of interest, namely high, middle and low, considering teacher-related, school-related and student-related factors, the interest of many teachers towards professional responsibility are spread over the middle range.

Keywords: first language, interest, professional responsibility, teachers

# An Investigation of Opportunities to Develop Soft Skills in the NCOE Primary Education Curriculum

B. L. J. W. C. Wijenayake[1], S. S. Dahanayake[2]

[1]Faculty of Education, University of Colombo

[2]Department of Humanities Education, Faculty of Education, University of Colombo

The purpose of this research is to develop the soft skills of NCOEs teacher trainees in order to produce a teacher professional who is suitable for the world of work by improving the soft skills in the teaching role. Thus, an appropriate program has been created for developing soft skills by studying the nature of opportunities available for developing soft skills in the primary syllabus using the Embedded Model. Our research objectives are identifying the soft skills that can be developed in the NCOEs primary curriculum, investigating whether the learning strategies are being used for developing soft skills in the implementation of the NCOEs primary curriculum, finding ways to implement the identified soft skills in teacher training and creating and implementing programs for developing soft skills in primary teacher trainees. The sample consists of 196 including presidents, vice presidents, lecturers, teacher trainees and academic boards of Ruwanpura, Maharagama and Wayamba NCOEs. Data collection and data analysis were based on mixed method and descriptive analysis. Data collected through the tools - questionnaires, content analysis, interviews, observation - were analyzed through tables, percentages and median values. It was revealed that: there was a minimum number of soft skills included in the curriculum, learning strategies and activities have not been used for developing soft skills, there was no a relationship between evaluation and soft skills and the least amount of soft skills are developed during teacher training. Recommendation is: to include the above mentioned seven soft skills in the primary curriculum and to implement programs to develop soft skills, increasing the duration of soft skills in the curriculum, and an intervention of the NCOEs administration in a positive manner.

Keywords: Soft skills, Embedded model, Curriculum, National College of Education

**Quantity vs. quality of participation: Stakeholder perceptions about school based participatory decision making in Sri Lanka**

C. P. W. Malepathirana

School of Education, Victoria University of Wellington, New Zealand

The study focused on identifying stakeholder perceptions about the quality of their participation in school-based participatory decision making (PDM). As the literature maintains that the quality of adequate stakeholder participation in Sri Lankan public school governance is questionable, the study examined the perceived reasons behind the stakeholder participation in school decision making. Based on a questionnaire survey (n=62), individual and focus group interviews conducted among the principals, teacher, parent, and past pupil representatives of school governing committees of public schools in Colombo, Sri Lanka, the study attempted to answer following research questions; (i) what are the perceived levels of stakeholder participation in Sri Lankan school decision making? (ii) what are the perceived reasons behind the levels of stakeholder participation in Sri Lankan school decision making? (iii) what are the challenges faced by stakeholders in participating in Sri Lankan school decision making? The majority of internal stakeholders perceived that their participation in school-based PDM is influential in most of the school decisions whereas the external stakeholders often perceived that their participation is limited to consultation in many school decisions. Based on the stakeholders' level of expertise about school decisions, bureaucratic influence, trust and loyalty towards other stakeholders, and statutory requirements, the majority of the participants were satisfied with the current arrangement of school-based PDM. Lack of proper training and education regarding school decision making, time and budget constraints, lack of support from authorities to translate policies into action, overburdened role of the school-principals and lower educational and socio-economic levels of school community members were identified as the challenges faced by stakeholders in participating in school-based PDM.

Keywords: Participatory decision making, levels of participation

**Factors affecting Activity Based Learning of G.C.E. Advanced level students to promote Sustainable Development Goals: A Critical Review**

H. D. A. Seneviratne[1], D. V. K. P. Seneviratne[2]

[1]Faculty of Education, University of Colombo

[2]Department of Science and Technology Education, Faculty of Education, University of Colombo

Sustainable Development Goals (SDGs) are compartmentalization of sectors that provide a holistic and multidimensional view on development to transform our world to ensure well-being, economic prosperity, and environmental protection. Sustained society can be achieved through education by developing knowledge and attitudes of the young generations towards SDGs which in turn will lead to favourable behaviour. However, extant researches have emphasized that the level of awareness, knowledge, and attitude towards the SDGs are not satisfactory not only among school children but also in society. Furthermore, the presence of Activity-based Learning (ABL) in the Sri Lankan classroom is also questionable. This study critically reviews positive and negative factors affecting the ABL of G.C.E. Advanced Level students to promote Sustainable Development Goals through multiple sources such as educational reports, text books, research papers, e-journals and related articles. Extant literature reveals that the examination-oriented mentality of senior secondary school students, lack of funds, lack of physical space in schools to carry out SDGs related programmes, the principals and teachers' perceptions reported inadequate on sustainability issues faced by the schools. Lack of learners' motivation, time constraints and a lack of teaching and learning materials and teacher centered approaches were also found to be negative factors in implementing sustainable development related ABL in schools which primarily aims at knowledge and attitude change. In contrast, the literature shows student-centered pedagogy, strong administrators, enthusiastic parents and past pupils, competent teachers, co-curricular activities such as sports, activities of environmental society, strong links with environmental agencies, special activities such as shramadana campaigns as positives in implementing ABL in the learning-teaching process of advanced level students to promote SDGs. This paper discusses the need for empowering school children with knowledge and attitudes towards SDGs considering the available resources and literature.

Keywords: Sustainable Development Goals, Activity-based learning

**Developing Essential Learning Skills in First Key Stage Students Through Online Education**

I. Perukanda[1], S. S. Dahanayaka[2]

[1]Faculty of Education, University of Colombo

[2]Department of Humanities, University of Colombo

In 2020 schools in Sri Lanka were closed due to the pandemic. The students who entered the first grade in 2020 can be mentioned as a group of students who were heavily affected. The students in that first key stage were a group of children who got a completely different experience from online education instead of classroom teaching. An that age students must achieve 48 essential learning skills. Evaluation reports showed that some of those essential learning skills were not achieved through online education. This research has been conducted to empirically investigate and identify new online methodology for unreached essential learning skills. Many studies have shown how mobile games, video shows, internet are being used for primary education and the effect on students' academic performance. By nature, any students above the age of five has a great interest in cartoons, computer games. This research investigates how that interest can be utilized for online education. The target population was students enrolled in first grade in the year 2020 and the sample was 34 students in a class of a 1C school in the Sri Jayewardenepura education zone. Based on the essential learning evaluation reports ten students were selected as the participation group and also five essential learning skills lessons were chosen from the subject of mathematics. Three online intervention programs were implemented for those five skills and for that program, PowerPoint related learning, video-based learning and computer/telephone game-based learning had been used. Through that action research post-intervention evaluation showed that most of students in the intervention group were able to reach the target proficiency level. Also, the ability to keep the students' attention throughout the lesson, the enthusiasm and activity of the students was evident in the active research. This was confirmed by the teacher who was previously involved in online education.

Keywords: Essential learning skills, First Key Stage, Evaluation report, Online Education

**Investigating the comprehensiveness of sexuality education curriculum in sri lanka**

M. P. S. A. Jayantha[1], Chinthaka Chandrakumara[2]

[1]Zonal Education Office, Balangoda.

[2]Department of Educational Psychology, Faculty of Education, University of Colombo

According to UNESCO et al. (2018), Comprehensive sexuality education (CSE) is a curriculum-based process of teaching and learning about the cognitive, emotional, physical and social aspects of sexuality. The belief of the international human rights bodies is that the children and youth of the society have the right to obtain accurate, scientifically reasonable, detailed and culturally sensitive sexuality education in accordance with existing international standards. The subject of school-based sex education in Sri Lanka is controversial, and the failure to provide CSE to the students has resulted in severe consequences. The purpose of this study was to identify the key components of CSE and determine how the CSE components are formulated and implemented in the Sri Lankan school context. A discriptive content analysis was carried out to review 5 Teachers' Instructional Manuals and 18 text books using a standerdized assessment tool (SERAT). The findings show that the intervention is not sufficient to cover all eight of the CSE core concepts recommended by UNESCO et al. (2018). The basic concepts have focused more on sexual and reproductive health, health and well-being skills. Sexual rights, sexual citizenship, and happiness did not appear to be adequate in the core curriculum. The curriculum was knowledge-biased, and it failed to provide suitable facilitation on affection and sexuality skills. Although students aged 12-15 received a moderate amount of CSE, the content did not satisfactorily address the youngest (5-8) and oldest (15-18) age groups. Further long-term follow-up studies are needed to review the comprehensiveness sexuality education. In essence, this study offers a timely assessment of school-based sexuality education in Sri Lanka, as well as recommendations for reform and improvement of the intervention.

Keywords: Comprehensive Sexuality Education, Curricilum, Sri Lanka

**Teacher Self-efficacy in teaching Electronics in Grade 11 Science curriculum in Sri Lanka**

N. V. D. P. Priyadarshani, D. V. K. P. Seneviratne

Faculty of Education, University of Colombo, Sri Lanka

Electronics is a subject content of science in grade 11 and it provides practical and theoretical knowledge of electronics. The problems related to the instructional process of teaching Electronics in secondary classrooms reported mainly due to the lack of teachers' competency and Self-efficacy. This study attempted to determine the teacher's self-efficacy in teaching electronics along with their demographic variables of academic qualification in teaching Electronics, teaching experience and the school type. This research employed mixed methods for science teachers of grade 11 of state schools in the Homagama educational zone of Western province in Sri Lanka. The data gathered using questionnaire and interviews were analyzed using SPSS and content analysis. The findings on respondent's academic qualification revealed that 35% of teachers with Postgraduate Diploma, 33% with general Degree and 35% with Special Degree. The majority (68.4%) reported with more than five years of teaching experience. However, 54.4% of teachers were with more than five years of teaching experience in teaching Electronics. Teachers in 1AB type of schools was the most confident (M = 3.44, SD= .629) in terms of their capability while 1C school type teachers appeared to be the least confident (M=3.0, SD=.816). Domain wise, Type 2 school teachers reported to be the most confident for the efficacy in student engagement (M = 3.32, SD=.871) while the least confident group was from 1C school type (M= 2.9, SD=.738). With respect to efficacy in classroom management, it found the highest mean score among Type 2(M=3.45, SD=.995) while the least mean score among the type 1C (M= 3.2, SD=.919). In contrast, the teachers belonging to 1AB type of schools found to be with high belief in their ability in instructional strategies (M = 3.62, SD=.719) while type 1C reported the least efficacy (M= 3.1, SD=.994). One-way ANOVA results revealed no statistically significant difference in teachers' total self-efficacy among and between the school types (F (2, 54) = 0.934, p = .399).

Keywords: Electronics, Self-efficacy, Student engagement, Classroom management, Instructional strategies

# Students' Performance in Van Hieles levels of Geometrical Thinking in Secondary Schools in Jaffna

N. Prashanthan[1], P. K. J. E. Nonis[2]

[1]Faculty of Education University of Colombo, Colombo

[2]Senior Lecturer, Department of Science and Technology Education, Faculty of Education, University of Colombo, Colombo

Geometry concepts are very essential to the study of mathematics and geometrical thinking. In this regards Van Hiele's theory helps both students as well as teachers to develop geometrical thinking by creating a much simpler environment in teaching and learning geometry. Since the Van Hiele levels of thinking offers an explanation and a remedy for student difficulty with higher-order cognitive processes, the purpose of this study was to analyse the performance of Van Hiele's level of geometry of senior secondary students in Jaffna district. A mixed methods design was used in this study. A sample of 379 students, 50 teachers, in-service advisors of mathematics, additional directors of mathematics and subject coordinators of mathematics was drawn from Jaffna district. Data for the study was collected through questionnaire, interviews and a geometry achievement test which includes all five levels of Van Hiele's theory. In analyzing process, quantitative data were analyzed with descriptive survey and qualitative data were analyzed with thematic analyzing techniques. Findings of the study revealed that the students' performance in Van Hieles levels of geometrical thinking in senior secondary students is poor. Furthermore, it was also revealed that the first two levels of geometrical thinking were achieved successfully by senior secondary students. From the third level they began to struggle and in level 4 and 5 their performance was poor.

Keywords: Van hieles levels, geometric thinking, concepts, higher-order cognitive processes

**Challenges Facing the Teacher Professional Development Centre in the Implementation of the Efficiency Bar Examination Programme for Teachers**

P. Sivananthan

Department of Social Science Education, University of Colombo

Several programmes have been implemented in Sri Lanka to develop the teaching profession. Opportunities have been created to improve the teaching profession through new teacher service minutes through modules. A teacher to be promoted from one class to another, he or she must pass the efficiency bar exam. It is conducted as a course to complete the modules prepared for each class. The course for completing a module of 20 hours is conducted over a period of 3 days. This module course is organized by the Teacher Education Administration Branch of the Ministry of Education and is conducted by the Teachers professional Development Centre in each Education Zone. The main purpose of this study was to identify the challenges faced by the Teacher Professional Development Centre in Northern Province in implementing this course effectively. This study was conducted based on descriptive survey design. Questionnaires and interviews were used to gather data from the 14 managers of these centres and 13 deputy directors in each educational zone. A descriptive analysis method was used to analyze the data. The following results have been obtained. The managers faced huge challenges in conducting this programme effectively due to physical and human resources were limited and insufficient. Due to the recent reduction in funding for this course, managers faced challenges in paying resource persons. Also, they faced administrative challenges as classes had to be conducted on weekends and after school. Also, they faced administrative challenges in conducting classes on weekends and after school and getting information about teachers' classes and grades.

Keywords: Teaching Profession, Efficiency Bar Examination, Teacher Professional Development Centre.

**Inclusive education, implementation and its impact on the self-concept of the students with special educational needs: A review of literature.**

R. A. B. U. I. Perera, W. Chandradasa

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

The inclusion of students with special educational needs in regular mainstream classrooms has been a focal point of debate in education systems across the world (Schemit, 2008: Zakaria, 2017). Inclusive education is a new approach to educating children with disability and learning difficulties with those with normal ones under the same roof ( Singh,2016). It serves as the primary strategy to achieve education for all concepts put into attention in Jomtien, Thailand. This article is a literature review related to ongoing research titled "Impact of inclusive education on the self-concept of the students with special educational needs." Research papers, e-journals, educational reports, books and related articles have been analyzed to identify the themes related to the topic. Structurally, the article first establishes the concept of inclusive education with strong evidence based on scholarly articles discussing the main aims and features of inclusive education. Then the theoretical perspective of inclusive education is presented by reviewing the theories related to inclusive education. Finally, the impact of inclusive education on the self-concept of students with special educational needs was given based on strong empirical evidence. The literature emphasizes that inclusive education is presented as an ideology that guides practice to respect the right of all learners to quality education. It aims to remove all the barriers and equip the students with special educational needs with skills that can be utilized in their life. Lev Vygotsky's sociocultural development theory emphasizes that social interaction and cooperation with peers at school are essential in their development. Self-concept is an individual's perception of their worth and is valued as a desirable outcome in many educational and psychological situations. The empirical studies examining the self-concept of students with special educational needs yielded mixed results. Some studies indicated lower self-concept among students in inclusive settings while reporting higher self-concepts in some domains.

Keywords: Inclusive Education, Self-concept, students with special educational needs

**Domain Factors Affecting Learning and Teaching Process of Mathematics of Type II Schools in the Jaffna District**

V. Balamurali[1], S. Athirathan[2]

[1]Faculty of Education, University of Colombo

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

The learning-teaching process is one of the various factors that influence student achievement. Schools and teachers both face various challenges as part of the process. The challenges mentioned above are one of the reasons why learning and teaching activities are ineffective. Mathematics is an essential subject in the secondary school curriculum in Sri Lanka. Unfortunately, the student achievement level in Mathematics is not satisfactory in type II schools in Jaffna District. So far, there have been no studies on the learning and teaching process of Mathematics in type II schools in the Jaffna district. The purpose of this study is to examine the opinions of students concerning the elements that affect the learning and teaching process of Mathematics in secondary schools in the Jaffna district. Survey research design and Quantitative dominant mixed method were adopted. Thirty schools were selected as the sample using the Systematic Sampling technique from 83 type II schools with G.C.E Ordinary Level in Jaffna, Valikamam, and Thenmaradchi education zones. Focus group discussions with selected students were implemented. Data were collected by questionnaire from 341 senior secondary students who were selected by Stratified random sampling technique. The Data were analyzed by factor analysis. The results revealed that the domain factors which affect learning and teaching process of Mathematics are 1) Teacher's and Students' roles and Attitudes, 2) Students' personal background, and 3) External aids and support.

Keywords: Factors, Affecting, learning-teaching, Mathematics.

# School Based Management and National Competency Framework for School Leadership and Management of Sri Lanka: A Comparative Perspective on Consistency in Policy and Practice in terms of Accountability

V. Vijayabskar, L. M. K. Bandara
Faculty of Education, University of Colombo, Sri Lanka

This study examines the two recent policy initiatives: the Enhanced Program for School Improvement (EPSI) which is the Sri Lankan version of School Based Management (SBM) and the National Competency Framework for School Leadership and Management (NCFSLM) a framework for evaluating the managerial competencies of principals, to identify the conformity of the two initiatives in structuring the managerial system and functions of schools. Multiple case study design was used to explore into the problem and explain the findings. Four school cases were selected through a purposive variant sampling technique from Jaffna district. Results reveal that SBM and NCFSLM , had very close conformity in the guidelines of circulars as the both policies had the same objectives. SBM and NCFSLM are effective policies to improve the managerial functions of the schools and their guidelines to the school management are complying and mutually augmentative. Though, both policies have gaps in demarcating the accountability of the school programme. As a result, the accountability for quality school outcomes was not properly assigned to the school level actors while the principals become solely accountable for the entire school process and performances. Such conditions contradict with the participatory management approach of the SBM. While the NCFSLM views the principals as executive leaders of schools and are solely accountable for the outcomes of the school process. This approach of evaluating the principals' competency also confronts with the accountability of shared leadership and participatory decision making of SBM.

Key terms: school based management, Accountability, National Competency Framework for School Leadership and Management, Enhanced Program for School Improvement.

# Faculty of Graduate Studies

***Developing Human Capital Through Informatization and Digitalization***

14th November 2022

## MESSAGE FROM THE DEAN

**Professor A. A. Azeez**
Dean,
Faculty of Graduate Studies, University of Colombo

It is with great pleasure that I write this message for the Annual Research Symposium 2022 of the University of Colombo. The Annual Research Conference of the Faculty of Graduate Studies (FGS) will be held on 14 November 2022 on the theme "Developing human capital through informatization and digitalization" in keeping with the overall objectives of the University Symposium. Abstracts were called from academics and postgraduate students under the tracks of Business Management and Economics, Information and Communication Technology, Education and linguistic studies, Environmental Management and Sustainability, and Psychology and Sociology to accommodate the multidisciplinary nature of postgraduate studies and research offered by the faculty. After the review process, a total of thirty two abstracts were selected for presentation at this year's research sessions.

The Annual Research Conference is especially significant for the FGS because it provides an opportunity for academics, researchers from the industry and postgraduate students to showcase their research and engage in discussions on varying interdisciplinary themes. Our postgraduate students from different programmes are also taking part by presenting their research findings in the proceedings. This will enhance the quality of postgraduate research through sharing new knowledge and best practices at the FGS. The conference participants will get an added advantage of networking with renowned scholars in the field locally and internationally.

In this context, I thank Professor (Dr.) B. Hareendran from Bharata Mata Institute of Management, India for accepting our invitation to be the Keynote Speaker at this event. I take this opportunity to place on record my appreciation of the hard work done by the conference co-chairs, programme coordinators, and staff of the FGS for organizing the Annual Research Conference 2022. I am confident that this year's conference will be memorable for its quality of research, enhancing the research progress of the faculty and the human potential of our nation in the future. Further, I congratulate the presenters and wish them all the best in their future endeavors.

## MESSAGE FROM THE CONFERENCE CO-CHAIRS

**Dr. Rajitha Silva**

**Dr. Tharindu Ediriwickrama**

Conference Co-chairs,

Faculty of Graduate Studies,

University of Colombo

This abstract book includes the all abstracts of the extended abstracts presented at the Annual Research Sessions 2022, organized by the Faculty of Graduate Studies, University of Colombo. In total, there were over 60 papers and presenters. The conference was under the theme “Developing Human Capital Through Informatization and Digitalization”. There were four main tracks in the conference which are Business Management and Economics; Environmental Management and Sustainability; Education and Linguistic Studies; Information and Communication Technology. The Faculty of Graduate Studies was established in 1987 with a mandate to sponsor, coordinate and regulate postgraduate studies and specialized in multi-disciplinary research carried out within the University of Colombo. Our mission is to provide advanced knowledge at postgraduate level and create human capital for growth and development. To serve this purpose, conferences are organized along the lines of well-established and well defined disciplines. A conference of this magnitude couldn’t be realized without the tremendous and generous support of a multitude of individuals, special amongst whom is the Vice Chancellor, Senior Professor (Chair) H.D. Karunarathne and the Dean, Faculty of Graduate Studies, Professor A. A. Azeez without whose wisdom, perseverance, guidance and encouragement this conference would not have been a possibility. We would also like thank all the presenters, authors, members of organizing and academic committees and most importantly the staff of the Faculty of Graduate Studies for putting this conference together.

# ORGANISING COMMITTEE

## CONFERENCE CO-CHAIRS

Dr. Rajitha Silva

Dr. Tharindu Ediriwickrama

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R. M. G. Karunarathne

# PROGRAMME OF SESSIONS

| Agenda – 14th November 2022 | |
|---|---|
| 08:30 a.m. | Registration |
| 09:30 a.m. | Arrival of Guests |
| 09:40 a.m. | National Anthem and Lighting of the Oil Lamp |
| 09.50 a.m. | Welcome Address by Professor A.A. Azeez,<br>Dean, Faculty of Graduate Studies, University of Colombo |
| 10.00 a.m. | Address by the Chief Guest, Senior Professor (Chair) H.D. Karunaratne<br>Vice Chancellor, University of Colombo |
| 10.10 a.m. | Introduction to the Keynote Speaker, by Dr. Seuwandhi B. Ranasinghe,<br>Faculty of Graduate Studies, University of Colombo |
| 10.20 a.m. | Keynote Speech by Professor B. Hareendran,<br>Academic Director, Bharata Mata Institute of Management, Kerala, India |
| 10.50 a.m. | Vote of Thanks by Dr. Rajitha Silva, Conference Co-chair |
| 11.00 a.m. | End of the Inauguration Ceremony and Morning Tea |
| 11.30 a.m. | Commencement of Parallel Sessions |

| | | | | |
|---|---|---|---|---|
| | Track 01 – Business Management & Economics | Track 02 – Environmental Management & Sustainability | Track 03 – Education & Linguistic Studies | Track 04 – Information & Communication Technology |
| 12.30 p.m. | Lunch Break | | | |
| 01.30 p.m. | Continuation of Parallel Sessions | | | |
| | Track 01 – Business Management & Economics | Track 02 – Environmental Management & Sustainability | Track 03 – Education & Linguistic Studies | Track 04 – Information & Communication Technology |
| 03.30 p.m. | Evening Tea and End of the Conference | | | |

# TRACK 01

# BUSINESS MANAGEMENT AND ECONOMICS

# ABSTRACTS

## Impact of Government intervention on Kithul Production in Mawathagama

K. P. P. V. Rathnapriya, H. N. Liyanage, T. P. G. W. D. Guruge
University of Colombo

Kithul (*Caryota Urens*) tree belongs to the family Palmae and grows in the wet zone of the country. The sap extracted from Kithul inflorescence is used for a vast number of highly demanded products such as treacle, jaggery, toddy, and vinegar with their indigenous medical values and especially anti-diabetic properties. Kithul is important in the regional development aspect, being a traditional agro-based cottage industry with low initiation cost and high return, which has vast potential to expand and lead to reducing rural poverty and income inequality. There is a considerable gap between the supply and demand for genuine Kithul products in local and export markets, and the government has already made some interventions to develop the industry. The Kithul industry is found in four Grama Niladhari divisions in Divisional Secretariat Division - Mawathagama. Though many government officials in the development sector have introduced new techniques to the industry, the community has not shown adequate progress. This research chooses to investigate factors involved in both parties not performing as expected and recommend measures to overcome them. Survey areas in the GN divisions were selected through convenience sampling as the Kithul industry is limited to a few GN divisions in the DSD. After identifying the most appropriate three GN Divisions, again convenience sampling was used for selecting informants for proceeding with the questionnaire. The survey was performed on 58 individuals in three GN divisions. Data analysis was done with mixed methods. Content Analysis was carried out with the information gathered from the Key Informant Interviews and focus group discussions. Information gathered through the questionnaire survey was analyzed using the quantitative method with tabulation, graphical presentation, econometric tools, and correlation. Three independent variables of Government intervention in Knowledge, Marketing, and Regulating were tested against the dependent variable of Kithul Production in Mawathagama. It is identified that there is a medium-level relationship between Government intervention in knowledge enhancement and Kithul Production in Mawathagama, a weak relationship between Government intervention in marketing and Kithul production in Mawathagama, and no relationship between Government intervention in regulating and developing Kithul production in Mawathagama. Considering the hypotheses, it

reveals that Government intervention does not significantly affect the Kithul industry in Mawathagama. Therefore, it is recommended to enhance the government intervention in the Kithul industry in all three aspects of Knowledge, Marketing, and Regulating measures with proper usage of ICT, which meets the changing needs of the modern customer, to achieve the goal of regional development.

Keywords: Government interventions, Information communication technology, Kithul industry, Regional Development, Rural economy

**Impact of Economic Crisis on Micro-Entrepreneurs in Chavakachcheri Division, Jaffna District**

N. Sathyaruban

Due to the economic crisis that has plagued the country for the past three years, Sri Lanka has faced its greatest challenge ever. The ongoing economic and political issues in Lanka are currently characterized by high inflation and sporadic protests around the country. Small and medium-sized enterprises (SMEs) are essential to Sri Lanka's economy today because they provide equitable growth consistent with peacebuilding. Policymakers intentionally employ micro-entrepreneurship to uplift (post)conflict-affected people and support local economies. The growth of the country's socioeconomic system is heavily dependent on micro, small & medium enterprises (MSMEs). MSMEs are the backbone of the economy, contributing an estimated 52% of the gross domestic product (GDP). According to estimates, MSMEs in Sri Lanka are thought to be responsible for 45% of all jobs and 90% of all non-agricultural enterprises. In the non-agricultural sector, there are 1.028 million SMEs that employ nearly 2.265 million people, according to the Economic Census 2017/19 of the Department of Census and Statistics of Sri Lanka (DCSSL). The purpose of the study is to investigate the impact of the current economic crisis and recession on the micro-enterprises in the Chavakachcheri division in the Jaffna district. Semi-structured interviews were conducted with 30 conveniently chosen male and female micro business owners to gather data. Findings show that 18% of micro-entrepreneurs had temporarily shut down owing to fuel shortages, particularly in food-based businesses. 34% of micro-entrepreneurs restricted operations due to raw material shortages, increased raw material prices, and decreased domestic and national demand for goods and services. Due to high production costs and poor customer demand, 60% of micro-entrepreneurs reduced their workforce by at least two employers, and 63% of micro-entrepreneurs had a reduction in annual turnover of over 75%. Additionally, 71% of micro-entrepreneurs are struggling with major issues, including paying back loans and interest, canceling orders, not having enough savings, having trouble getting employees back to work, not getting any new orders, etc. Several distinct factors impacted MSMEs; they are lack of fuel and gas (58%), the low purchasing power of the community (51%), frequent power failures (81%), frequent price increases for products and services (78%), and a lack of raw materials (42%). The study emphasizes the significance of providing adequate short- and long-term financial support to micro-enterprise owners, with the hope that this will improve their performance and enable them to contribute to the country's economic progress.

Keywords: demand, economic crisis, GDP, Micro Small & Medium Enterprises

**The Factors that Influence the Consumer Purchase Intention on Instant Food Products- With Special Reference to Jaela And Kandana Area**

Sudarsha Kodithuwakku

Instant food products play a vital role in the Sri Lankan context owing to the busy lifestyle of its people. There are numerous brands and varieties of instant food items in Sri Lanka. Some of them are local products, and some have been imported from various countries. The instant food industry has emerged as a potential industry that can both help the economy flourish as well as ease the lifestyles of people. The focus of this research is to identify the factors contributing to consumer purchase intention of instant food products in Sri Lanka, with special reference to the urbanized cities of Kandana and Ja-ela areas. The sample size was 100 respondents in the Kandana and Ja-ela areas, and the primary data needed for the study were collected using a questionnaire survey. The research objectives were achieved using various statistical tools such as the Pearson correlation coefficient, and regression analysis. The findings show that awareness, lifestyle changes, and socio-economic background create significant influence, while education level makes less impact on the purchase intention for instant food products. Furthermore, consumers expect high-quality food products, low prices, and good taste to be the same as fresh food by consuming instant food products. Hence, it is recommended that to fulfill consumer expectations, there needs to be an increase in awareness of instant food items, and the consumption of instant food products should be induced. There are opportunities for local instant food producers to foster a good image of local brands by outpacing imported instant food brands.

Keywords: awareness, Consumer expectation, lifestyle changes, local brands, Urbanized cities.

**The Effect of Job Satisfaction on Employee Retention in the Insurance Industry: A study from ABC Plc.**

E. A. S. S. Ediriweera, K. W. K. Gimhani and S. G. C. S. Kumara

SANASA Campus, Kegalle

Employee satisfaction is a measure of how happy workers are with their job and working environment. In recent years, job satisfaction has become an area of interest among insurance professionals due to the high rate of turnover in insurance companies. Moreover, employee retention is a major concern in an organization's competitive advantage since it would have an impact on the organization's efficiency, productivity, and sustainability. In particular, employee retention is a process in which employees are encouraged to remain with the organization for a maximum time. Labor turnover has recently become a critical issue in the insurance industry, particularly in the Sri Lankan context. This study aimed to explore the level of job satisfaction's contribution to employee retention in the insurance industry. Fifty randomly selected insurance professionals from AIA Insurance Lanka PLC were selected for this study. A questionnaire was used to collect primary data, and secondary data, such as annual labor turnover, records on salary, incentives, and the number of days off, were obtained from the HR department of the company. The results revealed that there is a significant correlation between job satisfaction and employee retention. However, it was noticed that other factors such as employee rewards, training and development, and employee recognition were related to the intention to turnover in an insurance company. The study suggests that retention in insurance companies can be enhanced by increasing job satisfaction.

Keywords: Employee satisfaction, Employee retention, the Insurance industry

**The Right to Health of Passive Smokers: An Analysis of Public Health Policies in Sri Lanka**

W. G. Nadeesha Sewwandi

Faculty of Graduate Studies, University of Colombo

According to the World Health Organization, passive smoking causes 1.2 million deaths worldwide each year. Sri Lanka recorded a 10.8% rate of exposure to passive smoking in 2011, according to the non-communicable diseases risk factor study (NCDRS, 2015). Due to this problem, particularly vulnerable groups like children and women experience serious issues with violations of their human rights, particularly the right to health. Therefore, this study aims to outline the suggested measures for analyzing the current public health policies in Sri Lanka to safeguard the health rights of passive smokers. The data are gathered and analyzed using the doctrinal research design and primary and secondary sources. The primary sources, in this case, are legislation and judicial rulings. The data are gathered and analyzed using the doctrinal research design and primary and secondary sources. Constitutions, statutes, cases, and regulations serve as the primary sources in this case, while legal dictionaries, textbooks, journals, articles, case digests, legal encyclopedias, and other materials serve as secondary sources. Since there hasn't been a thorough examination of the current policy framework, the researcher intends to evaluate domestic public health policies connected to passive smokers' right to health in Sri Lanka and how they affect the entire population. Future politicians and decision-makers can take care while enacting legislation to prevent disruption of the peace and breaches of human rights. Human rights information and analysis are crucial for early warning and focused action. It affects how national and international governments formulate policies, strategies, and operational plans to avoid, lessen, or deal with upcoming crises, including humanitarian crises and armed conflicts. As a result, this research provides an analysis that assists public servants, decision-makers, and other accountable parties in improving Sri Lanka's political, economic, and social conditions to meet this evolving society's demands.

Keywords: Human rights, Right to health, passive smokers, Public health policies, Sri Lanka

**Modeling the Impact of Population Aging on Economic Growth in Sri Lanka**

A. M. Shafna
University of Peradeniya

The economic growth of a country is one of the key determinants that determines the social well being of the nation or people. Numerous factors, both directly and indirectly, have an impact on the economic growth of a country. Among them, the aging population is considered to be the more important factor. In recent decades a lot of attention has been paid to the growing elderly population, which has become a global phenomenon. Sri Lanka faces the issue of shrinking the working-age population as a result of the rapid increase of the aging population in recent years. This study was undertaken with the main aim of understanding how the per capita output growth of Sri Lanka is influenced by the aging population. In addition, it also assessed the impact of total factor productivity growth, and capital deepening (capital-labor ratio) in per capita output growth. The Cobb-Douglas production function, Solow's growth accounting, and Leibfritz and Roeger's notion of demographic effects on the labor market served as the foundation for the analytical approach used in this research. Secondary panel data (a combination of cross-sectional and time series data) from the World Bank data source, the Central Bank annual report of Sri Lanka, and the Sri Lanka labour force survey were utilized to meet the study's objectives. The data were collected between 1960 to 2019. The evolution of labor market momentum was used to compute population aging, the widely utilized perpetual inventory method was used to create capital stock data and total factor productivity was assessed using the primal growth accounting approach. Further, to model the impact of an aging population, total factor productivity growth, and capital deepening on per capita output growth this study used a dynamic regression with an error ARIMA (Autoregressive Integrated Moving Average) model. The findings of the study revealed that the per capita output growth is positively influenced if the employment growth outgrows the total population growth. As a result, population aging has a negative effect on the per capita output growth of Sri Lanka. Also, capital deepening boosts per-capita output growth; as the capital-to-labor ratio rises, so does the economic growth of Sri Lanka. Likewise, the total factor productivity growth has a favorable impact on the per capita output growth; as total factor productivity growth rises, so does the economic growth of Sri Lanka. The findings of the study can be used to draw several policy implications for the betterment of our country as the government may take policy measures to combat this unfavorable development in output growth, including enhancing total factor productivity, encouraging labor force participation, increasing the rate of capital deepening, and promoting technological progress.

Keywords: Economic growth, total factor productivity, labour force, aging population, Time series model

**The impact of Logistic Service Quality on Customer Satisfaction in Omni-channel purchasing scenarios: Evidence from the Western province online consumers in Sri Lanka**

K. D. S. L. Karunathilake, R. A. D. R. P. Ranasinghe, Y. U. Manimelwadu and Maneesha Devindi and M. Weligodapola

The study is conducted to determine the impact of Logistic Service Quality (LSQ) on customer satisfaction in omnichannel purchasing scenarios which are Buy in Store Ship Direct (BSSD) and Buy Online Pick in Store (BOPS) in the Western Province of Sri Lanka. The LSQ impact on customer satisfaction in BSSD and BOPS purchasing scenarios is the research problem addressed in the study. Furthermore, only a few numbers of studies were found in this subject area and the main purpose of this study is to fill the identified gap. The objective of the study is to investigate how LSQ impacts customer satisfaction in BSSD and BOPS purchasing scenarios. LSQ is the desired quality that customers expect from logistical activities, and availability, condition, timeliness, order accuracy and information quality are the designated factors to measure LSQ. The study was carried out using the deductive approach and the population of the study was identified as the Western Province of Sri Lanka, as most of the retailing companies who are operating omnichannel platforms are in this region. A purposive sampling method was used, whereas the sample size was identified as 384 omni-channel customers. Through an online questionnaire, the required data were collected separately for BOPS and BSSD Omni-channel purchasing scenarios, and a 5-point Likert scale was used to evaluate the impact of collected data. To analyze the collected data regression analysis was used and a 95% confidence level was used as the significant rate. The results of the regression analysis discovered that timeliness, availability, and order accuracy significantly impact customer satisfaction in the BOPS Omni channel purchasing scenario, and timeliness, availability, and information quality significantly impacts customer satisfaction in the BSSD Omni channel purchasing scenario.

Keywords: Omni-channel retailing, Customer satisfaction, Logistic Service Quality.

**Impact of Micro Credit Financing on Rural Women in Karandeniya Divisional Secretariat Division**

T. P. G. W. D. Guruge, K. P. P. V. Rathnapriya and H. N. Liyanage
University of Colombo

Micro-credit financing is considered a significant tool for the socioeconomic development of women in developing counties. Rural women have been identified as a significant force in country development since empowering women is considered a successful strategic approach to poverty alleviation. But their participation in economic development reduces due to a lack of capital for investment. To fill the gap, a vast number of institutions in both public and private sectors, provide micro-credit facilities for rural women. These institutions offer micro-finance loans, easily accessible but at high-interest rates. Due to the attractive characteristic of easy access, it has become popular and has spread all over the country, making addicted followers. Since this micro-credit financing is actively based on rural women, discussing the impact of the same on rural women and revealing special mechanisms to assure positive impact on rural women is a significant topic in current research. This research chooses to investigate the extent to which micro-credit financing influences the economic, social, and psychological status of women in rural areas. Further, it chooses to understand the factors considered by women in taking MCF loans, analyze the impact of MCF on rural women, find out factors that determine the impact, propose methods to improve the positive impact, and ensure the sustainability of MCF on rural women. The study was done with 10 in-depth interviews and structured questionnaires survey of 375 women in 10 GN divisions in Karandeniya DSD, using mixed method analysis. This study focuses on examining the impact of microcredit on rural women to conclude the relationship between microcredit and women's economic, social and psychological status. This study identified that micro-credit exhibits a significant relationship with the economic, social, and psychological status of rural women, and found that even though women prefer micro-loans at low-interest rates, they were ready to take loans from less-documented institutions that provide micro-loans at high-interest rates. Further, it identified that the type of impact depends on the purpose of the loan. So, policy should be formulated to ensure the positive impact of micro-credit financing on rural women considering less documentation, short duration with a simple procedure for providing micro-credit, and confirm the use of credit for a productive purpose. And also, it is recommended to introduce relief and guidance methods for problems related to loan payment. Furthermore, it is identified that transaction digitization in micro-credit financing facilities can play a vital role in terms of women's empowerment by improving efficiency and transparency.

Keywords: Micro Credit Financing; Rural Women; Economic, Social and Psychological Impacts; Digitization; Sustainable women’s empowerment

**Revisiting the Impact of Bank Size and Performance: Evidence from Listed Commercial Banks in Sri Lanka**

D. D. Bamunkula and M. K. Wanniarachchige
Faculty of Management and Finance, University of Ruhuna

Bank performance is influenced by a variety of factors and, bank size is a major determinant among them. The majority of the research regarding bank size has been undertaken in developed countries, and these studies have revealed conflicting results regarding whether bank size affects performance. Further, the applicability of these results to emerging countries is also questionable due to the difference in contextual settings. Therefore, the purpose of this study is to explore whether bank size affects performance in Sri Lanka.

The population of this study includes all listed commercial banks in Sri Lanka. Data were gathered from published annual reports and the Central Bank data library for the period of 2011 to 2021 for the domestic private banks which were listed in CSE as of 31st May 2022. Performance was measured by using ROA and NIM. The natural logarithm of total bank assets, total income, and market capitalization was used to measure bank size. Further, operating cost, capital adequacy, and liquidity risk remain control variables in the study. The study analyzed the data using pooled OLS regression model. Even though the study contains a panel data set, due to time constraints, pooled OLS regression analysis was carried out instead of panel regression to analyze the effect of bank size on profitability.

In the banking context, scale economies exist when the cost per rupee of loans or assets declines as the number of loans or assets increases. An efficient bank operates at the lowest cost per rupee of assets or loans. Results of this study indicate that size measure under the log of total assets negatively affects performance. Bank assets have a negative effect on performance measures under net interest margin. This could be due to bureaucratic reasons and high maintenance costs.

Increased asset base results in decreased financial performance. Hence, banks cannot improve their financial performance by increasing the total assets of the firm. This proves the nonexistence of economies of scale in the sector. This effect arises due to bureaucratic effects and the findings of this study imply policymakers and government. They can reduce the stringency of existing governing policies on large banks to increase their profit margins. Finally, market share has a significant positive impact on both accounting and market performance measures. This finding implies banks can increase their market performance by increasing the total deposits of the firm. Increased deposits signal better performance of banks and lead to an increase in market performance.

Keywords: bank size, bureaucratization, economies of scale, performance, profitability

**Effect of Ownership on the Performance of Licensed Commercial Banks in Sri Lanka**

W. Y. M. M. N. Ekanayake and M. K. Wanniarachchige
Faculty of Management and Finance, University of Ruhuna

Despite the availability of many studies on the ownership-performance association, existing literature provides contradictory evidence on the effect of ownership on bank performance. Therefore, this study examines the effect of ownership on the performance of licensed commercial banks in Sri Lanka using annual data from 2012 to 2021. The data was collected through published annual reports of 18 licensed commercial banks in Sri Lanka. Bank ownership was categorized as state, private, and foreign and measured using two dummy variables. Return on equity, net interest margin, and non-performing loans were used as proxies of bank performance. A random effects panel regression model was used to explore the effect of ownership on bank performance while controlling for bank size, loan-to-deposit ratio, income diversification, and management quality. The findings suggest that state-owned banks perform better than other banks in terms of return on equity. However, their performance in terms of net interest margin and non-performing loans was not significantly different from other banks. Moreover, private banks outperform other banks in terms of return on equity and non-performing loans while their performance in terms of net interest margin was not significantly different from other banks. Therefore, this study does not show a straightforward association between ownership and bank performance. Instead, this association varies depending on the indicator used to measure bank performance. Nevertheless, this study provides recent evidence of the effect of ownership on bank performance in Sri Lanka. Further, the findings of this study will provide insights for the government, banks, and policymakers in formulating appropriate policies to improve performance in the banking sector.

Keywords: commercial banks, ownership, bank performance, Sri Lanka

# A Zestful Formation of Quad and Its Dynamic Relationship in the Stock Market: An Empirical Study Among Member Nations

Bejoy Joseph[1], V. Ambilikumar[2] , Albin Varghese[1]

[1]Bharata Mata Institute of Management, Kerala, India

[2]Faculty of Fisheries Management, Kerala University of Fisheries and Ocean Studies, Kerala, India

The study attempts to analyze the dynamic relationship between the stock indices of Quad member nations. The study has used daily stock index data for the period starting from 15th September 2017 to 15th September 2022. In this study, Johansen's Cointegration Test, and Vector Error Correction Model for testing long-run and short-run causality have been applied for determining long and short-run relationships among the stock indices of the USA, Australia, India, and Japan. The cointegration result exhibited a long-run relationship between the four stock indices. The VECM framework disclosed a long-run causality from ASX and BSE stock indices to other indices but the study revealed that long-run causality from JPX and Dow Jones to other stock indices does not exist. At the same time, short-run causality determined through the Wald test has revealed that there is no short-run causality from JPX to ASX and from BSE to JPX. The study has found that with the lack of long-run and short-run causality among some of the indices used in the study, there is a scope for diversification in investment in these international markets.

Keywords: Wald test, Johansen cointegration, unit root, causality, stock index

# TRACK 02

# ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

# ABSTRACTS

## A Preliminary Assessment of Microplastics in Sediments of Tissa Wewa Reservoir and Malwathu Oya River in Anuradhapura, Sri Lanka.

Ranawaka Arachchige Thilini Madushika[1] and Dissanayake Mudiyanselage Anusha Edirisinghe[2]

[1]Department of Aquaculture and Aquatic Resources Management, University College of Anuradhapura

[2]University of Vocational Technology, Sri Lanka

Plastic pollution is a growing concern all over the world including in Sri Lanka due to serious negative consequences. Thus, the current study focused on the investigation of the occurrence, and quantification of visually observed microplastics (MPs) in sediment samples from Tissa Wewa and Malwathu Oya in Anuradhapura during May 2022. The dried sediment samples were passed through 1 mm and 5 mm mesh sieves and < 1 mm MPs were subjected to density separation with NaCl and KI followed by Peroxide Oxidation. Visually observed and recovered MPs were observed through Trinocular Microscope, enumerated for color, and confirmed by hot needle test.

As results revealed, the total MPs in Malwathu Oya was 20.38±3.82 $kg^{-1}$dw whereas 49.17±5.77 $kg^{-1}$dw of MPs were detected in Tissa Wewa. In terms of colors of MPs, in Malwathu Oya, white-colored particles were dominant (44.00%) while black color MPs (35.59%) were dominant in Tissa Wewa. The number of MPs in Tissa Wewa (Mean rank – 25.64) was statistically significantly higher than those found in Malwathu Oya (Mean rank – 17.36) ($U = 133.5$, $p = 0.024$). This may be due to the lentic nature of Tissa Wewa which has a higher amount of MPs since slower flow rates may lead to the accumulation and settling of MPs in sediments.

More research is needed concerning MPs concentrations as a function of seasonality and understanding the drivers of MPs abundance would greatly benefit assessing their environmental impact.

Keywords: Microplastics, Freshwater, Sediment

**Sustainable management of e-waste in the Sri Lankan context: A business perspective**

R. B. C. Perera, B. V. Kavirathna, U. N. S. Fernando, A. M. M. Amanullah and S. M. Dassanayake

Department of Decision Sciences, University of Moratuwa

As a result of rapid innovations in the evolution of technology, the usage of technical equipment and E-Waste has soared within the last few years. Human health and the environment are threatened by E-Waste due to its hazardous content. E-Waste has become a critical global problem due to its adverse influence on human health, the environment, and the development of most countries, including Sri Lanka. The situation has worsened because of damaging consumer behavior towards E-Waste disposal. Lack of awareness about the adverse effect of E-Waste has strengthened informal recycling practices in most developing countries. Moreover, landfilling and informal recycling methods have discouraged formal recycling sectors. Governments, manufacturers, and consumers have equal responsibility to implement proper E-Waste recycling strategies to achieve sustainability and environmental management. Not having proper E-Waste recycling policies is the main reason for the growth in informal recycling practices. The responsible parties can take action to encourage formal E-Waste management sectors to gain environmental sustainability while earning economic benefits. Consumers can contribute to the process of proper E-Waste management without improper disposal of E-Waste. As the fundamental step, enhancing awareness regarding E-Waste is important as it leads to following formal disposal methods. This will no longer be a burning problem if all parties implement proper recycling practices without considering it a burden. Investigating innovations and policy-level interventions on public perception and awareness helps to manage E-Waste sustainably. By analyzing the public perception of E-Waste, the study has identified that a sustainable E-Waste management system can be carried out by enhancing awareness among the public. Moreover, due to approximately 50% of the respondents being dissatisfied with the current management of E-Waste, the government and manufacturers have a responsibility to take appropriate actions to develop the E-Waste management system. In the Sri Lankan context, E-Waste businesses can lead the economy by having improved infrastructure such as machinery and legal provisions. According to the study, Sri Lanka has the potential to develop the E-Waste industry into a global level market while achieving sustainability.

Keywords: E-Waste, Recycling, Awareness, Sustainability, Sri Lanka

**Investigation into citizens' awareness and willingness to participate in e-waste management in Thimbirigasyaya**

M. A. M. T. Weerasinghe
University of Colombo

The use of electronic items by households in Sri Lanka is on the rise. By the first half of 2020, one in five households owned a laptop/desktop. A three-fold increase in telecommunication device use was observed within a year, from 2019 to 2020. With such e-goods usage, households are regarded as one of the largest generators of e-waste, where the e-waste is discarded with other household wastes. Such haphazard disposal of e-waste bears negative health and environmental consequences. To overcome this issue, awareness alone of proper e-waste disposal is insufficient. According to the Theory of Planned Behaviour (TPB), Ajzen has shown that the intention/willingness to behave in a certain manner is a predecessor of the actual behavior. Such willingness is determined by attitudes, subjective norm (SN), and perceived behavioral control (PCB). Literature has shown how this model can be extended to include other variables, as appropriate. In that context, this research aims to identify the association of attitudes, SN, PCB, awareness, and previous recycling experience (PRE) (extended TPB model) on willingness to engage in e-waste management. A quantitative survey was carried out with primary data collection from 400 respondents of the Thimbirigasyaya Grama Niladhari Division and analyzed using statistical techniques such as the Chi-Square test of independence and Pearson correlation coefficient. Chi-square analysis indicated associations between willingness and each of the five variables ($p$-value <0.00 of all variables). The Pearson correlation coefficient results indicated that attitudes (*r value= 0.48*), PBC (*r value= 0.47*), PRE (*r value= 0.39*) showed moderate positive relationships with the willingness to engage in e-waste management, while weak positive correlations between awareness; $r$ (398) = 0.27, $p < 0.001$ and SN; $r$ (398) = 0.26, $p < 0.001$, against willingness, were observed. Therefore, implementation of awareness and educational programmes are important to create stronger attitudes. Moreover, simplicity of the process of e-waste recycling must be communicated, and more opportunities must be created for public engagement, thereby creating e-waste recycling habits in the long run. Due to the stronger connections that attitudes and SN had with the involvement of friends and family, awareness and educational programmes aimed at attitude building must highlight the negative health implications of non-recycling.

**Determination of Air Pollution Distribution Using a Geospatial Analysis Technique**

M. D. M. D. S. Meegaswatta

The environmental assessment that is carried out for development operations involves monitoring as one of its fundamental requirements. Environmental monitoring during the execution of a project acts as an environmental performance indicator. It illustrates the extent of the environmental damage caused by continuing construction activity. It demonstrates the magnitude of the environmental damage caused by continuing construction activity. The Ecosystem Conservation & Management Project, a building project funded by the World Bank and carried out in Nuwara Eliya, Sri Lanka, served as the basis for this study. The primary goals of this project are to renovate and modernize the Sri Lanka Forestry Institute's current training facilities (SLFI). Air pollution is one of the main factors taken into account while conducting an environmental impact assessment (EIA) or initial environmental examination (IEE) for a development project. Understanding and reducing the potential environmental impact of the proposed project is the sole purpose of the EIA or IEE. To reduce air pollution, the EIAs/IEEs suggest mitigation strategies. These suggested mitigation strategies will eventually be used throughout the project's construction phase. However, it is unknown how the implemented control measures will affect air quality during the construction period. Consequently, this study established a GIS-based air quality model and evaluated pollution dispersion as a response to this research problem. Understanding the pollutant dispersion from the project site to the surrounding environment was one of the study's key goals. This objective served as the foundation for choosing sampling locations and conducting air quality monitoring. Additionally, while selecting sampling locations, the adjacent land use pattern and wind direction were taken into consideration. The interpolation technique was used to derive the main distribution patterns of each monitoring parameter during the analysis. Many different interpolation methods are incorporated into GIS, including IDW, Kriging, and spline. These methods are mostly employed in investigations of air pollution. IDW is employed when the set of points is dense enough to fully represent the degree of local surface variation required for the analysis. Subsequently, the average concentration of each parameter was determined using the Zonal Statistics technique every 50m. Contrary to what has often been assumed, the air quality has been slightly impacted by project construction operations, however, the impact is minor and unevenly distributed.

Keywords: Air Quality, GIS, Interpolation, Modeling, Environmental Assessment

**Treatment of Lead containing wastewater by Adsorption process using drinking water treatment plant residues**

R. A. M. S. D. Rajakaruna and B. G. N. Sewwandi

Department of Zoology and Environmental Management, University of Kelaniya

Lead ($Pb^{2+}$) is a pollutant that causes serious health issues. It is also bioaccumulated through food chains, affecting the ecosystem's health. Drinking water treatment plant residues are being produced in large quantities in drinking water treatment plants and are disposed in landfills, exacerbating solid waste problems. Adsorption is an effective wastewater treatment method for removing heavy metals from wastewater. The present study investigated the performance of drinking water treatment plant residues produced during the water treatment process in a drinking water treatment plant for the removal of $Pb^{2+}$ in aqueous solutions by adsorption. The effect of pH, initial $Pb^{2+}$ concentration, and contact time on the adsorption of $Pb^{2+}$ onto drinking water treatment plant residues were examined. The adsorption mechanism of $Pb^{2+}$ onto drinking water treatment plant residues was described using isotherm and kinetic models. The experiments on the effect of pH showed that adsorption of $Pb^{2+}$ slightly increased from 8.18 ± 0.14 mg $g^{-1}$ to 9.19 ± 0.15 mg $g^{-1}$ with the increase in pH 3 to 8. The maximum adsorption capacity of $Pb^{2+}$ was 16.1 mg $g^{-1}$. $Pb^{2+}$ adsorption was well fitted to the Langmuir isotherm model indicating monolayer adsorption on a homogeneous adsorbent surface with identical active sites. The experiments on the effect of contact time on adsorption showed that the adsorption of $Pb^{2+}$ onto drinking water treatment plant residues increased with the increase in contact time and reached the equilibrium within 2 hours of contact time. The kinetic studies showed that the adsorption of $Pb^{2+}$ onto drinking water treatment plant residues was well described by both the pseudo first-order model and pseudo second-order model indicating that both chemical and physical adsorption contributes to the adsorption of $Pb^{2+}$ onto drinking water treatment plant residues. Therefore, this study proves that drinking water treatment plant residues are an effective, low-cost adsorbent for removing $Pb^{2+}$ in aqueous solutions. Hence, future studies are required to be conducted on the field-scale application of drinking water treatment plant residues which will be beneficial for cost-effective wastewater treatment, especially in developing countries.

Keywords: Heavy metals, Isotherm models, Kinetic models, Sludge, Water treatment

**Removal of nitrate and phosphate from wastewater by using activated carbon produced from *Limonia acidissima***

W. H. P. Yasanthika[1], M. Pratheepkumar[1], and T. Thanihaichelvan [2]

[1]Faculty of Applied Science, University of Vavuniya, Sri Lanka

[2]Faculty of Engineering, University of Jaffna, Sri Lanka

Adsorption is an important technique used in the purification, separation, and recovery of unwanted chemicals from wastewater and industrial processes. Among different types of adsorbents, activated carbons (AC) are the most widely used because of their high adsorptive capacity. Any cheap material with high carbon content and low inorganics can be used as a raw material for the production of AC. Containing a high microporous structure, high internal surface area, pore volume, and pore size distribution are increasing adsorptive capacity. This study used wood apple (*Limonia acidissima*) shells as a starting material for the preparation of AC using both physical and chemical activation methods. The varying dose of adsorbents (0.5 – 6 g/L) and varying contact time (30 - 240 min) were used to determine the optimum dosage and optimum contact time using isotherm and kinetics experiments respectively. Chemical-activated wood apple activated carbon (CAC) which is soaked in zinc chloride and physically activated wood apple activated carbon (PAC) showed a correlation between Nitrate removal and AC found to have optimum nitrate removal at 62.53% and 16.82% respectively. Based on the statistic the level of nitrate removal with CAC showed a significant (P value – 0.002) compared to PAC (P value – 0.026). Therefore, CAC is the suitable activated carbon for nitrate removal in wastewater. The results of paired sample t-test for the nitrate removal efficiencies of PAC vs. CAC P- value was 0.003. It was statistically proven that there was a significant difference in nitrate removal in PAC and CAC with that CAC showed a significant amount of nitrate removal from wastewater than PAC. According to the above results, zinc chloride-soaked activated carbon can be used to treat nitrate removal from wastewater in a cost-effective and environmentally friendly manner.

Keywords: Significant removal, Chemical activated, zinc chloride

**Feasible Solutions to Kelani River Pollution from High polluting industries under BOI Sri Lanka: An Exploratory Study**

C. J. Ranasinghe

National Water Supply and Drainage Board, Sri Lanka

The Kelani River basin which provides a precious source of potable water for Colombo and the suburbs was declared an environmentally sensitive area in 1993 by a Cabinet decision, prohibiting new high-polluting industrial establishments upstream. The common wastewater treatment Plant (CWWTP) which is situated at the Biyagama export promotion zone (BEPZ) is the largest wastewater treatment plant belonging to the Board of Investment (BOI) of Sri Lanka. At present, this Treatment Plant is operated by the National Water Supply and Drainage Board (NWSDB).

Currently, 54 factories are functioning in this zone and wastewater generation is approximately 220000 $m^3$/day. Out of the above 54 factories, 9 belong to type "A" industries that discharge effluents that are toxic and harmful to human health. Further, these industries have their wastewater treatment plants treat wastewater chemically in-house until it meets the zone's tolerance limit for discharging industrial wastewater into CWWTP. Though the industrial effluents generated within the export promotion zone at Biyagama are treated in a common wastewater treatment plant, water pollution in the Kelani River has surpassed the environmental thresholds. This paper investigates feasible solutions to optimize the overall quality of the treated effluent discharged into the Kelani River in the long run.

A mixed-method research design was adopted to conceptualize an optimal framework. Effluent quality data and observations of the NWSDB of Sri Lanka and the BOI of Sri Lanka were used as evidence. The management feasibilities of the BOI and NWSBD were qualitatively evaluated.

As per the analysis of the results of this study, it was observed that the root causes for 100% of non-conformities happened due to partially treated wastewater discharges from fabric washing plants of 3 type A industries. In addition, BOI at BEPZ does monitor the quality of industrial effluent discharges per industry twice a month to CWWTP. However, these industries operate 576 hrs. per month. Therefore, BEPZ, monitoring, and enforcement of regulations efficiency per month is 0.3%. During the COVID season, this percentage decreased to closer to zero. Some type A industries have reported functioning without any

operators for their wastewater treatment plants during the COVID-19 pandemic. Having considered all of the above facts, it is noted that the current administrative infrastructure responsible for the effluent quality monitoring and enforcement of regulations, which is the BOI at BEPZ, has significant inefficiencies. Furthermore, the potential of the CEA or NWSDB to intervene in process optimization is consequential. Therefore, this paper suggests transferring the responsibility of effluent quality monitoring and enforcement of regulations of in-house industrial treatment plants from BOI to bodies such as CEA, NWSBD, or any other independent agency.

**Role of the Dissemination of Climatic Information on the Livelihood of Fishing Community in Beruwala**

W. D. I. S. Kumari
Faculty of Graduate Studies, University of Colombo

Fisheries as an industry contributed 1.0% of the national GDP where 76% is from marine fishing in 2021. Still, the living standards of the fishery community are at a low level as the safetyand ability to earn an income from the fishery industry is from the fishery industry is highly dependent highly dependent on climate changes and general weather pattern changes. A proper system of climatic information dissemination is required to uplift the livelihood of the coastal fishing community. This research is an attempt to uncover the role of the dissemination of climatic information on the livelihood of the fishing community in Beruwala. Primary data were collected using a questionnaire survey (n=50) conducted both in-person and through telephone interviews. Key informant discussions, groupdiscussions, and field observation were also conducted for primary data collection. Simple random sampling was used to select the respondents. Data were analyzed using descriptive statistics. According to the results 80% of respondents were day boat fishermen and 20% were multi-day boat fishermen. The respondents were at 51 years of mean age, earning 48,000 LKR as their average monthly income. Gender distribution was 82% males; females are not directly involved in a sea voyage. Most of the respondents have an education level up to GCE O/L. The majority (98%) of respondents have faced economic losses and more than 50% have faced vessel andfishing gear damages, low fish harvest, coastal erosion, and sea level rise due to bad weather and climate change. Mostly searched climatic information is rainfall and wind. The majority (36%) used television and radio weather forecast to get climatic information and 20% are depending on their own experience in decision-making under weather patterns. Reliability analysis (Cronbach's coefficient alpha test) is conducted to measure the internal consistency of the variables and ensure the reliability of the questionnaire. The chi-square test of independence was conducted to test the association between the expected characteristics of climatic information dissemination systems and livelihood outcomes. The results revealed that qualityof information, timeliness, understandability, perceived usefulness, and perceived ease of use was associated with the livelihood outcomes of the coastal fishing community. The study concludes that properly designed climatic information dissemination affects the livelihood of the coastal fishing community to prevent or reduce the damages from adverse weather conditions and climate change.

Keywords: Climatic-information dissemination, Weather, Climate, Fisherman, Livelihood

# TRACK 03

# EDUCATION AND LINGUISTIC STUDIES

# ABSTRACTS

## Adaptation and Validation of the Strengths and Weaknesses of ADHD Symptoms and Normal Behavior (SWAN) Scale among 5 - 12-Year-Old Children in the Colombo District

W. A. R. N. M. T. Goonetilleke[1] and K. Hettigoda[2]

[1]Faculty of Graduate Studies, University of Colombo, [2]University of Peradeniya

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder and is characterized by persistent age-inappropriate core symptoms of inattention, hyperactivity, and impulsiveness that could result in impairment in one's major life activities and well-being. Hence, early identification and prompt treatment are essential. Clinicians and researchers have mostly used screening tools to assess ADHD, however lack of culturally adapted and validated screening tools in the Sri Lankan context hinders the early identification of ADHD in children. The Strengths and Weaknesses of (Attention Deficit Hyperactivity Disorder) ADHD symptoms and Normal behavior (SWAN) rating scale is based on DSM-5, a dimensional approach to assess the symptoms of ADHD and has 18 items with a 7-point rating to measure the full range of behavior of an individual. This study aimed to adapt and translate the SWAN scale to the Sinhala language by establishing content and consensual validity and measuring the construct, and criterion validity along with assessing reliability. This is a cross-sectional, correlational study. Research was carried out in two phases. Phase 1: translation of the SWAN scale from the English language into Sinhala using systematic, standardized procedures for adapting and validating cross-cultural research instruments employing the Delphi process, and the qualitative analysis were carried out. Phase 2: quantitative data were analyzed utilizing the SPSS 25 statistical software package (SPSS, 25). The psychometric properties of the SWAN Sinhala scale were established using a community sample of 220 parents of school children who were between 5 and 12 years old in the Colombo district, and a clinical sample of 50 parents of children that were diagnosed with ADHD at Lady Ridgway Hospital, Colombo. Construct validity of the community sample was measured by conducting convergent validity, divergent validity, and Exploratory Factor Analysis (EFA). The reliability of the SWAN scale was measured using the community sample and achieved internal consistency reliability Cronbach's alpha value 0.96 as excellent. The test-retest reliability stability was excellent (0.96). The clinical utility of the Sinhala

SWAN scale was examined by executing criterion validity through resulting good concurrent validity. Moreover, convergent validity was agreeable, and obtained adequate exploratory factor loadings and structures in the community sample. In conclusion, the SWAN Sinhala version retains sound psychometric properties as in the original SWAN and is a valuable instrument to screen ADHD among children from 5 to 12 years in Sri Lanka.

Keywords: SWAN English, SWAN Sinhala version, ADHD, Children, Validity

**Agricultural economics research article introductions: A genre analysis**

Suharshi Perera
Hector Kobbekaduwa Agrarian Research & Training Institute

English is the lingua franca of the academic publishing industry today. Due to the globalization and marketization of the academe, scholars are under increasing pressure to publish in English medium indexed journals, a vital performance indicator for career and academic mobility (Flowerdew, 2007). Both the conventions of academic English discourse and the higher-order skills required in expository scientific writing are daunting challenges for scholars who aspire to publish in international journals. The Introductory section of a Research Article (RA) poses the greatest challenges to writers whose L1 is not English, in terms of persuasive writing skills and strategic presentation to impress the gatekeepers of international academic publishing. This genre-based study draws insightful pedagogical implications for the designing of ESP academic writing instructional material and thereby helps expand novice writers' understanding of disciplinary-specific academic writing. Using Swales' CARS model (1990, 2004) the study explores the rhetorical structure of 10 RA introductions published in a Sri Lankan journal in agricultural economics to identify, categorize and critically analyze the rhetorical organization and linguistic strategies and the potential impact of these choices in terms of how their research is positioned within their discourse context. The framework of Move Analysis was adopted in coding and interpreting the data. In cases where the model was inadequate Kanoksilapatham (2012) was referred to. A pragmatic non-probability sampling technique was also applied. Both quantitative and qualitative approaches were adopted. The study found that writers possessed a fairly competent understanding of general academic conventions. Discipline-specific discourse demands were also evident. The data discerned a linear rhetorical pattern. The study also established that Swales' model is largely applicable in the sub-discipline of agricultural economics. The writing was largely prescriptive, restrained, and standardized. The writers' stance towards academic writing seemed to have a major impact on their rhetorical choices, thereby shaping the rhetorical structure. Linguistic realizations were key to delivering the desired communicative goals. The 'face-saving' approach was supplemented with an 'author evacuated' style of writing and linguistic choices. Reasons for the rhetorical and linguistic choices of the authors are tied to larger social, cultural, and economic contexts of the writers and their publishing contexts. The findings also highlight the importance of considering disciplinary-specific characteristics, mastering existing conventions before attempting innovative writing, and studying the rhetorical structure and style of internationally published research communications. The findings bear pedagogical implications that can inform the designing of ESP instructional material and thereby help novice writers publish successfully.

Key terms: RA introductions, genre analysis, Swales' model, academic publishing, ESP

**Contribution of guidance and counseling to improve the discipline of students in secondary schools in Badulla district, Welimada educational zone**

L. A. M. Hansani Pramila Udayakumari

Department of Education and Training, Faculty of Education, University of Vocational Technology, Sri Lanka

The goal of the study was to investigate how counseling and guidance may improve student behavior in secondary schools in the Welimada Educational Zone of Badulla District. Albert Bandura's humanistic philosophy and the theory of personality served as the guiding principles of the study and a descriptive survey research approach was used. Purposive sampling was utilized to choose a sample from the whole population that included 8 schools, 8 administrators, and 8 school counselors. To choose 24 teachers and 262 students from the chosen school, stratified random sampling and simple random sampling were both used. Questionnaires and an interview schedule were the tools utilized to gather data for the study. Descriptive statistics, including frequencies, percentages, mean scores, and the Statistical Package for Social Science, were used to analyze the data (SPSS). Results showed that teachers use a dynamic approach to a group of students' interactions. Additionally, the computer resources available were insufficient for the process of guiding and counseling and the children's behavior and academic performance have improved thanks to supervision and counseling. There is sufficient evidence to show that a lack of student supervision and counseling contributes to indiscipline in the classroom but because there isn't a clear legal or regulatory framework, there aren't enough qualified teacher counselors, and instructors have too much work to do, it's challenging for guidance and counseling to be effective in fostering student discipline. To resolve conflicts, discussion must be encouraged. This may be improved by fostering strong bonds between the students, counselors, instructors, and administrators so that they feel free to express their opinions on matters that concern both sides.

Keywords: Guidance and Counseling, student discipline, Pupils, Counsellor, Teacher

**Relations between Teacher Reasoning, Knowledge and Practice in Teaching English as a Second Language**

Rathnapriya Samitha Pothupitiya
Post Graduate Institute of English, Open University of Sri Lanka
Ministry of Education Royal College Colombo

The current view of classroom pedagogy observes the teacher as a developer of independent teaching forms on teacher knowledge. In this context, it is assumed that teacher decision-making in terms of reasons giving approach to pedagogical decision-making on knowledge has close connections to teacher practice. Contemporary studies recognize the importance of examining this concern to better understand what teaching is. This study observed the phenomena from an eclectic post-method perspective in teaching English as a second language (ESL). The study employed a qualitative multiple case study framework with three English language teachers selected using a convenience sampling method. The data collection procedure followed the framework of interpretative phenomenological analysis and hermeneutics. Primary data sources were two-fold; think-aloud verbal data in the form of short narratives and videotaped teaching sessions of teaching reading lessons for the English for Social Sciences classes to first-year art undergraduates. Qualitative content analysis mechanisms were used to analyze and describe the nature of the connections between pedagogical decision-making on teachers' interactive cognition in selecting and implementing classroom practice strategies. Preset codes were used to identify connections between these constructs. The analyses are presented in both thematic and graphic forms to show the connections between the main constructs. The results confirmed a strong agreement between the teacher's pedagogical reasoning on interactive cognition in choice-making pedagogical strategies. This condition provides evidence for personal forms of teacher practice in English language teaching. This manifestation was observed in a dual state of teacher interactive knowing; in single and multiple-arrangement relationships. Furthermore, this flow of demonstration was observed as both intentional and throughout, confirming solid connections between teacher reasoning in pedagogical decision-making, on cognition in teacher practice in ESL. These insights can be taken into account in teacher education, evaluation, and professional practice in ESL. Furthermore, these connections indicate that teachers' reasoning on teacher cognition can be used as a frame of reference for eclectic practice in the formation of personal pedagogical practice systems (PPPS). The results also provide insight into the explanation of eclectic pedagogy concerning teacher cognition. Future studies may utilize the

concept of PPPS in the study of pedagogy in any area of teaching and particularly in teaching ESL, as well as in studying the pedagogy of all other professions. Studies can also use the interpretive phenomenological framework and think-aloud method to survey and observe professional thinking in decision-making while in practice. Further studies can be designed with many case participants to understand whether certain categories of cognition versus others appear in the pattern formation of pedagogical practice.

Keywords: reasoning-in-action, interactive cognition, stimulated think-aloud oral Protocol, Interpretive Phenomenological Analysis, Personal Pedagogical Practice Systems in ESL

**Significance of Needs Analysis within a Proficiency Course in English: Addressing the needs of the undergraduates of the Faculty of Law – University of Colombo**

D. Y. Sandaru Diwakara
Department of English Language Teaching, University of Colombo

Within the field of English Language Teaching (ELT), the concept of Needs Analysis (NA) plays a significant role, specifically in curriculum design and material development. NA refers to the processes involved in gathering information about the needs of a particular client group in industry or education. In this study, this concept has been practically used to gauge the English language-related needs of law undergraduates of the University of Colombo, both within and outside the university. The Needs Analysis Approach introduced by Brown (2009) is the fundamental methodology used in this study. Level 3 law students who follow the Proficiency Course in English (PCiE) offered by the Department of English Language Teaching (DELT), University of Colombo are focused on in this NA. A mixed methodology was used in this study, where a survey and an interview were used as the main tools. Out of ninety-five Level 3 students, twenty-five students responded to the survey and a recently graduated lecturer participated as the respondent of the interview. The quantitative data collected from the survey and the qualitative data collected from the interview were triangulated to enhance reliability and validity. From the selected sample of students, reading-related skills seem to be significant during their undergraduate period and mastery of English speaking was highlighted as the most required skill after graduation. Moreover, most of them felt that their speaking skills were lacking and wanted to focus more on improving their spoken English. These findings were incorporated into the classroom teaching and learning process, where more English speech-oriented lesson materials and activities were introduced. Addressing the learning needs of the students, group activities were used within the classroom along with a mix of pair and individual activities as well. The nature of these students' needs, lacks, and wants were substantiated by the interview respondent as well. According to her perspective, mastery of all English language skills was important. However, she focused more on improving her English writing skills, which was essential both academically and professionally. Considering these notions, appropriate materials along with more writing-oriented activities like paragraph writing and essay writing were incorporated within the lessons. Thus, it is evident that NA is an effective way that can be used to understand the real needs of a learning community, where the perspectives of both students and other stakeholders are accounted for. In this study, this concept was practically used within the classroom context to improve lesson materials and lesson delivery. Moreover, it suggests that NA could be used within the larger processes of curriculum design and material development at the institutional and national levels as well.

Keywords: Needs Analysis, Curriculum Design, Material Development, James Dean Brown, DELT

**Potentiality of Sri Lanka to foster Digital Education**

S. M. Bamunuarachchi

Post Graduate Institute of Humanities and Social Studies, University of Peradeniya, Sri Lanka

Education is a significant factor that drives the economy of a country. It stimulates entrepreneurship in the minds of the youth and gradually helps to reduce poverty and inequality. In the context of globalization and the modern digital revolution, from the last decade onwards the education system has been in the process of modification. Unfortunately, in Sri Lanka, it's been the contrary. With the COVID-19 outbreak and the sudden shift to online learning, the vulnerability of the Sri Lankan education system was exposed to the dysfunctionality of the school system during the pandemic period. It has therefore raised the impending research question if Sri Lankan schools are prepared to face the challenges of digital learning. Even though it seems like education is given precedence of all under the concept of "free education" in Sri Lanka, it had undoubtedly ignored effecting digitalization in the educational sphere. Due to the benefits of digitalization, it is vital to groom students and teachers for the rapidly changing digital world but it seems to be overlooked due to unawareness and inevitable reasons (i.e. socio-economic conditions). This study, therefore, aims to assess the obstacles faced by Sri Lankan students and teachers in digitalization and to explain the strengths and weaknesses of digital education while determining if Sri Lankan schools are ready to implement it. This study adopts a Qualitative Research Methodology to analyze the research question given. An extensive analysis of primary sources; books, journal articles, conference proceedings, survey findings, and personal interviews focused on 20 teachers and 50 students of the central province as the sample and online resources as secondary sources have been conducted and the results of the questionnaire and personal interviews relating to this study has led to identifying the factors that need special attention in this process. In conclusion, this subject area must be highlighted to teach the importance of digital education, its strengths and weaknesses, and the ways to mitigate weaknesses and further strengthen the strengths to modify the Sri Lankan educational sphere.

Keywords: digitalization, education, Sri Lanka, strengths, weaknesses

**Teaching English as a Second Language through *Zoom*: The Perspective of English Language Teachers in Universities**

H. Sasanjalie Jayasinghe
University of Colombo School of Computing

Until the outbreak of COVID-19, online teaching and learning were new to many Sri Lankans. Teachers and students both had to adapt to this new lifestyle within a very short period as there were no other options left. The sudden change from face-to-face teaching to distance teaching caused numerous changes to the usual routine. Since teaching a language required a more practical approach rather than other subjects which are theory-based, teachers had to think differently to maintain their online classes without any interruptions. To carry out the teaching and learning process smoothly, various online teaching modes were introduced, and among them, *Zoom* became one of the popular channels for delivering lectures, especially in universities. However, the virtual classroom became a new experience for both teachers and students and as a result, many obstacles were faced. Hence, this research aims to find the challenges encountered when teaching English as a second language through *Zoom* with special reference to English Language teachers in a particular state university in Sri Lanka and to identify possible solutions to minimize the issues faced and thereby make recommendations. The methodology of this research study follows a mixed-method approach. The required data were gathered through an online questionnaire survey and semi-structured interviews were conducted with English language teachers who belong to different faculties in this particular university. As the findings of the study reveal, initially the teachers came across technical issues which they could not solve alone as it was a new experience for them. This challenge was mostly mentioned by teachers who are not very young. Hence the generation gap emerged with technical issues. Most participants mentioned that they are not sure whether *Zoom* is the most suitable tool to conduct English language lectures at the university. The teachers were doubtful about this reason because most students prefer not to turn on the camera saying that they face connection issues when they turn it on. Therefore, teachers find it difficult to observe the students. When the students refuse to provide answers during live lectures, the teachers say they feel like the students are not respecting them. Although preparing for a *Zoom* lesson takes a lot of time and effort, the features in *Zoom* such as screen sharing, and the breakout room option give the chance to present a successful lesson. The teachers said they will be more satisfied if they were made aware through seminars and workshops about organizing English lessons via *Zoom.* However, the teachers prefer *Zoom* over other options such as *Skype* or *Google Meet,* etc. In conclusion, it could be stated that the equal contribution of both teachers and students is mandatory to carry on a successful *Zoom* lecture.

Keywords: English Language Teaching, University Teachers, *Zoom*

**“The Influence of Teacher Professionalism on Effective Teaching” A case of Tamil language schools in Munthal Divisional Secretariat, South Division, Puttalam District**

J. F. Jasra

Teachers are seen as key stakeholders in better social development. A teacher should be seen to be well-trained and able to teach and guide students to produce better students. Thus, the teachers who go to teach in the school must receive training for teaching and become teachers with good professional skills. They should also be seen as interested in developing their skills over time after receiving appointments, but a negative trend can be seen in the teachers. This research was carried out at the Tamil medium Type-2 schools under the Mundal Divisional Secretariat of the South Division of the Puttalam District, under the research title "Influence of Teacher Professionalism on Effective Teaching". In this research, only the senior secondary division was considered within the definition. 4 research questions were created based on 4 main objectives and to achieve the purpose of the research by answering them, 20 teachers who teach in grades 10 and 11 were selected through convenience sampling method, considering the COVID-19 period of the research and the risk period conditions. Based on the analysis of the primary data obtained from them through an online questionnaire called Google form, through quantitative and qualitative analysis techniques, various personal and organizational factors are found for teachers not developing their professional skills and because it was found that lack of up-to-date professional skills of teachers has a negative influence on teaching performance, suggestions are also given. Therefore, by developing their professional skills, teachers can effectively teach and improve student teaching. The conclusion was also taken through this research. Therefore, it is my belief as a researcher that my research will be a basis for further studies and will help to conduct more studies on this topic.

Keywords: Effective teaching, professionalism, influence, teacher, teacher training

# TRACK 04

# INFORMATION AND COMMUNICATION TECHNOLOGY

# ABSTRACTS

## A decision framework for identification of sensor abnormalities and performing value estimation of not-available sensors in building sub-systems

K. A. R. Maduwantha Chandrasiri and Sanvitha Kasthuriarachchi
Department of Information Technology, Sri Lanka Institute of Information Technology

Building Management Systems are considered one of the critical systems of a facility to provide a properly commissioned and operational environment which ultimately results in a working or living-friendly indoor environment that leads to efficient utilization of energy and resources. Proper maintenance is required to deliver optimum and more reliable services with a higher level of satisfaction in terms of availability and reduced downtime. The proposed project is targeting two areas identified in the industry and provides mechanisms using prevailing deep-learning libraries and platforms. The first one is Deep learning-based abnormal sensor reading detection. This is to be achieved considering the sensor dependencies and malfunctions to be identified relative to the independent sensor readings related to a particular dependent sensor. The second one is the value estimation of non-available sensors using only a subset of physical sensors from the same model having the same design. In this case, having the corresponding root equipment which is having the physical sensor connected is required. For the other subset of equipment without the corresponding physical sensor, it is possible to estimate the values using the defined correlations of commonly available physical sensor values. Not malfunctioning sensor readings are essential in making maintenance decisions for building equipment and systems to have the correct maintenance at the right time. Not having required corrective maintenance will lead to the faults existing for a long time until the next planned and preventive maintenance. Further, the proposed mechanism for sensor value estimation will lead to cost and manpower saving for the building owner as there won't be a requirement to install additional required sensors on all the equipment. Instead, it is possible to install the sensors on a few pieces of equipment and use the proposed mechanism to estimate the readings considering the correlation to donor equipment of the same model and the same independent parameters. The experimental results on sensor abnormality detection have shown an accuracy level of around 80% and the result from the estimation of sensor values has shown 80% plus the level of considering the estimation gap less than two.

Keywords: Sensor Abnormality Detection, Sensor Value Estimation, Deep Learning, Tensorflow,Keras, Sensor Dependency Matrix

**Accurate Sentiment Analysis via Text Pre-processing and High-Quality Feature Selection and Representation**

K. H. S. L. Kanakkahewa[1], W. A. Mohotti[1], L. D. C. S. Subhashini[2]

[1]Department of Computer Science, University of Ruhuna

[2]Department of Information Technology, University of Sri Jayewardenepura

The extensive usage of the Internet and Web-based applications such as forums, wikis, blogs, news feeds, e-commerce sites, and email are contributing to the interchange of ideas and social viewpoints. This results in text data growing exponentially. The effective analysis of text-based social viewpoints and customer opinions exchange in digital media are used for better decision-making in numerous applications. Sentiment analysis is a technique to analyze the comments or reviews expressed in the form of text to determine opinion polarity. Traditional sentiment analysis methods have encountered several challenges in applying pre-processing, feature selection, and representation in determining opinions when dealing with text data. Specifically, the unstructured nature of the text and associated noise in some text sources stand against sentiment analysis methods to extract quality features. Also, the accuracy of capturing syntactic, semantic, and contextualized information controls the quality of feature selection in sentiment classification. In this work, we explore these issues following the experimental research method. We propose to extract high-quality features by developing specific pre-processing techniques that depend on the nature of the text. The proposed techniques go beyond the standard pre-processing techniques for handling emojis, emoticons and chat words to improve the quality of sentiment analysis in social media text data. Also, we explore the capabilities of advanced feature selection and representation approaches to learn syntactic, semantic, and contextualized information in improving the accuracy of sentiment analysis. We utilize pre-trained feature embedding techniques such as Word2Vec and Glove which generate a single vector for a word and, BERT which uses transformer architecture with the self-attention concept to capture contextual representation. Empirical analysis shows that the proposed pre-processing techniques with Word2Vec and Glove improve the accuracy of sentiment analysis compared to the state-of-the-art methods on well-known IMDB movie review and SemEval tweet datasets. Also, the application of BERT embedding without special preprocessing techniques produces superior results than all the baselines due to its ability in capturing high-quality features through contextual embedding.

Keywords: Sentiment Analysis, Pre-processing, Deep Learning, Attention Concept, Natural Language Processing

**Credit Card Approval Prediction by Using Machine Learning Techniques**

Poornima Peiris[1] and Rushan Abeygunewardana[2]

[1]University of Colombo School of Computing

[2]Department of Statistics of University of Colombo

This research is focuses on the application of machine learning (ML) techniques to predict customer eligibility for a credit card to mitigate possible future credit risk which may affect the bank's financial stability and credit performance. A credit card is a credit facility given toa customer by banks and finance companies around the globe. The credit facility has a credit risk for banks and financial companies. The repayments are least assured, and it often ends up as a non-performing credit facility (NPL). To mitigate credit risk banks are assessing applicants' creditworthiness and checking their eligibility before granting a credit facility. The decision is mostly based on traditional credit scoring models and creditworthiness will not always be accurate.

The project aims to help banking and financial institutions to identify and interact with creditworthy customers by using predictive models. During the literature review phase, we found that most researchers used classification algorithms such as Artificial Neural Networks (ANN) and Support Vector Mechanisms (SVM) for credit scoring models.

Therefore, we have used Artificial Neural Network (ANN) and Support Vector Mechanism (SVM) to develop models. The CRISP-DM (Cross-industry standard process for data mining) process is used as a systematic approach. The credit card-related data set has been taken from the publicly available kaggle.com data repository. Several data preparation activities were applied to the data set such as cleaning data, constructing data, handling missing values, integrating data, handling outliers, categorical to numerical encoding, feature selections, feature scaling, and handling imbalanced data. The data set has been divided into training and testing into a ratio of 80:20. Training data set is used to train the model and applied ML algorithms ANN and SVM. By using test data models were evaluated.

Under ANN model building we have tested the model using different sizes of batches, and low and high learning rates. Linear SVM and Nonlinear SVM are both models used to evaluate the best SVM method. Filter-based methods, correlation, and information gain under statistical feature selection were applied. Model accuracy was tested using Mean

Absolute Error, Confusion Matrix, and Area Under Curve (AUC) for training and test data.

We have evaluated three classifiers and observed that Nonlinear SVM performed better than ANN and linear SVM. Nonlinear SVM model Accuracy is 0.88, Precision is 0.88, Recall is 0.90 and AUC is 0.89. Accuracy, Precision, and Recall values are higher in Nonlinear SVM than ANN and Linear SVM. The recall rate is 0.90 means the model predicts positive class 90% correctly. Furthermore, we realized that customer behavior might be different from country to country. Moreover, the application of several real banking datasets not limited to customer demographic and socio-cultural but also other credit facility features including COVID-19 impact is an area of concern for researchers. Additionally, whether there is a relationship between nonlinearity in highly imbalanced class problems with SMORTE application is another area of concern for researchers.

**An Analysis of Animation Principles in UI Animations**

S. P. U. I. Wijesiri and C. Y. Gamage

Department of Information and Communication Technology, Faculty of Technology, University of Ruhuna

Animations are very popular graphics in every visual field including movies and any other visual content because they are very interactive with the audience when compared to the ordinary visuals in media. Animations used in websites' UI are very effective because they help to increase user interactivity and focus on functions in web applications. Also, they help users access functions easily because most are visualizing. Animation's principles are considered fundamentals of animation. They are techniques of making animations to improve the quality of animations with more engaging and believable motions of animation productions. But there is a problem in checking whether those animating principles are applied in a given animation. This research is based on analyzing the accuracy of simple animations according to the standard 12 principles of animations. The technologies behind this are Artificial Intelligence (AI) for identifying the real-time object detection of the input video animation and Machine Learning for predicting its particular animation principle. This is done by a model which gets an animation as the input and identifies its single object movement and detects the unique factors of selected two animating principles via artificial intelligence framework (OpenCV) and then analyzes the principles using a machine learning algorithm (Logistic Expression). The main outcome of this study is to make an algorithm to analyze an accurate animation according to the 12 animation principles so any beginner can determine whether the animation they created is according to the animating principles. This algorithm will indicate whether any single shape-based animation is according to the "slow in and slow out" and "anticipation" principles. And it will help beginners or anyone who does not have knowledge of making animations properly to apply great animations to any user interface.

Keywords: Animations, Animation principles, Machine learning, Artificial Intelligence

**Performance Enhancement of Convolutional Neural Networks based on Preprocessing of Datasets**

U. Priyatharsan

Unit of ICT, SVIAS, Eastern University, Sri Lanka

Convolutional neural networks (CNNs) have recently outperformed earlier methods in a variety of computer vision challenges, including picture classification, object recognition, and object segmentation issues. Due to powerful GPUs, which enable us to stack deep layers and analyse multiple aspects from the visual input, the deep neural network model is now possible. Convolutional neural networks (CNN) have produced very good results on a range of image recognition problems. Even though CNNs have had remarkable success in experimental evaluations, there are still many problems that require more research. In this study, we suggested a technique based on preprocessing the training and testing sets to enhance the performance of a convolutional neural network. We trained three well-known CNNs, AlexNet, GoogleNet, and ResNet, using data from three different databases: Oliva & Torralba, ImageNetDogs, and Caltech 256. When the grid approach was employed with the Oliva & Torralba database, the best results were obtained to the 70/30 ratio for the training and test set. Two different types of tests were run: one with standardization, which reduces all database classes to those with the fewest photos, and another with the full database. According to the findings, standardizing a database reduces performance. Additionally, test 1 reveals that the recognition rate for the class in Caltech 256 with the most samples, Clutter, was lower while classes with fewer samples, such as the golden-gate-bridge, harpsichord, scorpion-101, sun ower-10, and top-hat, had higher success rates. Which supports the decreasing prejudice against the Clutter class. Test 1 improved 106 classes' success rates while decreasing 143 classes' success rates. This shows that using entire databases yields the highest performance outcomes.

Keywords: Convolutional Neural Networks, Image Recognition, Data preprocessing

# Faculty of Law


***Digital Transformation and Innovative Approaches in Mitigating Challenges:***

***A Global Agenda for Legal Education, Research, and Reforms***

03rd - 04th December 2022

## MESSAGE FROM DEAN

**Professor N. S. Punchihewa**
Dean,
Faculty of Law

It is with immense pride that I write this message, as the Dean of the Faculty of Law, for the 2022 Annual Research Symposium of the University of Colombo.

While the Faculty of Law looks forward to the symposium of the University of Colombo annually, as the institution showcases its academic and research culture, this year is one of special significance and sentiment to the Faculty as it celebrates the completion of 75 years of academia.

The Faculty of Law this year, therefore, hosts its 'Diamond Jubilee International Research Conference' (DJIRC) 2022 in a hybrid mode, on the theme of "Digital Transformation and Innovative Approaches in Mitigating Challenges: A Global Agenda for Legal Education, Research and Reforms". The research being presented at the conference by both members of the Faculty and external applicants spans the areas of specialization offered by the three departments of the Faculty – the Departments of Public and International Law, Private and Comparative Law as well as Commercial Law- and beyond, encouraging also an interdisciplinary focus when suited.

I eagerly look forward to ARS 2022 as an opportunity to showcase the efforts of all the Faculties and Institutes of the University of Colombo that culminate from the culture of academic rigour of the University. It is my fervent hope that through our collective efforts, the University of Colombo will go from strength to strength in its service as an institution of higher education.

# MESSAGE FROM SYMPOSIUM CHAIR

**Chair Professor Wasantha Seneviratne**
Symposium chair,
Faculty of Law

The year 2022 is destined to be a momentous year for the Faculty of Law as it celebrates its 75th Anniversary this year. To mark this historic milestone, the Faculty has organized a series of events scheduled to be held from September 2022 through September 2023. The 'Diamond Jubilee International Research Conference' (DJIRC) 2022 is one of the flagship events of this year-long celebration. The conference is dedicated to honouring the robust tradition of academic and research excellence maintained by the Faculty of Law during its seventy-five years of proud history as a premier law teaching institution in Sri Lanka.

This year is a remarkable year for all of us. It brought us new hope and optimism with the receding of the pandemic and the emergence of the so-called 'post-pandemic normal'. The outbreak of Covid-19 forced unprecedented societal changes around the world in all fields of activity. Out of all the pandemic-driven changes, perhaps the most significant one is the creation of a landscape that encourages innovation and technological adoption. With a mindset to absorb the positive outcomes associated with the pandemic and to build back better as we exit the pandemic, we have chosen "Digital Transformation and Innovative Approaches for Mitigating Challenges: A Global Agenda for Legal Education, Research and Reforms" as the theme of DJIRC 2022.

The conference is committed to promoting a futuristic outlook for legal education, legal research and legal reforms in a digital-rich and technology-driven world. Out of the abstracts which we received from academics, practitioners, researchers and postgraduate students, we have accepted nearly 75 abstracts for presentation. The abstracts cover a wide range of topics associated with the theme including the impact of digitalization on pharmacology laws, regulation of artificial intelligence, reshaping the competition law in the digital economy, reforming the cybercrime legislative framework, legal education in a digitized world, innovations in medical law, the effects of digital transformation on law and law teaching etc.

The conference will provide a forum for both local and international researchers to exchange their cutting-edge research results. DJIRC-2022 is dedicated to showcasing high-quality legal scholarship in keeping with Faculty's long-standing commitment to excellence in legal research. Furthermore, this conference will provide a fantastic opportunity for both virtual and in-person attendees to network with a wide range of like-minded professionals in the legal field.

I am honored to be the conference chair of DJIRC -2022 year I sincerely hope that the conference will be an intellectually exciting and academically fruitful exercise.

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Professor (Chair)W. Seneviratne

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**Pre-conference Workshop**

Dr. W. A. D. J. Sumanadasa

Dr. I. D. L. Pathirana

Mr. G. D. Gunawardena

Mr. T. K. L. Hewa Geeganage

# Programme

| Agenda – 3rd December 2022 | |
|---|---|
| 08:30 AM | Registration |
| 09:00 AM | Lighting Oil Lamp |
| 09:05 AM | National Anthem |
| 09.10 AM | Welcome Dance |
| 09.15 AM | Welcome Address by Prof. (Dr.) Sampath Punchihewa, The Dean of the Faculty of Law, University of Colombo. |
| 09.20 AM | Address by Prof. (Chair) Wasantha Seneviratne, Conference Chair - DJIRC 2022 |
| 09.30 AM | Introductory Video of the Faculty of Law |
| 09.35 AM | Introduction to the Guest of Honour and Keynote Speaker by Prof. Indira Nanayakkara |
| 09.40 AM | Address by the Keynote Speaker, He Mizukoshi Hideaki, Ambassador of Japan to Sri Lanka |
| 10.15 AM | Video of Faculty Research Profiles |
| 10.25 AM | Address by Prof. Srilal Perera Adjunct Professor of Law and International Research Scholar in Residence at the Washington College of Law of the American University in Washington DC |
| 10.40 AM | Address by Dr. Udapadie Liyanage Head – Department of Private and Comparative Law, Faculty of Law |
| 10.45 AM | Address by Mr. Menaka Haranakaha Head – Department of Commercial Law, Faculty of Law |
| 10.50 AM | Vote of Thanks by Mr. Isuru Liyanage The Conference Secretary of DJIRC - 2022 |
| 10.55 AM | Refreshments (UCSC Open Pavilion) |

## Technical Session I

### Track – Interdisciplinary (LLM Reading Room)

| | |
|---|---|
| **Panelists** | **Dr Chathura Warnasuriya,**<br>**Mr.Naveen Marapana, P.C**<br>**Dr.Yasodara Kathirgamathamby** |
| **Time** | **Name of the Paper** |
| **11.30 am-**<br>**11.45 am** | Survival of the Fittest vs. Murder of the Weakest: A Defence of Darwinian Evolutionist Legal Theory<br>Author: Mr. Nath Gunawardena |
| **11.45 am-**<br>**12.00 pm** | Maintaining legal professional values without becoming orphans while adapting to Digital Transformation<br>Author: Mr.Vajira M Galigamuwa |
| **12.00pm –**<br>**12.15 pm** | **Discussion** |

### Track – Public Law (New Arts Theatre)

| | |
|---|---|
| **Panelists** | **Prof. Savitri Goonesekere**<br>**Prof. Selvakkumaran**<br>**Dr. Jayampathy Wickramaratne** |
| **Time** | **Name of the Paper** |
| **11.30 am -**<br>**11.45 am** | Sovereignty, Constitutional Change and the Supreme Court<br>Nigel K. Hatch |
| **11.45 am-**<br>**12.00 pm** | Sovereignty of People v. Sovereign Power of People: An Appraisal of Recent Constitutional Developments in Sri Lanka<br>Menaka Harankaha |
| **12.00 pm-**<br>**12.15 pm** | Decolonization, Democratic Crisis and Constitutional Designs: Changing Conceptions of South Asian Constitutionalism<br>Adithya A Variath |
| **12.15 pm-** | Role of the School in Constitutional Democracy |

| | |
|---|---|
| **12.30 pm** | Binendri Perera |
| **12.30 pm-12.45 pm** | Legal Education in a Digitalized World: Reforms to the Pedagogy of Public and International Law Courses at the Undergraduate Level<br>Prof. Wasantha Senevirathne |
| **12.30 pm - 1.00pm** | **Discussion** |

**Track – International Law (CSHR Class Room)**

| **Panelists** | **Dr. Radhika Coomaraswamy**<br>**Dr.Kalana Senarathne** |
|---|---|
| **Time** | **Name of the Paper** |
| **11.30 am - 11.45 am** | The Neglected in the Global Agenda: An Analysis on the Effective Participation of Indigenous Peoples<br>Isuru Liyanage, Thilini R. Galappaththige |
| **11.45 am-12.00 pm** | Whose Building Law? Empirical Approach to International Law in ASEAN and Thailand<br>Prem Singh Gill |
| **12.00 pm-12.15 pm** | **Discussion** |

**Track – Private Law (CSHR Boardroom)**

| **Panelists** | **Hon. Justice Dr. Saleem Marsoof, PC**<br>**Hon. Justice Arjuna Obeysekera**<br>**Dr. Darshana Sumanadasa** |
|---|---|
| **Time** | **Name of the Paper** |
| **11.30 am - 11.45 am** | Determining the Delictual Liability of the Police: The Legal Challenge and Way Forward<br>Thushanthiga K Thanikumar |
| **11.45 am-12.00 pm** | Liability for negligently inflicted psychiatric injury in the workplace: An analysis under the law of negligence |

| | |
|---|---|
| | Vaithulla Kamal Ahamed |
| **12.00 pm-12.15 pm** | An appraisal of the challenges faced by the Law of Defamation in Sri Lanka in the digital era<br>Chamath Fernando |
| **12.15 pm-12.30 pm** | Developing a Civil Liability Regime for Artificial Intelligence (AI) in Sri Lanka: A Critical Legal Study<br>Dr. D.S.E.U.S. Liyanage |
| **12.30 pm-1.00 pm** | **Discussion** |

**Track – Commercial Law (Board Room)**

| | |
|---|---|
| **Panelists** | **Professor (Dr.) N. S. Punchihewa**<br>**Hon. Justice A.H.M.D. Nawaz**<br>**Hon. Justice Dr. Ruwan Fernando**<br>**Dr. J. M. Swaminathan** |
| **Time** | **Name of the Paper** |
| **11.30 am - 11.45 am** | The normative value of the Doha declaration beyond Patents: lessons from landmark WTO rulings on Australia - Tobacco plain packaging measures<br>Sanath S Wijesinghe |
| **11.45 am-12.00 pm** | Blending Trademark Rights with the Metaverse: Can Sri Lanka Tackle Non-Fungible Tokens through the Conventional Trademark Law Regime? – Lessons From the United States.<br>Wathsala Ravihari Samaranayake |
| **12.00 pm-12.15 pm** | The role of Access and Benefit Sharing on the use of Genetic Resources and associated Traditional Knowledge: a comparative analysis<br>Kavindu Hewa Geeganage |
| **12.15 pm-12.30 pm** | Protection of Non-Traditional Trademarks under Sri Lankan Law: A Critical Perspective<br>Prof. Naazima Kamardeen |
| **12.30 pm – 1.00 pm** | **Discussion** |

**Technical Session 2**

**Track – Public Law (Hall A)**

| | |
|---|---|
| **Panelists** | **Mr. Saliya Peris PC**<br>**Ms. Kishali Pinto Jayawardhana**<br>**Mr. Nimal Punchihewa**<br>**Hon. Justice Arjuna Obeysekera** |
| **Time** | **Name of the Paper** |
| **2.00 pm-2.15 pm** | Whistle-blower Protection through Right to Information: A Critical Review with Special Reference to Sri Lanka<br>Dumindu Madushan |
| **2.15pm – 2.30 pm** | Shifting Towards E-voting for Enhancing the Right to Vote in Developing Countries<br>Dharanee U. Weerasekera |
| **2.30 pm-2.45pm** | A Critical Examination of the Legislature and Judiciary views on the Prevention of Terrorism (Temporary Provision) (Amendment) Act No.12 of 2022<br>Niluka Gamlath |
| **2.45pm-3.00pm** | Judicial Independence and Sri Lanka's Fundamental Rights Jurisprudence<br>Dr. Dinesha Samarathne |
| **3.00pm-3.30 pm** | **Discussion** |

**Track – International Law (CSHR Classroom)**

| | |
|---|---|
| **Panelists** | **Mr. George Dvaladze**<br>**Ms. Samindika Alkaduwa**<br>**Ms. Hasini Rathnamalala** |
| **Time** | **Name of the Paper** |
| **2.00 pm-2.15 pm** | Ending Conflict Related Sexual Violence Against Women: An Appraisal of Innovative Approaches in Implementing International Human Rights Obligations of Sri Lanka |

| | |
|---|---|
| | Ranuli Senarathne |
| **2.15pm – 2.30 pm** | Security Detention During Non-International Armed Conflicts; A Reassessment of The Sri Lankan Civil War<br>H.K.D.W.M. Navodini, Wagisha Kumari K Rathnatilake |
| **2.30 pm- 2.45pm** | Regulating the Circulation of Disinformation via social media amidst an Armed Conflict<br>Jayani Christina |
| **2.45pm-3.15 pm** | **Discussion** |

**Track – Private Law (CSHR Boardroom)**

| **Panelists** | **Hon. Justice Dr. Saleem Marsoof, PC,**<br>**Hon. Justice Arjuna Obeysekera**<br>**Dr. Rose Wijesekera** |
|---|---|
| **Time** | **Name of the Paper** |
| **2.00 pm- 2.15 pm** | Revival of Roman-Dutch Law in the Realm of Restraint of Trade in Sri Lanka<br>Darshana Sumanadasa |
| **2.15pm – 2.30 pm** | Liability of online platforms for cross-border E- commerce food fraud through Private International Law perspective<br>Samangi Abeyrathne |
| **2.30 pm- 2.45pm** | Rethinking the laws to accommodate medical law innovations: with special reference to embryo storage and disposal<br>Danushika Abeyrathna |
| **2.45pm 3.00pm** | Emerging Rights of Fetal Patients: A Legal Analysis<br>Ayodhya P Rathnayake |
| **3.00pm- 3.30 pm** | **Discussion** |

**Track – Commercial Law (Board Room)**

| | |
|---|---|
| **Panelists** | **Dr. Harsha Cabral PC**<br>**Dr. Sunil D.B. Abeyaratne**<br>**Dr. Thusitha B. Abeysekara** |
| **Time** | **Name of the Paper** |
| **2.00 pm-**<br>**2.15 pm** | Currencies of the future and their legal implications to Sri Lanka<br>Sehan A. T. Soyza |
| **2.15pm –**<br>**2.30 pm** | Regulating the Use of Artificial Intelligence in E-Commerce:<br>Challenges and Prospects for Developing International Legal Standards<br>Ruwanthika Ariyaratna |
| **2.30 pm-**<br>**2.45pm** | Protecting Integrated Circuits to promote business interests in Sri Lanka: a comparative analysis<br>Rashani Perera |
| **2.45pm**<br>**3.00pm** | Protecting consumer data in the retail sector in light of targeted advertising: A comparative analysis of the UK and Sri Lanka<br>Pramoda Shanika Vithanage |
| **3.00pm-**<br>**3. 30 pm** | Discussion |

**Day 02: 4th December 2022**

**Technical Session I**

**Track- General (LLM Reading Room)**

| | |
|---|---|
| **Panelists** | **Prof N. Selvakkumaran**<br>**Dr Thusitha Abeysekara**<br>**Dr. Sanath Wijesinghe** |
| **Time** | **Name of the Paper** |
| **9.00 am-**<br>**9.15 am** | An analysis of the law's entrapment in the private-public dichotomy through the lens of domestic violence<br>Rose Wijesekara |

| | |
|---|---|
| **9.15 am-**<br>**9.30 am** | Fighting Online Harassment: A Comparative Analysis of the Different Approaches<br>Samurdhi Jayamaha |
| **9.30 am-**<br>**9.45 am** | Trends of Intellectual Property Law: Epilogue to the Pandemic and a Prologue to Global Economic Downturn.<br>Ruvini Nissanka |
| **9.45 am-**<br>**10.15 am** | Discussion |

**Track- Public Law (Hall A)**

| **Panelists** | **Dr. Jagath Gunawardhana**<br>**Mr. Ravindranath Dabare**<br>**Mr. Hemantha Vithanage** |
|---|---|
| **Time** | **Name of the Paper** |
| **9.00 am-**<br>**9.15 am** | A Critical Analysis of The Legal Regime for E-Waste Management in Sri Lanka<br>Maheshika S. Kumari |
| **9.15 am-**<br>**9.30 am** | Recognition of the Right to Living in A Clean Environment as a Fundamental in Sri Lankan Constitution: A Comparative Legal Analysis with The Constitutions of India And Nepal<br>Manawa Nanayakkara |
| **9.30 am-**<br>**9.45 am** | Elevating Public Participation in the Environmental Impact Assessment Process in Sri Lanka – A Comparative Analysis<br>Selvaraj Puwanitha |
| **9.45 am-**<br>**10.00am** | Inclusivity of Animal Protection within Legal Education in Sri Lanka<br>Dulki Seethawaka |
| **10.00am-**<br>**10.30am** | Discussion |

**Track- International Law (CSHR Class Room)**

| **Panelists** | **Dr. Hiran Jayawardhane**<br>**Ms. Padmaja Wijesooriya** |
|---|---|
| **Time** | **Name of the Paper** |
| **9.00 am-**<br>**9.15 am** | The Accountability of International Legal Institutions over the Russian Intervention in Ukraine: A Critical Analysis<br>Theshani M. Weligamage |
| **9.15 am-**<br>**9.30 am** | International Tribunal for the Law of the Sea: A Way to End the Longstanding Fishing Dispute between India and Sri Lanka<br>Purnima D. Thennakoon |
| **9.30 am-**<br>**9.45 am** | Establishing the Outer Edge of the Continental Margin and the 'Sri Lanka Problem' under the Law of the Sea: A TWAIL Perspective<br>M.A.M. Hakeem |
| **9.45 am-**<br>**10.00am** | Discussion |

**Track- Private Law (CSHR Board Room)**

**9.00 am-10.30 am**

| **Panelists** | **Hon. Justice D.N. Samarakoon**<br>**Dr. Yasodara Kathirgamathamby**<br>**Dr. J.M. Swaminathan** |
|---|---|
| **Time** | **Name of the Paper** |
| **9.00 am-**<br>**9.15 am** | Digital Transformation, Land Law and its Teaching: A View from Sri Lanka<br>Malkanthi Abeyratne |
| **9.15 am-**<br>**9.30 am** | 3D bioprinting and the concept of ownership: challenges and prospects analysis in the field of property law regime<br>Buddhika M Munasinghe |
| **9.30 am-**<br>**9.45 am** | Harmonization or Diversification: Intestate Succession Rules under Private International Law with special reference to Thesawalamai in Sri Lanka |

| | |
|---|---|
| | Kaushani M.P.S. Pathirana |
| **9.45 am-10.00am** | Achieving Sustainable Development Acknowledging Gender Dimensions: Digital Financial Inclusion for Women's Economic Empowerment<br>Petricia Wijetunge |
| **10.00am-10.30am** | Discussion |

**Track- Commercial Law (Board Room)**

| **Panelists** | **Dr. Prathibha Mahanamahewa**<br>**Mr. Nigel Hatch PC**<br>**Dr. Shamila Dawood** |
|---|---|
| **Time** | **Name of the Paper** |
| **9.00 am-9.15 am** | The novel challenge for consumers: an urgent need to revisit the Sri Lankan competition law in the age of the digital market<br>Dianarthy Suthakar |
| **9.15 am-9.30 am** | The contributions of taxation and tax laws for the development of the country and its people during the financial and economic recession: The Sri Lankan Scenario and the Crisis<br>Darshika Pathirana |
| **9.30 am-9.45 am** | A critical appraisal of the legal framework on price control and emerging challenges in Sri Lanka: a way forward<br>Pradinath S Sivanesan |
| **9.45 am-10.00am** | Consumer Privacy vs Marketing Opportunities: Regulating Unsolicited Messages across Communication Channels in Sri Lanka<br>Panduka W Bandara |
| **10.00am-10.30 am** | **Discussion** |

**Technical Session 2**

**Track – General (LLM Reading Room)**

| | |
|---|---|
| **Panelists** | **Prof N. Selvakkumaran**<br>**Dr Thusitha Abeysekara**<br>**Dr. Sanath Wijesinghe** |
| **Time** | **Name of the Paper** |
| **9.00 am-**<br>**9.15 am** | What 'Deepfake' technology brings to the table: Learning from the EU approach on deepfakes<br>Ruvini Katugaha |
| **9.15 am-**<br>**9.30 am** | Digital Biometric Technology for Law Enforcement and Government Agencies<br>Sanduni Kawya |
| **9.30 am-**<br>**9.45 am** | Combating Zoom fatigue to enhance student centered teaching and learning through innovative approaches. A case study<br>Chathurika Akurugoda |
| **9.45 am-**<br>**10.00am** | A Legal Study on Consequences of Provision of Bail for suspected petitioners on Illicit Narcotic Consumption under Exceptional Circumstances<br>Sajini P Jayathilake |
| **10.00am-**<br>**10.30am** | Discussion |

**Track – Public Law (CSHR Class Room)**

| | |
|---|---|
| **Panelists** | **Mr. Prasnatha Lal de Alwis PC**<br>**Dr. Sarath Wijesjinghe**<br>**Mr. Nihal Chandrathilaka** |
| **Time** | **Name of the Paper** |
| **11.00am-**<br>**11.15am** | Passive smokers' right to health; analyzing the public health policies in Sri Lanka<br>Nadeesha WG Sewwandi |

| | |
|---|---|
| **11.15am-11.30am** | Land Reform Law Act No. 01 of 1972 of Sri Lanka: Policies, Practices and Problems<br>SM Anurudhdhika G. Senarathne |
| **11,30am-11.45am** | Strengthen the Legal and Regulatory Framework to Combat Corruption in Public Procurement in Sri Lanka: A Comparative Study<br>U.A.T. Udayanganie |
| **11.45 am-12.15 pm** | Discussion |

**Track – International Law (Hall A)**

| **Panelists** | **Prof. (Dr.) Sampath Punchihewa**<br>**Dr. Sharmila Dawood**<br>**Dr. U.A.T. Udayanganie** |
|---|---|
| **Time** | **Name of the Paper** |
| **11.00am-11.15am** | Analysis of legal methods of argument formation and e-discovery: A complete toolkit for legal professionals<br>Pawan Kumar |
| **11.15am-11.30am** | The Powers of the International Criminal Court to Prosecute Sri Lankan Heads of State for War Crimes<br>Faizer M. Shaheid |
| **11,30am-11.45am** | Analyzing the procedures and advantages of International Arbitration in the context of leading cases<br>Kazi Tamanna T Ferdush |
| **11.45 am-12.00pm** | Balancing Inherent Human Rights and Protection of Public Health-Special Focus Upon Compulsory Vaccination Against Infectious Diseases<br>Susarithaa Segar |
| **12.00 pm - 12.30pm** | Discussion |

**Track – Commercial Law (Board Room)**

| | |
|---|---|
| **Panelists** | **Mr. Menaka Harankaha**<br>**Hon. Justice Kumudini Wickremasinghe**<br>**Prof. (Dr). Naazima Kamardeen** |
| **Time** | **Name of the Paper** |
| 11.00<br>11.15 am | Intellectual property in school curricula: prospects and challenges for Sri Lanka<br>Prof. Sampath Punchihewa |
| 11.15 –<br>11.30 am | Registration of Geographical Indications in Sri Lanka: an analysis of the Intellectual Property Act, No. 36 0f 2003<br>Lankika Dayarathna |
| 11.30 –<br>11.45 am | Critical Analysis of Interim Measures of Arbitration in Sri Lanka: A Comparative Study of UK and India<br>Medani Navoda |
| 11.45 am –<br>12.00 pm | Reforming the Legal Regime in Relation to Independent Directors in Sri Lanka: A Comparative Analysis<br>Piyumi D Lekamge |
| 12.00 –<br>12.15 pm | Increasing Dangers of Cybercrime: The Need for a Robust Cybersecurity Strategy to Safeguard Digital Consumers<br>Prof. Indira W Nanayakkara |
| 12.15 –<br>12.45 pm | Discussion |

# ABSTRACTS

## Digital transformation and land law and its teaching: a view from Sri Lanka

M. D. M. Abeyratne

Faculty of Law, University of Colombo

Present worldwide since 1990s digital age, digital transformation occurs when institutions innovate their operational models using digital technologies of electronic tools, systems, platforms, devices, and resources which generate, store, or process data to create competitive edge, increased market relevance and enriched customer experience. Digital transformation gained sudden visibility when COVID-19 pandemic forced its accelerated adoption globally, as institutions pivoted to online Work From Home strategies and online academic activities, particularly in the higher education sector, to reduce productivity and economic loss resulting from measures introduced to curtail spread of disease. To examine the exploratory question whether digital transformation can mitigate challenges, three phenomena were studied in context of land law taught at state university level in Sri Lanka. Firstly, 2020s high visibility accelerated digital transformation of university academic activities. Secondly, a much earlier globally evident digitizing of land records, land administration and land services where progress is seen as slow and fragmentary. Thirdly, syllabus content of land law, pivotal to the subject's academic activity, where no digital transformation is evident. Analysis focused on whether digital transformation's mitigatory ability diminished on three grounds: firstly, constraints on its long-term sustainability or rapid launch; secondly, self-generated negative consequences; and thirdly, imperviousness of some system elements to digital transformation. Findings were that digital transformation's mitigatory ability is weakened by firstly, constraints of insufficient funding and lack of readily digitizable matter; secondly, self-generated negative consequences of privacy and surveillance issues; and thirdly, imperviousness of some operational elements, as doctrinal content of land law syllabus, to digital transformation. Literature review reveals the paper is original research for Sri Lanka. This exploratory research shows digital transformation may not mitigate challenges in every instance even though digital technological capabilities exist.

Keywords: digital technology, land records, law teaching

**The role of access and benefit sharing on the use of genetic resources and associated Traditional Knowledge: a comparative analysis**

Kavindu Hewa Geeganage
LL.B. (Hons.) University of Colombo
Lecturer (Probationary) – Department of Commercial Law, Faculty of Law, University of Colombo.

Traditional Knowledge refers to knowledge, innovations, and practices of local communities which have been developed in a distinct, long-established tradition over generations. Consequent to the Convention on Bio-Diversity entering into force, access to diverse genetic resources, as well as the fair and equitable sharing of benefits from the utilization of these resources and Traditional Knowledge, emerged as major debatable concerns. The need for institutional arrangements to control access and benefit-sharing agreements, as well as define ownership of biological resources including their associated Traditional Knowledge, is currently being argued under the topic. With the advancement of contemporary technologies, Traditional Knowledge related to natural and biological resources including their economic and scientific significance has drawn a diverse spectrum of commercial sector contributors for their use. Therefore, in this study, the function of access and benefit-sharing mechanisms on the utilization of Traditional Knowledge is hypothesized to be a beneficial approach to mitigate the constraints of contemporary society. The purpose of this research is to investigate and assess the significance of access and benefit sharing, particularly within the parameters of the Convention on Biological Diversity and the Nagoya Protocol, which provide avenues for encouraging local communities to safeguard their Traditional Knowledge while commercializing the same. This study primarily falls into the qualitative research paradigm of legal research and is based on the Black-Letter method of legal research. Additionally, the comparative legal analysis method was utilized to compare international legal instruments and analyze various practical examples from several jurisdictions in the area of protecting traditional knowledge. This study delved into unrevealed terrain in terms of the protection of Traditional Knowledge through 'access and benefit sharing' in Sri Lanka. It is expected that this study will contribute to the theoretical underpinning of Traditional Knowledge by conducting a comprehensive evaluation of 'access and benefit sharing' on the utilization of Traditional Knowledge.

Key Words: Traditional Knowledge, Genetic resources, fair and equitable sharing, access and benefit-sharing agreements

**Balancing Inherent Human Rights and Protection of Public Health - Special Focus Upon Compulsory Vaccination Against Infectious Diseases.**

Susarithaa Segar
LL. B (Hons.), LLM (Colombo), Attorney-at-Law
Lecturer (Probationary),
Department of Public and International Law, Faculty of Law, University of Colombo, Sri Lanka.

'Man is a political animal' is a famous quote of Aristotle. As per the history of the evolution of human rights at a certain point in time man has agreed to surrender such animal qualities to lawmakers for the protection of his inherent natural rights. Lawmakers can restrict inherent human rights in extreme situations where there is a threat to public health and protection. Those restrictions must be imposed following nature and reason. This paper seeks to examine the question of vaccination against infectious diseases such as COVID 19. Imposing compulsory vaccination against such infectious diseases may restrict certain inherent human rights. This paper will largely focus on the Sri Lankan laws during a pandemic such as COVID 19 which is an infectious disease. For the above discussion conceptual analysis of democracy and the philosophical foundation of Human Rights will be dealt with in this paper. This paper seeks to provide sustainable recommendations to retain a balance between inherent human rights and public health at large. For such purpose, a comparative study will be dealt with in this research exercise. This study is a preliminary outcome of a literature survey on this topic. The necessary information is gathered from primary sources of Constitutions; legislations and international instruments and secondary sources accessible and available such journal articles; textbooks; research and working papers; government publications; newspapers; electronic databases; and e-journals.

Keywords: COVID 19, vaccination, philosophical foundation, human rights, infectious disease

**Strengthen the legal and regulatory framework to combat corruption in public procurement in Sri Lanka: A Comparative Study**

U. A. T. Udayanganie

Senior Lecturer, Department of Public and International Law, Faculty of Law, University of Colombo

Abstract: Sri Lanka's current economic crisis is a result of several years of mismanagement of public funds, corruption, shortsighted policymaking, and an overall lack of good governance. Public Procurement is a key economic activity of governments that represents a significant percentage of the Gross Domestic Product (GDP) generating huge financial flows. An effective procurement system plays an iconic role in governments for avoiding mismanagement and waste of public money. One of the key allegations made about the government's large infrastructure projects is how the money has been spent and the criteria whereby projects were selected. Recently, several projects were questioned due process and an absence of following the competitive bidding process. Sri Lanka's procurement procedure is governed by the Procurement Guidelines and the Procurement Manual as amended. The absence of proper legislation sheds a red light to ensure transparency, accountability, fairness, competitiveness and cost-effectiveness in public procurements. Given the important role that public procurement plays the question has often arisen as to whether, and if so how public procurement should be regulated to combat corruption. This study advances the argument that the poor adherence to the public distribution of information relating to procurement procedures and contracts, including information on invitations to tender and relevant information on the award of contracts and frequent deviations from competitive bidding creates a larger space for corruptions. On the other hand, the inadequate role of the judiciary in reviewing public contracts further facilitates the corruptive practices of public procurement process. In this background, the paper aims to analyse the Sri Lankan legal and regulatory framework on public procurement with a view to fathoming accountability and transparency. Finally, the paper suggests an integrated approach of simplified rules, specific legislative provisions, more circumscribed administrative discretion, and a robust but principled judicial review of procurement decisions to combat corruption in the field. This paper seeks to recount experiences in public procurement law and regulations in UK, Singapore and Hong Kong and to glean lessons that can be learnt with regard to proper regulation. Hence, the paper is based on the combination of black-letter comparative research approaches.

Key Words: public procurement, corruption, transparency, accountability, legal and regulatory framework

**Significance of the school in a constitutional democracy**

S. B. I. Perera

Department of Public & International Law, Faculty of Law, University of Colombo, Sri Lanka.

What is the significance of school in a constitutional democracy? I explore this question using Sri Lanka as my case study. Schools in Sri Lanka originated during the colonial period continuing through nationalist struggles to the post-independence period. But there has been no assessment of the changing role of schools through these transformations. The Constitution of Sri Lanka 1978 recognises eradicating illiteracy and universal, equal access to education as a directive principle of state policy. In the post-independence period, Sri Lanka maintains a free education policy up to the tertiary level and high literacy rates. However, the current structure of the school system reinforces the ethnic and gender divisions and class and geography-based inequalities. The limited availability of opportunities for higher education, quality vocational education, and employment opportunities perpetuates the competitive focus. Therefore, the other values that school education seeks to promote remain underappreciated. For the purposes of the paper, I focus on highlighting the importance of the role that schools perform in a constitutional democracy. To achieve this aim, I follow the analytical approaches that constitutional scholars Anika Gauja, Tarunabh Khaitan, and Vicki Jackson have taken to theorise the political parties, fourth branch institutions, and knowledge institutions respectively. Accordingly, I analyse the importance of schools based on the function that the schools perform to promote the values of constitutional democracy and the institutional positioning of the school. In terms of functions, the schools impart education, and in a constitutional democracy, education teaches citizens about the duties and rights of citizenship and respecting community and diversity. In terms of institutional positioning, the school is the first institution that the citizens engage with outside their families and the state has an obligation in regulating them towards promoting constitutional democracy.

Keywords: Constitutional democracy, schools, citizenship, diversity, knowledge institutions

**Blending trademark rights with the metaverse: Can Sri Lanka tackle non-fungible tokens through the conventional trademark law regime? – Lessons from the United States**

W. R. Samaranayake
Department of Commercial Law, Faculty of Law, University of Colombo
94 Cumaratunga Munidasa Mawatha, Colombo 7

Non-Fungible Tokens (NFTs) have unveiled new opportunities as well as new challenges for trademark owners. NFTs are unique in that they cannot be easily replicated as they are 'minted' through smart contracts which verify ownership and manage transferability. However, this unique quality of having an immutable proof of ownership in NFTs does not necessarily foreclose avenues for misappropriation. The reason is that an NFT is merely a representation of the underlying asset and not the asset itself. Hence, the ownership of an NFT does not necessarily mean ownership of the underlying asset nor any intellectual property right pertaining to such asset. An upshot of this is that NFTs that simulate someone else's trademarks are quite common. Nevertheless, such imitation has sometimes been justified on the ground of 'nominative fair use'. Undeniably, the legal controversy posed by NFTs is a classic example of technology outstripping traditional legal strictures. Therefore, the question invariably arises whether the fundamental principles embodied in the canvas of conventional trademark law regime can be extended to the crypto world. For example, would the courts treat the respective virtual and real goods as similar in assessing the confusing similarity in such cases? What is the application of the exhaustion principle? Axiomatically, the bewildering complexity created by NFTs poses a major challenge for Sri Lanka's trademarks law regime. For instance, one might question if the statutory provision prohibiting dilution is adequate to grapple with NFT-related trademark violations. Similarly, would the absence of express statutory recognition of the nominative fair use exception unfairly prejudice NFTs owners? Thus, in this paper, an attempt is made to critically evaluate the adequacy of the existing law on trademarks in Sri Lanka to cope with the legal dilemma created by NFTs. This comparative study will employ a qualitative desk-based research method.

Keywords: Non-fungible tokens, trademarks, infringement, fair use.

**Establishing the Outer Edge of the Continental Margin and the 'Sri Lanka Problem' under the Law of the Sea: A Third-World Perspective**

M. A. M. Hakeem
Department of Public and International Law
Faculty of Law - University of Colombo, Sri Lanka

The United Nations Convention on the Law of the Sea of 1982 (UNCLOS) establishes the legal framework on delimitation of various maritime zones. The concept of the Continental Shelf is one of the innovative concepts of the UNCLOS. In the Third Conference of the UNCLOS, Sri Lanka raised objections to the application of the Irish formula, on the delimitation of her continental shelf margin, based on the grounds that it has its own unique features and that the application of the Irish formula would in the circumstances be inequitable. In the case of Sri Lanka, she would have to concede areas nearly five times in excess of minimum economic thickness. However, the UNCLOS lays down normative framework relating to continental shelf from Article 76 to 85 in line with the Irish formula. Article 76 of the UNCLOS determines that the foot of the continental slope is one of the major features in the establishment of the outer limits of the continental shelf. Therefore, this study critically analyses customary practices of States and reviews the existing literatures on the maritime claims for establishing outer edge of continental margin and as to why and how such western formula has been accepted as norms of UNCLOS, while alternative suggestions were made as an exception in the case of Sri Lanka. This study concludes that, in order to serve justice and fairness, adopting the alternative perspectives to the western international norms i.e. TWAIL approach shall be judicious in light of equitable solution with special reference to the maritime claim of Sri Lanka on the extended continental shelf beyond 200 nautical miles.

Keywords: Law of the Sea, Outer Edge of Continental Margin, Sri Lanka Problem, TWAIL.

**Legal education in a digitalized world: Reforms to the pedagogy of public and international law courses at the undergraduate level**

S. S. M. W. Seneviratne

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

Sri Lankan Law schools offer international law subjects in their curricula either as compulsory or optional courses based on their significance, relevance, availability of resources, needs and demands. International law courses provide universal parameters, to be followed by Sovereign States, through their public bodies. International law courses require dramatic reforms to keep abreast with changing dynamics and challenges in a digitalized world. This research aims at proposing necessary reforms to the pedagogy of international law courses offered at the undergraduate level in Sri Lankan Universities, by drawing comparative examples from prestigious law schools in selected jurisdictions. Main conundrum of the research is 'what kind of changes should the Sri Lankan Universities introduce in their undergraduate level pedagogy to make students to be equipped with satisfactory knowledge, skills, attitudes and mindset to conduct themselves upon graduation as professionals in law in a society, which suffers from several democratic deficits in the governance. This qualitative research analyses fundamental legal theories relating to international law subjects and their practical application considering the required changes to the law school curriculum to improve the pedagogy of these subjects. This research hypothesizes that the dearth of public discourses, with the involvement of academics, students, lawyers and affected communities as a major void in the pedagogy and emphasizes the need to integrate an investigative approach in the pedagogy, to the issues relating to the international obligations of sovereign States, having constant dialogues with public bodies, which hold responsibility to implement those obligations on behalf of the general public, in addition to its academic components. Technological developments should be used in this blended approach to improve the efficacy of this new pedagogy.

Keywords: legal education, public and international law courses, pedagogy, reforms

**3D bioprinting and the concept of ownership: challenges and prospects analysis in the field of property law regime**

B. M. Munasinghe

Private and Comparative Law, University of Colombo, Sri Lanka.

Three-dimensional bioprinting or 3D bioprinting is a field which has been developed as a result of the advancement of biotechnology engineering and it has a significant impact on the field of biomedicine. Even though this field can be identified as an emerging field of law; the impact of this field has immense importance in the law of property including intellectual property law and data protection laws. The issue of ownership coming under the property law is one of the controversial issues that is integrally linked to this subject, particularly the usage of patient data and resources required to continue the 3D printing process, as well as the stimulation of non-therapeutic applications by data. Moreover, the security of data and privacy is another legal challenge for three-dimensional printing. Therefore, 3D printing in the field of biomedicine poses substantial regulatory and social-ethical hurdles. Existing European Union regulations are the most recent law pertaining to human bioprinting compared to the vast majority of other ownership laws. Other existing laws and treaties, such as the Universal Declaration of Human Rights and the 1997 Universal Declaration on the Human Genome and Human Rights, are inadequate for addressing issues of ownership and control over human bio-printed creations. The objective of this paper is to analyze how the ownership and possessory rights in the field of 3D bioprinting have been impacting the traditional common law and civil law aspects of property law which totally decline to grant any ownership rights over human biomaterials by using qualitative methods of research.

Keywords: 3D bioprinting, ownership, possession, property law

**Revival of Roman-Dutch law in the realm of restraint of trade in Sri Lanka**

Darshana Sumanadasa

Department of Private and Comparative Law, Faculty of Law, University of Colombo

Restrictive covenants are a common phenomenon in the business world and the employment context, by which the covenantors agree to give up the personal freedom they would otherwise enjoy for the benefit of the covenantee. They include non-disclosures, non-competes, and non-solicitation agreements which intend to protect the legitimate interests of a business such as confidential information and clientele. The legal approach to such contracts in Sri Lanka relies upon English law principles. Accordingly, restrictive covenants are prima facie void unless they get through a two-fold test – reasonableness in the interests of the parties and reasonableness in the eye of the public. This test was established by the Nordenfelt case in the 19th century which has been a travelling jurisprudence in the common law jurisdictions for over a century. Krishnan Chetty, the first ever reported case on restraint of trade in Sri Lanka applied English law on the basis that South Africa which is identical to Ceylonese law follows English law on the issue. However, in 1984 in Magna Alloys, relying on Voet's Pandects, the South African Supreme Court of Appeal held that this area of law should be governed by Roman-Dutch law, the common law of South Africa. The court held that the restraints are prima facie valid unless the covenantor shows that it is against public policy. Accordingly, the burden of proof is with the covenantor to prove that the covenant is against public policy. This paper, based on desk research, argues that Sri Lankan courts may consider rectifying the judicial approaches to restraint of trade by applying Roman-Dutch Law principles. That is because Roman-Dutch law is considered to be the common law of Sri Lanka and Voet is recognised as the most respected classical Roman-Dutch law jurist in Sri Lanka and South Africa.

Keywords: Restraint of trade, Roman Dutch Law, English Law

**Liability for negligently inflicted psychiatric injury in the workplace: An analysis under the law of negligence**

V. Kamal Ahamed

Lecturer (Probationary),

Department of Private and Comparative Law, Faculty of Law, University of Colombo

Workplace psychosocial hazards increase the risk of prolonged workplace stress, which can lead to physical and psychological injury. In recent years, claims for damages for deliberately or negligently inflicted work-related psychiatric injury have succeeded against employers in many jurisdictions. In order to claim damages for psychiatric injury, the law of negligence requires the plaintiff to prove two elements: namely, proximity and reasonable foreseeability in a context where an employer had actual knowledge of the risk of psychological injury to all employees as a result of vicarious trauma. Sri Lanka has conventionally relied on employer liability to provide for employee injury compensation, complementing it through the Workmen's Compensation Ordinance (WCO), No. 19 of 1934. According to Schedule I of the WCO 'permanent incurable loss of mental capacity resulting in fatal incapacity to work or any other injury causing fatal incapacity to work' is the only compensable psychiatric injury. There is no arrangement for short-term or curable psychiatric injuries. As such this paper argues that the WCO has not effectively deals with all work-related psychiatric injuries. Hence, the law of negligence can be adequately applied to fill this lacuna. In order to deal these lacunas and to give suggestions, this paper analyses legal literatures from Australia, South Africa and Sri Lanka. The author employs doctrinal analysis from primary and secondary legal sources in arriving at the solutions to the above problem. This paper will significantly contribute to the existing literature by discussing the challenges faced by an employee in proving the conditions required by the law and its solutions to ensure that employee who suffered psychiatric illness or injury in the workplace has a redress under the law of negligence.

Key words: Negligence, psychiatric injury, foreseeability, proximity, damages

**Developing a Civil Liability Regime for Artificial Intelligence (AI) in Sri Lanka: A Critical Legal Study**

Udapadie Liyanage

Department of Private and Comparative Law

Use of artificial intelligence (AI) is apparent in every sector today. Simply, AI is a simulation of human intelligence to a machine for automation. The potential of AI cannot be ignored in the present, in view of the advancement of technology for the comfort and betterment of humankind. Driverless vehicles, information gathered from self-driven drones, robotic medicine and lawyering are a few interesting areas which have been developed through AI. However, certain matters pertaining to the use of AI are still left to be uncovered. Accidental deaths, serious bodily injuries, damage to property, economic losses and invasion of privacy have become more important legal issues relating to AI. The main concern is who should be liable to the victims of AI as those systems are self-piloted. The law governing AI in Sri Lanka is not established as the industry is still at a nascent stage in this country. Apart from products liability law, which is based on fault, no specific law on AI operates in Sri Lanka. Therefore, it is questionable whether the emerging issues relating to AI can be addressed under the existing law. This paper aims to examine present products liability law and its potential in handling cases relating to AI in Sri Lanka and or whether any policy intervention is warranted. This is a qualitative study which uses primary and secondary sources for its comparative analysis. It explores European Union Directives which evaluate the recovery of damages relating to torts of AI from a products liability perspective in a two-tiered way, on a high risk and low risk basis. It analyses whether the same approach is adequate and usable to improve the present Sri Lankan regime by recommending policy intervention for high-risk operations on the basis of strict liability.

Keywords: Civil liability, AI, Products' liability, damages

**Elevating Public Participation in the Environmental Impact Assessment Process in Sri Lanka – A Comparative Analysis**

Selvaraj Puwanitha

Department of Public and International Law. Faculty of Law, University of Colombo

Enhancement of Public Participation (PP) in the process of Environmental Impact Assessment (EIA) is considered as an essential factor in fostering Environmental Justice. Although PP is subsumed to the substantive laws of Sri Lanka, the lack of effective provisions to environmental laws in integrating effective participatory technics that ameliorate the quality of the information provided during project approval processes undermines the values and objectives of incorporating PP in the EIA process. It is essential that the public should be given a fair opportunity to defend their rights related to the environment for smoother functioning at the implementation level, even though it might be complicated at the initial stage. Thus, this research aims to explore the gaps in the law which hinder the nurturing of PP at the project approval stage to foster informed decision-making in the EIA process. This research will be conducted as exploratory research using both primary and secondary sources, exerting a qualitative approach. The findings reveal that Sri Lanka initially attempted to incorporate PP on an ad-hoc basis and later incorporated it into legislative enactments. However, the method used to incorporate the PP, the duration of such participation, utilisation of the comments of the public, addressing the concerns of the public, accountability and transparency, role of the expert panel in the process, and so on are not constructively aligned to meet the objectives of PP. Therefore, in light of the said context, the standard of adherence to the concepts of Participatory Democracy and Environmental Justice descended immensely. Thus, the author attempts to comparatively analyse the issue with the legal background of selected countries and recommend legal requirements that can be introduced to the Sri Lankan system to enhance the quality and effectiveness of PP in the EIA process in Sri Lanka.

Keywords: Public Participation, Environmental Impact Assessment, Environmental Justice, Decision Making, Participatory Democracy.

**Judicial independence and Sri Lanka's fundamental rights jurisprudence**

D. Samararatne

Dept of Public & International Law, Faculty of Law, University of Colombo

Since 2001, appointments to the appellate judiciary in Sri Lanka have been the subject of constitutional reform. Under the 17th and 19th Amendments to the Constitution, in 2001 and 2015 respectively, Presidential appointments of the appellate judiciary has been subject to the approval of the Constitutional Council. Before the 17th Amendment and under the 18th and 20th Amendments these appointments have been at the discretion of the President. One of the arguments in favour of subjecting judicial appointments to the approval of the Constitutional Council is that it strengthens judicial independence. This paper assesses this claim through a doctrinal study of the jurisprudence of the Supreme Court under Art 126, under the 19th Amendment (2015-2020). It contrasts the jurisprudence of this period with the jurisprudence of the Court under the 18th Amendment (2010 to 2015). The number of judgements 2015 to 2020 is greater, and the judicial reasoning is more detailed, well developed and expands the scope of rights protection. Through judicial interpretation the Court includes new rights such as rights of the environment through interpretation. In several cases the Court orders innovative remedies. The Court develops its jurisprudence on the right to life and human dignity in a reasoned manner. Moreover, the Court engages in direct judicial incorporation of relevant international law. It is suggested, therefore, that while causation is difficult to establish, there is a strong correlation between independence of the judiciary and the quality of the jurisprudence of the Court. It is further suggested that this finding supports arguments in support of the reintroduction of the Constitutional Council and the re-establishment of a Fourth Branch in Sri Lanka's constitutional architecture.

Keywords: Judicial independence, Fundamental Rights, Judicial Review, Sri Lanka, Constitutional Reform.

**Determining the Delictual Liability of the Police: The Legal Challenge and Way Forward**

Thushanthiga Kumarasoorier Thanikumar
Senior Lecturer (Transitional),
Department of Private and Comparative Law, Faculty of Law, University of Colombo

Sri Lanka has witnessed severe inefficiency in the police service and suffered irreparable losses so far. Though the idea of imposing delictual liability on the police service to overcome the issue of inefficiency has been received with much enthusiasm, the fear of its 'chilling effect' holds the legal profession a step back from making it into a reality. It is to be accepted that determination of delictual liability should be carried out with caution due to the reason that it may place unrealistic burden and responsibilities on the police service and may pull the officers to employ defensive practices while discharging their duties. In this context, it becomes inevitable to decide the boundary lines to impose delictual liability on the police.

The author has proposed a legislative amendment to the Police Ordinance No.16 of 1865 to incorporate clauses on common duty of care in the previous study on police negligence and omissions. Relying on this, the present study proceeds to explore as to how the delictual liability for the breach of common duty of care under the Police Ordinance No.16 of 1865 could be determined. For this purpose, the study looks at the experience and lessons learnt from the South African and England jurisdictions and proposes 'reasonableness' as the yardstick to determine the delictual liability of police in Sri Lanka.

Keywords: delicutal liability, police, reasonableness, negligence, omission

**The novel challenge for consumers: an urgent need to revisit the Sri Lankan competition law in the age of the digital market**

Dianarthy Suthakar

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

The consumer market in the digital economy relies on technology, the internet, and online platforms. The digital market transformed traditional business patterns into digitalization which cause a huge impact on the established principles of market competition and consumer safety. Most prominently, the purchase and choice patterns, safety standards, and, price determination methods of consumers have been drastically changed. Even though the platform-based business model allows consumers to get access to many choices, the consumer behaviors on the online platform are subjected to various algorithms which target the consumers through self-preferencing and advertising which cause harm to consumers. The objective of this research is to analyze the impact of digital market practices on the existing government policy on competition established under the Consumer Affairs Authority Act of Sri Lanka. Consequently, the research addresses the central question of whether the existing law governing market competition in Sri Lanka is adequate to regulate the novel issues that arise within the digitalized markets. To this end, the paper analyses the emerging issues in market competition in digitalized markets, in particular the ways to resort to fair competition in these novel markets through the legal and policy frameworks. It argues that to strengthen consumer well-being in the digital market, there is a need to review the existing competition laws and adopt a new legal framework for market competition to effectively deal with digital anti-competitive practices. Cooperation between relevant authorities and regulator is essential to deal with the challenges of the digitalized market with a holistic approach. The study is a doctrinal analysis, and various primary and secondary sources are utilized, and concludes the existing competition law of Sri Lanka can be reshaped with a new set of principles as those adopted in the Digital markets Act 2022 of the European Union which aims to regulate and ensure fair and contestable digital market platforms.

Keywords: Anti-competitive practices, Consumer welfare, digital market, market competition

**The Neglected in the Global Agenda: An Analysis on the Effective Participation of Indigenous Peoples**

I. Liyanage, T. R. Galappaththige

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

Although the indigenous peoples have a unique lifestyle and distinct characteristics there is uncertainty about their recognition and participation in global agendas. This has resulted in neglecting them in decision-making processes which has serious effects on their right to indigenous lands. This situation has got worse with the massive development projects penetrating into the indigenous territories disregarding their effective participation. Hence, the paper aims to ascertain how the international regime including United Nations (UN) and regional human rights systems, has recognized the consent, consultation, and compensation towards the recognition of effective participation of the indigenous peoples. Against this backdrop, the paper considers the meaningful participation of the indigenous peoples as an essential tool to mitigate the gravity of the identified problem. To this end, international instruments have developed certain modes of effective participation, namely, obtaining free, prior, and informed consent and making space for consultation. Similarly, the successful accommodation of effective participation creates a better way to resolve the problem by granting appropriate compensation to vulnerable indigenous peoples. The right to indigenous land of these peoples is necessarily violated when the obligations to consult, obtain consent, and/or compensation are not followed. This research follows the desk research methodology and thus, the primary focus will be on the UN, and the Inter-American and African human rights systems. This paper mainly focuses on two main UN initiatives namely, the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and Special Rapporteur on the rights of indigenous peoples. Accordingly, this paper argues that although the UN system has recognized the above-noted modes of participation, the system has rarely comprehended the means and methods to obtain participation effectively. This paper is of the view that, perceiving this issue solely from the UN human rights systems would not satisfactorily address the case and thus, it is pivotal to perceive the problem holistically by integrating inter-American and African human rights standards and precedents for a progressive resolution.

Keywords: Indigenous peoples, UN and regional Human Rights mechanisms, effective participation

**Survival of the fittest vs. murder of the weakest: A 21st century defence of Darwinian evolutionist legal theory**

G. D. Gunawardena

Department of Private and Comparative Law, Faculty of Law, University f Colombo

Legal scholarship has always been sceptical of jurisprudential theories derived from other disciplines. Evolutionist jurisprudence, which is rooted in the biological theory of evolution, is one such theory that has attracted its fair share of criticism. The evolutionist school of thought gained popularity towards the latter half of the 19th century, in the wake of the Darwinian revolution, and certain aspects of this natural science theory seeped into the social sciences as well. However, it rapidly fell into disfavour, especially after the second world war, due to its association with Social Darwinism which corrupted evolutionist jurisprudence and was used to justify fascist regimes, eugenics, imperialism, and various other human atrocities. Through a qualitative, library-based study, this paper grapples with the problem of whether Darwinian evolutionist jurisprudence can be isolated from such objectionable elements which have led it to disrepute. The author adopts an interdisciplinary approach, drawing on academic opinion from the disciplines of jurisprudence, sociology, biology, philosophy, economics, and political theory. Given its interdisciplinary nature and the inherently broad scope of jurisprudence, this study utilises Max Weber's ideal-typical methodology of conducting social science research. The analysis is primarily based on secondary sources such as books and journal articles which reflect academic opinion on the relevant theories. It also refers to certain primary sources such as legislation and case law across multiple jurisdictions to illustrate how the theories analysed in this study manifest in real-world situations. This paper begins with a characterisation of Darwinian evolutionist theory and highlights several benefits it offers over other jurisprudential theories. It will then analyse how certain misapplications of Darwinian theory led to the unpopularity of this school of thought. This paper ultimately seeks to defend Darwinian evolutionist legal theory by arguing that the 'survival of the fittest' does not necessitate the 'murder of the weakest'.

Keywords: Darwinian Evolutionist Legal Theory, Evolutionary Jurisprudence, Theory of Evolution, Social Darwinism, Law and Science

**Intellectual property in school curricula: prospects and challenges for Sri Lanka**

N. S. Punchihewa

Department of Commercial Law, University of Colombo, Sri Lanka

The purpose of this paper is to explore, whether and to what extent Intellectual Property (IP) education can be integrated into school curricula of primary and secondary education in Sri Lanka. The research employs a critical review of literature method by following black-letter legal research methodology. The results of this research indicate that there is a paucity of scholarly literature dealing with this issue and inadequate attention to the topic in Sri Lanka, which factors motivated the researcher to undertake this study. Even though IP is deemed the 'currency of the 21st century' and has gained immense recognition as a catalyst for economic growth around the globe, value of IP has been neither adequately inculcated in the minds nor sufficiently embedded in the DNA of the younger generation of the country. This is a worrying development which is a cause for concern among educational policymakers in Sri Lanka. It is also evident that up until today, IP education has been given meagre attention in the school curricula in Sri Lanka, except for a rudimentary reference to IP rights in Grade 11 ICT subject. Arguably, the inadequate attention to IP at the school level education has been instrumental in preventing Sri Lanka from becoming an innovation-driven country during the last seven decades or so. Therefore, this research offers new insights to educational policymakers on the paramount importance of introducing IP education through the school curricula at least at the next curriculum revision scheduled to be implemented in 2024. The National Institute of Education has proposed that IP education be embedded into the Civic Education curriculum which shall be taught to Grade 9 students. Nevertheless, this proposal will encounter several challenges: namely, the lack of learning resources; low-level of awareness amongst teachers; priority given to certain other subjects; and parents' negative perceptions due to exam-driven educational culture in the country. In terms of originality, to the best of the author's knowledge, this is the first research that explores the prospects and challenges in teaching IP at school level which will go a long way towards helping Sri Lanka to become an innovation-driven, IP exporting economy in decades to come.

Keywords: Intellectual Property, School Curricular, Promoting Innovation

**Increasing Dangers of Cybercrime: The Need for a Robust Cybersecurity Strategy to Safeguard Digital Consumers**

W. I. Nanayakkara

Department of Commercial Law, University of Colombo, Sri Lanka

Consumers today participate in a digital marketplace because it provides numerous benefits. On the other hand, the increasing volume of cross-border transactions raises some complex consumer protection issues. Cybersecurity is frequently cited as the most significant global threat. With the rise of cross-border and digital commerce, whether a specific jurisdiction has authority has become a critical issue in consumer protection. The law can only safeguard consumers through the enforcement of national statutes. The increasing sophistication of hackers and the pervasiveness of cybercrime in today's digital economy highlight the critical need to ensure consumer safety. Consumers may lose confidence in digital marketplaces if these problems and regulatory challenges are not resolved. To resolve some of these concerns, governments must stay receptive to the various initiatives that may be implemented to address the challenges posed by the digital marketplace without impeding or stifling the numerous benefits these advances provide to consumers. Sri Lankan consumer protection laws do not adequately protect consumers from cyber security threats. The significance of consumer protection necessitates introducing new legislation to protect consumers from the risks posed by evolving technology. This article is a brief overview of the existing consumer protection legislation in Sri Lanka. It draws several conclusions, including the need for a new, comprehensive legislative framework and integrated approach to consumer protection enforcement at both the domestic and international levels to address the issue of consumer protection in cyberspace. Domestic reforms alone are insufficient to address the problem in the Internet age, so higher-level security settings, globally permissible countermeasures, international cooperation, and enforcement aspects are required to protect consumers from cybercrime.

Keywords: Consumer Protection, Cybercrime, Digital Technology

**Harmonization or Diversification: Intestate succession rules under Private International Law with special reference to Thesawalamai in Sri Lanka**

M. P. S. Kaushani Pathirana

Senior Lecturer in Law (Trans), Department of Private and Comparative Law, Faculty of Law, University of Colombo

It is apparent that the rules of intestate succession under private international law have consistently adhered to the conclusion that the destination of movables on the death of the owner is governed by the law of his domicile (lex domicilii), and the destination of immovable is governed by the law of the place where the property is situated at the time of his death (lex situs). Although there is unity in private international law about the intestate succession of property, practical problems will arise when applying these rules in situations where there are multiple personal laws applicable in the countries like Sri Lanka. For instance, a person who governs under Thesawalamai should obtain a continuous and permanent domicile physically in Jaffna province in order to obtain his succession rights under Thesawalamai law (as per Sivagnanalingam v. Sunderalingam of 1988). If a person of Thesawalamai lives abroad for several years and dies in that country leaving property both in Sri Lanka and abroad, there will be several problems in proving his permanent domicile in Jaffna which is an essential requirement in the application of Thesawalamai for the deceased's intestate succession. The Sri Lankan law consists of a conglomeration of transplanted laws made up of a mixture of Roman-Dutch Law and English Law as well as indigenous laws referred to as Kandyan Law, Thesawalamai, and Muslim Law. Nevertheless, there is no proper mechanism in Sri Lanka to harmonize these laws as any harmonizing mechanism can be contradicted the fundamental rights of the persons who govern under personal laws. This research proposes a proper mechanism to unify or harmonize the rules of intestate succession in Sri Lanka using the principles of private international law (unity of succession rule) which is the main problem-solving mechanism used by many other countries in these types of private international law issues.

Keywords: Private International Law, Intestate Succession, Legal Pluralism, Thesawalamai, Sri Lanka

**Whistle-blower Protection through Right to Information: A Critical Review with Special Reference to Sri Lanka**

G. P. D. Madhushan, K. A. A. N. Thilakarathna

Department of Private and Comparative Law, Faculty of Law, University of Colombo

Whistleblowing can be identified as a means of voicing out wrongdoings in a given establishment to either inside or outside channels. It should also be noted that whistleblowing is a way of expressing ones dissent concerning a wrongdoing which should be respected and guaranteed, albeit with such limitations as required in a democratic society. While this can be identified as a means of combating corruption and enhancing accountability, transparency and good governance through such disclosures, the existing legal regime in Sri Lanka does not provide explicit protection for such individuals when they are being retaliated against. This research aims to analyse the right to information regime in protecting the whistle-blowers through the right to information law, through a qualitative method by analysing statutory provisions and decisions of the Right to Information Commission of Sri Lanka. The results reveal that section 40 of the Right to Information Act No. 12 of 2016 provides protection for officers and employees of public authorities who disclose or release information which is under their custody, control or possession that they are entitled to disclose under RTI Act should not be retaliated by means of disciplinary action or any punishment. It is argued that this provision is capable of providing some protection for individuals in the public authorities who decide to blow the whistle by a way of disclosing, or releasing upon their own initiation. It is recommended that; whistle-blower protection should be widely recognized in order to achieve the objectives of the Act.

Keywords: Whistleblowing, Right to Information, Release of Information, Transparency, Whistle-blower Protection.

**Protecting consumer data in the retail sector in light of targeted advertising: A comparative analysis of the UK and Sri Lanka**

P. S. P. G. Vithanage

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

The interface of retail and marketing industries has drastically changed with e-commerce in the modern world. Traditional marketing occurred on billboards and road signs are shifted to online platforms. Today, the 'adtech' industry processes consumers data and observes consumer behaviour to provide more personalised advertisements to consumers. As a result, ensuring consumer data privacy in modern markets has become a challenge. Thus, the central research problem of this study is whether the existing data protection laws are adequate to protect consumer data privacy in the retail sector targeted advertising in the UK and Sri Lanka? The main research objective is to examine to what extent consumer data is, could, and should be protected in retail sector targeted advertising. This research deploys a comparative research methodology through a critical review of the literature. The comparative research with the UK contributes to identify the possible challenges and solutions in the implementation of the data protection law in Sri Lanka which is at a primitive stage. The research concludes with recommendations through a user-centric dualist approach of regulating the industry and empowering consumers. The research argues that consumers' legal right to data privacy should never be undervalued in the interest of adtech industry. The researcher argues that becoming a highly conscious consumer is challenging in this information age where a large amount of consumer data is processed specifically in the retail marketing. Thus, the data protection law and supplementary consumer law approach under 'unfair commercial practices' has the potential to mitigate the risk and ensure consumer data privacy through regulatory and industry involvement.

Keywords: consumer behaviour, consumer choice, privacy, nudging, targeted advertising

**Rethinking the laws to accommodate medical law innovations: with special reference to embryo storage and disposal**

A. H. M. D. L. Abeyrathna

Department of Private and Comparative Law, Faculty of Law, University of Colombo

The innovations relating to assisted reproductive technology have given wider opportunities for infertile couples to have children, while there are many dilemmas to address by law. The disposal of surplus frozen human embryos poses contentious ethical concerns that lack legal attention in Sri Lanka. To achieve pregnancy, physicians frequently fertilise many eggs and generate cryopreserved or frozen human embryos for eventual transfer to the woman's womb. Successful egg retrievals produce 1 to 20 eggs, with the quantity cryopreserved depending on fertilisation and development prior to freezing. In their efforts to produce a child, many couples do not use all of their stored embryos. A related and more sophisticated dilemma arises when couples who have already had IVF and have frozen embryos in storage disagree about how to dispose of their frozen embryos. The primary objective of this research is to evaluate the effectiveness of the existing legal framework in addressing issues related to embryo storage and disposal and to make recommendations for reform. The research is primarily qualitative in nature. A desk review of the existing international human rights instruments is followed by a comparative analysis of domestic and foreign legislation, academic articles, case law, and reports by recognised organisations/institutions from Sri Lanka and the UK. In light of Dworkin's argument on abortion in his book Life's Dominion, the research is expected to address the dilemmas posed by embryo storage and disposal. In conclusion, the paper recommends that the State eliminate the ambiguities of embryo storage and disposal through appropriate legislative intervention.

Keywords: assisted reproductive technology, embryo, disposal, storage

**Combating Zoom Fatigue to Enhance Student Centred Teaching and Learning. A case study of Year I Students of Faculty of Law.**

C. L. Akurugoda

Department of Public and International Law, Faculty of Law

The covid-19 pandemic forced university teaching to transform from onsite to online education. Though there were many obstacles at the outset, Zoom became the preferred academic teaching and learning platform for synchronous education. Despite many technological challenges, students and faculty now sat and looked at their screens for hours. While looking at their screens, the viewers were often distracted by events in their environment, notifications from smartphones, social media, and email, which promoted multitasking and as a result there are many complains as to the stress generated by zooming for long hours. The purpose of this qualitative research is to ascertain the impact of zoom fatigue in the student learning in the Faculty of Law, especially after teaching was shifted to a Zoom environment without adapting the course materials to optimize student-centered online learning and suggesting a few practical solutions to overcome it. Thus, first part of this paper will conceptualize the term 'Zoom Fatigue' in the context of higher education while second part analyses the impact of the same on the learning and teaching process in the Faculty of Law, by using a few selected student-centred active learning theories. Third part of the paper discusses a few selected innovative active learning methods which could optimize the online learning of law undergraduates of the Faculty of Law.

Keywords: zoom fatigue, student centred learning, higher education.

**Protection of Non-Traditional Trademarks under Sri Lankan Law: A Critical Perspective**

N. Kamardeen

Department of Commercial Law

In the past few years, there has been some debate as to whether non-traditional trademarks (including sound, touch, taste and feel marks) should find protection under the intellectual property laws of Sri Lanka. The original drafters of Sri Lanka's IP legislation omitted this category of marks from the scope of registrable trademarks for extremely valid reasons, such as the dearth of local innovation in the area and the cumbersome nature of the examination and protection process. This paper hopes to revisit some of these arguments in light of modern developments and consider whether non-traditional trademarks should be admitted to the category of marks receiving protection under the Sri Lankan law.

The paper will adopt a doctrinal approach with some elements of sociolegal inquiry in order to ascertain the views of experts in the field. It will first define non-traditional trademarks and analyse both the Sri Lankan and global rules governing trademarks, including approaches of jurisdictions that allow non-traditional trademarks to be registered. It will then consider the economic, social and cultural reasons for both allowing and denying the registration of non-traditional trademarks in Sri Lanka, with reference to both research already done and empirical research conducted specifically for the purpose of this paper. Finally the paper offers some projections for the future of non-traditional trademarks in Sri Lanka.

# Faculty of Management and Finance


## *Challenges of Change in Volatility*

21st October 2022

# MESSAGE FROM THE DEAN

**Professor M. P. P. Dharmadasa**
Dean
Faculty of Management and Finance

I am delighted to send this message for the Annual International Research Conference on Management and Finance (IRCMF) 2022 and the Doctoral Colloquium of the Faculty of Management and Finance of the University of Colombo.

The Faculty of Management and Finance of the University of Colombo conducts IRCMF 2022, the annual research conference of the Faculty, which will be held for the seventeenth consecutive year on 21st October 2022 in hybrid mode. A growing body of research is vital for management practices and for improving organizational outcomes. Certainly, this type of conference and colloquium brings all the researchers to one platform and inculcates a research culture among the fraternity, thereby contributing to the nation's development. In this light, IRCMF strives to create a research culture among academia, and it is a platform for academics to discuss and debate scholarly dilemmas from different theoretical, methodological, and practical lenses by bringing different ideologies under one roof to provide opportunities to exchange ideas face to face and to establish research relations. The abstracts submitted here fit the overarching objective of our conference and colloquium and had a peer-reviewed process to maintain the quality of the abstracts.

I am sure that conferences and colloquiums of this type will inculcate a much-needed research culture among academics and researchers and trigger interactions among them to exchange ideas about recent advances in management. I take this opportunity to thank the conference and colloquium chairs, staff, reviewers, and the organizing committee for contributing to successfully organizing and managing this event.

I wish the Annual International Research Conference on Management and Finance (IRCMF) 2022 and the doctoral colloquium a grand success.

## MESSAGE FROM CONFERENCE CO-CHAIRS

**Dr. W. Pemarathne Gamage**
Senior Lecturer
Department of Marketing
Faculty of Management & Finance

**Dr. A. M. C. P. Atapattu**
Senior Lecturer
Department of Business Economics
Faculty of Management & Finance

It has been an honour and a privilege to co-chair this year's International Research Conference on Management and Finance (IRCMF) organized by the Faculty of Management and Finance, University of Colombo for the 17th consecutive year. As with our predecessors, we attempted to continue the rich academic tradition of our faculty this year as well through this conference by enabling academics of our discipline to engage, debate, and present their on-going research work.

We thank our authors for their hard work, as this conference is a platform to showcase and improve their work for future publications. Further, through the Doctoral Colloquium – which is part of our main conference – we anticipate that current and prospective doctoral students will be able to present their research ideas and obtain valuable feedback to progress in their research. Further to this, we anticipate that our session on the industrial dialogue would enable both academics and practitioners to bridge industry phenomena, concerns and trends by inspiring researchers with new research ideas, and also industry professionals to explore solutions to their contemporary organizational problems.

A conference of this magnitude cannot be done merely by its co-chairs. We need to thank the organizing committee of the conference for their hard work. The organizers had to endure many road blocks during this year with many disruptions to academic work. However, even with these difficulties the organizing committee – the staff of the Faculty of Management and

Finance – did a wonderful job in making this conference a reality. A note of special thanks to our Dean, conference secretaries, track chairs and coordinators, panel of reviewers, editorial committee, industry dialogue and doctoral colloquium organizers for their hard work.

We are honoured to have Professor Roy Suddaby, Professor and Chair in organization as our keynote speaker this year and the renowned panellists who are sharing their experience at the industry dialogue session.

Hope all of you will have a wonderful and enriching experience at this conference.

## ORGANIZING COMMITTEE

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Dr. W. Pemarathne Gamage

Dr. A. M. C. P. Atapattu

**Co-Secretaries**

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- T. Kuhendran

# PROGRAM

21st October 2022 (A Virtual Conference on Zoom)

## Inaugural Ceremony (8.30 AM to 12.00 PM)

8.30 AM – Registration

9.00 AM – National Anthem

9.10 AM – Video on UOC and FMF

9.30 AM – Welcome Speech

9.45 AM – Speech by Vice Chancellor, University of Colombo

10.00 AM – Speech by the Dean, Faculty of Management and Finance

10.15 AM – Keynote Address

11.15 AM – Vote of Thanks

## Conference Tracks (1.00 PM to 2.45 PM)

Accounting and MIS

Business Economics and Finance

Marketing and Hospitality Management

Management and Organization Studies

## Industry Dialogue (3.00 PM to 4.30 PM)

**Theme** – "Thriving in Chaos"

**Participants –**

Dr. W.A. Wijewardena (Former Deputy Governor, Central Bank of Sri Lanka)

Mr. Lasantha Senaratne (Company Secretary, Sampath Bank PLC)

Mr. Sampath Jayasundara (CEO, hSenid Business Solutions and PeoplesHR)

Mr. Nihal Muhandiram (Vice President, Operations Galle Face Group)

**Moderator** –

Dr. Dharshani Thennakoon, Senior Lecturer, Department of Human Resources Management, Faculty of Management and Finance

# INTRODUCTION TO KEYNOTE SPEAKER

**Professor Roy Suddaby**
Professor and Chair in Organisation Theory,
Work, Organisation and Management,
University of Liverpool,
United Kingdom

Roy Suddaby is the Winspear Chair of Management at the Peter B. Gustavson School of Business, University of Victoria, Canada, Professor of Entrepreneurship at the Carson College of Business at Washington State University, USA and Professor of Organization Theory at Liverpool University Management School, University of Liverpool, UK. Professor Suddaby is an internationally regarded scholar of organizational theory and institutional change. His work has contributed to our understanding of the critical role of symbolic resources – legitimacy, authenticity, identity and history – in processes of entrepreneurial change and innovation. His current research examines the rhetorical use of the past to mobilize resources for entrepreneurial change.

Roy is a past editor of the Academy of Management Review and is a current associate editor of Academy of Management Perspectives. He is or has been an editorial board member of the Academy of Management Journal, Administrative Science Quarterly, Organization Studies, Journal of Management Studies, and the Journal of Business Venturing. He has won best-paper awards from the Academy of Management Journal, Administrative Science Quarterly, and the Administrative Sciences Association of Canada as well as the Greif Research Impact Award from the Academy of Management.

Roy was recently named a Fellow of the Academy of Management, a JMI Scholar and an Ascendant Scholar by the Western Academy of Management and a Member of the College of New Scholars, Artists and Scientists of the Royal Society of Canada. Thompson Reuters identified Roy as one of the world's most highly cited researchers in business and economics in 2014, 2015, 2016 and 2017.

# ABSTRACTS

## Accounting benefits and ERP user satisfaction: from the perspective of accountants and internal auditors in Sri Lanka

R. G. D. C. Karunarathna dulshan.changa.dc@gmail.com
R. D. S. B. Rajapaksha samithabhagya@dac.cmb.ac.lk
Department of Accounting, Faculty of Management and Finance, University of Colombo

At present, many business organizations are extensively implementing Enterprise Resource Planning (ERP) systems while sharing a common database and being real-time. In the past scholars have highlighted the necessity for an empirical study on the impact of ERP in terms of accounting benefits and ERP user satisfaction. Thus, the present study was conducted from the perspective of accountants and internal auditors as recent scholars shed light on the cruciality of these two groups' perceptions as key ERP users in organizations. This study examines the accounting benefits that may ensue through the adoption of ERP systems by Sri Lankan companies with regard to ERP user satisfaction. A quantitative survey methodology is employed to draw empirical evidence. The findings confirm that organizational, operational (time), and IT accounting benefits derived from the ERP system significantly and positively influence ERP users' satisfaction. In contrast, operational accounting benefits (cost) received the lowest rating and did not significantly influence ERP user satisfaction. While these findings are valuable to accountants and internal auditors to better understand the ERP accounting benefits, ERP consultants and system providers also benefit in identifying ERP accounting features to uplift user satisfaction in developing countries.

Keywords: ERP systems, Accounting benefits, Accountants and internal auditors, User satisfaction

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# Reflected identity work in strategy work: an explanation from strategy-as-practice perspective

T. Nayomi S. De Peiris[1] nayomipeiris@sjp.ac.lk

K. A. S. P. Kaluarachchi[2] samanthakaluarachchi@mos.cmb.ac.lk

[1]University of Sri Jayewardenepura, Sri Lanka

[2] Department of Management and Organization Studies, Faculty of Management and Finance, University of Colombo

The purpose of this empirical study is to discuss how the practices of managers in strategy work are linked with their identity work. With the strategy-as-practice perspective, this study exemplified how the identity work of organisational managers are reflected in their strategy work. The participants of the study were managers representing a cross-section of an organization which has experienced a strategy change. Thirty semi-structured interviews were used for the generation of the data for thematic analysis. NVivo12 data management software was used for data management and the initial coding. The different identity work of managers was reflected through practices of managers including defining, claiming, sense-making, separating, maintaining, strengthening, accommodating, classifying, stabilizing, complying, joining, resisting, accepting, and supporting. Further, the explanations and justifications of practices by managers reflect how they are performing identity work of defining others, discrediting practices of others, and reflecting ways of dominating others while doing their strategy work by taking and occupying positions in the field. The present study contributes the strategy as practice perspective, as it analysed the practices linked with strategy work of managers and the identity work that is reflected through those practices. This study also analysed how the reflected identity work for self, differs based on the managerial level and years of experience at the organization. As contribution to the strategy-as-practice perspective, this study highlights dynamics with identity work reflected through the strategy work of managers' practices at the case organisation.

Keywords: Organisational field, Identity work, Position taking, Strategy work

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# Challenges for the successful implementation of BASEL III framework in licensed commercial banks in Sri Lanka

R. Weerabahu[1], N. Ekanayake[1]

[1] Department of Finance, Faculty of Management and Finance, University of Colombo

The presence of deficiencies in the banking sectors led to a continuous occurrence of financial crises in the past. To overcome such deficiencies, the Basel framework was introduced to the banking sector. However, banks of developing countries including Sri Lanka face challenges in the implementation of the Basel framework successfully. Hence, this research is an investigation of challenges for the successful implementation of Basel III framework in Licensed Commercial Banks (LCBs) of Sri Lanka. Also, it investigates implementation differences of Basel III standards between public and private LCBs. The study has adopted a quantitative research approach with a hypothetic-deductive method. A pilot study was carried out at the initial stage to improve the reliability of the findings. Data is collected from 198 bank employees representing 13 domestic LCBs of Sri Lanka using an open-ended questionnaire. Collected data were analyzed using regression analysis, Pearson correlation, and ANOVA under SPSS 23 statistical software. The results highlighted several challenges to Basel III implementation namely, lack of awareness level of the bank management, lack of human resource expertise, weak upgrades to the information technology infrastructure, high implementation cost, and culture of the context. These identified challenges have a strong negative relationship with successful Basel III implementation except the cost which has a strong positive relationship. Furthermore, there is a significant difference in public and private LCBs in implementing Basel III standards. The results of the findings will assist the regulators and policy makers in terms of reforms to encourage the Sri Lankan LCBs in implementing Basel III successfully.

Keywords**:** Licensed Commercial Banks, Basel III framework, Challenges, Sri Lanka

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# The impact of credit risk management on non-performing loans in licensed commercial banks: evidence from Sri Lanka

Charuka Hatharasinghe[1] c.m.hatharasinghe@gmail.com

Nishani Ekanayake[1] nishnaie@dfn.cmb.ac.lk

[1]Department of Finance, Faculty of Management and Finance, University of Colombo

This study aims to explore the impact of credit risk management on the non-performing loans (NPLs) in the Licensed Commercial Banks (LCBs) of Sri Lanka. As such, the difference between the private and public commercial banks in the credit risk management performance is also investigated. The study relies on primary data, gathered from 151 survey questionnaires from senior officers including board members of 13 commercial banks operating in Sri Lanka. The analysis was supported by regression analysis, descriptive statistics, Pearson correlation analysis, ANOVA test, coefficient analysis, and one-way ANOVA. The findings suggest that credit risk identification, assessment, and control significantly and negatively impact the NPLs in commercial banks. Further, the evidence supports the view that better credit risk management is achieved in private LCBs compared to public banks. The study has implications for the country's commercial banks which are experiencing high NPLs over the recent past. In addition, useful insights were derived in terms of risk management under the Basel III regulatory requirements. The study contributes to the empirical gap in the literature on credit risk management of Sri Lankan banks and its relationship with NPLs. Findings highlight the importance of effective credit risk management to improve the asset quality in banks which is imperative in the context of rising NPLs.

Keywords: Licensed Commercial Banks, Sri Lanka, Credit Risk Management, Non-Performing Loans

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# Impact of board governance and audit committee characteristics on financial reporting quality of listed companies in Sri Lanka

N. T. Amarasekara[1] norashaamarasekara971103@gmail.com

Y. M. Hewage[1] yashodha@dac.cmb.ac.lk

[1]Department of Accounting, Faculty of Management and Finance, University of Colombo

The purpose of this paper is to investigate the relationship between selected Corporate Governance (CG) characteristics namely Board Governance (BG) and Audit Committee (AC) characteristics and the level of Financial Reporting Quality (FRQ). The study was carried out using secondary data obtained through published annual reports from 202 listed companies in Sri Lanka. Three selected BG characteristics (Board Size, Board Independence, CEO Duality) and three selected AC characteristics (Audit Committee Size, Audit Committee Independence, and Audit Committee Accounting Expertise) were used as independent variables. The level of FRQ was evaluated by the absolute value of discretionary accruals (ADA) using panel linear regression analysis. It was found that, a significant positive relationship exists between the audit committee accounting expertise and FRQ, while a significant negative relationship was found between Board Size and FRQ. However, the other remaining characteristics do not significantly influence the level of FRQ. Overall, this analysis highlights the importance of having a comparatively smaller board size and the members in the audit committee having financial and accounting background to enhance FRQ and transparency. Since the past studies shows inconsistent results when analyzing BG and AC characteristics on FRQ and with less recent studies in Sri Lankan context, the present study covering 2017-2020 contributes to the literature by extending the finding to the local context as well. The findings of this study conveyed a significant policy implication for policy makers and regulators in terms of formulating strategies and policies on corporate governance best practices in Sri Lanka. Similarly, the entities should promote smaller board size and recruit a majority of independent non-executive directors with sufficient accounting skills and financial experience with the aim of curtailing the adverse earnings management practices to improve FRQ.

Keywords*:* Board Governance, Audit Committee Characteristics, Financial Reporting Quality, CSE, Sri Lanka

The full paper of this abstract was published in the Proceedings of the 17th International Research Conference on Management and Finance 2022 organised by the Faculty of Management and Finance, University of Colombo

# Faculty of Medicine

# Colombo Medical Congress 2022

***Sustainable and Affordable Healthcare through Research Innovation and Practice***

23rd - 26th November 2022

# MESSAGE FROM THE DEAN AND CONGRESS CO-CHAIR

**Vidya Jyothi Senior Professor (Chair) Vajira H. W. Dissanayake**
Dean
Faculty of Medicine, University of Colombo

I am pleased to provide this message to the Programme Book of the Colombo Medical Congress 2022 in my capacity as the Dean of the Faculty and the Co-Chair of the Colombo Medical Congress 2022.

This year's Congress is special because we are able to have a fully-fledged onsite Congress after two years. The theme of the congress "Sustainable and Affordable Healthcare through Research, Innovation and Practice" that would be highlighted in all presentations during the congress including orations, plenaries, keynote addresses and symposia is aimed at raising awareness on how health care should be planned and delivered in the current socio-economic context.

This year's Congress has three special features. Firstly, our strategic partnership with the World Health Organisation (WHO). The Faculty hosts two WHO Collaborating Centres. There are more in the pipeline. This congress with the country representative of the World Health Organisation, Dr.Alaka Singh, as Chief Guest sets the background for the continuing collaboration between the Faculty and the World Health Organisation (WHO). Secondly, two symposia are embedded in the Congress programme but conducted overseas. The first one is conducted by our alumni in Thimphu, Bhutan and the other by our alumni in Gold Coast, Australia. Both these symposia would add a new dimension to the Congress. I am sure that such symposia conducted by our alumni in other countries too would become a regular feature of the Colombo Medical Congress in the years to come. Thirdly, the expression of the humane aspects of the practice of medicine through song, music, art and sculpture. The inaugural performances of the Colombo Medical Orchestra and the Colombo Medical Choir at the Inauguration of the Congress and the exhibition of art and sculpture would be a unique experience to all the delegates.

I wish to extend a warm word of appreciation to my co-chair, Dr. Anula Wijesundere, and her team at COMSAA and all my colleagues in the Faculty of Medicine who performed many roles in the organising team of this Congress. The success of this conference exemplifies their dedication, commitment and hard work. I wish to thank our sponsors and others who supported this Congress in numerous ways. I hope that the delegates enjoy the Congress and that they would come back to future Congresses and continue to support the Faculty.

## MESSAGE FROM THE CONGRESS CO-CHAIR

**Dr. Anula Wijesundere**

President, Colombo Medical School Alumni Association

It is indeed a great honour and a special privilege to convey my best wishes for the Annual Research Symposium of the University of Colombo. The Faculty of Medicine, University of Colombo is undoubtedly the benchmark for medical education in Sri Lanka, having provided health manpower needs for the nation for the past 152 years. Apart from academic scholarships, the Faculty of Medicine has provided the environment which actively promotes research excellence.

The value of research in medicine cannot be overemphasized. High quality research impacts patients' lives positively and also adds much prestige to the respective academic institutions. As the current President of the Colombo Medical School Alumni Association, I am proud to state that many alumni of this hallowed and prestigious institution have earned world recognition through excellent research and innovations.

The Annual Research Symposium of the University of Colombo and the Colombo Medical Congress provide the academic staff, extended faculty, allied health professionals and the students wonderful opportunities for showcasing their research talents and achievements. This conference will also be an opportunity to share knowledge, forge networks and plan collaboration with other researchers.

I urge all participants to utilize these opportunities to the fullest.

I wish the Annual Research Symposium every success.

## MESSAGE FROM CO-CHAIRS, SCIENTIFIC COMMITTEE

**Senior Professor Nadira D. Karunaweera**

**Professor Panduka Karunanayake**

Faculty of Medicine, Colombo

It is a pleasure and a privilege to provide this message to the Colombo Medical Congress 2022. This international event is jointly organized with the Colombo Medical School Alumni Association (CoMSAA) in line with the Annual Research Symposium of the University of Colombo.

The theme of our Congress was chosen very carefully, to represent major challenges that our nation is facing right now and the need for academia to realign itself to serve the nation in this hour of need. We have also made every effort to make maximum use of available resources, give the widest possible platform for our resource persons and audience to interact and innovate, and act with responsibility towards our national economy and shared environment. This has been an extensive operation that had to be meticulously planned over many months, with a central organizing committee and several satellite committees. The organizing committees consisted of the Faculty's academics, non-academic staff, students and alumni. All members worked with commendable levels of commitment and dedication to put together the event, which will be inaugurated on 23rd November 2022 with Dr. Alaka Singh, WHO Country Representative to Sri Lanka, as the Chief Guest.

This year's event is of particular significance, as the venue is the newly built University of Colombo Faculty of Medicine (UCFM) Tower. The inauguration will be held in the main auditorium with plenaries and symposia spread across the two adjoining floors. This however, added many challenges, especially to our logistics team who worked tirelessly to clear many hurdles prior to the event. This will go down as the first ever event of this magnitude held in the new premises and will mark a significant milestone in the history of the UCFM Tower.

The Keynote Address of the Congress will be delivered by Dr. Anila Dias Bandaranaike, former Assistant Governor of the Central Bank of Sri Lanka, who will speak on a timely topic for the nation, 'An opportunity for self-criticism and positive change', which will mark the beginning of the technical sessions of the congress. The two orations of the event will be

delivered by two internationally renowned clinician-scientists of the country, Professor Janaka de Silva and Professor Prasad Katulanda.

It is indeed with pride we announce that the technical sessions of this year's Congress will consist of 6 plenaries, 27 symposia, 9 free paper (7 oral and 2 poster) sessions, and 3 student sessions. There are also 7 workshops covering a diversity of topics, of which 5 are pre-congress and 2 are post-congress. In line with the 'green' concept of the Congress, the programme book this year will be in electronic form and the link to it will be shared with the participants.

One of the special features of this Congress is that we solicited expressions of interest from the Faculty and its Alumni to conduct its sessions. The response was overwhelming; indeed, in the end, the vast majority of the sessions of the Congress have been based on the submissions to this call. We believe that this will enable the Congress to truly become a portrayal of the academic activities of our Faculty: our academics, non-academics, students, alumni and their collaborators. It is a great opportunity to share with our world what we do, create new collaborations and reach new vistas.

As the Scientific Committee Co-chairs, we know that the success of the Congress ultimately depends on the many people who have worked with us in planning, organizing the conference and precisely implementing the planned activities. We take this opportunity to express our sincere gratitude to the Dean of the Faculty of Medicine Professor Vajira Dissanayake and President of the CoMSAA Dr. Anula Wijesundere, the Co-Chairs of the Congress, for their leadership and constant advice. We would also like to extend our gratitude to the co-secretaries Dr. Hermali Silva and Dr. Dilushi Wijayaratne for their untiring efforts, and all members of committees for their hard work. We also say a big thank you to our reviewers; orators and keynote speaker; resource persons in the workshops, plenaries and symposia; free paper presenters; judges; and session chairs. Finally, we would like to thank all our sponsors, without whose support this conference would not be possible. And above all, a big thank you to our audience – without whom no conference is complete!

It is a great pleasure to note that our scientific programme has been well complemented and balanced by an equally elaborate cultural programme, consisting of exhibitions and live performances. We thank our Department of Medical Humanities for organising it, and we are sure that it will make our Congress even more memorable. We hope that you will have a productive as well as an enjoyable conference!

# ORGANISING COMMITTEE

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# Programme of Sessions

## Pre-Congress Workshops

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<tr><td colspan="3">Pre-Congress Hackathon: 18th November 2022</td></tr>
<tr><td colspan="3">“Rescue mission: Planet Earth”<br>Team Planetary Health, UCFM</td></tr>
<tr><td colspan="3">Pre-Congress workshops: 22nd November 2022</td></tr>
<tr><td>9.00 - 12.00 IST</td><td>Ethics review of medical research<br>Ethics Review Committee, UCFM</td><td>Academic Mentoring Programme, Faculty of Medicine, University of Colombo (AMP-UCFM)<br>Mentoring workshop series 2022 for universities and professional networks:<br>final workshop and awarding of certificates<br>AMP, UCFM</td></tr>
<tr><td>13.00-16.00 IST</td><td colspan="2">Enhancing the quality of health research with patient and public involvement and engagement (PPIE)<br>Institute for Research & Development in Health & Social Care, Sri Lanka</td></tr>
<tr><td colspan="3">Pre-Congress workshops: 23rd November 2022</td></tr>
<tr><td>9.00 - 15.00 IST</td><td colspan="2">Effective research communication: beyond the basics<br>Research Promotion and Facilitation Centre, UCFM</td></tr>
</table>

# Inauguration

| **23rd November 2022** | **UCFM Tower Main Auditorium** |
|---|---|
| 16.30-16.50 | Academic Procession |
| 16.50-17.00 | National Anthem and Traditional Lighting of the Oil Lamp |
| 17.00- 17.00 | Welcome Address<br>*Vidya Jyothi Prof. Vajira H.W. Dissanayake, Co-Chair of the CMC 2022, Dean, UCFM* |
| 17.10-17.20 | Introduction to the Scientific Sessions<br>*Prof. N. Karunaweera and Prof. P. Karunanayake, Co-Chairs of the Scientific Committee, CMC 2022* |
| 17.20-17.30 | Address by the President, COMSAA<br>*Dr. Anula Wijesundere, Co-Chair of the CMC 2022* |
| 17.30-17.40 | Cultural event<br>*Students of UCFM* |
| 17.40-17.50 | Address by the Vice Chancellor, University of Colombo<br>*Senior Professor H.D. Karunaratne* |
| 17.50-18.00 | Address by the Guest of Honour<br>*Secretary, Ministry of Education* |
| 18.00-18.10 | Address by the Guest of Honour<br>*Secretary, Ministry of Health* |
| 18.10-18.20 | Address by the Chief Guest<br>*Dr. Alaka Singh, WHO Country Representative to Sri Lanka* |
| 18.20-18.30 | Vote of Thanks<br>*Dr. Hermali Silva, Joint-Secretary, CMC 2022* |
| 18.30-19.15 | Faculty Oration<br>The diabetic epidemic in Sri Lanka - The UCFM Response<br>*Vidya Jyothi Prof. Prasad Katulanda, UCFM* |
| 19.15-19.20 | Procession leaves the hall |
| 19.20-19.30 | Launching of the Orchestra and the Choir of UCFM |
| 19.30 | Reception |

# Main Sessions

| **Day 1: 24th November 2022** | | | |
|---|---|---|---|
| Time | **UCFM Tower, Main Auditorium**<br>**Keynote Address**<br>Sri Lanka's Economic and Political Crisis - An Opportunity for Self -Criticism and Positive Change<br>*Dr Anila Dias Bandaranaike, Former Assistant Governor, Central Bank of Sri Lanka* | | |
| 08.15– 09.00 IST | | | |
| | **Main Auditorium** | **1st floor venues** | **2nd floor venues** |
| 09.00-10.15 IST | Symposium – 01<br>Planetary health : transformation to heal the world | Symposium – 02<br>Advances in physiology teaching and research: opportunities for collaborations | Symposium – 03<br>A biochemical approach to anticancer drug development |
| 10.15-10.30 IST | Tea | | |
| 10.30-11.45 IST | Symposium – 04<br>Political economy of health | Symposium – 05<br>Pathway to green and sustainable clinical and research laboratories | Symposium – 06<br>Promotion of early detection and effective management of breast cancer in Sri Lanka |
| 11.45-13.00 IST | Symposium – 07<br>Falls in people with diabetes mellitus: risk factors and prevention strategies | Symposium – 08<br>Recent updates in the management of snakebite envenomation | Symposium – 09<br>Child mental health issues, contemporary social challenges and parenting |
| 13.00-14.00 IST | Lunch | | |
| 14.00-14.30 IST | **UCFM Tower, Main Auditorium**<br>**Plenary 1**<br>Policy options for improving health systems efficiency to recover from the economic crisis<br>*Dr. Alaka Singh, World Health Organization Country Representative to Sri Lanka* | | |
| 14.30-15.00 IST | **UCFM Tower, Main Auditorium**<br>**Plenary 2**<br>The Doctor in Society - A Sri Lankan Perspective<br>*Dr Sarath Gamini De Silva, Colombo Medical School Alumni Association* | | |
| 15.00-16.15 IST | Symposium – 10<br>Good governance for medicines: from funding to utilisation | Symposium – 11<br>Translational Research: in advance therapies | Symposium – 12<br>Hormonal gender disorders: when 'pink or blue' is not black and white |

| | |
|---|---|
| 11.00 IST Onwards | **UCFM Tower, Atrium**<br>**The Resplendent world of medical humanities**<br>Art exhibition & Live Portrait Session |
| **The history walk – Leaves the UCFM Tower, Atrium at 13.00 IST and at 15.00 IST** | |

| **Day 2: 25th November 2022** | | | | |
|---|---|---|---|---|
| Time<br>08.15– 09.00 IST | **UCFM Tower, Main Auditorium**<br>**Plenary 3**<br>A hope for a prophylactic vaccine for leishmaniasis<br>*Prof Abhay R Satoskar, Professor of Pathology and Microbiology, Ohio State University, USA* | | | |
| | **Main Auditorium** | **1st floor venues** | | **2nd floor venues** |
| 09.00-10.15 IST | Symposium – 13<br>Bhutan's contributions towards global health and wellbeing | Symposium – 14<br>Digital surgery - Robotics, AI, computer simulation and beyond. Are we ready for the next frontier? | | Symposium – 15<br>The way forward in cancer diagnostics in Sri Lanka: the role of CEDARC. |
| 10.15-10.30 IST | Tea | | | |
| 10.30-11.45 IST | Free paper session 1 (Orals) | Student session 1 (Orals) | Free papers Poster session 1 Breakout rooms | Free paper session 2 (Orals) |
| 11.45-13.00 IST | Symposium – 16<br>Practice of family medicine for cost effective patient centred care at primary care settings | Symposium – 17<br>Recent advances in eye care | | Symposium – 18<br>Thyroid cancer |
| 13.00-14.00 IST | Lunch | | | |
| 14.00-14.30 IST | **UCFM Tower, Main Auditorium**<br>**Plenary 4**<br>Novel nanomedical applications to destroy viruses, antibiotic resistant bacteria and cancer<br>*Prof Richard S Gunasekera, Professor of Biochemistry, Biola University, USA* | | | |
| 14.30-15.00 IST | **UCFM Tower, Main Auditorium**<br>**Plenary 5**<br>How smallpox changed the course of Sri Lankan history<br>*Dr Zameer Careem, Director, Centre for Policy Alternatives, Sri Lanka* | | | |
| 15.00-16.15 IST | Symposium – 19<br>Undergraduate medical research: the present and the future | Symposium – 20<br>Solid organ transplantation | | Symposium – 21<br>Medication safety |

| | |
|---|---|
| 11.00 IST Onwards | **UCFM Tower, Atrium**<br>**The Resplendent world of medical humanities**<br>Sculpture exhibition and live sculpture session |
| **The history walk – Leaves the UCFM Tower, Atrium at 13.00 IST and at 15.00 IST** | |

| **Day 3: 26th November 2022** | | | | | |
|---|---|---|---|---|---|
| Time | **UCFM Tower, Auditorium** | | | | |
| 08.15– 9.00 IST | **Plenary 6**<br>Anatomy of a Medical Innovation<br>*Vidya Jyothi Dr. Bandula Wijay, Medical Inventor, Ambassador for Science, Technology and Innovation, Sri Lanka* | | | | |
| | **Main Auditorium** | **1st floor venues** | | **2nd floor venues** | |
| 09.00-10.15 IST | Symposium – 22<br>Navigating the troubled waters of the Sri Lankan health sector, to provide high-quality, safe, sustainable and affordable healthcare to the Sri Lankan public | Symposium – 23<br>Meditation for well-being | | Symposium – 24<br>Boosting a diverse and an open research culture: enhancing quality | |
| 10.15-10.30 IST | Tea | | | | |
| 10.30-11.45 IST | Free paper session 3 (Orals) | Free paper session 4 (Orals) | Student poster session | Free paper session 5 (Orals) | |
| 11.45-13.00 IST | Free paper session 6 (Orals) | Student session 2 (Orals) | Free papers Poster session 2 | Free paper session 7 (Orals) | Medical Debate |
| 13.00-14.00 IST | Lunch | | | | |
| 14.00-15.15 IST | Symposium – 25<br>Health care models in Australia | Symposium – 26<br>Neurophysiological kinship between humanities and medicine | | Symposium – 27<br>Leishmaniasis and other vector borne parasitic infections: the Sri Lankan perspective and challenges | |
| 15.15-16.15 IST | **UCFM Tower Main Auditorium**<br>**Colombo Medical School Alumni Association(CoMSAA) Oration**<br>Supporting affordable health care through innovative research<br>*Vidya Jyothi Prof Janaka De Silva* | | | | |
| 16.15 -16.45 IST | **UCFM Tower Main Auditorium**<br>Closing session and award ceremony - Presentation of Awards for free paper and poster sessions<br>Vote of thanks - *Dr. Dilushi Wijayaratne, Joint-Secretary CMC2022* | | | | |
| 19.00 IST | Colombo Medical Banquet | | | | |

| 11:00 IST onwards | **UCFM Tower, Atrium**<br>**The resplendent world of medical humanities**<br>Photography exhibition |
|---|---|
| **The history walk – Leaves the UCFM Tower, Atrium at 13.00 IST and at 15.00 IST** | |

# Post-Congress Workshops

| **Post- congress workshop: 27th November 2022** | |
|---|---|
| 09.00– 16.00<br>IST | **UCFM Tower, Main Auditorium**<br>Digital Health<br>Health Informatics Society of Sri Lanka (HISSL) |
| **Post- congress workshop: 28th November 2022** | |
| 09.00– 16.00<br>IST | **UCFM Tower, Main Auditorium**<br>Meditation Day<br>Centre for Meditation Research, UoC |

## INTRODUCTION TO KEYNOTE SPEAKER

**Dr. Anila Dias Bandaranaike**
Former Assistant Governor
Central Bank of Sri Lanka (CBSL)

Dr Anila Dias Bandaranaike served as the Assistant Governor of the Central Bank of Sri Lanka (CBSL) until her retirement in October 2007, having served there for 24 years. She later served on the Council of the Open University of Sri Lanka from 2008 to 2011; as a Board member of the Centre for Poverty Analysis from 2014 to 2019, as Chairperson of the Committee on National Information for Evidence-based Decision-making from 2015 to 2018; as a member of the Delimitation Commission of Sri Lanka from 2015 to 2020; and currently, as a Board member of the Federation of Environmental Organisations since 2021.

In retirement, she has pursued her personal and professional interests, particularly raising awareness on socio-economic and environmental issues for sustainable, equitable development in Sri Lanka. She holds a PhD in Statistics (Cornell, USA), MSc in Applied Statistics (Oxford, UK) and BSc (First Class Honours) in Mathematics (Colombo, Sri Lanka). She began her professional career as a Post-doctoral Research Fellow in the Dept. of Biostatistics, Harvard University, USA.

# ABSTRACT OF KEYNOTE ADDRESS

## Dr Anila Dias Bandaranaike, Ph.D.

**Sri Lanka's Economic and Political Crisis – An Opportunity for Self-Criticism and Positive Change**

Sri Lanka is currently facing multiple crises, encumbered by an Executive with all powers and a Legislature with little powers. The call of citizens, united in their diversity, is for real change. This requires strong, ethical leaders, with vision, focus and a clear plan, backed by efficient systems and led by capable, experienced professionals, to implement that plan. That combination of ethical, visionary leadership, efficient systems and competent professionals, has been missing in Sri Lanka for a very long time.

Consequently, the country has lived beyond its means for several decades. All stakeholders - citizens, formal and informal businesses and state employees - depend on handouts and political patronage for their existence. We have unquestioningly accepted the direction in which the country was heading, living on borrowed funds. In the past year, Sri Lanka has been without leadership or governance, unable to pay its debts or provide citizens with essential medicines, nutrition, transport fuel, cooking gas or electricity. Today, the government has neither rupees nor foreign exchange, and is facing national and international loss of investor confidence. This has been entirely due to bad policies and economic mismanagement, to meet the unrealistic expectations for goods and services, of a complacent citizenry with no thought of paying taxes, nor how government expenditure is met.

We see an entitled citizenry, a rent-seeking corporate sector and rampant corruption at all levels. Overlapping functions of too many government institutions in a bloated public service has eroded accountability and led to inefficiency and waste. Deterioration of independent decision-making processes in key public institutions has critically hindered service delivery to citizens.

So, unless we act fast on several fronts, while protecting the vulnerable, we will not get back on our feet. We have no choice now, but to follow a tough reform path. It will mean economic difficulties for the entire country for some time to come.

The current crisis has made it very clear that a country's development is not about economics or politics. It is about people's lives, and ensuring their livelihoods and their well-being, while protecting the country's environment. This requires sustainable development with social justice, that reduces inequalities and poverty. Sri Lanka needs clear priorities, supported by relevant policies, and a plan for sustainable development, which assigns responsibilities to its Executive, Legislature, Judiciary, Public Service and people, to implement that plan.

The Keynote Address gives an overview of the crisis we face today and how we got there, and then suggest priorities, policies and a plan to get us out of the abyss we are in.

# ABSTRACTS

## OP-01: Cardiovascular response to isometric handgrip in healthy long-term meditators: a comparative study

L. J. U. Karunarathne, W. D. A. L. Amarasiri, A. D. A. Fernando
Department of Physiology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Effects of meditation on the cardiovascular system are mediated through the autonomic nervous system. Meditators are thought to have lower sympathetic activity. We evaluated cardiovascular response to isometric handgrip test (IHG) in healthy long-term meditators (LTMs) and non-meditators.

**Methods:** This cross-sectional comparative study compared 18 healthy LTMs practising Buddhist meditation consistently >3 years, selected by a validated intake interview, with 18 age-sex matched healthy non-meditators, selected through purposive sampling as controls. Participants performed IHG at 30% of maximal voluntary contraction for three minutes with MLT004/ST Grip Force Transducer and Power Lab 4/26 (AD Instruments) in the supine position. Non-dominant arm systolic blood pressure (SBP) and diastolic blood pressure (DBP) was measured in the last 15 seconds of every minute, two minutes before, after and during IHG by a calibrated automated BP metre. The differences of parameters between the highest BP during IHG and at baseline were taken as the measure of response. Mann-Whitney U test assessed between-group comparisons.

**Results:** The LTMs (50% male; mean (SD) age 41.44 (12.73) years) and the controls (50% male; mean (SD) age 43.39 (8.51) years) were comparable. LTMs had meditated mean (SD) 12.28 (7.18) years, with mean (SD) frequency of 10.17 (4.57) hours per week. Mean (SD) of resting SBP [103.56 (5.43) vs. 116.94 (10.86) mmHg; $p < 0.001$], DBP [63.56 (6.06) vs.70.5 (7.38) mmHg; $p<0.01$] and heart rate (HR) [57.11 (5.72) vs. 66.17 (9.15) beats. $min^{-1}$; $p=0.001$] were lower in LTMs compared to controls. In response to IHG, increase in DBP [mean (SD); 22.78 (5.07) vs. 28.67 (7.87) mmHg; $p=0.012$], SBP [median (IQR); 22.5 (14.75) vs. 33 (20.5) mmHg; $p=0.029$] and HR [mean (SD); 16.33 (8.07) vs. 17.33 (7.01) beats. $min^{-1}$; $p>0.05$] were lower in LTMs than controls.

**Conclusions:** Smaller increase in DBP, SBP and HR on sustained grip indicates possible lower sympathetic activity in LTMs than non-meditators.

**Keywords:** long-term meditation, sympathetic nervous system function, sympathetic activity, isometric handgrip test, cardiovascular response

## OP-02: Barriers to obesity management of obese young adults: perspectives of healthcare professionals

G. P. Gamage[1], P. Hettiarachchi[2], T. Amarasekara[3], R. Jayawardena[4], S. Wasalathanthri[4]

[1]Department of Nursing and Midwifery, Faculty of Allied Health Sciences, General Sir John Kotelawala Defence University, Sri Lanka

[2]Department of Physiology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka

[3]Department of Nursing and Midwifery, Faculty of Allied Health Sciences, University of Sri Jayewardenepura, Sri Lanka

[4]Department of Physiology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Understanding the barriers experienced by key stakeholders is important in planning effective population-specific weight management interventions. Obese individuals and healthcare professionals (HCPs) managing them are the key stakeholders in obesity management. This study aimed to explore the barriers perceived by HCPs in the obesity management of obese young adults in urban Sri Lanka.

**Methods:** This qualitative study was conducted as a needs assessment for the development of a weight management programme targeting obese (BMI ≥25 kg/m$^2$) young adults (18-35 years) in the Colombo district. A sample of HCPs (n=8) encompassing the specialties involved in obesity management in different settings of the Colombo district was purposively chosen for the study. The data collection was done by guided semi-structured interviews up to the point of saturation. Data were analysed by the framework method under thematic analysis. The themes identified were categorised into three groups of barriers; HCP-related, client-related and healthcare system-related.

**Results:** The HCPs were in the fields of nutrition (2), psychology (2), sports medicine (1), physiotherapy (1), endocrinology (1) and yoga (1), with years of experience varying between 2-23 years. Five main themes were identified as barriers to obesity management. HCP-related barriers were inadequate knowledge and confidence of HCPs, especially on comprehensive weight management consisting of dietary, physical activity and behavioural components, and attitudes of HCPs towards their clients. Inadequate motivation and poor compliance, and cultural influences and myths were the client-related barriers. The resource and service limitations emerged as the healthcare system-related barrier.

**Conclusions:** This study provides new insight into the field of obesity management. Since HCPs are considered as key stakeholders, identifying the barriers perceived by them is crucial when planning culturally sensitive, population-specific weight management programmes for obese young adults in urban Sri Lanka.

**Keywords**: obesity, young adults, obesity management, barriers, healthcare professionals

## OP-03: Early results of an amputee care pathway: a single unit experience

C. M. Gurusinghe, A. G. A. V. J. Abeysinghe, T. D. Gooneratne

Department of Surgery, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Major lower limb amputation in critical limb ischemia is associated with significant mortality, morbidity and poor quality of life. The first multidisciplinary amputation care pathway in Sri Lanka was established in January 2022 to improve survival, use of prostheses and reintegration into society. In this study, we present the early outcomes of this amputation care pathway.

**Methods:** All patients with critical limb ischemia who underwent major lower limb amputation in the University Vascular Unit of the National Hospital of Sri Lanka (NHSL) were included in the amputation care pathway. The patients underwent amputation due to non revascularizability of the limb, failed revascularization, non-functional limb or sepsis. Patients were prospectively followed up at three-monthly intervals regarding their adherence to the care pathway, quality of life and use of prosthesis. The level of quality of life was measured using a standard tool; the 5Q-5D-5L index.

**Results**: Thirty amputees were included in the study. The mean age was 62 years (37–82 years). The majority were female (60.0%) with diabetes mellitus (90.0%), hyperlipidaemia (56.7%) and hypertension (43.3%). All patients received preoperative optimization when possible and physiotherapy, occupational therapy and prosthesis input before discharge. 30-day and 90-day mortality were 33.3% and 46.6%, respectively. Twelve defaulted follow-up and only four were following the care pathway at the three-month analysis. Distance of residence <50 km to NHSL (75.0% vs. 8.0%; $p<0.05$); was the only significant factor affecting compliance with the care pathway. The mean 5Q-5D-5L value before amputation was 0.62 (0-1). The mean quality of life score in the patients who followed the amputation care pathway at the three-month follow-up was 0.75. None were using prostheses at the 3-month follow-up.

**Conclusions**: Early results of the amputation care pathway demonstrate the potential for improving perioperative mortality, quality of life and prosthesis use. Establishing new centres or liaising with existing regional centres will enable the continuation of post-amputee rehabilitation to improve the outcome of this patient cohort.

**Keywords:** amputee care pathway, post-amputee rehabilitation, quality of life

## OP-05: Television marketing of food and non-alcoholic beverages (FNAB) high in fats to children in Sri Lanka

S. M. D. R. Samarakoon[1], A. N. Y. Senevirathne[1], H. Abeysinghe[1], B. G. W. W. P. Piyasena[1], V. P. Wickramasinghe[2], P. De Zoysa[3], C. Arambepola[4], S. T. Thoradeniya[1]

[1]Department of Biochemistry and Molecular Biology, [2]Department of Paediatrics, [3]Department of Psychiatry, [4]Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Dietary fat exerts a significant risk of coronary heart disease (CHD) and obesity, which is on the rise in children. Television marketing of food and non-alcoholic beverages (FNAB) influences the dietary choices of children. There is a global interest in reducing fat, particularly trans-fat, contents in food and in regulating unhealthy FNAB marketing to children. This study aimed to explore the extent of the television marketing of FNAB high in fat, to which Sri Lankan children are potentially exposed.

**Methods:** The analysis was on FNAB products advertised over 33 hours on the three most popular television channels for children aged 4-16 years in Sri Lanka. The International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) Network Protocol was used, and the food products were categorised as 'permitted' or 'non-permitted based on their fat content according to the WHO-South-East Asia Region (SEARO)-Nutrient Profile Model (NPM).

**Results:** Of the 1517 advertisements, 321 were on 56 FNAB products. Twenty FNAB products out of 56 (35.7%) were non-permitted to be marketed to children due to their high-fat content [biscuits (n=9), instant noodles (n=3), seasoning (n=2), burgers (n=2), pizzas (n=2), ice-cream (n=1) and milk formula for 2-5-year-olds (n=1)]. Notably, in all FNAB, there was no mention of trans-fat, except for pizza and burger. The advertisements on non-permitted food products included claims (e.g. biscuits: 'Enriched with Vitamins A, D, and E' and formula milk: 'Fortified with Omega-3') potentially masking the perception of the high-fat content in them.

**Conclusions:** More than one-third of the FNABs marketed on children's popular television channels were non-permitted due to their high-fat content. Sri Lankan children watching popular channels are exposed to unhealthy FNAB advertisements. Regulatory actions are necessary to prevent this, therefore reducing the burden of CHD and obesity in children.

**Keywords:** fat, trans fat, FNAB marketing, television advertising, food advertising

**Funding:** International Development Research Centre (IDRC), Grant Number: 109170

## OP-06: How do online and street vended lunch packets compare with nutritional recommendations for non-communicable disease prevention?

P. H. P. O. Mendis[1], M. de Lanerolle Dias[1], D. M. S. Jayawardene[2], P. Lanerolle[1], I. Waidyathilaka[1]

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

[2]Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Out-of-home food consumption has increased significantly over the last few years. The aim of this study was to analyse the energy, macronutrients, fibre and sodium content in lunch packets obtained from the Colombo Municipal Council Area.

**Methods:** Of all available online vendors selling lunch packets (n=40), twenty were randomly selected. A further eight street food vendors were conveniently selected. Three packets were obtained from each vendor, homogenised and analysed. A total of 28 samples were analysed for sodium content using flame-photometry. Contents were weighed to analyse energy, macronutrient and fibre using food composition tables and to assess adequacy of food groups in relation to food based dietary guidelines.

**Results:** The mean sodium content of food was 147.6 (SD=20.7) mg/100g. There was no significant difference in sodium content between online and street vended packets. Packets were categorised as chicken, fish, egg and vegetarian packets. Packets consisted of four, five or six accompaniments, and gravy was included in some. Sodium content in chicken lunch packets was significantly higher (p=0.008) than fish lunch packets. Packets with six curries had significantly higher sodium content than packets with four (p=0.012) or five (p=0.003) curries. The sodium content was significantly higher (p=0.006) in packets with gravy than without. Also, 25.0% of packets had a sodium content above recommendation. Majority of packets had carbohydrate (89.3%) content above recommendation, while fibre (64.3%) and fat (75%) content were below recommendations. Only 14.26% had protein content below recommendations, while 74.1% were above or within recommendation for the vegetable group.

**Conclusions:** While one fourth of packets had sodium above the acceptable limit, inclusion of gravy increased the sodium content. Majority of packets did not satisfy fibre recommendations and exceeded recommendations for carbohydrate, indicating reduced healthfulness with respect to recommendations for non-communicable disease prevention.

**Keywords:** energy content, nutrient composition, sodium content, online vendors

## OP-07: Rational use of diagnostics for acute dengue infection

K. Kariyawasam[1], D. D. P. C. Perera[1], S. Gamage[1], L. D. A. C. Liyanage[1], P. Bandara[2], E. M. Corea[1], N. Rockwood[1]

[1]Department of Medical Microbiology and Immunology, Faculty of Medicine, University of Colombo, Sri Lanka

[2]District General Hospital, Kalutara, Sri Lanka

**Introduction:** Large numbers of suspected cases of dengue are admitted to hospital for monitoring and care. Considering the ongoing limitations on health budgets, we assessed the sensitivity and implications of NS1/IgM/IgG lateral flow immunochromatographic assay (LFIA) and reverse transcriptase polymerase chain reaction (RT-PCR) in the management of hospitalised patients with acute undifferentiated febrile illness (AUFI).

**Methods:** We prospectively recruited 151 patients admitted to a district hospital in the Western Province within seven days of fever onset. Data were collected on presumed diagnosis, investigations and treatment on admission. Serum samples were separated and stored at -80°C pending LFIA for NS1, IgM and IgG and RT-PCR. Sensitivity was compared to a composite gold standard of RT-PCR and/or NS1 positivity.

**Results:** Dengue diagnostics were performed on serum collected at a median of 4 days (IQR 3 to 5) post onset of fever. 82/151 were confirmed as dengue (75/151 by RT-PCR, 70/151 by NS1 and 63/151 by both). Sensitivity of NS1 and RT-PCR were 85.0% and 91.0%. Only 38/82 (45.0%) were IgM positive (median day of fever 4, range 2-6). 52/82 (63.0%) were secondary dengue infections (IgG positive). A third, 28/82 (34%) had platelets in the normal range >150 $x10^3$/uL. Antibiotics were used in management of 14/82 (17.0%) of dengue patients. Where NS1 was not performed on admission (n=60), a clinical diagnosis of dengue was made in 15/60 (25.0%), of whom eight (53.0%) were confirmed as dengue on NS1/RT-PCR. Conversely, dengue was confirmed by NS1/RT-PCR in 10/60 (17.0%) patients without a clinical diagnosis of dengue, and antibiotics were used in 6/10 (60.0%) of these patients.

**Conclusions:** In this cohort, the clinical diagnosis of dengue had a low precision. Sensitivity of NS1 was comparable to RT-PCR, even in secondary dengue patients. Rational use of diagnostics reduces inappropriate use of antibiotics in hospitalised patients with AUFI.

**Keywords:** dengue diagnostics, inpatient management, rational use

## OP-08: Improved in-house ELISA assay for serodiagnosis of *Leishmania donovani* induced cutaneous leishmaniasis in Sri Lanka

H. V. Y. D. Siriwardana[1], D. R. L. Thalayarathne[1], B. Deepachandi[1], S. Weerasinghe[1], T. S. Rathnayaka[1], P. I. Soysa[2]

[1]Department of Parasitology, Faculty of Medicine, University of Colombo, Sri Lanka

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

**Introduction:** In Sri Lanka, cutaneous leishmaniasis (CL) is caused by a genetic variant of a visceralizing parasitic species called *Leishmania donovani*. A high seroprevalence of 82% has been observed in Sri Lanka during a previous study. The National Action Plan of Leishmaniasis Control of Sri Lanka and the World Health Organization have recognized the significance of the development of diagnostic methods in disease control. Sensitive serodiagnostic methods will minimise the cost, need for second-line investigations, and need for methods that require invasive sampling. In this study, the diagnostic accuracy of a previously developed ELISA assay was improved further.

**Methods:** A total of 100 samples were used (50 laboratory confirmed CL, 50 controls). Modified and previously used methods were utilised. The composition of the cell lysis buffer, blocking buffer, concentration of primary antibody and incubation periods were modified. Standard statistical methods using SPSS were used for data analysis and validation.

**Results:** The original method showed 78.0% sensitivity, positive predictive value of 97.5% and negative predictive value of 81.7% at a high specificity of 98.0%. The modified method showed 86.0% sensitivity, positive predictive value of 97.7% and negative predictive value of 87.5% at 98.0% specificity. The sensitivity of modified ELISA could be further increased up to 94.0% with a reduction of specificity to 86.0%. However, this was not further examined since a high specificity is also required in a tropical setting where many clinically similar conditions are prevalent.

**Conclusions:** Since established serological tools gave poor response locally, improving and assessing the usefulness of the tools both in patients and field asymptomatic case screening in local settings will be useful. The modified ELISA assay can be used in the laboratory for confirmation of active CL. Its ability to be used in the field screening of asymptomatic cases can also be evaluated.

**Keywords:** ELISA, cutaneous leishmaniasis, *Leishmania donovani*, Sri Lanka

## OP-09: Usefulness of different fractions of cell lysate of *Leishmania* in serodiagnosis of leishmaniasis: a preliminary study

A. U. Maha Gamage[1,2], T. Rathnayaka[2], B. Deepachandi[2], S. Weerasinghe[2], T. P. Andrahennadi[1], C. Witharana[1], H. V. Y. D. Siriwardana[2]

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

[2]Department of Parasitology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Leishmaniasis is a vector-borne parasitic disease. Three major clinical forms exist: visceral leishmaniasis (VL), cutaneous leishmaniasis (CL) and mucocutaneous leishmaniasis (MCL). CL is predominant in Sri Lanka. Established serological assays (rK 39 dipstick assay) result in a lower response for local patients, demanding a local parasite-based assay. Therefore, an in-house enzyme-linked immunosorbent assay (ELISA) was developed using whole cell lysate of parasites. Use of whole cell lysate of *Leishmania* species in ELISA can result in non-specific binding with the ELISA plates leading to unreliable results. We examined the usefulness of different fractions of antigens in ELISA as a better diagnostic approach in leishmaniasis.

**Methods:** The promastigotes of *Leishmania donovani* were cultured following in-house protocols. Whole cell lysate was prepared and fractionated to obtain whole crude lysate as fraction one (F1), supernatant of whole crude lysate as fraction two (F2), total soluble antigens (F2 and mostly peripheral membrane antigens) as fraction three (F3) and insoluble antigens as fraction four (F4). A modified micro-Lowry assay was carried out to estimate protein content. ELISA was carried out using 60 serum samples (n=30 laboratory-confirmed CL positive and 30 controls) using the in-house protocol. Ethical approval (EC-14-154) was obtained from the Ethics Review Committee, University of Colombo. A literature-based antigen study was carried out considering 20 *Leishmania* antigens to identify the distribution of antigens in each antigen fraction.

**Results:** Higher ELISA values were obtained for F1 (0.476) and F3 (0.444). F4 (0.158) reported the lowest values. ELISA absorbance values of control samples of F1 (0.21) were higher in comparison to F3 (0.177). According to literature-based antigen studies, F1 (20) and F3 (14) consist of a higher number of antigens which are mostly immune-dominant compared to F2 (12) and F4 (9).

**Conclusions:** F3 may be better than F1 for patient diagnosis. Antigen profiling can be carried out for confirmation.

**Keywords:** *Leishmania donovani*, cutaneous leishmaniasis, whole cell lysate, antigen fractions, enzyme-linked immunosorbent assay

## OP-10: The impact of COVID-19 pandemic on visually disabled persons in Sri Lanka and their suggestions for a better support system

C. L. Weeraratne[1], T. H. R. Samanmalee[2], P. P. Kumaradasa[1], M. Gunawardane[1], D. M. S. Jayawardene[3], A. Ariyasinghe[4], U. Ariyasinghe[5], P. Arunoda[6]

[1]Department of Pharmacology, [2]Department of Psychiatry, [3]Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

[4]Tianjin Medical University, China

[5]Colombo South Teaching Hospital, Sri Lanka

[6]KK Women's & Children's Hospital, Singapore

**Introduction:** Individuals with visual disabilities (VD) are under privileged and face many challenges in their daily lives. The aim of the current study was to describe the impact of the COVID-19 pandemic on persons with VD in Sri Lanka and their suggestions for a better support system.

**Methods:** A descriptive cross-sectional study, using a telephone-based interviewer-administered questionnaire was carried out on fifty individuals with VD who were members of the Sri Lanka Federation for the Visually Handicapped or Sri Lanka Council of Visually Handicapped Graduates selected using convenient sampling. Suggestions for improvement were obtained by carrying out in depth interviews via telephone.

**Results:** Although 76% (n=38) identified N-95 masks as best for COVID-19 protection and 100% (n=50) identified that crowded places and touching surfaces used by public increased the risk of COVID-19 transmission, only 36% (n=18) knew that spread of COVID-19 occurs through air. Nearly 46% (n=23) found it challenging to secure transport to obtain medical services, while 22% (n=11) did not seek medical care due to fear of COVID-19. Majority (n=35; 70%) found not being able to touch surfaces challenging, while 50% (n=25) found maintaining social distancing a challenge. Majority (n=45; 90%) found financial issues a challenge. Nearly 30% (n=15) faced emotional violence during this period. All (n=50; 100%) stated that government policies, circulars and guidelines on COVID-19 did not pay attention to people with disabilities. A dedicated hotline for disabled persons, improved e-banking automatic teller machine facilities with read aloud option, providing educational, economic and counselling support for disabled persons were the suggestions for a better support system.

**Conclusions:** Although knowledge regarding COVID-19 was good, many challenges were identified that affected those with VD. Suggestions put forward should be taken into consideration to provide a better environment for them during future COVID-19 pandemics.

**Keywords:** COVID-19 pandemic, visual disabilities, knowledge, visual challenges, visually handicapped

## OP-11: Student perceptions about the impact of the COVID-19 pandemic on their educational and personal life: a cross-sectional study in the Colombo Medical Faculty

W. D. S. Lakindi[1], W. S. P. Perera[1], S. Fernando[1], S. D. Amarasuriya[1], D. M. A. Dahanayake[2], P. Galappatthy[1]

[1]Department of Medical Humanities, Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Psychiatry, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** The COVID-19 pandemic has impacted university education worldwide. This study aimed to examine undergraduates' perceptions on how their learning and lifestyle were affected and the institutional support they received during the pandemic.

**Methods:** A descriptive cross-sectional study was conducted between January 2021 to March 2022 using an online questionnaire at the Colombo Medical Faculty among all students from the first to fifth year (n=1120). The participants used a Likert scale to rate their degree of agreement on how they were affected by the pandemic. The data were dichotomized (i.e., as 'agree'/'disagree') to examine its association with the students' demographic characteristics using Chi-squared test. A p value of $<0.05$ was considered significant.

**Results:** The response rate was low (249; 22.23%). The mean age of participants was 22.3 years (SD=2.0) with a predominance of females (62.2%). A majority disagreed that they had higher monthly expenditure due to online learning, or that they faced technical problems, and that they had been negatively affected by delayed examinations. A majority also indicated that they had been negatively affected by examinations being clumped together and that they were anxious about the future, and this was seen more among junior (1$^{st}$ and 2$^{nd}$ years) as compared to senior students (3$^{rd}$, 4$^{th}$ and final years). Only half of the sample indicated that the personal tutor scheme was helpful, while 60.0% of those residing in the hostel did not indicate satisfaction with hostel facilities. Watching movies or television series (85.1%) was the highest reported leisure activity. Cooking (56.2%) and gardening (25.3%) were reported as new skills acquired.

**Conclusions:** The majority of students did not face accessibility issues during online learning. The changes in the programme due to the pandemic may have led to difficulties in exam performance and feelings of uncertainty and this was more among the junior students. The faculty support services need to be further improved to meet the students' needs.

**Keywords:** COVID-19, medical students, online learning

## OP-12: National survey of practices adopted for reconstitution, storage, administration, and disposal of antibacterial agents in neonatal units in Sri Lanka

S. Sri Ranganathan[1], S. Abhayaratna[1], M. G. Sathiadas[2], M. B. C. Samanmalie[3], I. Weerasundara[1], P. Panchalee[1], B. V. S. H. Beneragama[3]

[1]Department of Pharmacology, Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Paediatrics, Faculty of Medicine, University of Jaffna, Sri Lanka

[3]Ministry of Health, Sri Lanka

**Introduction**: Optimal use of antibacterial agents (ABAs) includes correct practices of reconstitution, storage, administration, and disposal of leftovers. Inappropriate practices contribute to emergence and spread of antibacterial resistance. These practices are challenging in neonatal units (NUs) due to the small volume required and administration difficulties. This survey was done to describe the practices adopted for reconstitution, storage, administration and disposal of ABAs in NUs in Sri Lanka.

**Methods**: This cross-sectional descriptive national survey included all the public hospitals having a NU. Study participants were nurses working in neonatal intensive care and special care baby units in these hospitals. From each unit, the in-charge nursing officer, and one or more nurses selected by the in-charge nursing officer provided the data. Data were collected by trained data collectors in 2020/21 using a pre-tested content and face validated structured self-administered questionnaire. Descriptive statistics were used in analysing the data.

**Results:** Participants, 297 nurses working in NUs from 60 hospitals, named cefotaxime, benzylpenicillin and meropenem as the commonly used ABAs in NUs. Although the majority (94.0%) indicated that they received training in handling ABAs, many incorrect practices were observed; none listed the correct steps in reconstituting ABAs while only eight listed the correct steps in getting the dose. About 90.0% failed to correctly name the solution used for reconstitution as sterile water. Regarding discarding the balance reconstituted ABA, 43.0% followed the product information leaflet and 10.0% discarded immediately, while 16.0% discarded after 24 hours. About 80.0% correctly indicated that they would store the reconstituted ABA in the refrigerator if it had to be given to another neonate later. A wide range of incorrect practices were followed to discard left-over ABAs including pouring it into the wash basin.

**Conclusions:** Diverse and unsatisfactory practices are adopted for reconstitution, storage, administration and disposal of antibacterial agents in neonatology units in Sri Lanka.

**Keywords:** antibacterial agents, neonates, nurses, reconstitution, storage

**Funding:** University of Colombo (AP/3/2/2019/SG/12)

## OP-13: A project to improve the environmental, economical and social performances by applying the Green Human Resource Management practices in the health sector

S. G. G. Chamal[1], S. Alwis[2], H. Opatha[3]

[1]Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

[2]Ministry of Health, Sri Lanka

[3]Department of Human Resource Management, University of Jayewardenepura, Sri Lanka

**Introduction:** Green Human Resource Management (GHRM) is increasingly considered as a critical branch of Human Resource Management (HRM). It is interesting and highly instrumental in creating and enhancing the natural environment sustainability. This study was carried out at Base Hospital Tangalle (BHT), with the intention of identifying the gaps and improving the green inputs and employee green performance by adopting GHRM practices.

**Methods:** The project was carried out with three phases, by adopting the mixed method approach. Based on pre-interventional assessment, literature review and comprehensive stakeholder consultation, an intervention package was planned and implemented. Effectiveness of the interventions was assessed at the end of three months of implementation by using the same instruments. In the pre-interventional phase, it was revealed that there was a lack of a systemic mechanism that linked employee performances and organisational performance with environment related human resource management practices. Considering these gaps, interventions were designed and implemented. The main intervention was applying Milliman and Clair's GHRM model (1996) consisting of four parts. It commenced with the strategic change of organisation's vision and mission; secondly by training of the staff towards acquiring skills and knowledge in organisational green philosophy and greening; thirdly by introducing the environmental performance evaluation mechanism; and finally by recognizing their environmental activities and rewarding them.

**Results:** Following implementation, the green attitude of employees improved from 2.03 to 3.83; green competency from 1.1 to 3.29; and green behaviour from 1.24 to 3.37 at $p<0.005$ level. BHT has started practising GHRM activities: training and development, empowerment, performance assessment, reward and safety culture. Amount of waste accumulated has reduced and the "reduce and reuse" concept of energy has managed to save costs. The Environmental Protection Authority of Sri Lanka has granted the Environmental Protection Licence-2021- the highest environment related achievement of BHT in its recent history.

**Conclusions:** GHRM practices are a powerful tool in improving green inputs, employee green performance, and environmental organisational performance. Hence, it is recommended to create, maintain, improve and expand these practices at healthcare institutions by adopting the experience gained through the interventions.

**Keywords:** Green Human Resource Management, environmental performance, economic performance, social performance

## OP-14: A project to improve the effectiveness of management of vehicles at Regional Director of Health Services, Hambantota

S. G. G. Chamal[1], S. Samarage[1], E. Janaka[2]

[1]Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

[2]Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Transport plays a critical role in the effective and efficient delivery of health care. It enables people to access services and health workers to reach communities. This quasi-experimental research project was carried out at Regional Director of Health Service **(**RDHS) Hambantota with the intention of identifying the gaps in the current vehicle management, maintenance and operating system, and improving the effectiveness of management of vehicles. The project was carried out in three stages.

**Methods:** The pre-intervention phase aimed at identifying the existing situation and gaps in the vehicle management system, using both qualitative and quantitative techniques. It was revealed that inadequate staff training regarding proper fleet management, lack of technical knowledge of drivers, absence of preventive maintenance schedules and a poorly managed vehicle inventory system led to inefficient vehicle management at RDHS Hambantota. In the second phase of study, a digital platform created through establishing a database for the transport section of RDHS Hambantota, helped to maintain, manage and operate the vehicles. It consisted of different sections for vehicle profiles, monitoring, managing preventive maintenance and inventory, identifying and analysing high cost vehicles, developing reports for regular complaints and monitoring vehicles used. Post interventional qualitative results indicated that the availability of the online and offline digital platform for vehicle management improved the transport related processes, streamlined the vehicle management operations and maintenance and improved the accountability of the relevant officers and their decision making process.

**Results:** It is evident that after the interventional phase, significance test statistics reveal that the average time for the documentation process at RDHS improved from 16.52 days to 3.56 days at $p<0.0001$ level. Vehicle availability increased from 62% to 81%, utilisation improved from 68 % to 76%, and performance improved from 69.0 % to 84.0% at RDHS Hambantota.

**Conclusions:** The multifaceted and package of interventions implemented in this project was effective in improving the vehicle management at RDHS. It is recommended to improve the online system further by adapting the experience gained throughout the intervention phase and expand the project to the other healthcare institutions.

**Keywords:** fleet management information system, inventory management system, key vehicle performance indicators

## OP-15: A retrospective study on the safety and effectiveness of the use of KTP Laser in stapedotomy

S. M. Thelikorala[1,2], D. A. M. D. Dumingoarachchi[1]

[1]Otorhinolaryngology Unit, Teaching Hospital Anuradhapura, Sri Lanka

[2]Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

**Introduction:** This study describes the safety and effectiveness of using the KTP laser in patients with otosclerosis who underwent endoscopic stapedotomy at the Teaching Hospital Anuradhapura. The study aims to assess the effectiveness and safety of KTP laser in stapedotomy in Sri Lanka. Laser endoscopic stapedotomy is introduced as a no-touch technique, and is considered superior to conventional stapedotomy.

**Methods:** This is a retrospective descriptive study conducted amongst the eight patients who underwent laser stapedotomy surgery from October 2020 to September 2021. The data were collected via a pre-formed questionnaire. The results of pre-operative pure tone audiogram (PTA) were compared with three-month post-operative PTA results. The variables analysed were pre- and post-operative air conduction, bone conduction and air-bone-gap (ABG) at 500 kHz, 1 kHz, 2 kHz, 4kHz and complications.

**Results:** The age distribution was from 33 years to 72 years. Five patients were females and six had surgery in the left ear. The mean 4 frequency pre-operative ABG was 37.3 dB and post-operative ABG was 13.1 dB with a mean ABG closure of 24.2 dB. ABG closure was found in the range of 0-40 dB. Dehisced facial nerve canal was found in one patient with a stiff incus. One patient had high frequency sensorineural hearing impairment at 4 kHz.

**Conclusions:** Use of KTP laser in endoscopic stapedotomy has produced improvement in air-bone-gap closure resulting in improvement of hearing with less side effects, as a minimally invasive surgical modality in patients with otosclerosis.

**Keywords:** laser stapedotomy, conductive hearing loss, otosclerosis

## OP-16: First ever Forensic Nursing Facility in Sri Lanka: experiences and way forward

H. J. M. Perera, C. M. A. Gunathilaka, N. D. N. A. Mendis, S. A. Gunawardena, D. L. U. Senaviratne

Department of Forensic Medicine and Toxicology, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction:** A Forensic Nursing Facility primarily provides care to victims of crime. The scope of the forensic nurse varies worldwide, with greater responsibilities in some jurisdictions and limited in others. The Department of Forensic Medicine and Toxicology, Faculty of Medicine (DFMT), Colombo, which services five suburban police areas, introduced the first ever forensic nursing facility in Sri Lanka in 2018. The role of the Forensic Nursing Officer (FNO) was to facilitate the medicolegal management of victims of crime especially victims of sexual and gender-based violence and child abuse. The FNO develops a rapport with the victim, explains the procedures, obtains informed consent, chaperones and assists the victim during the entire examination procedure with a compassionate, case sensitive manner in order to create a victim-friendly environment and to prevent retraumatization and secondary victimisation. This study presents the experience, its impact, limitations and recommendations for further development of the Forensic Nursing Facility.

**Methods:** Victim satisfaction surveys conducted by the DFMT before and after introduction of this facility were reviewed and compared.

**Results:** On comparison between 'pre FNO introduction' (n=59) and 'post-forensic nurse introduction' (n=20), victims 'relieved after SAFE' increased from 33.9% (pre-FNO) to 65% (post-FNO) examinations (p=0.015). The task of audio-recording the medico-legal narrative by the specialists in Forensic Medicine has been facilitated by the presence of the FNO especially in child victims where age-appropriate communication is required. Victim review and follow-up was another unique feature that was introduced through this facility. Further training and guidance was needed in injury recording and injury interpretation in both clinical and autopsy medico-legal work.

**Conclusions:** FNO has enhanced the victim satisfaction following medicolegal examinations, especially in sexual assaults. However, unlike in other jurisdictions, further training and experience is needed before the FNO could be given greater responsibilities regarding clinical observations, deeper clinical interpretations or providing expert evidence in courts.

**Keywords:** forensic nursing facility, medico legal service, forensic nursing officer, victim satisfaction survey, case sensitive manner

## OP-18: Identification of data elements in Electronic Health Records in primary care: a systematic review

L. D. Jayathilaka[1], P. Siribaddana[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

**Introduction:** It was necessary to identify Data Elements (DEs) clinicians used and make them interoperable to build an Electronic Health Record that all clinicians can use for clinical decision making, minimising repetitive clinical exams, ancillary testing, unnecessary radiation exposure, etc.

**Methods:** Scopus, MEDLINE and ScienceDirect databases in the English language were searched from 2010 to 2020. Search terms were identified by a simple MEDLINE search. Researchers and an independent reviewer looked at the terms and 12 were chosen. Systematic reviews, randomised controlled trials, non-controlled interventions, service evaluations, case-control studies, case studies, questionnaire surveys and qualitative research were included. After the search, titles and abstracts were extracted to Zotero. Two reviewers looked at the titles and abstracts separately for inclusion. The two reviewers addressed and resolved disagreements. If agreement could not be reached, a third reviewer was consulted. Checklists based on CASP (Critical Appraisal Skill Programme) were used to assess the quality of each included study. The protocol for systematic review was established and documented in PROSPERO. https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=209423

**Results:** Five hundred and thirty DEs were identified initially. Twenty three duplicates were removed. The researcher and a group of two health informaticians checked the remaining 506 DEs. Ontology mapping and semantic duplicates were eliminated. Disputes have been settled, and agreement consensus has been reached. The final list included 187 DEs.

**Conclusions:** Many health information systems (HIS) are used in primary care. The majority of HIS operates in silos. Different DEs collected the same value. If DEs adhere to a common agreed-upon structure, the HIS can make the information we generated interoperable.

**Keywords:** data elements, electronic health record , primary care , systematic review

## OP-19: Heterozygosity of the glucose-6-phosphate dehydrogenase gene may offer protection against chronic kidney disease of unknown aetiology (CKDu): a case-control study done in a Sri Lankan population

R. L. Dewasurendra[1], H. J. D. Liyanage[2], P. M. C. S. de Silva[3], N. D. Karunaweera[1], S. Gunawardena[1]

[1]Department of Parasitology, Faculty of Medicine, University of Colombo, Sri Lanka

[2]Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

[3]Department of Zoology, Faculty of Science, University of Ruhuna, Sri Lanka

**Introduction:** Chronic kidney disease of unknown aetiology (CKDu) is an important health burden in Sri Lanka. Prevalence of CKDu has increased alarmingly during the recent past. Multiple causative factors appear to be involved in its aetiology. This study was done to determine any association between selected glucose-6-phosphate dehydrogenase **(**G6PD) gene variants and CKDu in the Sri Lankan population.

**Methods:** Samples were collected from CKDu patients attending the Teaching Hospitals of Kandy/Anuradhapura, using probability sampling methods. A total of 180 CKDu patients and 283 healthy controls were recruited (case:control for males 1:1; for females 1:3). Genotyping of 12 single nucleotide polymorphisms (SNPs) located in/near the G6PD gene was done commercially. Three SNPs were monomorphic and excluded from further analysis. The remaining nine SNPs were analysed separately for males and females, and the association of each SNP with the CKDu status was determined. Significant genotypes found among females were analysed further.

**Results:** The majority of CKDu cases were male (n=133; 73.9%) and over 40 years of age (n=147; 81.6%). None of the nine SNPs analysed were significantly different between cases and controls in males ($p>0.05$). However, in females, six of these SNPs (rs766420**,** rs2071429**,** rs2230037**,** rs4898389**,** rs5986877, rs7879049) significantly differed between CKDu cases and controls ($p<0.05$), with heterozygotes being significantly greater among the control group ($p<0.05$).

**Conclusions:** Males in older age groups were the most affected by CKDu. Six SNPs seemed to offer protection (either individually or collectively) to heterozygous females against CKDu in this population. Further studies with larger sample sizes are warranted to provide more robust information on the genetic effects of these SNPs on CKDu.

**Keywords**: CKDu, G6PD, genetics

**Funding**: Project funded by the National Research Council, Sri Lanka (Grant No: 14-069)

## OP-20: Germline genetic variants, their frequency, and clinico-pathological features in Sri Lankan patients with hereditary breast cancer

K. Gunawardena, N. D. Sirisena, G. Anandagoda, N. Neththikumara, V. H. W. Dissanayake

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

**Introduction**: The incidence of breast cancer in Sri Lankan women is rising at an alarming rate of 4% per year. Next-generation sequencing (NGS)-based whole exome sequencing (WES) is increasingly being utilised to detect germline variants in cancer predisposing genes and to predict inherited cancer risk. This study aims to assess the frequency of germline genetic variants and clinico-pathological features in a cohort of Sri Lankan hereditary breast cancer patients.

**Methods**: Genomic data of 72 hereditary breast cancer patients who underwent WES between January 2015 and December 2021 were maintained prospectively in a database and analysed retrospectively. Data were subjected to bioinformatics analysis and variants were classified according to international standard guidelines. Information including demographic data, family history of cancer, tumour histopathology and receptor status were also analysed.

**Results**: Germline variants were identified in 33/72 (45.8%) patients. Among them, 32 (96.9%) were females and 17 (51.5%) had cancer onset before the age of 50 years. 16/33 (48.5%) had pathogenic/likely pathogenic variants and 17/33 (51.5%) had variants of uncertain significance. Highest frequency of pathogenic/likely pathogenic variants were in *BRCA1* (n=7; 43.8%) and *BRCA2* (n=7; 43.8%) genes. *BRCA2*:c.1294_1295GA;p.Asn433fs was the most frequently occurring pathogenic variant (n=3; 18.8%). Non-*BRCA* likely pathogenic variants were detected in *PALB2* (n=1; 6.3%) and *PTCH1* (n=1; 6.3%) genes. *PALB2*:c.2768T>G;p.V923G and *BRCA1*:c.5225A>C;p.Q1742P were novel likely pathogenic variants. Predominant histopathology was ductal carcinoma (n=20; 79.1%). Oestrogen and progesterone receptor negativity was observed in (n=4; 50%) harbouring *BRCA* variants and triple negativity was seen in only two patients both of whom were harbouring *BRCA2* variants. Family history of breast cancer was present in 24 (77.4%).

**Conclusions**: Highest frequency of pathogenic/likely pathogenic germline variants were detected in the *BRCA1* and *BRCA2* genes, respectively. Predominant tumour histopathology was ductal carcinoma. WES allows identification of germline genetic variants in families with hereditary breast cancer predisposition which would be beneficial for guiding implementation of therapeutic and preventive risk-reduction measures.

**Keywords**: hereditary breast cancer, germline variants, NGS

## OP-21: Optimization of initial nanobiotechnology procedures to design a gold nanoparticle-based nucleic acid lateral flow assay to detect BRAF V600E mutation in papillary thyroid carcinoma

N. D. Wijesuriya[1], W. S. S. Wijesundera[1], S. T. Thoradeniya[1], D. R. Jayasundara[2], A. A. H. Priyani[3]

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

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

[3]Department of Pathology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Lateral flow assays (LFAs) have significant applications in point-of-care detection of cancer biomarkers. Proper validation of each step in their development process is crucial in achieving the final outcome. This study aimed to develop optimised protocols to design a gold nanoparticle (AuNP)-based nucleic acid lateral flow assay (NALFA) to detect the BRAF V600E mutation for prognostication of papillary thyroid carcinoma (PTC).

**Methods:** Design of primers for the multiplex polymerase chain reaction (PCR) and oligonucleotide probes for LFA and optimization of multiplex PCR to amplify fragments of *BRAF* and *GAPDH* were carried out. Characterization of AuNPs, evaluation of their stability overtime and assessment of their conjugation to detection probes (DPs) were performed.

**Results:** PCR conditions were optimised to amplify a 255 bp fragment of *BRAF*, flanking the V600E mutation site and a 208 bp fragment of *GAPDH* flanking exon 2. A λmax of 525 nm was obtained for AuNPs indicating an average diameter of approximately 20 nm. The sharp peak and absence of secondary spectral features in the localised surface plasmon resonance (LSPR) spectrum revealed a narrow particle size distribution and good shape homogeneity. These properties were retained until two weeks post synthesis assuring stable AuNPs. Four weeks later, λmax ranged from 528-530 nm and the peak of LSPR spectrum broadened towards longer wavelengths, indicating AuNP agglomeration. The expected shift in λmax averaged 3nm, was observed for the DPs specific for *BRAF* and *GAPDH* PCR fragments when conjugated with AuNPs. This indicated successful conjugation of DPs to AuNPs.

**Conclusions:** Since expected results were obtained for the initial steps carried out, it is possible to proceed with determination of the hybridization conditions and subsequent analyses on sensitivity and specificity of the LFA. These findings will contribute to the development of a LFA to detect BRAF V600E mutation status of patients having PTC for efficient prognostication.

**Keywords:** BRAF V600E, gold nanoparticle-based nucleic acid lateral flow assay, multiplex polymerase chain reaction, papillary thyroid carcinoma

## OP-22: Molecular docking simulation of *Aspergillus flavus* AlmA like protein binding with long chain alkanes (C16-C40)

P. Viswanathan, J. Jayasena, M. Perera

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

**Introduction:** AlmA is a bacterial enzyme known to initiate the degradation of long-chain alkanes. Although efficient degradation of alkanes has been observed in fungi, their mechanisms and the enzymes involved are poorly understood. The objective of this study was to identify the binding capability of AlmA like protein in *A.flavus* using *in-silico* methods.

**Methods:** A putative AlmA homolog protein sequence similar to the *Acinetobacter sp.* was identified from *Aspergillus flavus* and its 3D structure was modelled and validated using bioinformatics techniques. The 3D structures of Alkanes and the cofactors required for AlmA (FAD and NADP), were optimised using Orca Version 4.2.1 and molecules were docked stepwise using AutoDock Vina 1.2.0. The cofactors were initially docked on to the AlmA. The AlmA homolog bound to co-factors were then docked with alkanes (C16-C40). The RMSD value and binding affinity of molecules were evaluated. Hydrophobic interactions and docking site analysis of the *A. flavus* AlmA like protein and AlmA of *Acinetobacter sp.* were conducted using Chimera, Protein Ligand Interaction Profiler (PLIP), and ProteinsPlus and results were compared and analysed for ubiquity of similar interactions.

**Results:** FAD showed a higher affinity towards the AlmA like protein of *A. flavus,* than NADP suggesting it may bind to the active pocket initially. Hydrophobic interactions between the cofactor and active pocket amino acids showed comparable results with multiple programs (Chimera, PLIP and ProteinsPlus). Affinity and RMSD (0.0Å) values of tetracontane (C40 alkane) showed valid docking and docking site interactions showed ubiquity with Chimera and PLIP. The results imply that the identified AlmA homolog in *A.flavus* has great potential for bioremediation of crude-oil contamination which needs to be verified experimentally.

**Conclusions:** It was evident that the identified AlmA like protein of *A. flavus* uses long chain alkanes as substrates and therefore has a strong likelihood of structural and functional homology to the bacterial AlmA.

**Keywords:** docking, Aspergillus flavus, *alkane* degradation

## OP-23: Developing a protocol for RNA extraction and quantification from amniotic epithelial cells in gestational diabetes mellitus (GDM) and non-GDM mothers

S. A. C. D. Ranatunga, C. Ishak Sahabdeen, K. Wetthasinghe, H. W. W. Goonasekera

Human Genetics Unit, Department of Anatomy, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction:** Human amniotic epithelial cells (hAECs) are a source of perinatal stem cells. The altered environment in gestational diabetes mellitus (GDM) is known to leave genomic imprints on hAECs which are potential biomarkers of GDM. Direct extraction of RNA from hAECs; instead from culture-expanded hAECs; would provide better quality RNA for further studies. We aimed to develop a protocol for direct RNA extraction using PAXgene® microRNA kit from hAECs and comparative study of RNA amount extracted from GDM versus a non-GDM cohort.

**Methods:** In keeping with the principles of Declaration of Helsinki; following ethical approval (ERC No: 21-014) and institutional approvals; gravid females undergoing caesarean section deliveries were recruited from De Soysa Hospital for Women. The amniotic membranes (AM) of GDM (n=7) and non-GDM (n=10) placentae were subjected to the following RNA extraction protocols. Protocol-I: Followed all the steps as defined by the PAXgene® microRNA kit manufacturer including embedding in wax and tissue sectioning prior to RNA extraction steps. Protocol-II: The AM were kept in a stabilising solution and directly subjected to RNA extraction steps bypassing the wax embedding step. The quality of RNA extraction was checked by using gel electrophoresis and quantified using a Qubit-3-fluorometer. Independent sample t test was used to compare the two groups.

**Results:** The GDM and non-GDM population mean ages were 33.85 and 30.7 years. RNA extraction results using Protocol-I- RNA detection using gel electrophoresis, none for both groups (GDM n=7; non-GDM n=10). Protocol-II- RNA was detected by gel electrophoresis as single bands; the mean RNA quantity for GDM (n=7) = 23,177.14 ng/ml (SD=32,189.88) and non-GDM (n=10) = 34,345 ng/ml (SD=40,339.29) (p=0.536).

**Conclusions:** A protocol for RNA extraction using PAXgene® microRNA kit was developed. Greater RNA extraction yield using protocol II needs to be verified in a repeat study. Whether the lower RNA yield from the GDM group is disease related, requires verification using a larger cohort.

**Keywords:** gestational diabetes mellitus, amniotic membrane, RNA extraction, PAXgene® microRNA kit

## OP-24: The design and implementation of a novel pharmacogenomic assay to study the distribution of *CYP3A5*3* (rs776746) and *CYP3A5*1E* (rs4646453) polymorphisms and its implications to predict the response to the immunosuppressive drug tacrolimus

R. Sameem, N. Noordeen, K. T. Wetthasinghe, S. Praveenan, V. H. W. Dissanayake

Human Genetics Unit, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Tacrolimus is a first-line immunosuppressive agent for solid organ transplantations. Due to its narrow therapeutic index, tacrolimus demonstrates a wide inter-individual variability in pharmacokinetics. Genetic polymorphisms in *CYP3A5* are significant determinants of tacrolimus efficacy.

**Methods:** A total of 100 healthy individuals from the Sri Lankan population were screened for the *CYP3A5* single nucleotide polymorphisms (SNPs), *CYP3A5*3* (rs776746) and *CYP3A5*1E* (rs4646453) using a novel single variant tetra-primer amplification refractory mutation system (ARMS) polymerase chain reaction (PCR) assay and the results were validated by DNA sequencing.

**Results:** The *CYP3A5*3* variant was the most frequent allele detected in 82% of the Sri Lankan population, while the *CYP3A5*1E* C allele was found in 66.5% of the population. The observed *CYP3A5* genotype frequency distributions for the *CYP3A5*3* (rs776746) and *CYP3A5*1E* (rs4646453) variants in the study population were consistent with the Hardy–Weinberg equilibrium ($p>0.05$). The expected phenotype frequency for the clinically significant *CYP3A5*3* (rs776746) variant was reported as T/T [extensive metabolizer] 4.0%, C/T [intermediate metabolizer] 28.0% and C/C [poor metabolizer] 68.0%. As 68.0% of the Sri Lankan population were identified to be poor metabolizers (*CYP3A5*3/*3), lower doses of tacrolimus would be required to reach therapeutic concentrations.

**Conclusions:** A novel tetra-primer ARMS PCR assay was successfully designed for genotyping the *CYP3A5* variants *CYP3A5*3* (rs776746) and *CYP3A5*1E* (rs4646453). Further studies comprising a larger number of samples and more related genes are recommended.

**Keywords:** tacrolimus, CYP3A5, tetra-primer ARMS polymerase chain reaction, pharmacogenomic assay

## OP-25: An analysis of learning style preferences among second-year medical undergraduates using the VARK model

E. Janaka[1], R. Hewapathirana[2], I. Karunathilake[3]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Anatomy, Genetics and Biomedical Informatics Unit, Faculty of Medicine, University of Colombo, Sri Lanka

[3]Department of Medical Education, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** The purpose of this study was to examine the preferred learning styles of undergraduate medical students at the Faculty of Medicine, University of Colombo, Sri Lanka. Medical students have a wide range of diversity in their learning preferences. Proper identification of the preferred learning style is important to design and deliver the instructional contents to gain the maximum outcome of the teaching.

**Methods:** A cross-sectional study was performed on second-year medical students using a locally validated (Cronbach Alpha >0.7) VARK Questionnaire in October 2021. The questionnaire consisted of 16 items that identified four different learning styles: visual, aural, reading/writing, and kinesthetic. The questionnaire was distributed online as a google form to the study population (n=205). The questionnaire was kept available online for two weeks. Responses were collected into the default google sheet. Inferential statistics were used to identify the associations. Pearson's Chi-squared test was used in the analysis.

**Results:** A total of 148 students completed the study. The response rate was 72%. 52% of the respondents were female. The majority (91.2%) favoured Quad-Model, while 8.8% favoured Tri-Model. No one favoured a single model learning style. There was no significant difference between model preferences among male and female students. The overall results suggest the students were more in favour of a multi-model. The kinaesthetic learning style was the most preferred among the study group, visual was the second most while reading/writing was the least preferred.

**Conclusion:** The results of this study provide useful information for improving the quality of teaching and learning experiences of the students. However, more research on this topic will be helpful to understand the association between learning style preferences and teaching/learning strategies.

**Keywords:** learning style preferences, VARK model, undergraduate

## OP-26: Medical students' view on the curriculum: a comparison of two student batches

G. G. Ponnamperuma, I. M. Karunathilake, A. de Abrew, T. L. Dias, G. T. S. V. Somaratne, H. P. M. C. Gunawardhane

Department of Medical Education, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Perceptions of a medical undergraduate reflect the effectiveness of the programme offered. Teaching at the Faculty of Medicine, University of Colombo is carried out in five parallel "streams" which run longitudinally throughout the course, namely Basic Sciences, Applied Sciences, Community, Behavioural Sciences and Clinical Sciences Streams. Clinical education is carried out in a dynamic teaching environment which underwent several changes including the expansion of e-learning platforms, especially during the COVID-19 pandemic. The two consecutive student batches (2013-A/L and 2014-A/L) surveyed in this study, faced the final year examination one year apart. 2013 AL batch had to carryout learning amidst COVID-19 from January 2020 to March 2021 during their final year and the 2014 batch had to carryout learning amidst COVID-19 from January 2020 to March 2022 which included their fourth year and final year learning. During this period, online learning was introduced in the place of onsite lectures. The aim of this study was to assess the perceptions of new graduates on the academic programme amidst the COVID-19 pandemic.

**Methods:** A purpose designed self-administered questionnaire based on several themes including the curriculum amidst the pandemic was administered at the end of the final year examination for both 2013-A/L and 2014-A/L batches of students, including 192 students and 198 students respectively who had undergone the same curriculum.

**Results:** A total of 289 responded. The overall perception regarding the curriculum was that learning outcomes, teaching activities and examinations matched appropriately. More focus on clinically relevant subject matter was suggested. The 2014-A/L batch noted a considerable effect from the COVID-19 pandemic during the final year clinical training. This was mostly due to reduced clinical exposure. Compared to the 2013-A/L batch, 2014-A/L batch appreciated e-learning as a more convenient mode of learning, especially during the pandemic.

**Conclusions**: The analysis showed that both batches emphasise on paying special attention to clinically relevant subject matter. As the junior batch has appreciated e-learning more, it is apparent that although e-learning was incorporated incidentally during the pandemic, it could be the new way forward in medical education as students get more accustomed to it.

**Keywords:** graduate perception, curriculum, COVID-19

## OP-27: Effectiveness of problem-based learning in physiotherapy undergraduate curriculum: a systematic review

C. Pathmanathan[1], S. P. Maddumage[2], U. Rajasinghe[1]

[1]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

[2]School of Physiotherapy, International Institute of Health Sciences, Welisara, Sri Lanka

**Introduction:** The effectiveness of problem-based learning (PBL) in physiotherapy education is not clearly studied. The aim of this study was to determine the effectiveness of PBL compared to traditional methods (TM) in physiotherapy education.

**Methods:** PubMed, Pedro, Science direct, and Google Scholar Databases were searched on 11 January 2022 for randomised controlled trials, non-randomised control trials, quasi-experimental trials, before and after study designs and cohort studies published in English from 2000 to 2022. Two reviewers conducted screening, eligibility assessment, data extraction, and risk of bias assessment independently. A narrative synthesis of outcomes is presented. Preferred Reporting Items for Systematic reviews and Meta Analysis (PRISMA) was used to report the review. Meta-analysis was not performed due to the heterogeneity of studies. This protocol was registered in Prospero (Prospero ID: CRD 42022301693).

**Results:** The primary search strategy identified 2826 potentially relevant articles, of which 1666 remained after removing duplicates. After title and abstract screening, 22 potentially eligible studies were identified. Out of those, two studies met all the predefined eligibility criteria. One had a mixed method study design and it was categorised as moderate bias while the other one had a quasi-experimental design which was categorised as serious bias according to the risk of assessment tool. The results indicated that PBL was effective compared to the traditional methods in terms of promoting early evidence-based practice (EBP), PBL facilitated learning strategies and study preference was high for PBL in comparison to traditional teaching.

**Conclusions:** PBL was reported to be effective in developing different competencies in physiotherapy undergraduates such as promoting early EBP and was preferred over traditional methods. Since there is limited evidence to confirm this finding, research studies with high methodological quality should be performed in future.

**Keywords:** problem-based learning, physiotherapy, undergraduate, curriculum

## OP-28: eHealth literacy skills and associated factors among physiotherapy undergraduates in Sri Lanka: a cross-sectional study

S. P. Maddumage[1], S. M. Withanage[2], A. H. Wettasinghe[1]

[1]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

[2]Durdans Hospital, Colombo, Sri Lanka

**Introduction:** eHealth literacy or using health information on the internet allows healthcare professionals and patients to actively engage in healthcare decisions. Physiotherapy undergraduates, as future healthcare professionals, should be skilled in identifying, utilising and assessing credible online health information. Thus, the objective of this study was to determine eHealth literacy skills and its associated factors among physiotherapy undergraduates in Sri Lanka.

**Methods:** A self-administered questionnaire was distributed among physiotherapy undergraduates of two state universities. The questionnaire comprised questions related to demographic data and the eHealth Literacy Scale (eHEALS). The eHealth Literacy Scale has eight questions that allow respondents to select an answer from a five-point Likert scale. The association between eHEALS score and participant characteristics (gender, family status, living status, etc.) was assessed using the independent sample t test.

**Results:** A total of 129 participants (23.21 ± 1.57 years of age; 21.71% males) completed the questionnaire. The average eHealth literacy score (eHEALS) was 29.57 (SD ± 3.56). Those who had done information technology (IT) as a subject in school had significantly higher mean eHEALS scores. Inadequate eHealth literacy skills were reported in 43.4 % (n=56) of the sample. Poor skills were reported especially in differentiating reliable information from unreliable information and being confident in using information from the internet to make health decisions.

**Conclusions:** Nearly half of the physiotherapy undergraduates had eHEALS scores lower than the mean eHEALS score and had inadequate skills particularly in finding credible information from the internet. Thus, including eHealth literacy concepts in the undergraduate physiotherapy curriculum would be invaluable.

**Keywords:** eHealth literacy, eHEALS, undergraduate, physiotherapy, Sri Lanka

## OP-29: Disabilities and chronic illnesses - challenges faced and expectations from university support systems: a study among medical undergraduates of the University of Colombo

C. L. Weeraratne[1], A. D. A. Fernando[2], N. Senanayake[3], M. Dayabandara[4], R. E. E Silva[5], V. Hewageegana[5], D. G. S.K. L. Jayawardana[6], M. R. Haniffa[5], H. M. P. M. K. Haluwana[7], P. P. Kumaradasa[1], M. Gunawardane[1], K. D. I. Wasudeva[8]

[1]Department of Pharmacology, [2]Department of Physiology, [3]Department of Medical Microbiology and Immunology, [4]Department of Psychiatry, [5]Department of Family Medicine, [6]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

[7]Faculty of Medicine, University of Colombo, Sri Lanka

[8]Health Center, University of Colombo, Sri Lanka

**Introduction:** Despite a recent increase in the number of undergraduates with disabilities and chronic illnesses enrolling in tertiary education, their concerns and difficulties remain under-explored. The objective of this study was to assess the prevalence of disabilities and chronic illnesses among undergraduates of the Faculty of Medicine, University of Colombo and to identify the academic and socioeconomic challenges they face and the support they expect from the university to overcome these.

**Methods:** A descriptive cross-sectional study was conducted using total population sampling of 1589 undergraduates of the faculty. Data were collected through a self-administered, online questionnaire with open- and close-ended questions.

**Results:** A total of 408 undergraduates participated in the study. The mean age was 22.2 ± 1.80 years. Thirty-nine (9.6%), 36 (8.8%) and 39 (9.6%) had disabilities, chronic illnesses, or both, respectively. Forty-three suffered from disabilities/chronic illnesses for more than five years. Visual impairment (34.2%) and asthma (17.5%) were the most common disability and chronic illness, respectively. The majority (n=69; 61%) were reluctant to disclose their condition to the faculty due to reasons such as fear of stigma and rejection. The most frequent academic challenges were difficulty in completing assignments and academic work on time (n=39; 34.2%), difficulty in completing an exam in the given time (n=27; 23.7%), difficulty in studying due to side effects of medications (n=16; 14.0%), and poor attendance (n=14; 12.3%). The majority (n=47; 41.2%) had financial difficulties. Only 18.4% (n=21) were aware of the existing facilities and university support systems for students with disabilities or chronic conditions. They desired better understanding and support from the faculty staff (14.9%) and strengthening of the facilities (10.5%) to overcome their challenges.

**Conclusions:** Exploring the concerns of undergraduates with disabilities and chronic illnesses is much needed to address their challenges, improve awareness of university support systems, and identify aspects of support needed by them to overcome their challenges.

**Keywords:** undergraduates, disabilities, chronic illness, university support system

## OP-30: Authentic learning environments through simulated crime scene investigation for medical undergraduates and stakeholders in the criminal justice system

C. M. A. Gunathilaka, H. J. M. Perera , S. A. Gunawardena

Department of Forensic Medicine and Toxicology, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction**: Forensic medical experts, magistrates, inquirers into sudden deaths and police officers are required to examine, collect evidence and prepare reports based on crime scene investigations (CSI). Some of them formulate relevant, crucial, high impact opinions. Simulated CSI which was introduced five years ago at the Department of Forensic Medicine and Toxicology (DFMT), Faculty of Medicine, Colombo for the first time in a Sri Lankan University setting, is an authentic learning activity since it simulates the real-life scenario. This paper reflects upon the experiences gained in implementing simulated CSI as a teaching tool, and will present participant feedback of one such activity.

**Methods**: Diverse simulated crime scene scenarios are used, with mannequins having injuries or artefacts created through moulage. The participants observe, describe, synthesise, interpret the information gathered and formulate conclusions. Participants are divided into two groups; one performs the simulated CSI while the other observes and critically analyses their performance. The same format is used regardless of whether the participants are from a medical or non-medical background. Feedback through online surveys obtained from simulated CSI are presented and are used for further improvement.

**Results**: The resource persons were able to improve the simulated CSI teaching activity through formal and informal feedback obtained from participants. In one simulated CSI, 11 out of 30 participants responded to an online feedback form. While 7/11 stated that objectives were clearly communicated prior to activity, the extent of overall objectives met at the activity was rated as excellent or very good by 10/11. Some specific objectives were rated as not being fulfilled adequately. All rated the level of satisfaction regarding facilitation of the activity as very good. While the majority felt that the concept of scene was excellent, the physical design and injuries created on mannequins received a lower rating.

**Conclusions**: Authentic learning environments using CSI have achieved the objectives of CSI teaching and are recommended for teaching and training of stakeholders within the criminal justice system. While facilitation has been rated very good, some objectives need re-visiting and upgrading of the simulated learning activity.

**Keywords**: crime scene investigation, authentic learning, simulated crime scenes, moulage

## OP-31: Child emotional and behavioural difficulties and parental stress during the COVID-19 lockdown in Sri Lankan families

A. Athapathu[1], D. Navaratnam[2], M. Doluweera[3], G. Liyanage[4]

[1]Faculty of Medicine, University of Moratuwa, Sri Lanka

[2]Lady Ridgeway Hospital for Children, Sri Lanka

[3]Faculty of Medicine, University of Colombo, Sri Lanka

[4]Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka

**Introduction**: Understanding parents' and childrens' mental health issues could help design population-specific intervention programs. This study explored parents' perceived stress and child emotions and behaviour among Sri Lankan families during the COVID-19 lockdown.

**Methods**: An online survey link was disseminated among Sri Lankan parents of children aged 11-17 years through selected schools in the Colombo district. Additional participants were enrolled using the snowball sampling method by asking respondents to share the survey link among their contacts. Validated instruments (Perceived Stress Scale-PSS; Strengths and Difficulties Questionnaire-SDQ) evaluated parental stress, child emotions and hyperactivity-inattention. Using multiple linear regression, predictors of mental health issues, including the interaction between age and gender, were assessed.

**Results:** A total of 355 parents responded to the survey (76% mothers). One-third of parents experienced difficulties with their children during the pandemic, as compared to before. Emotional and hyperactivity-inattention problems were measured via the SDQ scale, which had increased in 38% of children, while perceived stress had increased in 79.2% of parents. Overall, child emotional and hyperactivity-inattention problems increased with decreasing age, increasing parental stress, having middle income compared to high-income, and having a family member/close relative testing positive for COVID-19. Hyperactivity-inattention (29.3%) was more than emotional problems (22%) among children. Emotional problems were reported more with increasing parental stress, while child hyperactivity-inattention alone was reported more with decreasing age, middle-income compared to high-income families, and increasing parental stress. Also, the interaction effect of age and gender indicated that higher age was related to stronger parent-reported hyperactivity-inattention problems in male children.

**Conclusions:** A significant proportion of parents experienced child emotional and hyperactivity-inattention difficulties during the COVID-19 pandemic. Parental stress had an impact on a child's emotional and behavioural problems. In addition to cautioning healthcare workers, socioculturally appropriate preventive and supportive mental health programs may help manage parental stress and child emotional and hyperactivity-inattention problems.

**Keywords:** behaviour, COVID-19, emotions, psychological stress, Sri Lanka

## OP-32: Exploring associations between meditation, being green and perceived quality of life

E. A. S. K. Somarathne[1,2], M. W. Gunathunga[3], E. Lokupitiya[1]
[1]Department of Zoology and Environment Sciences, Faculty of Science,
University of Colombo, Sri Lanka
[2]Research Promotion and Facilitation Centre, Faculty of Medicine,
University of Colombo, Sri Lanka
[3]Department of Community Medicine, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction**: Meditation has been recently studied in the context of pro-environmental behaviour and perceived quality of life (PQoL). It has been found to have a favourable association with nature connectedness, PQoL and pro-environmental behaviour. The present research investigated the association of meditation experience and trait mindfulness with PQoL and per capita carbon footprint (CF), among 25 skilled meditators.

**Methods**: Self-reported validated questionnaires in a sinhala-speaking context were used in collecting data on meditation experience (duration of practice of meditation, average time duration of a meditation session, perception on Impact of Meditation on Daily life (IMD), five facets of mindfulness (observing facet, acting with awareness, describing facet, non-judging of inner experiences, non-reactivity to experience) and PQoL. To collect CF data, a self-reported data collection booklet was also used. Each participant had to record CF data for 14 days within four domains: food and beverage consumption, electricity consumption at residence, travelling and solid waste disposal at residence.

**Results**: IMD was strongly associated ($r > 0.4$) with all facets of PQoL. Observing and non-reactivity facets of trait mindfulness showed significant positive correlations ($r > 0.4$) with PQoL. Further, results revealed that IMD significantly mediates the negative relationship between observing facet of trait mindfulness and $CF_{FB}$ (Indirect Effect; IE= 0.002; SE=0.001; 95% CI [0.01, 0.417]). Further, IMD significantly mediated the association between mindfulness (based on acting with awareness) and CF (based on solid waste disposal behaviour) ($CF_{SWDS}$); IE=-0.003; SE=0.003; 95% CI [-0.0124, 0.0001]).

**Conclusions**: The present study has contributed to the body of knowledge on meditation, PQoL, and pro-environmental behaviour by filling a gap in the literature on the effect of meditation training on per capita carbon emissions. Investigated direct and indirect relationships between meditation and per capita carbon footprint indicated that meditation could have an impact on one's climate change mitigation behaviour.

**Keywords:** meditation, mindfulness, carbon footprint, GHG, PEB

**Funding**: Supported by the Accelerating Higher Education Expansion and Development (AHEAD) Operation of the Ministry of Higher Education and funded by the World Bank (Grant No. 6026-LK/8743-LK)

## OP-33: Self-reported differences in resilience and psychological distress between Sri Lankan skilled meditators and non-meditators: a preliminary cross-sectional analysis

N. O. Outschoorn[1], H. M. J. C. Herath[2], S. D. Amarasuriya[3]

[1]Research Promotion and Facilitation Centre, Faculty of Medicine, University of Colombo, Sri Lanka

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

[3]Department of Medical Humanities, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction**: Meditation is viewed to result in calm and relaxed states of mind which may buffer against psychopathology. The current study explored differences between self-reported levels of psychological distress (namely depression, stress, and anxiety) and resilience in a sample of Sri Lankan skilled meditators and non-meditators.

**Methods**: A purposive sample of skilled meditators (SM; n=32) with a meditation experience of more than three years, who followed meditation practices taught in Sri Lankan Buddhist meditation centres/temples/monasteries, and as identified through the "Colombo intake interview to recruit skilled meditators for scientific research (CIISMR)" and a community sample of age and gender-matched non-meditating controls (NM; n=32) participated. They completed the Sinhala versions of Resilience Scale, the Depression Anxiety Stress Scale (DASS-21), and a demographic details questionnaire, after providing informed consent for participation. The study (EC-19-095) was approved by the Ethics Review Committee of the Faculty of Medicine, University of Colombo.

**Results**: The SM (n=32) ranged from 27-59 (M=42.13; SD=9.26) years of age and reported 4-21 hours of meditation per week and 3-25 years of meditation practice. The NM (n=32) ranged from 28-58 (M=42.16; SD=9.0) years of age. In terms of findings, a series of Mann-Whitney U tests indicated that levels of resilience were greater for SM (Mdn=145) than for NM (Mdn=139) (U=365; p=0.048). Levels of depression were greater for NM (Mdn=4.0) than for SM (Mdn=2.0) (U=312; p=0.006); levels of anxiety were greater for NM (Mdn=2.0) than for SM (Mdn=0) (U=328.5; p=0.009); stress levels were greater for NM (Mdn=10.0) than for SM (Mdn=4.0) (U=340.5; p=0.02); and levels of total DASS-21 scores were greater for NM (Mdn=21.0) than for SM (Mdn=8.0) (U=314.5; p=0.008).

**Conclusions**: Skilled meditators who follow buddhist-based meditation as practised in a Sri Lankan context show greater levels of resilience and lower levels of psychological distress.

**Keywords**: buddhist-based meditation, psychological distress, resilience, depression, anxiety

**Funding:** AHEAD grant of the World Bank (Grant No. 6026-LK/8743-LK)

## OP-34: A survey on the presentation of adolescents to a specialised child and adolescent psychiatry unit in the Colombo district

D. M. A. Dahanayake, T. H. R. Samanmalee

Department of Psychiatry, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction**: In Sri Lanka, there is only one specialised psychiatry in-patient unit for adolescents, with most out-patient services provided by general adult psychiatrists. There is a lack of data on adolescents within mental health services, impeding resource allocation. This study aimed to describe the socio-demographic factors, clinical factors and management practices relating to adolescents presenting to psychiatry services.

**Methods**: A survey of clinic records of adolescents (10-19-year-olds) presenting to the University Psychiatry Unit, Lady Ridgeway Hospital for Children, Colombo, during the year 2020 was conducted, using a specifically designed data collection sheet.

**Results**: Total new patient presentations in 2020 were 114 and 52.7% were boys. The mean age was 12.3 years with 88.5% aged 14 years or younger. Most (49.8%) were residents of Colombo District, with adolescents presenting from all provinces except the Northern and Eastern Provinces. All were enrolled at schools, four in special education. Thirty-eight (33.3%) were referred from the hospital out-patient department, 32.5% from wards, and 25.4% from specialised clinics such as paediatric neurology and rheumatology. Most (28%) were referred due to behavioural problems, 23.7% due to medically unexplained somatic symptoms and 19.3% due to poor school performance. Psychiatric disorders were diagnosed in 79 (69.3%) with 46.8% of them meeting the criteria for mental retardation. Regarding management, 52.6% were offered psychological management (with or without medication); medication was offered to 38.6%. Multidisciplinary care was offered, with most referrals made to psychology (12.3%). Referrals were also made to occupational therapy, social work, speech and language therapy and physiotherapy. Liaison with paediatric neurology, rheumatology and general paediatric units occurred in 21.9%. Follow-up was arranged for 87 (76.3%) with only 54% attending the appointment.

**Conclusions**: Multidisciplinary input, psychological therapy, pharmacotherapy and follow-up plans have been offered but only half had attended follow-up. However, further studies are needed as this was a single-centre study in a tertiary care setting.

**Keywords**: adolescence, adolescent mental health, mental health services

## OP-35: Advances in investigations into alleged child sexual abuse

N. V. Ewaduge, M. A. D. P. K. Abeyratne, T. D. D. D. Siriwardana, S. M. H. D. Senadhipathi, H. J. M. Perera

Department of Forensic Medicine and Toxicology, Faculty of Medicine,

University of Colombo, Sri Lanka

**Introduction:** Child sexual abuse (CSA) is a major health problem worldwide, associated with a wide range of physical, psychological and social adversities. Victims undergo interviewing and examination in the process of management, along with the provision of necessary treatment. Healthcare practitioners need to possess the necessary knowledge and expertise to provide optimal care. This article focuses on advances in medical and police interviewing, roles of emergency physicians, sexual assault nurse examiners (SANE) and social workers in managing CSA in the recent past.

**Methods**: Pubmed, Researchgate and Google Scholar were searched for keywords for articles in the English language. Twenty-five articles published after 2005 were reviewed, while the current practice was based on articles published by Sri Lankan authors after 2001.

**Results:** Sri Lanka has limited forensic child care services, therefore interviewing is done by both specialised and non-specialised health care personnel in cases of CSA. The testimony of the child is a crucial determinant of the outcome; hence it is important to incorporate standardised methods into practice which is currently not done in Sri Lanka. The National Institute for Child Health and Human Development (NICHD) Investigative Interview Protocol is one such widely followed protocol which considers a child's age and developmental level and yields a better narrative. Roles of social workers and SANE are beneficial in providing social and emotional support to victims. Emergency physicians can contribute by early detection and emergency medical management of CSA. One-stop centres involving a multidisciplinary team provide comprehensive care in the management by preventing secondary victimisation.

**Conclusions:** Additional training of both medical and non-medical professionals with regards to interviewing victims of CSA incorporating NICHD protocol and establishing one-stop centres with multidisciplinary involvement including SANE and social workers could be carried out to provide holistic care and improve the victim outcome.

**Keywords:** advances in child sexual abuse, one-stop centres, medical and police interviewing, sexual assault nurse examiner, secondary victimization

## OP-36: Evidence-based practice: attitudes, knowledge and behaviours of Sri Lankan physiotherapists

P. Cinthuja, P. P. Nanayakkarawasam

Department of Allied Health Sciences, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction:** Evidence-based practice (EBP) is a globally accepted model of clinical decision making, which is considered a gold standard in clinical practice by many health professionals, including physiotherapists. Access to evidence, having positive attitudes and beliefs, and overcoming barriers are critical factors in implementing EBP to improve patient care. This study describes physiotherapists' self-reported attitudes, beliefs, knowledge, and barriers to EBP.

**Methods:** In a cross-sectional online survey, practising physiotherapists were invited to complete a google form with Likert scales, which measured the required components. Social media platforms were used to circulate the questionnaire to participants. A convenient sampling method was used. Chi-squared test was performed to analyse data.

**Results:** The majority of 108 participants were females (56.5%). Most of the physiotherapists (63%) belonged to the age group 30-39 years. It was found that 90% of participants had positive attitudes towards EBP. Although 89.8% of participants had learnt EBP during their academic programmes, complete awareness of the terminology of EBP was poor. More participants (57.4%) revealed that they received support to use current research in their practice, but 51% did not have access to current research. Insufficient time was the main barrier for practising EBP (26%) in clinical settings. Implementing EBP in their clinical practice was low (74%) despite training during their academic programme.

**Conclusions:** It is noted that there was a lack of implementation of EBP, even though participants had a positive attitude towards EBP. Based on results, it is recommended to have a national level policy to enhance EBP in physiotherapy clinical practice in Sri Lanka.

**Keywords:** evidence-based practice, physiotherapy, evidence-based healthcare

## OP-37: Effectiveness of physiotherapy in pulmonary rehabilitation program for patients with chronic obstructive pulmonary disease at National Hospital for Respiratory Diseases, Sri Lanka

K. A. T. S. Mihindukula[1], B. Gunasena[1], K. R. M. Chandrathilaka[2]

[1]National Hospital for Respiratory Diseases, Sri Lanka

[2]Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Chronic obstructive pulmonary disease (COPD) is a chronic airway disease which could be improved by physiotherapy interventions such as pulmonary rehabilitation (PR). Improvements in physical fitness and breathing difficulty results in an increase in quality of life of COPD patients. Thus, this study aimed to determine the effectiveness of physiotherapy for COPD patients in a PR programme at National Hospital for Respiratory Diseases (NHRD), Sri Lanka.

**Methods:** This retrospective descriptive study included 75 patients with COPD, of which 92% were males (n=69). Physiotherapy interventions consisted of pre-designed chest clearance techniques, breathing and relaxation exercises, endurance, and stretching and strengthening exercises. Frequency and intensity of interventions were adjusted according to the baseline health status of the participants. Pulmonary function, physical functionality, level of dyspnoea, and health status of the patient were assessed using lung function tests ($FEV_1$), 6-minute walk test (6MWT), modified-BORG scale, COPD assessment tool (CAT) respectively at the baseline of the programme, at 7$^{th}$ week and at 20$^{th}$ week.

**Results:** Mean age of the participants was 68.39 years (SD=8). Mean height, weight and body mass index were 160.91 cm (SD=6.72), 53.608 kg (SD=10.36) and 20.57 $kgm^{-2}$ (SD=3.122), respectively. Majority of the participants were smoking males (n=67; 89%). The 6MWT results (mean) were significantly improved ($p<0.05$) from 345.81 m (SD=93.4) at baseline to 404.45 m (SD=83.37) at 20$^{th}$ week. Mean modified-BORG scale scores were significantly ($p<0.05$) reduced from 6.36 (SD=1.768) at baseline to 4.32 (SD=1.435) at 20$^{th}$ week, while the mean CAT score reduced from 20.89 (SD=6.287) at baseline to 13.87 (SD=5.614) at 20$^{th}$ week. Severity stage of COPD did not change significantly ($p>0.05$).

**Conclusions:** Physiotherapy interventions in PR improved physical functionality, breathlessness and health status of COPD patients. Effects of physiotherapy interventions on severity of COPD should be further studied.

**Keywords**: chronic obstructive pulmonary disease, pulmonary rehabilitation, physiotherapy

## OP-38: Awareness of physiotherapy specialties among bank employees in the Dehiwala- Mount-Lavinia suburb in Colombo District

K. Nidhya[1], P. Cinthuja[2], K. R. M. Chandrathilaka[2]

[1]Faculty of Human Health Sciences, Tokyo Metropolitan University, Japan

[2]Department of Allied Health Sciences, Faculty of Medicine,
University of Colombo, Sri Lanka

I**ntroduction**: The working environment of the bankers may cause physical health issues such as back pain, neck pain, etc. The general public frequently confuses the functions of different healthcare professionals including physiotherapists, which makes it difficult in selecting the best specialist to consult for their health problems. Thus, public awareness on physiotherapy may lead to early diagnosis, better management and prevention of several common health conditions. Accordingly, this study aimed at investigating the awareness of different physiotherapy specialties among bank employees and determining the association between the level of awareness and the socio-economic characteristics of bank employees.

**Methods**: A cross-sectional survey was conducted using a self-administered questionnaire on 124 bank employees at their workplaces. Data were analysed using standard descriptive statistics. Inferential statistics was used to assess the relationship between education level, gender and age groups and awareness of physiotherapy.

**Results**: The response rate was 67.03%. There were 61 males and 63 females. Among them, 92% were aged between 23-52 years. G.C.E. Advanced Level and diploma were the highest educational levels with 63.7%. Only 20.2% had a bachelor's degree. Awareness of physiotherapy was 93.5%. Television and internet led with 52.4% as sources of information. Well-known specialties were geriatrics (79%) and musculoskeletal physiotherapy (77.4%). Most of the fields in physiotherapy were known by 40-70% respondents. There was no statistically significant difference between the level of awareness and age, gender or level of education of bank employees in this population.

**Conclusions**: Physiotherapy awareness among bank employees is high. Mass media plays a major role in information. Majority of this population is aware of geriatric and musculoskeletal specialties. Physiotherapy in head injuries is the least known field. However, knowledge on treatment options was inadequate.

**Keywords:** physiotherapy, awareness, bank employees

## OP-39: Outcome of a psychologically based pain coping skills intervention for chronic knee osteoarthritis pain: study protocol

M. Gunasekara[1], P. de Zoysa[1], M. P. Dissanayake[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Faculty of Health Sciences, The Open University of Sri Lanka

**Introduction:** Knee osteoarthritis is a common musculoskeletal condition that causes chronic pain and psychological distress. The biological aspects of arthritis pain can be effectively managed with medication, physiotherapy and surgical procedures. However, no known psychological interventions to manage the psychosocial aspects of chronic pain have been developed in Sri Lanka. The specific aims are (1) to design a psychological intervention for chronic knee osteoarthritis pain, (2) to deliver the intervention and to assess the outcome, and (3) to train physiotherapists and occupational therapists to deliver the designed intervention in the future.

**Methods:** The study was approved by the Ethics Review Committees of the Faculty of Medicine, University of Colombo and the National Hospital Sri Lanka. It will be conducted in three phases: (1) designing a psychological intervention, (2) an experimental study to find the effectiveness of the intervention, and (3) training physiotherapists and occupational therapists to deliver the new designed intervention and evaluating its impact.

**Results:** The therapist's manual "Pain Coping Skills for Chronic Knee Osteoarthritis: a Psychological Intervention" was developed, which was based on cognitive behaviour theory. It consists of six sessions: orientation to the intervention; relaxation techniques; physical activation and pacing; pleasant activities; cognitive restructuring and termination. The intervention was developed in English and translated into Sinhala and Tamil languages. The feasibility of the intervention was determined using a Delphi process and focus group discussions.

**Conclusions:** This intervention has the potential to address the psychosocial aspects of chronic pain that the biomedical model has previously overlooked. Furthermore, training physiotherapists and occupational therapists to deliver the intervention may make this new intervention more accessible to those who do not have access to psychologists.

**Keywords:** culturally relevant, chronic pain, coping skills intervention, knee osteoarthritis

## OP-40: The effects of soccer match like exercise on ankle position sense in healthy athletes

L. Jayalath[1], M. de Noronha[2], N. Weerakkody[3], D. Wundersitz[2]

[1]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Community and Allied Health, La Trobe Rural Health School, La Trobe University, Australia,

[3]Department of Pharmacy and Applied Sciences, Community and Allied Health, La Trobe Rural Health School, La Trobe University, Australia

**Introduction:** Ankle proprioception is the body's ability to identify the ankle joint position during movement. It plays a major role during sports and exercise to maintain balance and upper body adjustments and is the commonly affected joint during soccer. Fatigue occurring during soccer can disturb this ability which in return can increase the injury risk in the ankle. Thus, this study aimed to investigate the effects of soccer match-like exercise on ankle position sense.

**Methods:** This study was a laboratory-based experimental study design. Eighteen healthy male recreational athletes with no history of ankle sprains performed a 90-minute soccer-like exercise that replicated the physiological demands of a soccer match. Main outcome measures were position matching tasks of the dominant leg (unilateral replication) which was assessed using six wireless motion tracking sensors (Xsens). The ankle was taken to a desired position measured by the Xsense and the participant was advised to match that angle with the opposite limb. Angle matching was assessed actively at 10° dorsiflexion and 20° plantarflexion during pre-exercise and post-exercise sessions. The measurement taken before the exercise session was used as the control measurement. Body fatigue and heart rate was measured at the end of each exercise cycle using the rating of perceived exertion scale and polar heart rate monitor. Data were analysed by an independent sample t test.

**Results:** No significant change in matching tasks was seen between the control and pre-exercise sessions. There was a significant increase in heart rate and exertion levels after exercise ($p<0.05$), indicating that the exercise protocol fatigued the athletes. No significant change in matching tasks was seen between the control and pre-exercise sessions. Immediately after exercise, for the 20° plantarflexion, an increase in absolute error (-1.3°; 95% CI: -2.03, -0.57) and variable error (-1.1°; 95% CI: -1.79, -0.41) was observed.

**Conclusions:** Ankle plantarflexion position sense was impaired by soccer match like exercise and is likely to have implications for the risk of ankle injuries

**Keywords:** proprioception, exercise, ankle, limb awareness

## OP-41: Effects of dance on gait and dual-task gait in Parkinson's disease assessed using Vicon 3D-motion capture

N. Kalyani[1], K. Sullivan[2], G. Moyle[3], S. Brauer[4], E. R. Jeffrey[5], G. Kerr[6]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]School of Psychology and Counselling, Faculty of Health, [3]School of Creative Practice, Faculty of Creative Industries, [6]School of Exercise and Nutrition Science, Faculty of Health, Queensland University of Technology, Australia

[4]School of Health and Rehabilitation Sciences, Faculty of Health and Behavioural Sciences, University of Queensland, Australia

[5]Dance for Parkinson's, Australia

**Introduction:** Gait impairments are well-known in people with Parkinson's disease (PD). While dance-based interventions could improve gait, further studies are needed to determine if the benefits generalise to different terrains and when dual-tasking. A feasibility study was performed to assess the effects of Dance for PD® (DfPD®)-program on gait under different dual-tasks (verbal fluency, serial subtraction) and surfaces (even, uneven), and to determine if a larger-scale randomised clinical trial (RCT) is warranted.

**Methods:** A dance group (DG; n=17; age=65.8 ± 11.7 years) and a control group (CG: n=16; age=67.0 ± 7.7 years) comprising non-cognitively impaired (Addenbrooke's score: DG=93.2 ± 3.6, CG=92.6 ± 4.3) independently locomoting people with PD (Hoehn & Yahr I-III) participated in the study. The DG undertook a one-hour DfPD®-based class, twice weekly for 12 weeks. The CG had treatment as usual. Gait analysis was performed at baseline and post-intervention while walking on two surfaces (even, uneven) under three conditions (regular walking; dual-task: verbal-fluency- $DT_{VERB}$, serial-subtraction- $DT_{SUBT}$).

**Results:** The spatio-temporal variables of gait for regular walking and dual-tasking did not differ significantly at baseline. Based on pre-post change scores, the DG improved significantly compared to the CG in gait velocity (p=0.017), cadence (p=0.039), step length (p=0.040) and stride length (p=0.041) during regular walking on even surface. During $DT_{VERB}$, significant improvements were noted in gait velocity (p=0.035), cadence (p=0.034) and step length (p=0.039). The DG also exhibited significant improvement compared to the CG during $DT_{SUBT}$ in the measures of gait velocity (p=0.012), cadence (p=0.021), step length (p=0.018) and stride length (p=0.151). On the uneven surface, the DG walked more cautiously during regular walking but had improved gait velocity (p=0.048), cadence (p=0.026) and step length (p=0.051) when performing serial-subtractions.

**Conclusions:** DfPD®-based classes produced clinically significant improvement on spatiotemporal even surface gait parameters with and without a dual-task and uneven surface walking with a serial subtraction task. This could arise from improved movement confidence and coordination; emotional expression; cognitive skills (planning, multitasking), and utilisation of external movement cues. A large-scale RCT of this program is warranted.

**Keywords**: Parkinson's disease, gait, dance

## PP-02: Development of a PCR based assay for the detection of *Rigidoporus microporus* (causative organism of white root disease of rubber)

S. Dharmadeva[1,2], K. Siridewa[1], O. V. D. S. J. Weerasena[2], L. N. R. Gunaratna[2], M. K. Ediriweera[1], T. H. P. S. Fernando[3]

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

[2]Institute of Biochemistry Molecular Biology and Biotechnology, University of Colombo, Sri Lanka

[3]Rubber Research Institute, Sri Lanka

**Introduction:** *Rigidoporus microporus*, one of the most harmful fungal pathogens which cause white root disease, affects Para rubber (*Hevea brasiliensis*) plantation, the second largest plantation in Sri Lanka. *R. Microporus*, a member of basidiomycetes division, affects the plants starting from its root to other parts. The damage is caused due to certain enzymes produced by the fungus and this occurs stage by stage. Firstly, a formation of white rhizomorphs grows and firmly adheres to the root's debris. Next, the collar region of trees gets infected and basidiocarps occur. The primary justification for conducting this study is because the roots of plants are initially affected making it difficult to detect the fungus. Hence initial identification of the fungus is important so that the pathogen can be detected at an early stage which helps to halt the progression of the disease. Accordingly, the objective of the study was to develop a polymerase chain reaction (PCR) based assay for the detection of *R. microporus*.

**Methods:** *R. microporus* isolates' DNA was extracted using two methods and PCR amplification was performed. For PCR amplification, β-tubulin primers were designed using the Bioedit software and Primer3 Input (version 0.4.0). With the chosen primer, temperature, $MgCl_2$ and dNTPs were optimised. Sensitivity and specificity assay was performed using prior PCR conditions.

**Results:** The annealing temperature was adjusted to 60.7°C. Optimal PCR conditions were found to be 2.0mM $MgCl_2$, and 0.15mM dNTPs. Sensitivity and specificity assay showed the lowest detectable template concentration was 0.29ng and the primers were specific for this particular fungus, respectively.

**Conclusions:** In conclusion, the PCR assay developed in the current study is sensitive and specific for the detection of *R. microporus.*

**Keywords:** *Hevea brasiliensis*, polymerase chain reaction, primer, *Rigidoporus microporus*, sensitivity

## PP-03: DNA methylation in methylenetetrahydrofolate reductase (MTHFR) gene promoter and 5-formyl-tetrahydrofolate (5-formyl-THF) levels in folic acid supplemented pregnant women

S. A. Weerasinghe, S. T. Thoradeniya, W. S. S. Wijesundera, M. S. K. Rabindrakumar

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

**Introduction:** DNA methylation is an epigenetic modification critical for gene expression regulation. Folate metabolism cycle is intricately regulated to provide methyl groups for DNA methylation. The genetic and epigenetic influences on folate metabolism and on the levels of different folate forms are yet unclear. Methylenetetrahydrofolate reductase (MTHFR) is a key enzyme in folate metabolism that determines the availability of methyl groups. The study aims were to assess the methylation status of MTHFR gene promoter and to investigate the association between DNA methylation status of MTHFR promoter and concentrations of 5-formyl-tetrahydrofolate in folic acid supplemented Sri Lankan pregnant women.

**Methods:** Methylation Specific PCR was used to analyse methylation status of MTHFR promoter (n=20) at two time points: baseline (before FA supplementation) and delivery (after FA supplementation). Available data on 5-formyl-THF levels of these pregnant women were compared with the methylation status. Wilcoxon rank test was performed to compare the change in DNA methylation status at baseline and delivery, while one-way ANOVA was performed to compare the mean change of 5-formyl-THF level from baseline to delivery between groups.

**Results:** At baseline, twelve pregnant women had fully-methylated status, seven had partially-methylated status and one had unmethylated status. All women with partially-methylated and unmethylated status at baseline were fully-methylated at delivery. Interestingly, of the twelve women with fully-methylated status at baseline, one changed to partially-methylated status at delivery. Although 5-formyl-THF levels significantly increased from baseline to delivery following FA supplementation, the mean change was not significantly different between fully and partially-methylated groups ($p=0.541$).

**Conclusions:** Results indicate that DNA methylation in MTHFR gene promoters increased in partially methylated and unmethylated groups after FA supplementation while the majority of the fully methylated group at baseline have maintained their methylation at delivery too. The fully-methylated status of MTHFR gene promoter may indicate the direction of metabolism towards 5-formyl-THF formation to maintain the stability of folate mediated 1C metabolism.

**Keywords:** DNA methylation, folic acid, MTHFR gene

## PP-04: External ophthalmomyiasis by larvae of *Oestrus ovis* (sheep nasal botfly): second case report from Sri Lanka

J. A. M. T. N. Gunathilake[1], G. Rajapaksha[2], M. H. Gunatilake[2], S. A. S. C. Senanayake[2], K. R. Dayawansa[1], S. Gunawardena[2]

[1]National Eye Hospital of Sri Lanka

[2]Department of Parasitology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** External ophthalmomyiasis is the invasion of superficial tissues of the eye by fly larvae of the order Diptera. Human ophthalmomyiasis due to *Oestrus ovis* has been reported worldwide, typically in farmers and shepherds, especially in sheep and goat rearing countries of the Mediterranean basin. It is rare in Sri Lanka, and this is the second case that is being reported. In 2004, the first case was identified in a paddy farmer residing in Puttalam.

**Case report:** A 28-year-old man was admitted to the National Eye Hospital of Sri Lanka complaining of itching, redness, foreign body sensation and swelling of his right eye. On examination, visual acuity in both eyes was normal; conjunctival injection was noted in the right eye; and the presence of a few motile larvae were observed on the conjunctival surface. The patient recovered completely following the removal of six larvae and treatment with topical antibiotics. Microscopic examination revealed the larva to be translucent, segmented, white in colour and measuring approximately 1.07 mm x 0.36 mm in size. The tapering anterior end had two dark horn-shaped oral hooks connected to a cephalopharyngeal skeleton.

**Conclusion:** The morphological features of the extracted larvae were compatible with the first instar larva of *Oestrus ovis*. Sheep and goats are the natural hosts of these botflies. This patient gives no history of contact with either sheep or goats, nor does he give a history of trauma to his eye by any flies. Early detection and removal of botfly larvae will help minimise ocular damage.

**Keywords:** external ophthalmomyiasis, Oestrus ovis, sheep nasal botfly, Sri Lanka

## PP-05: Serodiagnosis of *Leishmania donovani* induced cutaneous leishmaniasis: a method comparison study

A. S. C. Samarakone[1], B. Deepachandi[1], S. A. Ejazi[2], A. Bhattacharyya[2], N. Ali[2], P. Soysa[3], H. V. Y. D. Siriwardana[1]

[1]Department of Parasitology, Faculty of Medicine, University of Colombo, Sri Lanka

[2]CSIR-Indian Institute of Chemical Biology, Kolkata, West Bengal, India

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

**Introduction:** Sri Lanka reports a large focus of cutaneous leishmaniasis (CL). CL is not known to exert a high humoral response. However, we detected a high seroprevalence for CL in Sri Lanka and developed a cost-effective in-house ELISA assay that has been described previously. This assay is important to detect microscopy negative patients prior to conducting second line investigations and to detect pre-clinical infections in the field. The aim of the current study was to compare the local assay with other known assays.

**Methods:** Study samples (n=100) were collected randomly from patients with laboratory confirmed CL. Control samples (n=25) were collected through field visits to disease endemic and non-endemic areas. In-house ELISA, DAT, Indian dipstick test and rK39 strip test were carried out on all study samples. The specificity and sensitivity were analysed. The cost analysis was also done per patient.

**Results:** In house ELISA showed a high seropositivity of 81.0% (n=81/100) while DAT (57.5%; n=23/40), Indian dipstick test (22.0%; n=22/100) and rK39 test (15.0%; n=15/100) showed a comparatively less seropositivity. According to Kappa index values, there was no perfect agreement between tests. Among ELISA positive patients (n=81), DAT, Indian dipstick test and rK39 demonstrated seropositivity rates of 61.3% (n=19/31), 25.9% (n=21/81) and 16.0% (n=13/81), respectively. Among ELISA negative patients (n=19), the three assays demonstrated seropositivity rates of 44.4% (n=4/9), 5.3% (n=1/9) and 10.5% (n=2/19), respectively. The clinico-epidemiological profiles of seropositive patients in each assay were also different. Cost per patient was approximately 5.5 USD for DAT and 3.0 USD for each of the other tests.

**Conclusions:** In-house ELISA performs better than standard assays in the local setting. DAT can be used as an alternative test when ELISA is not available or negative. This establishes a suitable method for clinical and preclinical screening of CL in Sri Lanka.

**Keywords:** *Leishmania donovani*, cutaneous leishmaniasis, seroprevalence, serodiagnosis

## PP-06: Development and validation of an in-house ELISA to detect *Leishmania* parasites in dogs

B. K. Greniyar[1,2], H. W. Dilanthi[1], T. Thoradeniya[1], S. Senanayake[2], N. D. Karunaweera[2]

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

[2]Department of Parasitology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Leishmaniasis, a vector-borne parasitic disease, caused by *Leishmania donovani* is endemic in Sri Lanka. Inconclusive evidence suggests the possibility of dogs being a reservoir for Leishmania. Identification of animal reservoirs is crucial to control the infection. The objective of this study was to develop and validate a low-cost ELISA method to screen for Leishmania in dogs.

**Methods:** An experimental study was conducted. Leishmania parasites were cultured, and crude protein lysate was extracted and quantified. The ELISA was optimised using checkerboard titration and was validated using a commercial kit. Accuracy, precision, linearity, specificity and sensitivity of the in-house ELISA were determined. The crosstab analysis was performed to determine the sensitivity and specificity of the in-house method. Blood samples were collected from 71 dogs: 60 from Kilinochchi and 11 from Mirigama. The collected serum samples were analysed using the optimised in-house ELISA.

**Results:** An antigen concentration of 5 µg/ml and 1/400 primary antibody dilution were chosen as the best combination for the ELISA. The cut-off absorbance value to detect positive cases was identified as 0.212. The sensitivity and specificity of the in-house method were 92.9% and 90.9%, respectively. The accuracy, intra-assay precision and inter-assay precision were 91.6%, 2.6%, and 3.5%, respectively. The dilutional linearity was up to 0.9904 of absorbance. Out of 71 dogs, 14 were positive for leishmaniasis according to the developed method and confirmed by the commercial kit.

**Conclusion:** The developed assay is a valid low-cost method to determine the presence of Leishmania in dogs. The non-specificity of the antigen used in crude lysate is a limitation. The results add evidence to suggest that dogs are potential reservoirs for Leishmania in Sri Lanka. However, it cannot be generalised due to the small sample size obtained from the limited number of hotspots. Further molecular and epidemiological studies are needed to confirm our findings.

**Keywords:** leishmaniasis, dogs, ELISA, development, validation

## PP-07: Variations in the infrainguinal anatomical distribution of critical limb ischemia according to digital subtraction angiography

A. G. A. V. J. Abeysinghe, M. R. N. Cassim, C. M. Gurusinghe
Department of Surgery, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Chronic limb threatening ischemia is a global burden that results in death, amputation and impairment in the quality of life. It is caused by atherosclerosis of the limb vasculature with one-year mortality rates ranging from 10-40%. Digital subtraction angiography (DSA) and subsequent angioplasty are minimally invasive procedures that are currently accepted due to improved outcome and lower rates of complications. The aim of this study was to describe the anatomical distribution of critical limb ischemia.

**Methods:** A retrospective study was done in a single unit, inclusive of 97 patients who underwent angiography and subsequent angioplasty between February 2021-June 2022. Following the procedure, DSA reporting was done by a vascular surgeon and recorded. SPSS was used to analyse data.

**Results:** Among the 97 participants 71% (n=69) were males. 96% (n=93) had diabetes, 76.3% (n=74) were hypertensive and 50.5% (n=49) had a history of ischemic heart disease. 50.5% (n=49) angiograms were done in the left limb. Of the total study population, 66% (n=64) had patency in the superficial femoral artery and 64% (n=62) had the popliteal artery patent. Tibio-peroneal trunk was patent in 66% (n=64). Anterior tibial artery was patent in 19.6% (n=19) and the posterior tibial was patent in 20.6% (n=20) participants. Of 69 male participants, 69.5% and 15.9% had patency in the superficial femoral artery and anterior tibial artery, respectively. Females had 57% of patency rates in the superficial femoral artery and almost double rates of patency (28.5%) than males in the anterior tibial artery ($p>0.05$).

**Conclusions:** Majority had patency in the superficial femoral artery than anterior tibial artery. Females had a higher rate of patency in the anterior tibial artery but lower rates in the superficial femoral artery when compared to males.

**Keywords:** angiography, patency, infra-inguinal

## PP-08: Development of an online home-based exercise intervention to reduce the risk of falls and to improve the mobility and gait in diabetes mellitus:a study protocol

A. H. Wettasinghe[1], D. W. N. Dissanayake[2]

[1]Department of Allied Health Sciences, Faculty of Medicine,
University of Colombo, Sri Lanka

[2]Department of Physiology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Exercise interventions are found to be effective in reducing the risk of falls in older adults with diabetes mellitus (DM). However, there are no home or clinic based interventions which can be used with minimal supervision. Furthermore, a digital intervention program based on validated data with a valid monitoring tool is not present in literature. The aim of this study is to develop a digital exercise intervention and to test its effectiveness to reduce the risk of falls, fear of falling, mobility and gait characteristics in older adults with DM.

**Methods**: A home-based digital exercise programme will be developed based on the neurophysiological and cognitive function data already obtained from patients with DM (n=103) by the principal investigator. Intervention will be given to the study group and the control group will receive general fall prevention advice. The programme will be accessible through a smartphone or a tablet. Exercises will be instructed in short video clips imaging older persons doing the exercises, and the user-interface will be clean and uncomplicated. Participants will have the opportunity to select up to 12 exercises, one from each category. Categories are upper limb strengthening (three groups), lower limb strengthening (five groups), balance training (two groups) and cognitive training (two groups). The primary outcome measure will be the number of falls during the intervention period assessed with fall calendars. Neuropathy symptoms and examination scores, physiological profile assessment (PPA), iconographical falls efficacy scale (Icon-FES), timed up and go test (TUG), balance assessments and gait analysis will also be performed before and after the intervention.

**Conclusions**: The generated exercise programme, if effective, could be utilised for people with DM to reduce the risk of falls. Hence, we can reduce the fear of falling and improve the quality of life of older adults with DM. The possible reduction in morbidity and mortality related to falls will contribute positively to the quality of life and economy.

**Keywords:** diabetes mellitus, risk of falls, fear of falling, exercise intervention

**PP-09: A 10-year-old girl with a suicide attempt:are our social services failing?**

D. M. A Dahanayake, T. H. R. Samanmalee

Department of Psychiatry, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Suicide attempts are rare under 12 years. Family conflict and lack of parental monitoring predict suicidal thoughts and acts in this age group. Data on young children with suicide attempts in Sri Lanka are scarce. This case highlights the role of psychosocial factors in suicide attempts.

**Case report:** A 10-year-old girl from a socioeconomically disadvantaged suburb was brought to the hospital following a hanging attempt. She needed intensive care for one week. She was unhappy with her mother for bringing a cheap alternative for breakfast and after her mother left for work, leaving her with her father and two younger siblings, she hanged herself.

Her mother is the sole breadwinner, and her father uses heroin. The two school-aged children are not schooled as they lack stable accommodation, their income is low, and their parents have taken minimal effort (both being illiterate). They spend the day watching television without adult supervision. This child looks after her three-year-old brother. They had recently watched a movie where a family had taken their lives by hanging - the mother lacked an understanding that this was inappropriate for children.

On assessment, no features of depression or trauma-related disorders were found. She had average intelligence but could only identify and write a few letters due to inadequate stimulation. There was no previous involvement of social or child protection services despite the children not attending school. A multi-agency case conference with mental health professionals, judicial medical officers, police, education, and child protection officers was held. Psychosocial concerns were discussed and a plan to support the family was formulated. Children were placed with parents under regular supervision of the Department of Probation.

**Conclusions:** This case reveals how social and family systems coalesced, creating a cascade of events leading to the child's hanging attempt. Early detection and coordinated action by relevant authorities are needed if these unfortunate incidents are to be avoided in the future.

**Keywords**: psychosocial concerns, suicide attempt, social and family conflict, parental monitoring

## PP-10: Dispositional mindfulness as a moderator between the experience of subclinical post-traumatic stress symptoms and subjective well being among Sri Lankans

J. A. Perera[1,2], A. K. Perera[3]

[1]School of Social and Human Sciences, University of West London, United Kingdom

[2]Research Promotion and Facilitation Centre, Faculty of Medicine, University of Colombo, Sri Lanka

[3]Counselling and Psychological Services, George Mason University, Virginia, United States

**Introduction:** The Sri Lankan population has endured many traumatic experiences such as the three-decade-long civil war and the Easter Sunday attacks. These events may have precipitated the development of subclinical post-traumatic stress symptoms (PTSS) among its people. This may negatively impact their subjective well-being (SW). A low level of SW has been associated with many adverse outcomes. Literature has established the moderating effects of dispositional mindfulness (DM) against the negative outcomes that are derived from psychopathology. As such, the present study aimed to see the moderating effect of DM on the relationship between PTSS and SW among Sri Lankan adults.

**Methods:** The study was carried out across 105 Sri Lankan adults aged 18-65 years through an online survey. The participants represented the major ethnic groups of the country and were residing in Sri Lanka at the time of data collection. The trait version of the MAAS, the PCL-5, and the SWLS were the measures used for data collection. The study employed SPSS version 28 for the data analysis process.

**Results**: The reliability analyses revealed high levels of consistency across all measures administered. The results revealed the presence of a high rate of PTSS among the participants. A weak positive correlation between DM and SW; a moderate negative correlation between PTSS and DM; and a weak negative correlation between PTSS and SW were observed. Additionally, the relationship between PTSS and SW was not moderated by DM within this sample.

**Conclusions:** A high level of PTSS was associated with a decrease in SW, and DM did not moderate the relationship between subclinical PTSD symptoms and SW. The presence of a high rate of PTSS among the participants suggests the need for suitable interventions.

**Keywords:** dispositional mindfulness, post-traumatic stress symptoms, subjective well being, Sri Lanka, moderator

## PP-11: Effects of a meditation-based psychotherapeutic intervention on psychological distress and perceived health-related quality of life of stage IV and V chronic kidney disease patients: a randomised controlled trial protocol

N. O. Outschoorn[1], H. M. J. C. Herath[2], S. D. Amarasuriya[3]

[1]Research Promotion and Facilitation Centre, Faculty of Medicine, [2]Department of Social Science Education, Faculty of Education,[3]Department of Medical Humanities, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Meditation is empirically supported as a sustainable and non-invasive mind-body therapy in illness contexts. The proposed randomised controlled trial (RCT) intends to explore whether a meditation-based psychotherapeutic intervention (MBPI) could alleviate psychological distress (PD) and enhance perceived health-related quality of life (pHRQOL) in a sample of Sri Lankan patients diagnosed with stages IV and V chronic kidney disease (CKD).

**Methods:** A repeated-measures, open RCT will be performed. Fifty-six CKD patients who are in stage IV/V of the illness, who have not undergone renal-replacement therapy and are between the ages 18-65 years will participate in an eight-week MBPI compared to an active control group (CG; n=56), who will participate in a parallel series of illness-related education sessions. The proposed MBPI will consist of eight 1.5 hourly sessions where the 1$^{st}$ and the 8$^{th}$ session will be conducted onsite while 2$^{nd}$ - 7$^{th}$ sessions will be conducted online and will require a 30-40 home-based daily individual practice of meditation between sessions. Participants will be recruited from renal care clinics at the National Hospital of Sri Lanka, Colombo (NHSL) using purposive sampling and will be grouped using block randomization. To avoid contamination bias and influence on the CG, the participants of the experimental group will be instructed not to share any information related to the MBPI with others during the study. All participants will complete validated psychometric measures to evaluate primary outcomes (i.e. PD and pHRQOL) and secondary outcomes (i.e. mindfulness, self-compassion, coping, psychological resilience) during three-time points: before, immediately after, and three months after the completion of the intervention. The study will be conducted in the Clinical Medicine Academic and Research Centre premises at the NHSL. Outcomes between groups will be compared by adhering to standard principles for RCTs.

**Keywords:** meditation-based psychotherapeutic intervention, psychological distress, health-related quality of life, chronic kidney disease

**Funding:** AHEAD Grant of the World Bank (Grant No. 6026-LK/8743-LK)

## PP-12: Effects of long-term meditation practice on expression of *CRY1 and CRY2* genes related to circadian rhythm:a case-control study

N. N. Dasanayaka[1], N. D. Sirisena[2], N. Samaranayake[3]
[1]Research Promotion and Facilitation Centre, Faculty of Medicine,
University of Colombo, Sri Lanka
[2]Department of Anatomy, Genetics and Biomedical Informatics, Faculty of Medicine,
University of Colombo, Sri Lanka
[3]Department of Parasitology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Many physical, metabolic and behavioural changes in the human body follow a circadian rhythm. Cryptochrome circadian regulator (*CRY*) 1 and 2 genes encode circadian proteins important for circadian rhythmicity. Up-regulated *CRY* genes ensure the stability of the circadian rhythm which contribute to maintenance of homeostasis in the body. Practice of meditation has been suggested to up-regulate the expression of *CRY1* and *CRY2* genes. This case-control study compared expression of *CRY1* and *CRY2* genes between long-term, skilled meditators and non-meditators.

**Methods:** Thirty meditators were recruited from meditation centres in different parts of Sri Lanka following a two-tier screening process and age and gender matched non-meditators were recruited from the community. Socio-demographic characteristics including exercise hours per week were collected. Expression of *CRY1* and *CRY2* genes was assessed via reverse transcriptase polymerase chain reaction. Relative gene expression was determined using the $2^{-\Delta\Delta CT}$ method. Independent sample t-test was used to compare the mean fold changes of the expression of genes between meditators and controls. Pearson correlation was used to determine the bivariate relationships between continuous variables.

**Results:** Nineteen of the 30 participants (63.34%) in each group were male and the average age (SD) of participants was 43.83 (9.92) years. Mean duration of the meditation practice of the meditators was 6.80 (3.27) years and they had meditated for a mean period of 5.82 (3.45) hours per day. A significant increase in the expression of *CRY1* (FC=9; p=0.037) and *CRY2* (FC=6.6; p=0.05) were found in meditators compared to controls which indicate that the meditators had stabilised circadian rhythmicity. Expression of *CRY1* gene increased significantly with the duration of meditation practice (r=0.377; p=0.040). The expression of *CRY2* gene significantly increased with the duration of exercise hours (r=0.256; p=0.046).

**Conclusions:** Up-regulated *CRY* genes in meditators result in stabilised circadian rhythmicity which contribute to maintenance of body homeostasis.

**Keywords:** meditation, gene expression, *CRY1*, *CRY2*, long-term meditators, case-control

**Funding:** AHEAD Grant of the World Bank (Grant No. 6026-LK/8743-LK)

## PP-14: Background prevalence of genotypic variants associated severe COVID-19 in a Sri Lankan cohort

P. Somasundaram, G. G. Anandagoda, D. Hettiarachchi, T. K. Wetthasinghe, V. H.W. Dissanayake

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

**Introduction:** The global pandemic coronavirus disease 2019 (COVID-19) has impacted every individual either by affecting the health or economy. The variations in clinical manifestations and fatality ratios are attributable to the health care system, disease management strategies, variants of the virus and importantly genetic variations within populations. Hence, it is important to check the host genetic factors to understand the disease severity. Meta-analysis of 60 Genome Wide Association studies from 25 countries identified 23 genetic variants as biomarkers of severe COVID-19 disease. Our aim was to identify the background prevalence of these biomarkers in a Sri Lankan cohort.

**Methods:** The genomic data of patients undergoing exome sequencing at our unit is maintained in an anonymized database. The candidate variants were assessed in 323 exomes. Analysis was performed using an in-house bioinformatics pipeline.

**Results:** The prevalence of the risk allele of the following variants were as follows: *SFTPD* rs721917(GG)=0.68, *OAS1* rs2660(AA)=0.70, *IFNAR2* rs17860115(AA)=0.19, *EFNA4* rs114301457(TT)=0.0031, *THBS3* rs41264915(GG)=0.0712, *SLC6A20* rs2271616(TT) =0.096, *PLSCR1* rs343320(AA)=0.0341, *SLC22A31* rs117169628(AA)=0.0015, *ATP11A* rs9577175(TT)=0.0062, *TYK2* rs34536443(CC)=0.0046, *IFNAR2* rs188401375(GG)=0.0031, and *FUT2* rs516316(CC)=0.0015. The following risk variants alleles were not present: *HLA-DRB1* rs9271609(CC), *IFNA10* rs28368148(GG), *FBRSL1* rs56106917(GG), rs3848456(AA), *TMPRSS2* rs915823(CC), *LZTFL1* rs17713054(AA), *AQP3* rs60840586(del AACT), *TAC4* rs77534576(TT) and *IL10RB* rs8178521(TT).

**Conclusions:** The highest prevalence was seen for the *SFTPD* rs721917=0.68, *OAS1* rs2660=0.70 and *IFNAR2* rs17860115=0.19 risk alleles. Surfactant protein D coded by *SFTPD* protects the lungs from inhaled microbes, rs721917 GG leads to low expression of *SFTPD* conferring the risk for hospitalisation. Low expression of the *OAS1* in those with the rs2660 AA genotype is associated with higher hospitalisation rate. Low *INFAR2* expression is seen in those with rs17860115 AA genotype with life threatening infections. We conclude that rs721917, rs2660 and rs17860115 as potential biomarkers for severe COVID-19 disease in the Sri Lankan population. Further studies are needed for confirmation.

**Keywords**: COVID-19, alleles, biomarkers

## PP-17: A survey of trust, self-esteem, psychological well-being, and their correlation, among journalists in the Colombo District of Sri Lanka

S. R. Sathanandan[1], H. Zulfikar[2]

[1]Colombo Institute of Research and Psychology, Coventry University, England, Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Health Sciences, Colombo Institute of Research and Psychology, Sri Lanka

**Introduction:** Journalists must maintain professional ethics while exercising their freedom of expression towards keeping citizens aware of their rights. This study aimed to determine the association between trust and self-esteem, and how this predicts psychological well-being among journalists aged 18 years and above, in the Colombo district of Sri Lanka.

**Methods:** A quantitative cross-sectional survey was conducted by purposive sampling of subjects fulfilling inclusion and exclusion criteria. The sample size was 151 (74 females; 77 males). The three scales administered were Yamagishi's General Trust Scale, Rosenberg's Self-Esteem Scale, and Ryff's Psychological Well-Being Scale. Spearman Correlation analysis and multiple linear regression analysis were used to identify correlations.

**Results:** Spearman-rank correlation was run to assess the association between trust and self-esteem. The results of the study indicated that there was no significant association between trust and self-esteem. Further, simple linear regression was run to understand if self-esteem and trust have an impact on six dimensions of psychological well-being (i.e., autonomy, environmental mastery, positive relations, purpose in life, self-acceptance, and personal growth), which indicated that self-esteem predicted psychological well-being, and trust predicted psychological well-being. This, therefore, indicated that an increase in self-esteem increases psychological well-being and an increase in trust levels increases psychological well-being.

**Conclusions:** The findings indicated that there was no significant association between trust and self-esteem and that an increase in self-esteem increases psychological well-being and, when trust increases psychological well-being increases too.

**Keywords:** self-esteem, trust, psychological well-being, journalist, Sri Lankan

## PP-21: Online learning during the COVID-19 pandemic: the experience of physiotherapy undergraduates in Sri Lanka

P. Cinthuja[1], P. de Zoysa[2]

[1]Department of Allied Health Sciences, Faculty of Medicine,
University of Colombo, Sri Lanka
[2]Department of Psychiatry, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Online learning was an alternative method during the COVID-19 pandemic. The objectives of the study were to explore perceptions and preferences of online learning among physiotherapy undergraduates during the pandemic.

**Methods:** An online cross-sectional survey was conducted. Ethics approval and permission were obtained from the relevant authorities. Physiotherapy undergraduates from all three universities which offer physiotherapy degree programmes in Sri Lanka were recruited and a convenient sampling method was used. First year undergraduates were excluded since they did not have experience in clinical or onsite practical classes during the data collection period.

**Results:** The response rate was 48.8%. Of the 147 respondents, 72% were females. During the pandemic period, 63% of the participants spent between 10-40 hours/week on online learning. 78% mentioned that they have moderate knowledge on Information Technology. Being able to stay at home and to learn at their own pace were commonly mentioned advantages of online learning. However, 36% of participants indicated that internet connectivity issues impacted their learning, whilst 78% of the participants indicated that clinical teaching and practical classes could not be replaced by online teaching. Seventy-seven of the participants preferred a hybrid learning method, even post-pandemic. Results indicated that online learning would be made more effective if the classes were more interactive, stimulating and engaging. Low response which may lead to a response bias was a study limitation.

**Conclusions:** Physiotherapy students have a positive perception towards traditional learning for clinical and practical classes compared to online learning. However, considering the advantages of online learning for theory components, students prefer a hybrid learning method for the physiotherapy study programme. Problems such as internet connectivity issues should be addressed to provide a satisfactory learning experience to students.

**Keywords:** physiotherapy, online-learning, traditional learning

## PP-22: Study to describe key components required in a mentoring program that impact the success of the mentoring process

D. R. L. Thalayarathne[1], Y. W. S. Suranadee[2], I. Prematthileka[2], H. D. Wijesinghe[3], A. W. C. P. Witharana[4], R. E. Ediriweera de Silva[5], S. A. Gunawardena[6], C. A. Gnanathasan[7], M. W. Gunathunga[8], H. V. Y. D. Siriwardana[1]

[1]Department of Parasitology, [2]Department of Medical Microbiology and Immunology, [3]Department of Pathology, [4]Department of Biochemistry and Molecular Biology, [5]Department of Family Medicine, [6]Department of Forensic Medicine & Toxicology, [7]Department of Clinical Medicine, [8]Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction**: Mentoring is considered as a fundamental component of a mentee's personal and professional development. Understanding the needs of the mentee, the nature of the profession, and their experience in mentoring is necessary for a successful mentoring process and to improve mentoring relationships. This preliminary analysis was carried out to understand requirements of academics and professionals in order to design a training program on mentoring. The surveys assessed the areas in which the target population expected guidance from a mentor in order to improve their performance in their academic careers.

**Methods**: The sample included academic professionals and alumni staff of the University of Colombo. Data were collected from participants who attended a pre-congress (Colombo Medical Congress-CMC) workshop in academic mentoring in January 2020, using a self-administered questionnaire. Thirty-six respondents aged 28-74 years, participated.

**Results**: Participants identified many areas as important components in a mentoring session [support in professionalism (n=15/36; 47%), research (n=11/36; 31%), academic life (n=11/36; 31%), personal life (n=8/36; 22%), skill development (n=8/36; 22%), motivation (n=7/36; 19%), and mental health (n=6/36; 17%). The graduates (n=5/36; 14%) mentioned improvement of academic life (n=3/5; 33.3%) and personal life (n=3/5; 33.3%) as their preponderant interests, while the postgraduates (n=31/36; 86%) were interested in the improvement of knowledge on researching (n=11/31; 35.4%) and skill development (n=10/31; 32.2%). Majority requested a mentoring program for themselves (n=27/36; 75%) and their trainees (n=15/36; 42%).

**Conclusions**: Expectations and the interests of academics are diverse. Mentees do not expect support only for career development, but also for their personal life and wellbeing. When planning a successful mentoring process, evaluating and understanding mentees' abilities, professional and personal situations can help select more suitable mentors according to their needs. An evidence-based approach may be useful to correctly understand the requirements before designing training programs.

**Keywords:** needs assessment, mentoring, mentee

**PP-23: Ideal educational model for the clinical education component of B.Sc. Honours in the Physiotherapy degree programme at University of Colombo, Sri Lanka**

H. D. B. S. Perera[1], G. G. Ponnamperuma[2], D. G. S. K. L. Jayawardana[1]

[1]Department of Allied Health Sciences, Faculty of Medicine,
University of Colombo, Sri Lanka

[2]Department of Medical Education, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Clinical education is a crucial component of an entry level physiotherapy education programme. This study aims to identify ideal educational strategies to improve the clinical education component of the B.Sc. Honours in Physiotherapy degree programme at the University of Colombo in order to produce more competent physiotherapists in future.

**Methods:** A qualitative phenomenological study will be conducted at the Faculty of Medicine, University of Colombo and relevant clinical training stations. Second to fourth year physiotherapy undergraduates who have commenced their clinical training, academic staff members who have actively participated in clinical teaching during the past four years, clinical educators with at least two years of experience in training physiotherapy undergraduates, internal and external examiners participating for clinical examinations of the degree programme, physiotherapy graduates with more than one year of experience in clinical practice and other health professionals who have worked with physiotherapy graduates for more than one year will be recruited as study participants using maximum variation sampling method. Selection and recruitment of participants will be terminated upon data saturation. Focus group discussions will be conducted with physiotherapy undergraduates and individual semi-structured interviews will be conducted with other categories of participants. Interviews will be audiotaped and transcribed. Document analysis will be conducted to evaluate the existing curriculum. In addition, a literature review will be conducted on the best educational strategies for physiotherapy clinical education. Framework analysis methods will be used to analyse data.

**Conclusions:** This study will explore the clinical education component of the B.Sc. Honours in Physiotherapy degree programme at University of Colombo more descriptively using the qualitative phenomenological approach which is frequently used to assess educational interventions in health professions' education. The investigators expect to enhance the credibility of the study through triangulation of data collection methods.

**Keywords:** clinical education, physiotherapy, entry-level education programmes

## PP-24: Ensuring the sustainability of a diploma programme: reflection of decades long experience

H. J. M. Perera, C. M. A. Gunathilaka, R. Samaranayake, A. P. Liyanage, D. L. U. Senaviratne, N. Mampitiya

Department of Forensic Medicine and Toxicology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Provision of expert testimony in Forensic Medicine and Science is crucial in court trials. The Diploma in Forensic Medicine and Science (DFMS) for legal professionals commenced over twenty-five years ago, to empower them to evaluate, apply or challenge expert medical and scientific evidence. This paper reflects on the long-term sustenance of the programme, the programme transformation from traditional to active learning and recommendations for improvement.

**Methods:** The programme transformed gradually from didactic lectures and post-mortem demonstrations to active teaching learning activities (TLA) with hands-on simulated crime scene investigation and other simulations leaving a unique stamp. Based on stakeholder feedback, the content area was modified, and the resource pool expanded to include forensic psychiatrists, senior police investigators and sociologists. Prior-knowledge quizzes, formative assessments (FA), end of semester assessments including FA, continuous assessments (CA) and take-home assignments were new additions. Online teaching and uploading of the activities to the learning management system (LMS) constitutes hybrid teaching. Student-friendly management strategies include a comprehensive handbook, inclusivity education and addressing of student concerns by an empathic staff member. Managerial staff strategies included online programme planning with document sharing and compulsion of the team to regularly update their digital acumen. As an income generation project incentives to team and welfare are ensured with other minor benefits for all department staff.

**Results:** Increased student enrolments could be due to student-friendly environment, active teaching and learning methods and increased commitment due to CA and FA keeping students engaged. Group assignments encouraged peer-peer communication, teamwork, and breaking hierarchies. Greater teamwork, staff compliance and information technology (IT) savviness could be associated with incentives, welfare programmes and team-based planning thus contributing to a better equipped and satisfied workforce.

**Conclusions:** The DFMS programme has evolved with respect to its content delivery and student-friendly learning environment as well as enhanced management principles and has had increasing enrolments despite cost involved.

**Keywords:** forensic medicine, legal professionals, active learning, teamwork, teaching learning activities

## SOP-01: Prevalence and associated factors of psychological distress of patients with stroke attending neurology clinics of the National Hospital of Sri Lanka, Colombo

W. M. P. C. Weerasekara[1], C. N. Warshawithana[1], W. M. N. N. P. Weerasinghe[1], I. Mashood[2], S. Pathirana[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** There are many reasons for psychological discomfort in stroke patients, which has a negative impact on their prognosis. Hence, this study was carried out to assess the prevalence of psychological distress and associated factors among stroke patients attending neurology clinics of the National Hospital of Sri Lanka (NHSL), Colombo.

**Methods:** A descriptive cross-sectional study was conducted among 177 stroke patients attending neurology clinics of the NHSL, Colombo who were sampled by multi-stage random sampling. The level of psychological distress, dependency on activities of daily living (ADL), and disability status were evaluated using the 10-item Kessler psychological distress measure, the Barthel Index, and the modified Rankin Scale, respectively. A pre-tested interviewer-administered questionnaire was used to gather data. Bivariate analysis was conducted using Chi-squared tests and simple logistic regression, and multivariate analysis was conducted using binary logistic regression. Odds ratios with 95% confidence interval (95% CI) were used to express the results of the final regression model, and all types of analyses considered associations with p value less than 0.05 to be significant.

**Results :** The mean age of the participants was 59.6 (SD=12.29) years. The prevalence of psychological distress among participants was found to be 23.3% (95% CI=16.1, 31.9) using the validated K10 score of ≥22. The final results of regression identified five independent predictors: age (b=-0.13; $p<0.05$), gender (b=4.26; p=0.05), patient being the sole source of income (b=3.21; $p<0.05$), level of disability (b=2.57; $p<0.001$) and past personal history of psychiatric disorders (b=5.15; $p<0.05$) with r2 of 0.77.

**Conclusions:** There is a considerably high prevalence of psychological distress among stroke patients at neurology clinics at the NHSL in Colombo, and it is linked to both health-related and non-health-related factors. Measures should be taken to reduce psychological distress taking into account the related factors.

**Keywords:** stroke, psychological distress, neurology clinics

**Acknowledgment**: Community Stream, Faculty of Medicine, University of Colombo

## SOP-02: Knowledge, attitudes, practices and factors associated with knowledge regarding contact lens usage among undergraduate spectacle wearers in a selected medical faculty in Sri Lanka

G. A. D. S. B. Siriwardhana[1], Sonam Yangchen[1], S. M. N. Sosai[1], D. M. S. Jayawardene[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Refractive error is one of the main causes of visual impairment thus increasing dependency on spectacles and contact lenses. Though spectacles are the most frequently used method, with rapid modernization, contact lenses are becoming popular. Therefore, this study aimed to assess knowledge, attitude, practices and factors associated with knowledge regarding contact lens usage among medical undergraduate spectacle wearers in Sri Lanka.

**Methods:** A cross-sectional study was done among 106, 1st to 4th year undergraduate spectacle wearers from a selected medical faculty in Sri Lanka via a google form. Consecutive sampling was used. While a scoring system was used to assess the knowledge, attitudes and practices were assessed using frequency distributions. Factors associated with knowledge were determined using Chi-squared test.

**Results:** Majority (n=94; 88.3%) had heard about contact lenses. Of them, most (n=54; 57.4%) had good knowledge regarding contact lenses. However, only 8.5% (n=8) were aware that the maximum daily wearing time of contact lenses was 14-16 hours per day and only 6.4% (n=6) were aware that the container of contact lenses should be replaced once every 3 months. Only 27.7% (n=26) were aware that contact lenses should not be worn during swimming. Majority (n=75; 79.8%) felt that contact lenses required extra care, while only 46.8% (n=44) felt that contact lenses were more expensive. Proportion of contact lens users was 8.5% (n=9). Of them, only 22.2% (n=2) replaced the container of contact lenses once in 3 months, while only 22.2% (n=2) rinse the lenses with lens solutions daily. None of the considered factors were significantly associated with knowledge.

**Conclusions:** Although knowledge and practices regarding contact lens usage were moderate, attitudes regarding contact lens usage were good. Measures should be taken to improve knowledge and practices, taking into account their good attitudes.

**Keywords:** knowledge**,** attitude, practices, contact lenses, spectacles wearers

**Acknowledgment:** Community Stream, Faculty of Medicine, University of Colombo

## SOP-03: The effect of physiotherapy in reducing pain and disability and patient satisfaction in patients with osteoarthritis of the knee joint attending the physiotherapy clinics at District General Hospital, Matara

M. P. Rajapaksha[1], I. Waidyatilaka[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

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

**Introduction:** It is a timely need to assess the effectiveness of physiotherapy modalities in the management of knee osteoarthritis (KOA). Patient satisfaction is also an important component in physiotherapy care. However, the number of studies that have evaluated the effects of physiotherapy combined with satisfaction is limited. This study aimed to determine the effects of physiotherapy in reducing pain and disability in KOA and to determine patient satisfaction among patients with osteoarthritis of the knee joint attending the physiotherapy clinics at District General Hospital, Matara.

**Methods:** A quasi-experimental study was conducted at the District General Hospital, Matara, using convenience sampling involving 50 patients diagnosed with KOA. The existing treatment protocol of the department which included heat therapy and quadriceps strengthening was given to patients. It included 30 minutes of physiotherapy at the clinic twice a week and a home exercise programme twice a day over a period of six weeks. The outcome was taken at the baseline and six weeks after the treatment using Western Ontario and McMaster Universities Osteoarthritis Index questionnaire and the 50-foot walk test to find the effect of physiotherapy and were analysed using paired sample t-test. Patient satisfaction was assessed by descriptive statistics with mean and standard deviation (SD) of the data collected from the Physiotherapy Outpatient Survey questionnaire.

**Results:** There was a significant reduction ($p<0.05$) in the time taken for the 50-foot walk test, pain, stiffness and difficulty in physical function following six weeks of treatment. There was a high level of satisfaction about the treatment and the highest and the lowest levels of satisfaction were for "therapist's professional manner" and "treatment outcome" subscales, respectively.

**Conclusions:** Pain, stiffness and disability were significantly reduced with physiotherapy in patients with KOA, and patients were satisfied with physiotherapy treatment.

**Keywords:** osteoarthritis of the knee, effect of physiotherapy, patient satisfaction

**Acknowledgement**: Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

**SOP-04: Self-stigma in Sinhala-speaking patients receiving follow-up care for chronic mental illness at the National Hospital of Sri Lanka: a comparison between patients with chronic psychotic disorders and chronic affective disorders**

D. A. Liyanapathirana[1], L. Jurmey[1], A. R. A. Madarasinghe[1], S. M. Senanayake[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Psychological Medicine, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction:** Self-stigmatisation among persons with chronic mental illness provides insight into how these people view themselves, and indirectly on how society treats them. This study compared levels of self-stigmatisation between patients with chronic psychotic and affective disorders, among patients receiving clinic-based follow-up at the National Hospital of Sri Lanka. It also assessed the association between self-stigmatisation and several socio-demographic and health-related factors.

**Methods:** A cross-sectional design with descriptive and analytical components was used, recruiting 80 participants: 40 in each disorder group. Ethical clearance was obtained. The study population was selected by consecutive sampling. An interviewer-administered questionnaire via telephone, assessed levels of self-stigma using the Internalised Stigma of Mental Illness scale (ISMI scale) questionnaire. Data analysis utilised the Statistical Package for Social Sciences (SPSS) version 25. The average ISMI score was used to identify the level of self-stigmatisation, with a cut-off value of more than 2.5 considered significant, as in prior literature.

**Results:** The majority of the study population was female (60.0%), had received formal education of 12 or more years (63.7%), was employed (90.0%) and was married (56.3%). The mean age was 40 years. The prevalence of significant self-stigma in the study population was 16.3%. Association between the level of self-stigma and the disorder group was statistically insignificant ($\chi 2=2.29$; $p=0.13$). Additionally, no association was identified between self-stigma and socio-demographic factors (age, gender, relationship status, employment status and educational level) or health related factors (number of admissions, age of onset, duration of illness and treatment modalities).

**Conclusions:** Significant self-stigmatisation being present in a minority (16.3%) is an encouraging finding as self-stigmatisation is consistently linked with poorer quality of life. The absence of association with the disorder, health related factors and socio-demographic factors suggests positive attitudes within the health care service and wider society.

**Keywords:** self-stigma, chronic mental illness, Sri Lanka, clinic based, follow-up care

**Acknowledgement:** Community Stream, Faculty of Medicine, University of Colombo

**SOP-05: Knowledge, practices and associated factors with knowledge and practices of food safety and hygiene among food handlers in Galle Municipal Council**

K. Varatharajan[1], H. D. S. P. Vidumina[1], K. A. U. H. Vithana[1], W. S. P. Abeysinghe[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Community Medicine, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction:** There is an increasing trend of consumption of outside food due to urbanisation and changes in consumer behaviour. Therefore, food handlers' knowledge on food safety and hygiene and related practices play a major role in preventing foodborne diseases. Although studies have been done across the globe regarding food safety and hygiene, only a small number of studies have been conducted in Sri Lanka targeting restaurants. Hence, this study was carried out to assess the knowledge, practices and associated factors of food safety and hygiene among food handlers working in restaurants in Galle Municipal Council (MC).

**Methods:** A descriptive cross-sectional study was carried out among 125 food handlers working in restaurants in Galle MC Area. From 412 registered restaurants 100 restaurants were selected using systematic sampling. A list of food handlers were collected from each selected restaurant and an interviewer-administered questionnaire was used to assess the knowledge and practices among food handlers with a working experience of more than 3 months. Data were analysed using SPSS version 25. Frequency and percentages were used to present descriptive data and Chi-squared test was used to assess the associations with knowledge and practices.

**Results:** In the study, most of the subjects were between 18-50 years (n=101; 80.8%), males (n=96; 76.8%) and supporting cooks (n=59; 47.2%). The study revealed a significant association between knowledge and the practices on food safety and personal hygiene ($p=0.006$). Education level ($p=0.026$), occupation related education ($p<0.01$) and monthly income ($p<0.01$) were found to have significant associations between practices of food safety and personal hygiene. Education level ($p=0.007$) and occupation related education ($p=0.048$) also has a significant association between the knowledge of food safety and personal hygiene.

**Conclusions:** Steps have to be taken in order to improve the knowledge on food safety and hygiene among food handlers and thereby improve practices. Supportive supervision and targeted training should be given. Regular medical check-ups and strict hygiene follow-ups should be encouraged.

**Keywords:** food safety, food handlers, personal hygiene, knowledge, practices

**Acknowledgement:** Community Stream, Faculty of Medicine, University of Colombo

## SOP-06: The effects of neck posture and duration of computer usage on musculoskeletal pain among computer-using office workers in selected Regional Secretariat Offices

P. P. D. N. Jinadasa[1], Y. Mathangasinghe[2], R. S. Perera[3]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

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

[3]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Musculoskeletal (MSK) pain is associated with the rapidly increasing use of computers in occupational settings. Bad posture and prolonged computer use may lead to increased postural load resulting in MSK pain. We investigated the effects of neck posture and the duration of computer usage on MSK pain among computer-using office workers.

**Methods:** A descriptive cross-sectional study was carried out among 198 office workers aged 20-65 years using computers daily in two selected Regional Secretariat Offices in Matara District. The prevalence of MSK pain was assessed using self-administered Brief Pain Inventory Questionnaire and Nordic Musculoskeletal Questionnaire. Posture of the neck was recorded using photogrammetry and the angles of neck were calculated with image J software. Independent sample t-test and Pearson's correlation were used to assess significance of the difference at $\alpha$=0.05.

**Results:** The mean age was 39 years (SD=7.47) and 78% (n=154) were females. Majority (68.2%) had MSK pain during the last 24 hours, and 69.7% had pain in any joint for more than 3 months. Back pain was the most frequent MSK pain in the previous 24 hours and more than 3 months, while neck pain was the second. The mean degrees of head flexion, neck flexion and cranio-cervical angles were 75.92 (SD=11.25), 51.59 (SD=12.89) and 154.86 (SD=12.42), respectively. The mean duration of computer usage per day was 3.58 (SD=2.05) hours. Neck angles were not associated with MSK pain, but the duration of computer usage per day was associated with MSK pain in the previous 24 hours ($t$=3.25; $p$=0.02). MSK pain did not show significant correlations with age ($r$=-0.02; $p$=0.78).

**Conclusions:** MSK pain was common among computer-using office workers, while back pain was the most prevalent. However, neck posture angles and age were not related to pain. The duration of computer usage was significantly associated with MSK pain. Measures should be taken to reduce MSK pain by taking into consideration the associated factors.

**Keywords:** musculoskeletal pain, neck posture, computer worker

**Acknowledgement:** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

## SOP-07: Prevalence of post-stroke depression, associated factors and its relationship with functional ability among stroke survivors during early rehabilitation in Rheumatology and Rehabilitation Hospital, Ragama

S. A. T. Harini[1], C. Suraweera[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Psychiatry, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Post-stroke depression (PSD) is the commonest psychiatric morbidity observed among stroke survivors that has a significant negative impact on rehabilitation. This study aimed to identify the prevalence of PSD, associated factors and the relationship between severity of depression and functional impairment of stroke survivors during the first six months of rehabilitation following a stroke, among stroke survivors in Rheumatology and Rehabilitation Hospital, Ragama.

**Methods:** A cross-sectional descriptive study was done using 70 patients undergoing post-stroke rehabilitation at the Rheumatology and Rehabilitation Hospital, Ragama. Depressive symptoms were identified using the validated Patient Health Questionnaire-9 (PHQ-9), and functional ability using the validated Lawton Instrumental Activities of Daily Living (IADL) Scale. Demographic data and stroke-related variables were gathered to assess the factors associated with PSD. Statistical analysis was done using independent sample t-test, Pearson's Chi-squared test and ANOVA.

**Results:** The mean age (SD) of the participants was 56.29 (11.311) years. In this study, a high prevalence (74.3%) of PSD was detected. However, most (45.7%) showed mild depressive symptoms, and only 28.6% scored above 10 in PHQ-9, indicating major depression. A statistically significant association ($p<0.05$) was identified between PSD and functionality level with a negative correlation ($p=0.000$; $r=-0.429$), indicating a relationship between decreased functional ability and PSD. There was a significant association ($p<0.05$) with female gender, employment status before the stroke, involvement of the dominant side and previous history of stroke with PSD. Age, ethnicity, marital status and educational status were not associated with PSD significantly.

**Conclusions:** The high prevalence of PSD impacts on the overall rehabilitation outcome of patients. Therefore, early detection/prevention of PSD is recommended to ensure better prognosis for patients.

**Keywords:** stroke, post-stroke depression, functioning, rehabilitation

**Acknowledgement:** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

## SOP-08: Knowledge and attitudes of medical officers on the healthcare needs of LGBT people

U. H. S. N. Wijerathne[1], S. Wijesekara[1], D. A. T. V. Wijesekara[1], W. M. A. C. Wijesundara[1], N. Chandraratne[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** The lesbian, gay, bi-sexual and transgender (LGBT) community, being the sexual minority, is subjected to discrimination in healthcare settings due to the lack of knowledge and development of hostile attitudes among healthcare professionals. This study assessed the knowledge and attitudes of medical officers in two selected hospitals in Sri Lanka towards LGBT people and their healthcare needs and identified various factors associated with their attitudes.

**Methods:** The study was carried out as a descriptive cross-sectional study with an analytical component with the participation of 112 medical officers from two selected hospitals in Sri Lanka. Data were collected through an online self-administered questionnaire made by the amalgamation of modified Sex Education and Knowledge about Homosexuality Questionnaire and Attitudes towards Homosexuality Questionnaire (AHQ).

**Results**: The response rate was 97.3%. Out of 109 medical officers, the majority had a good level of knowledge (70.6%) and attitudes (94.5%) towards LGBT people. Furthermore, a moderate, positive linear correlation (r=0.567) between knowledge and attitudes was noted. Socio-demographic factors; sex, marital status, hometown of the participants and professional factors; years of experience and graduated university showed no association with attitudes, whereas a strong association between religiosity which was determined based on a subjective question and negative attitudes was noted ($p<0.05$).

**Conclusions**: Knowledge and attitudes of medical officers in the selected hospitals are satisfactory and knowledge is a possible tool in shaping the attitudes towards the LGBT community. Factors like sex, marital status, hometown, years of service and graduated university have no impact on the attitudes of medical officers towards LGBT people. However, increased religiosity has a negative impact on the attitudes towards the LGBT community.

**Keywords:** LGBT, medical Officers, healthcare needs, knowledge, attitudes

**Acknowledgment:** Community Stream, Faculty of Medicine, University of Colombo

## SOP-09: Gait responses with backpack load during level walking: results from two schools in Galle District

H. Madurangi[1], R. Cassim[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Surgery, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Backpacks are forms of manual carriage techniques. They are very common among Sri Lankan school children. When observing the gait associated with children who carry backpacks, differences in gait have been observed among children with and without backpack loads. The aim of this study was to determine the effect of backpack load on gait response during level walking of school children in two selected schools in Galle district.

**Methods:** A cross-sectional study was carried out among 50 school children (25 females and 25 males) aged 11-15 years. They walked on the level floor using natural cadence with backpack loads of 0%, 5%, 10%, 15% and 20% from the children's body weight. Spatio-temporal parameters were measured using footprint method and video records.

**Results:** Multiple comparisons between the duration of gait cycle, stance phase, swing phase, single support phase, stride length, step length, step width, velocity and cadence with 0%, 5%, 10%, 15% and 20% of weights were not statistically significant ($p>0.05$). Multiple comparisons between double support phase with 0%, 5%, 10%, 15% and 20% of weights was statistically significant ($p<0.05$). There was little increment in the means of stride length, step length, velocity, double support phase between walking without backpack load and with more than 15% of backpack load.

**Conclusions**: Increasing backpack loads were not significantly associated with the duration of gait cycle, stance phase, swing phase, stride length, step length, step width, walking velocity, cadence and duration of single support phase. These changes indicate that children respond to heavier backpack loads by increasing the duration of the double support phase. However, more research on this topic is needed in Sri Lanka to identify the effect of gait response with backpack loads in children.

**Keywords**: backpack load, spatio- temporal parameters, children, gait responses

**Acknowledgement:** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

## SOP-10: The effect of obesity on pain and psychological level among women with knee osteoarthritis attending District General Hospital, Kalutara, Sri Lanka

G. K. H. P. Sumanarathne[1], R. Dissanayake[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Paediatrics, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Osteoarthritis is a chronic degenerative condition that mainly affects the knee joint and is characterised by deterioration of the articular cartilage, joint stiffness, pain and impaired movement. This study was conducted to examine the effect of obesity on pain intensity, pain-related fear of movement, physical functioning and depression-anxiety level in women with knee osteoarthritis attending District General Hospital, Kalutara.

**Methods:** A cross-sectional study was conducted at the Department of Physical Medicine, District General Hospital, Kalutara. Seventy-five women with a mean age of 61.71 years (SD=5.91) with knee osteoarthritis were divided into obese (BMI>30 kg/$m^2$), overweight (25<BMI>30 kg/$m^2$), or non-overweight (BMI<25 kg/$m^2$) using simple random sampling method. Pain intensity, pain-related fear of movement, physical functioning and depression-anxiety level were assessed using Short-form McGill Pain (SF-MPQ-2), Tampa Scale-11 (TSK-11), WOMAC Osteoarthritis Index, and Hospital Anxiety and Depression Score (HADS) questionnaires, respectively. Patients were given the questionnaires according to their preferred language (Sinhala/Tamil). Weight and height were measured using a standard weighing scale and measuring tape. Data were analysed using one-way ANOVA and Pearson's correlation statistical test in SPSS version 23.

**Results**: Women with knee osteoarthritis in different BMI groups showed significant differences in SF-MPQ-2 (p=0.025), TSK-11 (p=0.032), WOMAC Index (p=0.043) and anxiety score of HADS (p=0.037) but not in depression score of HADS (p>0.05). The SF-MPQ-2 score (r=0.307; p=0.02), TSK-11 (r=0.301; p=0.009), WOMAC Index (r=0.287; p=0.012) and anxiety score of HADS (r=0.271; p=0.019) showed significant positive correlations with BMI.

**Conclusions**: There was a significant difference in pain intensity, pain-related fear, physical functioning and anxiety level among women with knee osteoarthritis of different BMI groups. Pain intensity, difficulty in functioning, pain-related fear of movement and anxiety level were higher in women with higher BMI.

**Keywords:** knee osteoarthritis, BMI, pain, physical functioning, anxiety

**Acknowledgment:** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

## SOP-11: Knowledge, practices and their correlates related to adequate water intake among schoolteachers in Colombo Educational Zone

B. D. M. N. Bandara[1], F. R. A. Azeez[1], E. A. R. Y. Athukorala[1], H. W. W. Goonasekera[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Anatomy, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Adequate water drinking is essential for good health; however, often overlooked. Studies on this subject are lacking in Sri Lanka. Teachers impart knowledge and may influence water drinking practices of students. We assessed knowledge, practices and their correlates related to adequate water intake among schoolteachers.

**Methods:** A descriptive cross-sectional study was conducted among 111 schoolteachers of two schools in Colombo Educational Zone, using snowball sampling method. An online self-administered google-form comprising 27 questions assessed socio-demographic factors, knowledge and practices related to adequate water intake. Scores were given for knowledge (≥35 good; <35 poor) and water related practices (≥ 37 good; <37 poor). Statistical analysis was done using Chi-squared test and t-test.

**Results:** The male to female ratio was 4:33 with a mean age of 45.06 years. Non-science subjects were taught by 73.9% (n=82). Mean score of knowledge on adequate water intake was 42.72 (range: 24-57), while the mean score of adequate water intake practices was 29.49 (range: 12-44). There was a significant difference between the mean water intake practice scores of non-science and science teachers (p=0.03). Knowledge regarding the importance of hydration for spinal cord protection among science teachers significantly differed from that of non-science teachers (p=0.005). Teachers with experience of ≥19 years (n=45; 90%) (p=0.001) imparted knowledge on adequate water intake outside the curriculum than other teachers.

**Conclusions:** Overall, water intake practices were poor among science teachers despite having adequate knowledge. Older teachers preferred traditional modes of gaining knowledge while having a positive influence on water habits. The study findings could be useful for future studies on water habits among different population groups in Sri Lanka.

**Keywords:** adequate water intake, knowledge of water intake, practice of water intake, teachers

**Acknowledgement:** Community Stream, Faculty of Medicine, University of Colombo

## SOP-12: Change of behavioural risk factors after myocardial infarction of patients attending cardiology clinic in two selected teaching hospitals in Sri Lanka

P. P. Karunarathne[1], A. W. W. W. Karunasinghe[1], D. T. D. H. Karunathilaka[1], D. C. Ranasinghe[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Myocardial infarction occurs when an imbalance exists between coronary perfusion and myocardial demand. According to Sri Lanka Annual Health Statistics, hospitalizations due to ischaemic heart disease in 2019 were 667.2 per 100,000 population accounting for 15.1% of hospital deaths. This study aimed to study the change of behavioural risk factors after an acute ischaemic event of patients attending the cardiology clinic in two selected hospitals in Sri Lanka.

**Methods:** A descriptive cross-sectional study was conducted in cardiology clinics in the National Hospital of Sri Lanka and Karapitiya Teaching Hospital among 110 patients diagnosed with ST elevation myocardial infarction or non-ST elevation myocardial infarction within the last 12 months. The change in behavioural risk factors (smoking, alcohol use, physical activity) was assessed after myocardial infarction. Smokers were categorised according to the number of cigarettes per day. Percentage change of mean number of cigarettes per day in each category was compared. Daily consumed pure alcohol mass was calculated and grouped into the WHO categories, to compare the change. International Physical Activity Questionnaire scores were used to compare physical activity.

**Results:** Of the sample, 17.5% (n=18) stopped cigarette smoking after myocardial infarction and among smokers who reduced cigarette smoking, the reduction rate was 50% or above. Majority (n=71; 64.5%) refrained from passive smoking and smokeless smoking completely ceased. Majority (n=62; 79.5%) totally stopped alcohol consumption, while 10.25% (n=8) reduced to low-risk category, 3.8% (n=3) remained as before, and 6.4% (n=5) increased alcohol consumption while still remaining in low-risk category. Binge drinking was reduced by 92.3%. Physical activity level reduced in 88.1% (n=96), while it increased in 9.2% (n=10) and remained unchanged in 2.7% (n=3).

**Conclusions:** Although physical activity decreased after myocardial infarction, active smoking, passive smoking and smokeless smoking were reduced greatly. Daily alcohol use too had reduced to the low-risk category, while the majority had completely stopped.

**Keywords:** myocardial infarction, secondary prevention, smoking, alcohol, physical activity

**Acknowledgement:** Community Stream, Faculty of Medicine, University of Colombo

## SOP-13: Knowledge, attitudes and prevalence of selected cardiovascular disease risk factors among Advanced Level students in government schools in Colombo Municipal Council Area

S. Vinoprasath[1], L. V. U. Wanigasuriya[1], S. B. K. Warnasinghe[1], W. D. C. N. Adikaram[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Community Medicine, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction:** Cardiovascular diseases (CVD) have been the subject of numerous researches, but there haven't been many that specifically target adolescents in Sri Lanka. This study aimed at assessing the knowledge, attitudes and the prevalence of behavioural risk factors, and the association between behavioural risk factors and knowledge on CVD among Advanced Level (A/L) students of government schools in Colombo Municipal Council area.

**Methods:** A cross-sectional descriptive study was done in a total of 109 students using a pretested self-administered questionnaire, prepared from selected parts of a validated questionnaire used in STEPS survey.

**Results:** The mean score on knowledge on CVD risk factors was 68.2%, while 54.1% had sufficient knowledge (above the mean score) on CVD. It was found that 98.2% students did not meet the WHO recommendation on daily vegetable intake. Only 18.3% consumed the recommended daily number or more of fruit servings. However, 38.5% of students always consumed more than the recommended amount of salt, while 28.4% of students ate oily food all the time. Similarly, the WHO recommended level of physical activity was not met by 51.4% of the students. Regarding attitudes, 70.64% agreed that heart diseases are preventable, 88.9% disagreed that learning about CVD is a waste of time, and 73.39% agreed that heart diseases are a public health problem in Sri Lanka. On the contrary, students with a good level of knowledge on CVD, consumed oily food all the time ($p=0.008$). However, there was no significant association between knowledge and other risk factors, such as salt intake or physical activity.

**Conclusions:** Adequate knowledge alone is insufficient to reduce the prevalence of behavioural risk factors, thus action to uplift healthy lifestyle behaviour among school children is warranted.

**Keywords:** knowledge, attitudes, risk factors, cardiovascular diseases, adolescents

**Acknowledgment:** Community Stream, Faculty of Medicine, University of Colombo

## SPP-01: Prevalence and attitudes of using herbal medicines during the COVID-19 pandemic among adults residing in Western Province, Sri Lanka

M. S. A. Deedat[1], M. M. K. De Silva[1], D. D. I. T Dehipitiya[1], U. Mannapperuma[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Pharmacology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products that contain parts of plants, other plant materials or combinations, as active ingredients. During the COVID-19 pandemic, the use of herbal remedies as a primary treatment, both in conjunction with prescription drugs and on their own, dramatically increased. Hence, this study was carried out to determine the prevalence and attitudes of using herbal medicines during the COVID-19 pandemic among adults in Western Province.

**Methods**: A descriptive cross-sectional study was done among 121 adults residing in Western Province, Sri Lanka. Stratified cluster sampling was used. An interviewer-administered telephone-based questionnaire was used to collect data.

**Results:** Among 121 participants, 89.3% had used herbal medicine during their lifetime. There was no association between herbal medicine use and socio-demographic factors. There was a 20.6% increase in the prevalence of usage of herbal medicine as a preventive measure against diseases from before to during the pandemic. The use of herbal medicine was considered to be harmless by 61.98%. Vast majority (99.07%) felt that using herbal medicine helped as a preventive measure against any diseases during the pandemic, while 96.25% (n=77) felt it helped in relieving symptoms like cough, cold, fever and pain during the pandemic. The participants mainly used herbal medicine due to its previously reported or self-perceived effectiveness (64.81%). The majority (78.05%) that did not disclose their use of herbal medicines to their physicians did not do so as the doctor did not ask.

**Conclusions:** The study findings point out that regardless of the facet of life that patients belong to, most use herbal medicines. Based on these current findings, it is good practice for doctors to ask their patients regarding their use of herbal medicines and for patients to disclose their use which may minimise potential harm due to interactions with western medicines.

**Keywords:** herbal medicines, COVID-19 pandemic, Sri Lanka

**Acknowledgement:** Community Stream, Faculty of Medicine, University of Colombo

## SPP-02: Level of COVID-19 related anxiety, its associated factors and coping mechanisms of Grade 9 female students in two schools

W. D. D. Silva[1], B. M. H. M. Singhakumara[1], M. A. F. Sireena[1], D. B. D. L. Samaranayake[2]

[1]Faculty of Medicine, University of Colombo

[2]Department of Community Medicine, Faculty of Medicine, University of Colombo

**Introduction:** Adolescents are a vulnerable group at risk of developing COVID-19 related anxiety, with long-term consequences. However, local evidence on the mental health of adolescents during the pandemic is scarce. This study determined the level of COVID-19 related anxiety, its associated factors and coping mechanisms among Grade 9 female students in two schools.

**Methods:** A descriptive cross-sectional study with an analytical component was conducted among 268 Grade 9 female students selected using cluster sampling from two schools in Colombo and Gampaha Districts. Data were collected using an online self-administered questionnaire, where anxiety level was assessed using Coronavirus Pandemic Anxiety Scale (CPAS-11), which was not validated in Sri Lanka but showed strong positive correlations with the scales which are widely used in local settings. Data analysis was done using the Chi-squared test and correlation analysis.

**Results:** The prevalence of severe COVID-19 related anxiety in the study population was 7.1% (95% CI=4.3, 10.9) using the recommended cut-off of ≥15 in the CPAS-11 score. Considering the factors associated with anxiety, having frequent disagreements with family members ($p<0.001$), experiencing stigmatisation ($p=0.01$), frequent searching of COVID-19 related information from the media ($p=0.04$), distractions during online classes ($p<0.001$) and neglecting other activities due to social media ($p=0.01$) were statistically significantly associated with severe anxiety. A significant moderate correlation was found between anxiety level and maladaptive coping mechanisms score ($r=0.52$; $p<0.001$).

**Conclusions:** The level of COVID-19 related anxiety in our study population was higher than in other populations in the local and foreign contexts. Some factors related to COVID-19 infection, family, education and social media as well as maladaptive coping showed a significant association with the level of anxiety. Increasing awareness, promoting mental well-being, expanding available counselling services and introducing psychosocial support services are recommended.

**Keywords:** COVID-19 pandemic, adolescents, anxiety

**Acknowledgment:** Community Stream, Faculty of Medicine, University of Colombo

## SPP-03: Practices regarding NCD related risk factors among preoperative coronary artery bypass grafting patients in Teaching Hospital, Karapitiya

P. H. P. Dissanayake[1], G. R. Constantine[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Clinical Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Coronary Artery Bypass Graft (CABG) patients have poor practices regarding the factors that might affect them preoperatively worldwide. No research was found on these aspects in Sri Lanka. This research aimed to identify the practices regarding non-communicable disease (NCD) risk factors among preoperative coronary artery bypass grafting patients in a teaching hospital, Sri Lanka.

**Methods:** A descriptive cross-sectional study was conducted among 85 selected patients in Teaching Hospital Karapitiya using convenience sampling. The data were collected by using a self-administered questionnaire. Data were analysed by descriptive statistics using SPSS version 23.0.

**Results:** The mean age of participants was 58.53 years (SD=10.55). Their age ranged between 35-75 years. Majority (90%) of patients checked their blood pressure within the past year and 77.5% of patients had normal blood pressure status. Majority (92.1%) of them checked their blood cholesterol within the past year, and 52.6% of patients had normal blood cholesterol status. Majority (67.5%) of patients reported that they performed some light physical activity every week and 100% of patients used vegetables with rice for their main meal. Majority (87.5%) of patients consumed fruit once a week or more. Most (52.5%) patients never read food labels to look for low sodium content and low saturated fat. Majority (97.5%) of patients did not smoke cigarettes at the time of data collection although 50% had previously smoked.

**Conclusions:** Patients should be encouraged to maintain normal blood pressure and cholesterol levels, do light physical activities, do flexibility and strengthening exercises, smoke cessation and read food labels.

**Keywords:** blood pressure, cholesterol, physical activity, diet, tobacco

**Acknowledgement:** Department of Allied health Science, Faculty of Medicine, University of Colombo

## SPP-04: Risk of falls among elderly patients with type 2 diabetes mellitus attending clinic at Kegalle Teaching Hospital, Sri Lanka

B. M. R. U. Buddhasinghe[1], P. Galappatthy[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Medical Humanities, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Type 2 diabetes is a major non-communicable disease in the world and falls are common among elderly population. Complications of diabetes, such as peripheral neuropathy, poor vision, sarcopenia and reduced muscle strength can contribute to falls. Hence, the objective of this study was to determine the risk of falls among elderly type 2 diabetic patients attending the clinic at Kegalle Teaching Hospital.

**Methods:** Convenient sampling was used. Balance, lower limb muscle strength and other risk factors for falls were evaluated. Balance was measured using the timed 'up and go' test. Patients with >13.5 seconds were considered as having high risk for falls. Lower limb muscle strength was measured using a hand-held dynamometer (Lafayette Manual Muscle Tester). Dynamometer was placed perpendicular to the test surface, and subjects were instructed to perform maximum isometric contractions for 5 seconds. Other information was gathered using an interviewer-administered questionnaire.

**Results:** Mean age was 67 (SD=4) years. Mean test completion time was 10.57 (SD=1.93) seconds. According to the balance test, 6% of the participants had a high risk of falls. Mean knee extensor and ankle dorsiflexor strengths were 18.29 (SD=3.61) kg and 9.36 (SD=2.04) kg, respectively. Participants with a high risk of falls had a mean knee extensor strength of 14.56 kg, which was significantly lower ($p=0.01$) than that for the patients with low risk (18.66 kg). A significant relationship was identified between insulin use and test completion time ($p=0.03$). Test time was higher in participants with previous falls (13.67 seconds) and vision impairments (10.84 seconds). All the participants who had previous falls were at a high risk for falls ($p<0.001$). Mean duration of diabetes was higher (17 years) in participants with high risk than others with low risk (9 years).

**Conclusions:** Insulin use affects the balance of this population. Furthermore, lower limb muscle strength, previous falls and vision impairments affect the balance. Patients with high risk of falls had reduced knee extensor strength, previous falls and higher duration of diabetes than other participants.

**Keywords:** type 2 diabetes, elders, risk of falls, muscle strength, balance

**Acknowledgment:** Department of Allied Health Science, Faculty of Medicine, University of Colombo

## SPP-05: Injury prevalence and pattern of injury among professional and university level basketball players in Colombo district Sri Lanka

P.W. Abeygunawardana[1], L.R. Jayalath[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Basketball is a popular non-contact team sport with high vulnerability for injuries. Injury pattern is known to be related with sports movement. Identifying the prevalence and pattern of injuries can be utilised in decreasing the risk of injuries in basketball. No study has been done to identify basketball injury prevalence and pattern in the Sri Lankan context. Therefore, this study was conducted to identify the prevalence and pattern of injury among Colombo district basketball players and assess how age, gender, body mass index (BMI) and playing position affect the results.

**Methods:** A descriptive cross-sectional study was conducted among 104 basketball players aged 18-35 years (52 males and 52 females) who were selected by random sampling method from Colombo District. Data were collected through a self-administered questionnaire which recorded the injuries during the previous 10 months. Descriptive statistics and correlation test with 0.05 significance level was used for data analysis using SPSS version 23.0.

**Results:** There were 106 injuries among 104 players with a mean age of 24.8 (SD=3.68) years. The prevalence of injury was 57.7%. Majority were lower limb injuries (62.3%) followed by ankle sprain (34.9%) and knee injuries (18.9%). Males had more ankle sprains (38.5%) than females (32.7%). Females had a higher percentage of knee injuries (25%) compared to males (13.5%). Guards (playing position) had the highest percentage of ankle sprains (39.6%) and centres had the highest percentage of knee injuries (25%). A statistically significant relationship was found between age and anterior cruciate ligament injury (p=0.046), age and meniscal injury (p=0.031). Furthermore, a statistically significant relationship was found between BMI and medial collateral ligament injury (p=0.007). The most common period of returning to training after an injury was 1-7 days (48.1%).

**Conclusions:** This study suggests that ankle sprains are common among males, while knee injuries are common among female basketball players. Furthermore, age and BMI are contributory factors for knee injuries.

**Keywords:** basketball, injury prevalence, pattern of injury

**Acknowledgment:** Department of Allied Health Science, Faculty of Medicine, University of Colombo

## SPP-06: Relationship between lower limb muscle strength, arm span and balance for player performance in selected basketball clubs in Colombo District

P.R.P.T. Ishani[1], J.L.R. Jayalath[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Allied Health Sciences, Faculty of Medicine,
University of Colombo, Sri Lanka

**Introduction:** This study aimed to identify the relationship between lower limb muscle strength, arm span and balance for performance (sprint ability, vertical jump height) among players in selected basketball clubs in Colombo District.

**Methods**: A descriptive cross-sectional study was done in a sample of eighty (40 males and 40 females) aged 18-30 years. Height and weight were taken as anthropometric parameters. Strength was measured by using a handheld dynamometer. Balance was measured with the Star excursion balance test. Arm span was measured by using measuring tape. Performance was measured using the sprint test and maximum jump height test. Descriptive analysis and Bivariate Pearson correlation test was performed.

**Results**: The mean age of players was 24.09 years (SD=1.72), mean height was 1.72 m (SD=0.08), mean weight was 64.40 kg (SD=7.23), mean BMI was 21.71 kg/m$^2$ (SD=1.03), mean arm span was 1.72 m (SD=0.09), vertical jump height was 0.35 m (SD=0.04) and sprint ability time was 4.41 seconds (SD=0.95). The mean strength of right hip extensor was 21.404 kg (SD=2.69), left hip extensor was 20.45 kg (SD=2.67), right knee extensor was 41.39 kg (SD=2.67), left knee extensor was 40.25 kg (SD=2.96), right plantar flexor was 46.21 kg (SD=2.65) and left plantar flexor was 44.89 kg (SD=2.98). There was a significantly strong correlation between arm span and performance (sprint ability, vertical jump height) ($p<0.01$); and between lower limb muscle strength and performance ($p<0.01$). Also, there was a significantly strong correlation between balance and sprint ability ($p<0.01$), while no significant correlation was identified between balance and vertical jump height of players.

**Conclusions**: Significant relations were found between lower limb muscle strength, arm span, balance and performance of basketball players in Sri Lanka.

**Keywords**: lower limb muscle strength, arm span, balance, vertical jump height, sprint ability

**Acknowledgement:** Department of Allied Health Science, Faculty of Medicine, University of Colombo

## SPP-07: Prevalence, causes and responses to work-related musculoskeletal disorders among government physiotherapists in selected hospitals of Colombo District

H.B.S.D. Kawshan[1], P. Galappatthy[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Medical Humanities, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Physiotherapists are at higher risk of developing work-related musculoskeletal disorders (WMSD) due to tasks that demand intense and repetitive physical activities. WMSDs among physiotherapists in Sri Lanka remain unknown. This study aimed to determine the prevalence, causes and response to WMSDs among government physiotherapists in selected hospitals in Colombo District.

**Methods:** A descriptive cross-sectional study was conducted among 100 government physiotherapists from 3 selected hospitals in the district of Colombo using simple random sampling, where 99, 23 and 25 participants were recruited from National Hospital of Sri Lanka, Lady Ridgeway Hospital and Rehabilitation Hospital Ragama, respectively. WMSDs were assessed using a self-administered questionnaire on occupational injuries. Data were analysed using descriptive statistics and Pearson correlation test in SPSS version 23.0.

**Results**: The mean age was 31.3 years (SD=3.5) and 61.2% (n=60) of participants were males. The 24-month prevalence of WMSDs was 83.7%. The highest prevalence of injured body parts were low back (n=36; 47.4%) and shoulder (n=24; 31.6%). Results revealed that 25% (n=20) of physiotherapists were injured when performing manual therapy techniques for patients. Maintaining a position for a prolonged period (n=28; 41.2%) had the highest rate of prevalence that led to the recurrence of symptoms. There was no statistical significance found in gender (p=0.2) and years of working experience (p=0.8) for having WMSDs among participants. Fifty percent (n=30) of injured physiotherapists changed their work position frequently and 46.7% (n=28) used improved body mechanics to avoid further injuries. Despite the high prevalence of WMSDs, the majority continued their work without changing to another job.

**Conclusions:** There was a high prevalence of WMSDs among the selected population with a higher prevalence of lower back and shoulder injuries. This might be due to exposure to higher physical stresses while performing manual therapy techniques, transferring patients and incorrect body mechanics during work.

**Keywords:** musculoskeletal disorders, work related, physiotherapy, prevalence, risk factors

**Acknowledgment:** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

**SPP-08: Relationship between physical activity level and academic self-efficacy among physiotherapy undergraduates, Faculty of Medicine, University of Colombo.**

H.M.S.N.K. Ariyarathne[1], R. Jayawardena[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Physiology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Physical inactivity is a major risk factor for various non-communicable diseases. Currently, physical inactivity is becoming increasingly prevalent among university students as they are more focused on their academic activities. Academic self-efficacy is having confidence to perform academic activities successfully at a required level. Hence, this study explored the relationship between physical activity level and academic self-efficacy among physiotherapy undergraduates.

**Methods:** A cross-sectional descriptive study was conducted among 100 physiotherapy undergraduates in Allied Health Sciences of the Faculty of Medicine, University of Colombo. Data were collected through google form using International Physical Activity Questionnaire (Short form) and the Academic Self-efficacy Scale. The Academic self-efficacy scale was previously validated for use among Sri Lankan undergraduates.

**Results:** Response rate was 95.2%. The mean age of participants was 24 years (SD=2.1). The majority (57%) were physically inactive, while 26% were moderately active and only 17% were highly active. Males had significantly higher physical activity levels compared to females ($p=0.028$). Females had significantly higher mean time in sitting than males ($p=0.017$). Final year undergraduates had significantly higher academic self-efficacy compared to the first year ($p=0.008$), the second year ($p=0.017$) and the third year ($p=0.017$). A significant positive relationship was found between physical activity level and academic self-efficacy among physiotherapy undergraduates ($p=0.041$). Furthermore, results revealed that gender and academic year affects this relationship.

**Conclusions:** The majority of physiotherapy undergraduates were physically inactive. Physical activity level showed a significant positive relationship with academic self-efficacy. The study strengthens the idea that engaging in physical activities enhances academic self-efficacy. Hence, the current study suggests a more proactive approach to be taken to improve physical activity level of physiotherapy undergraduates.

**Keywords:** physical activity level, academic self-efficacy, physiotherapy undergraduates

**Acknowledgment:** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

## SPP-09: Relationship between perceived stress and body mass index among physiotherapy students of a university in Sri Lanka

J.V.W. Liyanage[1], D.G.S.K.L. Jayawardana[2]

[1]Faculty of Medicine, University of Colombo

[2]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

**Introduction:** Stress is the body's response to external or internal demands. University students encounter different types of stressors during their academic life, and they use different mechanisms for coping. The prevalence of eating disorders is increasing worldwide. Factors such as stress also play a role in eating disorders, thereby influencing the body mass index (BMI). Similar types of relationships have been found among university students. This study aimed at assessing the relationship between stress and BMI among physiotherapy students of a university in Sri Lanka.

**Methods:** A descriptive cross-sectional study was conducted among 105 physiotherapy students of a selected university. Convenient sampling was used. Information on stress scores, related stressors (example - frustrations) and stress reactions (example - physiological) were collected using the Students-Life Stress Inventory, which is a validated self-administered questionnaire. Self-reported height and weight measurements were taken for this study. BMI was calculated from the height and weight of the participants. BMI was categorised according to the standard World Health Organisation guidelines. The relationship between stress score and BMI was analysed using Pearson correlation test.

**Results:** The sample consisted of 26% males. Mean age of the participants was 23.85 years (SD=1.25). The mean total stress score was 25.35 (SD=7.869). The mean BMI was 21.882 $kgm^{-2}$ (SD=4.211). The self-imposed stressors were the most prevalent category of stressors (79% above midpoint) and frustrations were the least common category of stressors among participants (64% above midpoint). Cognitive responses were the most prevalent reactions, being 73% above the midpoint. The correlation coefficient between total stress score and BMI was 0.121 (p=0.231).

**Conclusions:** The mean BMI of the population falls under the normal weight category. There was no significant relationship between stress score and BMI among the participants.

**Keywords**: stress, body mass index, Students-Life Stress Inventory

**Acknowledgment:** Department of Allied Health Sciences, Faculty of Medicine, University of Colombo

## SPP-10: Emotional intelligence among national and university level badminton players in Sri Lanka

K.H.K.C. Kariyawasam[1], D.C. Ranasinghe[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Allied Health Science, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Badminton is a popular sport that needs both physical and mental fitness. As part of mental health, emotional intelligence (EI) is defined as the ability to accurately perceive and express emotion. Identifying the EI of players is useful for improving badminton performance. This study aimed to determine the patterns and associated factors of EI among national and university level badminton players in Sri Lanka.

**Methods:** A descriptive cross-sectional study was conducted with a comparison group. National (Sri Lanka Badminton Association) and university (Universities of Colombo and Sabaragamuwa) level badminton players were used as the population. Four-dimension Wong and Law Emotional Intelligence Scales were used to assess the EI. A score from 4 to 28 for each EI dimension (1. Self-Emotional Appraisal, 2. Others' Emotional Appraisal, 3. Regulation of Emotion, 4. Use of Emotion) and a score from 16 to 112 was given for total EI. Descriptive statistics and independent sample t-test were used to analyse the data.

**Results:** Out of the 106 players (86% response rate) with mean age of 22.12 (SD=2.4) years, 52.7% were male and 48% were national level players. The total EI of national level players was 94.33 (SD=8.9) and university players was 91.96 (SD=10.3). This difference was not significant ($p>0.05$). Male national players scored the highest total EI 98.0 (SD=6.6) and female university players scored the lowest 90.1 (SD=11.3). Among different domains, national players scored higher in the “use of emotions” ($p<0.05$) and university players scored higher in “others’ emotional appraisal” ($p<0.05$) and these differences were significant. In the total sample, males scored significantly higher than females in total EI ($p<0.05$) and “regulation of emotion” ($p<0.05$).

**Conclusions:** In the studied sample, the total EI did not differ among national and university level badminton players, where males were better than females. In sub-dimensions of EI, the national players used their emotions well, compared to university players who appraised others’ emotions well.

**Keywords:** badminton, emotional intelligence, national players, university players

**Acknowledgment:** Department of Allied Health Science, Faculty of Medicine, University of Colombo

**SPP-11**: **Relationship between duration of employment and ankle swelling among female garment factory workers at a selected garment factory**

A. Fernando[1], R. Jayawardena[2]

[1]Faculty of Medicine, University of Colombo, Sri Lanka

[2]Department of Physiology, Faculty of Medicine, University of Colombo, Sri Lanka

**Introduction:** Prolonged usage of sewing machines with limited ankle movements in the same forwardly bent-over sitting posture for years, leads to several health issues among workers from garment factories. Ankle swelling is one of them. The objectives of this study were to assess the level of ankle swelling and relationship between ankle swelling and the duration of employment among female workers at a selected garment factory.

**Methods:** This cross-sectional analytical study was conducted among 45 female garment workers who were in sitting posture from 7 a.m. to 11 a.m. by using convenient sampling. The subjects were assessed for the duration of employment, foot usage (screening questionnaire) and ankle volume (figure of eight method). Ankle swelling was calculated by subtracting the initial volume from the final volume. The relationship between ankle swellings and employment duration was assessed with Pearson correlation test.

**Results:** The mean age of the sample was 31.0 years (SD=7.9), while the mean body weight was 57.1 kg (SD=11.3). The mean height was 1.5 m (SD=0.1) and the mean BMI was 24.3 $kg/m^2$ (SD=4.1). Foot pedal usage to operate the machines was highest at right (n=34; 75.6%) followed by both feet (n=7) and left foot (n=4). Mean ankle swelling was 9.96 mm (SD=8.4) for the right ankle (range: -9.7, 24.4) and 11.2 mm (SD=7.6) for the left ankle (-6.0, 28.6). Correlation between ankle swelling and duration of employment analysed as continuous variables for the right side (r=0.34; p=0.021) and left side (r=0.25; p=0.097) showed a statistically significant, positive but weak in strength relationship.

**Conclusions:** Reduced ankle swelling was present in the right ankle compared to the left. The duration of employment showed a significant positive correlation only with the right ankle swelling.

**Keywords**: prolonged sitting, ankle swelling, duration of employment, figure of eight method, garment workers

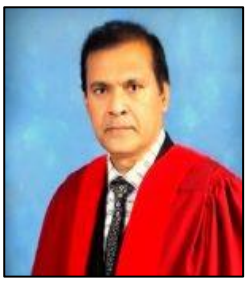
**Acknowledgment:** Department of Allied Health Science, Faculty of Medicine, University of Colombo

# Faculty of Nursing

***Co-creation of better health care through collaboration and innovation***

20th October 2022

## MESSAGE FROM DEAN



**Professor S. S. P. Warnakulasuriya**
Dean
Faculty of Nursing
University of Colombo

It is a great pleasure to write this message on the occasion of the International Nursing Conference (INC), 2022 of the Faculty of Nursing, University of Colombo, Sri Lanka under the theme of "Co-creation of better healthcare through collaboration and innovation". The Annual Research Symposium of the Faculty is an annual event in the academic calendar of the Faculty, and it has been a great success during the past four years with high quality research presentations and participation of academics, undergraduates, and scientists from different universities and research institutions. The INC 2022 has a special significance this year as the theme of the symposium is very relevant to the international collaboration and the nEUROcare project that the Faculty is currently involved in. I strongly believe that INC 2022 will be a very successful event as this time we have organized four technical sessions and the number of abstracts have been increased and therefore more scientific dialogues are expected to occur. The proceedings of this year conference consist of 44 research abstracts presented by the researchers including Faculty undergraduates. The quality of abstracts has been maintained by a thorough review process and assessed by a panel of academics. I would like to express my sincere gratitude to the organizing committee of the INC 2022 headed by Dr. Thanuja Asurakkody, the Chair of the INC and her active team for their commitment, hard work and effort to make this event a reality.

As the Dean of the Faculty, I also wish to convey my sincere gratitude to the Heads of Departments, academic staff, Assistant Registrar and non-academic staff of the Faculty of Nursing for extending their fullest support and cooperation to run this research conference for the 5$^{th}$ consecutive year. I also congratulate all the presenters who are presenting their research at the conference. Special thanks to Prof. Jina Oh, Keynote Speaker and all the guest speakers of the INC 2022. I would like to say a special thank you to Senior Professor H. D. Karunarathne, Vice Chancellor, University of Colombo for his moral support, visionary leadership, guidance and inspiration to make this event a success. I hope all the participants enjoy the glamor of the INC 2022 in the Faculty of Nursing. I wish the International Nursing Conference 2022 a great success!

## MESSAGE FROM CONFERENCE CHAIR

**Dr. Thanuja Asurakkody**

Senior Lecturer

Department of Fundamentals of Nursing

Faculty of Nursing

University of Colombo

On behalf of the Organizing Committee of the 1st International Nursing Conference 2022 (INC 2022), I would like to extend my warm welcome to all of you. As the Chair of the organizing committee, I am very happy to note that we upgraded our 5th Annual Research Symposium to the international level for the first time making it the "1st International Nursing Conference 2022" under the theme "Co-creation of better healthcare through collaboration and innovation". Hence, this will be a historical event in the Faculty of Nursing, University of Colombo. I believe that this international conference on Nursing will give opportunities for sharing and exchanging original research ideas and expert opinions, inspiring future research, and broadening knowledge about nursing education, nursing practice, nursing management and health related disciplines amongst members of Sri Lankan research communities, in addition to researchers from Thailand, South Korea, India, Laos, Vietnam, Philippine and other countries.

This conference focuses on the development of education, clinical practice, management and leadership in nursing with the collaboration of innovative and creative multidisciplinary research teams. Along with the 4 invited speeches, the proceedings of this conference contains 44 abstracts which have been selected from a total of 48 abstracts from five different countries. These selected abstracts will be presented during the conference at 4 sessions via both online and onsite.

I express my sincere gratitude to the Vice Chancellor, University of Colombo for initiating and encouraging the 1st International Nursing Conference in the Faculty. I extend my heartiest thanks to Prof. S. S. P. Warnakulasuriya, Dean of the Faculty of Nursing, University of Colombo for granting us the opportunity to organize an international conference on nursing in the year 2022, and for supporting us always in the process of organizing the conference even in the economic crisis situation in our country. I acknowledge local and international reviewers

for their critical review of the submitted abstracts, as well as the editorial committee for the time and energy they have devoted to editing the conference proceedings.

In particular, I want to express my sincere appreciation to the keynote speaker Prof. Jina Oh from Inje University, Rep. of Korea for being with us at the conference onsite on our request. I also express my heartfelt appreciation to the guest speakers for accepting our invitation to conduct speeches on their expertise. I extend sincere thanks to the sponsors who contributed financially in this critical situation. I extend my most sincere thanks and congratulations to all the authors who have submitted their excellent work to our conference to share their opinions with the international research community. Last but not least, I would like to appreciate all the main organizing committee members, all the staff and the students of the Faculty of Nursing, University of Colombo for their valuable contribution to see the successfully completion of the 1st International Nursing Conference. I wish good luck to all the presenters!

# ORGANISING COMMITTEE

**Conference Chair**

Dr. Thanuja Asurakkody

**Conference Secretary**

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Ms. Nirmala Priyadarshani

Ms. Sachintha Lokuyaddage

# Programme of Sessions

## 20th October 2022

| Agenda | |
|---|---|
| 8.00am- 8.15am | Inauguration of the 1st International Nursing Conference 2022<br>Arrival of the Guests |
| 8.15am- 8.30am | Welcome Address<br>Dr. Thanuja Asurakkody – Chairperson, INC 2022 |
| 8.30am- 8.45am | Address by the Dean – Faculty of Nursing<br>Prof. S. S. P. Warnakulasuriya |
| 8.45am- 8.50am | Introduction to the Chief Guest by the Dean – Faculty of Nursing |
| 8.50am- 9.10am | Address by the Chief Guest<br>Senior Professor H. D. Karunaratne,<br>Vice-Chancellor, University of Colombo |
| 9.10am- 9.50am | Keynote Speech<br>Professor Jina Oh,<br>College of Nursing<br>Inje University, Rep. of Korea |
| 9.50am- 10.00am | Vote of Thanks<br>Mr. Thimira Amarasinghe, Secretary, INC 2022 |
| 10.00am-10.30am | Refreshments |
| 10.30am-11.00am | Guest Speech- 01<br>Professor Anousone Sisoulath, Vice Dean, Faculty of Nursing Sciences, University of Health Sciences, Laos |
| 11.00am- 11.30am | Guest Speech- 02<br>Professor Wasana Ruaisungnoen, Faculty of Nursing, Khon Kaen University, Thailand |
| 11.30am- 12.00pm | Guest Speech- 03 |

| | |
|---|---|
| | Professor Sandeep Kumar, Department of Electronic and Communication Engineering, National Institute of Technology, Surathkal, India |
| 12.00pm- 1.00pm | Lunch |
| 1.00 pm onwards | Technical Sessions |
| 3.30pm- 4.00pm | Closing Remarks |

# INTRODUCTION TO KEYNOTE SPEAKER

**Prof. Jina Oh (PhD, RN)**
College of Nursing
Inje University
South Korea

Prof. Jina Oh obtained her master's and doctoral degrees from the College of Nursing, Ewha Womans University in South Korea. About three years after graduating from university, she worked as a nurse in the pediatric ward of Ewha Medical Center and has been teaching nursing students who dream of becoming good nurses with a warm heart at Inje University since 2001.

She has a philosophy that in order to become a good nurse, one must understand human beings, treat them with hospitality, and practice caring. That is why she teaches human growth and development, caring, culture and art, and nursing philosophy.

She is active as a nursing professor and researcher. She has published more than 120 papers in SCI/SSCI journals. She is interested in various research topics including nursing intervention for child health and nursing education with creative teaching-learning strategies such as art-based learning (ABL), problem-based learning (PBL), and Simulation.

On the other hand, she has been working as a Vice Dean of the regional linkage center for prospering regional cultural. Furthermore, she has been working as a project manager for Leading University Project for International Cooperation supported by the Ministry of Education in South Korea, and has been working hard to improve nursing education in developing countries such as Sri Lanka and Lao PDR.

She has published about 20 books. The titles of her books during the past three years are ‘Nursing for Children and Adolescents (2021)’, ‘Human Growth and Development learned from films (2020)”, “Nursing philosophy for nursing students (2022)” and “Use of Greek Myths (2020)” which is a liberal arts book. Moreover, she has translated “Nursing Education and the Role of Educators (2020)”, “Nursing Examination and Evaluation (2020)” and “Nursing Quality Improvement and Safety Education (2020, QSEN).

# ABSTRACT OF KEYNOTE ADDRESS

## Prof. Jina Oh

**Co-creation of better health care through collaboration and innovation**

Co-creation is integrating customers into the processes of product and service ideation and execution so that their unique perspectives and cooperation may ultimately drive value for both the producer and the customer. In healthcare service system, stakeholders often have conflicting goals, so co-creation is suggested. Providing collaborative patients-centered care as one team of healthcare professionals is needed to better understand how patients contribute on value co-creation. Recently, patient participation in the value co-creation process for shared goals with the care provider has received much attention. Moreover, a utilization of new knowledge and technology into providing healthcare in the workplace is also important to support ongoing investment strategies for value co-creation in the healthcare ecosystem, as integrating advanced technology has positive implications for the well-being of people.

Based on Elg's model, Zhang's model is designed for collecting and analyzing patient feedback in a healthcare service setting, where patients are regarded as customers and healthcare providers are service providers. Three phases of Zhang's practical model of value co-creation for patients are: (1) feedback collection, (2) data analysis, and (3) process improvement. Through gaining feedback from patients, a better communication channel and definition of good service are constructed between patients and healthcare providers. Healthcare providers need other feedback loops to develop improvement strategies related to service time, healthcare providers' attitude, service cost, etc. Understanding the relation between patients' psychological activities and their health, the researchers can implement a better service to accelerate the treatment by improving patients' emotional health.

Furthermore, health allied educators should understand the concept of co-creation and strategies for creating value and invite students in their class design. Involving learners in the design of teaching and learning contributes to improvement in the quality of education by addressing perspectives of different stakeholders and stimulating teachers' growth.

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# ABSTRACTS

## Perceived Stress, Coping Strategies and Emotional Intelligence among Nursing Students at School of Nursing Colombo

Thilakarathna U. G. M. P.[1], Kisokanth G.[2]

[1]Department of Fundamentals of Nursing, Faculty of Nursing, University of Colombo

[2]Department of Clinical Nursing, Faculty of Nursing, University of Colombo

**Introduction:** Nursing students experience high levels of stress during their study period which leads to psychological distress, poor academic outcomes, and high attrition rates. Coping strategies are used to deal with stress during their studentship. Emotional intelligence helps reduce stress and lessen effects of stress and is found to be strongly associated with academic achievement, critical thinking, peer learning and help-seeking.

**Objective:** To assess perceived stress, coping strategies and emotional intelligence among nursing students at the School of Nursing, Colombo.

**Methods:** A descriptive cross-sectional study was conducted among 382 second- and third-year nursing students. Data were collected by online self-administered questionnaires. Validated Perceived Stress Scale, Brief Cope Scale and GENOS concise Inventory were used to collect perceived stress, coping strategy and emotional intelligence among participants respectively. Data were analysed using descriptive and inferential statistics.

**Results:** Nearly 72% of the participants had moderate levels of stress and 52% of the participants had lower levels of emotional intelligence. The most of the participants reported the use of adaptive, rather than maladaptive coping strategies. A significant negative correlation was found between perceived stress and emotional intelligence ($r = -0.322$, $p=0.001$). Statistical significant differences were identified between level of emotional intelligence and gender ($p =0.049$).

**Conclusion:** This study shows a moderate level of stress and low level of emotional intelligence among nursing students. Also, students used adaptive coping strategies more often than maladaptation. Future research is needed to explore the development, application, and evaluation of strategies to reduce stress and enhance emotional intelligence in nursing education.

**Keywords:** Perceived stress, coping, emotional intelligence, Nursing students, Sri Lanka

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Life narratives of adults with Obsessive-Compulsive Disorder in Galle area: An explorative study

Vithana, K. V. G. S. G.[1], Boralessa P.[2], Asurakkody, T. A.[3], Perera, D. P. [4]

[1]Teaching hospital, Karapitiya

[2]Department of Psychology, International College of Business and Technology

[3]Department of Fundamentals of Nursing, Faculty of Nursing, University of Colombo

[4]Department of Family Medicine, Faculty of Medicine, University of Kelaniya

**Introduction:** Obsessive-compulsive disorder (OCD) is a largely prevalent and debilitating psychological health disorder known to influence various life domains. Yet little is known about the subjective narratives of living with OCD amongst Sri Lankans and the ways in which it impacts to daily life.

**Objective**: To qualitatively explore the life narratives of adult individuals diagnosed with OCD within the Galle area in Sri Lanka with a focus on the impact of OCD on their life.

**Methods:** Qualitative phenomenological study selected a purposive sample of ten adults primarily diagnosed with OCD who were registered in psychiatric clinics in Teaching Hospital, Karapitiya, Sri Lanka. Data in the form of semi-structured interviews were collected from April to July 2021. Interviews were audio recorded and transcribed verbatim. Transcripts was analyzed thematically.

**Results:** Overall, four main themes and 11 sub-themes were found which comprised a) Direct impact to self-coping strategies, sleep and cognitive impairment b) Living with family - various reactions from family, family members' perception c) Influences on academics and work - impairment of productivity of work or academic progress, communication issues in work or academic environment d) Social and cultural impact - socializing issues, cultural influences and religious impact and support from society. The individuals viewed OCD as a disorder that unfavorably influenced their life. They become at risk of interrupting continuing treatments, with the possibility of enhanced severities or recurrences of symptoms in OCD.

**Conclusion:** Adults with OCD have issues with their life related to self, family, work, academic and sociocultural aspects of their life. Findings can be used as a basis for developing interventions that meet the person's needs and attention to increase quality of life. Findings will help arrange supportive programs to adjust treatment and nursing strategies with community nursing programs.

**Keywords**: Life narratives, Adults, Obsessive-compulsive disorder

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Psychological impact of natural disasters on victims and health services required: A Scoping Review

Weththasinghe C.[1], Senanayake K. I. D. F.[2]

[1] Department of Planning & Quality Improvement, Ninewells Hospital, Sri Lanka

[2] The Library, Faculty of Nursing, University of Colombo

**Introduction**: Natural disasters are sudden calamitous events which lead to a devastating impact on the stability and health of the population in a country. The psychological impact of natural disasters has become a major focus of disaster health management, and the morbidity of psychiatric disorders after disasters has been reported to increase in number.

**Objective**: The study aims at providing an overview of the psychological impact of natural disasters on the victims and to explore the needs of victims of natural disasters for healthcare services in Sri Lanka.

**Methods**: Saunders' research onion model was used adopting interpretivism philosophy, inductive approach, qualitative method, grounded theory, and cross-sectional time horizon. Published literature between the period 2010 and 2022 was obtained by searching library databases such as CINHAL, BMC, Science Direct, Web of Science, and Emerald using the terms "natural disasters", "psychological impact", "victims of natural disasters" and "need for multidisciplinary healthcare services.

**Result**: Fifty articles were reviewed, and 35 articles were selected considering the inclusion and exclusion criteria. Selected articles were categorized into two themes; "psychological impact" and "required health services". Following a natural disaster, there is a sharp increase in reporting of long-term health consequences including Post-Traumatic Stress Disorder (PTSD), depressive disorders, and anxiety disorders. PTSD was founded as the commonest condition among natural disaster victims. The required health services may differ according to the nature of the disaster and the geographical spread of those affected. Most health services tend to deal with the short-term needs of the victims while their long-term needs remain less treated.

**Conclusion**: The findings highlight the severe psychological impact of natural disasters and suggests the provision of accessible and comprehensive mental health services such as post-disaster psychological support systems, psychotherapy, strengthening community resilience, and fostering effective coping programs to meet the long-term needs of affected individuals.

**Keywords**: Natural disasters, Psychological impact, Victims, Healthcare services, Post-Traumatic Stress Disorder

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Isolation of Zerumbone, the potent bioactive compound, from Sri Lankan *Zingiber zerumbet* (L)

Weeratunge H.D.[1,2], De Silva E.D.[2] and Premakumara G.A.S.[3]

[1]Herbal Technology Section, Modern Research & Development Complex, Industrial Technology Institute, Halbarawa Gardens, Malabe

[2]Department of Chemistry, Faculty of Science, University of Colombo

[3]Department of Basic Sciences and Social Science, Faculty of Nursing, University of Colombo

**Introduction:** *Zingiber zerumbet* (L), a member of the family Zingiberaceae, known as "Wal-inguru" in Sri Lanka is a medicinal herb distributed in Sri Lanka, Bangladesh, India, Malaysia and Nepal. This plant is used to treat stomach aches, worm infestation in children, swelling sores and loss of appetite in traditional medicine in Sri Lanka. It has been reported that zerumbone, isolated from rhizome of *Z. zerumbet* has reduced the inflammatory response of acute lung injury in endotoxin–treated mice via Akt-NFkB pathway. Also, zerumbone shows anticancer, anti-inflammatory, anti-ulceration, antioxidant and antimicrobial properties.

**Objective:** Use of Sri Lankan *Z. zerumbet* in immunomodulatory and lung protection herbal preparations needs scientifically validated zerumbone content in Sri Lankan *Zingiber zerumbet.* Therefore, aim of this study was to isolate zerumbone and quantify the content for potential biomedical and clinical experiments/applications.

**Methods:** The rhizome and leaf of *Z. zerumbet* from Nilgala forest of Sri Lanka was hydro-distilled to obtain its volatile oils and analyzed for volatile oil composition using GC-MS. The essential oil extracted from the rhizome was purified to isolate zerumbone by size exclusion chromatography using Sephadex $LH_{20}$ followed by preparative HPLC. The purified zerumbone was confirmed by $^{1}$H-NMR, $^{13}$C-NMR and 2D-NMR including HH-COSY, NOESY, DEPT-HSQC and HMBC analysis.

**Results:** The leaf oil contained 28 compounds in which 26 compounds were identified by GC-MS. It has *trans*-nerolidol (41.0%), β-caryophyllene (21.3%) and zerumbone (6.2%) as the major compounds. The rhizome oil contained 16 compounds of which 14 compounds were identified by GC-MS. The major components of rhizome oil were zerumbone (68.7%), humulene (12.2%) and camphene (3.6%).

**Conclusion:** The rhizome oil had 68.7% zerumbone whereas leaf oil had 6.2%. The novel approach adopted in this study could isolate zermbone with high purity (99.9%) in sufficient quantities of zerumbone for potential biomedical applications and lung protection studies.

**Keywords:** Hydro-distillation, volatile oils, *Zingiber zerumbet,* Zerumbone, Sri Lanka

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# A Review of Nursing Informatics on Nursing Education

Chathurika J. N., Kaushalya K. A. D. S., Asurakkody T. A.
Department of Fundamentals of Nursing, Faculty of Nursing, University of Colombo

**Introduction:** Integration of scientific knowledge and data into health care information processing is the core concept of nursing informatics. Nursing informatics has continued to impact nursing education concerning technological advancements, which have paved the way for contemporary changes in nursing education.

**Objective:** To identify advantages, possible disadvantages, required skills and recognize the parts of informatics in designing educational purposes in nursing education.

**Methods:** A literature search from 1998 to 2022 was conducted using keywords “nursing”, “education”, and “informatics” on electronic databases Google scholar, PubMed, and Science Direct. Twenty-five articles were selected from 3704 articles for reporting the findings.

**Results:** Identified benefits of adopting informatics into an education system are: reducing medical errors, improving telenursing and health promotion relevant to clinical practice, nursing shift management, comprehensive delivery methods of teaching, and improving nursing research. Possible disadvantages of using informatics are: impairment in critical thinking, time taken for data entering, and deficiency in pre-requisite skills. The use of informatics in nursing education requires skills in information literacy, evidence-based nursing, communication, cooperation, teamwork, problem solving, self-assessment, nursing competencies, the reflection of nursing, and peer support of nursing students. Integral parts of an informatics-based information system include a visual interface, course materials, assessment tests, use of technology software in audio-video courses, editing of recordings, referencing with instructional media or hyperlinks in finalizing interactions, obtaining feedback, and testing the overall operation.

**Conclusion:** Findings suggest that more benefits can be gained through the incorporation of informatics into nursing education compared to its possible disadvantages. The role of informatics in nursing education is vital in developing students’ education with the changing trends of highly advanced technology. Further reforms such as formulating user-friendly interfaces, software and hardware application training, informatics knowledge, and skill training programs are required to improve the successive use of informatics in nursing education.

**Keywords:** Education, Informatics, Nursing

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Developing a conceptual framework for cultural competence in healthcare: looking at antecedents and consequences

Nishara M. G. S., Herath H. M. H. I., Asurakkody T. A.
Department of Fundamentals of Nursing, Faculty of Nursing, University of Colombo

**Introduction:** Cultural Competence (CC) is a continuous endeavor to develop the capacity to deliver care by health professionals to interact with people from various cultural backgrounds. Being a culturally competent health practitioner in a culturally diverse society is a challenging prerequisite. Hence, for developing a conceptual framework for CC, it is essential to identify the antecedents and consequences.

**Objective:** To identify and synthesize available evidence on antecedents and consequences to develop a conceptual framework for cultural competency.

**Methods:** A narrative review of the literature was performed on Google Scholar, Science Direct, PubMed, and Web of Science to identify publications between 2000 and 2022.

**Results:** Forty-three articles were eligible from the initial search of 4804 studies. Of these, 81.4% and 18.6% were related to nurses and healthcare workers respectively. Dimensions of CC care are: cultural awareness, cultural sensitivity, cultural desire, and encounters. Antecedents are included under four domains: cognitive (cultural knowledge, skills, understanding), affective (cultural diversity including demographic factors), behavioral (cultural proficiency, humility, and respect subsisted), and environmental (organizational infrastructure, service support, and healthcare policy guidelines). Upon available evidence, consequences were categorized into three variables as: client related variables (enhancing patient's quality of life, holistic care, patient satisfaction), healthcare professional related variables (development of cultural skills, professional growth, communication, and improving nursing practice), and health system related variables (positive organizational outcome, cost-effectiveness, and effective treatment).

**Conclusion:** Ensuring precise deployment of CC provides a positive outcome for both healthcare professional and the client and directly influences the quality of the healthcare system. A comprehensive approach to the assessment of CC and implementation in healthcare practice, education, administration, and research of strategies to enhance cultural competence is vital to promoting culturally congruent healthcare practices. The model could provide a framework for health educators to create significant patient safety and organizational culture curriculum.

**Keywords:** Cultural competence, antecedents, consequences, healthcare workers

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Undergraduate nursing students' experiences of clinical placement in intensive care units: A literature review

Lokuyaddage S.[1], Medagedara A.[1], Rathnayake S.[2]

[1] Department of Fundamentals of Nursing, Faculty of Nursing, University of Colombo

[2]Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya

**Introduction:** Clinical placement in the Intensive Care Unit (ICU) is a significant milestone in student nurses' life as it is one of the specialized settings where critically ill patients are treated and cared for. However, evidence of nursing undergraduates' experiences of clinical placement in intensive care units is limited.

**Objective:** To analyze current evidence of the experiences of student nurses during their ICU placement.

**Methods:** A systematic literature review was conducted following PRISMA guidelines. Two electronic databases (PubMed and Google Scholar) were consulted using keywords that include undergraduate nursing students, the ICU and experience. It featured articles published from January 2011 to July 2021. Narrative synthesis was used to analyse the data.

**Results:** The search generated 1784 publications. Following the screening process, seven articles based on qualitative studies from four countries were included. Four studies were from Turkey, and three studies were from South Korea, Spain and Saudi Arabia. Five meta-themes emerged: complex learning environment leads to stress and fear among students, dealing with critically ill patients and death is a stressful experience, communication in ICU is challenging, feeling incompetent in the provision of care, and selecting intensive care as a career choice. Further, students were afraid of the complex environment of ICUs and were anxious and nervous when approaching patients with complicated diagnoses and different appearances. Difficulties in communicating with patients and staff have hindered effective care and led to psychological distress. Although students had negative experiences in ICU placements, they had opportunities for personal improvement, and most were interested in choosing intensive care nursing as a career choice.

**Conclusions:** ICU clinical placement is a stressful experience for the majority of student nurses. However, they are interested in selecting ICU as a future career choice. These findings can be incorporated into designing ICU course modules, revising curricula and planning ICU clinical placement effectively.

**Keywords:** Clinical placement, Experience, Intensive care unit, Nursing students

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Effectiveness of methylprednisolone in the treatment of dengue fever: An observational study

Alwis K.[1], Rajapaksha M. B. D. T.[1], Amarasinghe T. S.[2], Warnasooriya W. M. S. N.[3], Ralapanawa D. M. P. U. K.[2], Kularatne S. A. M.[2]

[1]Base Hospital, Gampola

[2]Department of Basic Sciences and Social Science, Faculty of Nursing, University of Colombo

[3]Faculty of Medicine, University of Peradeniya

[4]Department of Medicine, Faculty of Medicine, University of Peradeniya

**Introduction:** Dengue infection can cause intense immune activation causing cytokine overproduction and Cytokine Storm Syndrome (CSS). Steroids are known to have an action on CSS. Abolition of overproduction of Cytokines can mitigate manifestations of Dengue hemorrhagic fever (DHF).

**Objective:** To assess the effectiveness of Methylprednisolone (MP) as a steroid in the treatment of dengue fever.

**Methods:** Clinical data for this observational descriptive study was collected from the diagnosed adult dengue patients (n=496) admitted to the Teaching Hospital Peradeniya and Base Hospital, Gampola. Data was collected regarding the use of MP by physicians for the treatment of dengue fever. A total of 100 dengue patients from Base Hospital Gampola were treated with 12 mg of MP by physicians while standard treatment was provided for all the patients from Teaching Hospital, Peradeniya. Parameters for the clinical improvement of both groups, those who received MP treatment and those who did not receive MP, were compared at the significance level of $p<0.05$.

**Results:** Mean age of the participants were 32.96 ± 14.55 years including 223 females (45%) and 273 males (55%). Mean hospital stay duration of patients under MP was 3.89 days and no deaths while it was 4.18 days with three deaths in the control group and the mean difference was significant ($p = 0.039$). Patients went under MP had a mean of 2.05 days to increase platelet counts and it was 2.83 days for control group and the mean days of the two groups were significantly different ($p<0.001$). Time taken to reduce ALT/AST levels did not show any significant differences in both groups.

**Conclusion**: Results of this observational study show evidence for effective application of MP in the treatment of DHF. Randomized controlled trials (RCTs) are recommended to establish a strong relationship between steroid treatment and dengue fever.

**Keywords:** Dengue fever, Methylprednisolone, Effectiveness

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Hypocalcemia in dengue patients: A single center observational study in central Sri Lanka

Warnasooriya W. M. S. N.[1], Jayasinghe S.[2], Amarasinghe T. S. [3], Rajapakse R. P. V. J.[4], Kularatne S. A. M.[5]

[1]Faculty of Medicine, University of Peradeniya

[2]Department of Pathology, Faculty of Medicine, University of Peradeniya

[3] Department of Basic Sciences and Social Science, Faculty of Nursing, University of Colombo

[4]Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya

[5]Department of Medicine, Faculty of Medicine, University of Peradeniya

**Introduction:** Dengue is known to be fatal due to the limited evidence of pathogenesis and specific treatment options. Serum calcium is very important in cardiac functions, haemostasis and immunopathogenesis.

**Objective:** To explore the prevalence of hypocalcaemia among the dengue patients presented to Medical Wards, Teaching Hospital, Peradeniya and its association with the severity of the disease.

**Methods:** This is a descriptive observational study. Data were collected from the clinically diagnosed patients presented to Medical Wards, Teaching Hospital, Peradeniya. According to the laboratory reference range, the normal range of corrected calcium levels was indicated between 2.2 to 2.6 mmol/dl.

**Results:** The sample size was 386 and the mean age was 35.2 ± 15.79 years, while the majority were males (n = 205, 53.1 %). Mean serum Calcium level of the total sample was 2.1 ± 0.16 mmol/L (range = 1.18 – 2.22). There were 122 dengue hemorrhagic fever (DHF) patients (31.6%). Mean serum Calcium level of DHF patients was 2.06 ± 0.13 mmol/L while it was 2.13 ± 0.17 mmol/L in dengue fever (DF) patients. It is significantly lower than patients with DF ($p < 0.001$). Prevalence of low serum calcium levels in DF and DHF patients was 69.3% (n =183) and 92.1% (n =116), ($p < 0.05$).

**Conclusions:** Individuals with DHF had considerably lower serum Ca2+ levels than patients with DF, and hypocalcemia was more common. This might be used to evaluate the severity of the disease. We suggest that further research is needed to assess the effectiveness of calcium as a specific treatment option in preventing the severity of dengue.

**Keywords**: Dengue, Dengue hemorrhagic fever, Serum calcium levels, Severity of dengue

This abstract was published in the Proceedings of the 1st International Nursing Conference 2022 organised by the Faculty of Nursing, University of Colombo

# Faculty of Science


***Progressive Research in Science for a Sustainable Future***

17th November 2022

# MESSAGE FROM THE DEAN

**Senior Professor Upul Sonnadara**
Dean
Faculty of Science
University of Colombo

I am pleased to extend my warmest congratulations to the academics and postgraduates of the Faculty of Science who will be disseminating their research findings at the Technical Sessions of the University of Colombo, Annual Research Symposium scheduled on November 17, 2022.

In selecting the theme for the technical sessions of the Faculty of Science, which is "Progressive Research in Science for a Sustainable Future", we recognize the key role that scientists play in creating and disseminating knowledge, thus making a vital contribution towards sustainable development in the country. The faculty continues to demonstrate a high level of commitment to research as demonstrated through the quality and quantum of publications spanning across seven disciplines of science. The majority of the publications produced by the academics and postgraduates of the faculty are in indexed journals bearing testimony to the high standard of research. Research has also led to many innovations, international patents and in niche areas, with some research having made a critical impact on national development. At any given time, more than 500 postgraduates are enrolled in masters and research degree programmes offered by the faculty.

The technical sessions without doubt would provide a platform for knowledge-sharing. The opening talk given by Prof. SUK Ekaratne, who is well versed in both science and education on 'Approaches that mitigate learning challenges in preparing for progressive science research in higher education' would highlight the importance of our theme for this year.

I am confident that this year's scientific sessions would prove to be very productive and pave the way for more innovative and advanced research within the faculty in time to come. I would like to take this opportunity to thank the organizing committee and wish the Annual Sessions every success.

## MESSAGE FROM THE
## DIRECTOR, POSTGRADUATE STUDIES

**Professor Mayuri Wijesinghe**
Director, Postgraduate Studies
Faculty of Science
University of Colombo

As the Director, Postgraduate Studies, I am indeed honoured to write a message for the technical sessions of the Faculty of Science, University of Colombo.

In keeping with our vision to produce postgraduates that are distinguished by their professionalism, committed towards ongoing learning and personal development, capable of spearheading research, confident, adaptable, and able to aptly communicate and blend into the wider contexts in which they work, we continuously strive to equip them to be globally competitive and productive.

Research is a key focus of the Faculty of Science. We have thus taken several important steps to elevate the quality of research programmes in the faculty. This is primarily through the introduction of many quality-control checks and mechanisms through the progression of their research degree, and by providing supplementary knowledge and training that would further strengthen their capacity and potential to undertake research work in the chosen discipline. We strongly encourage research dissemination and take initiatives to showcase and reward research efforts. The technical sessions of the Faculty of Science is one such instance where academics and postgraduates are provided an opportunity to share their research findings and experiences.

I am grateful to Prof. SUK Ekaratne for accepting our invitation to deliver the opening talk which would no doubt bring in valuable insights in terms of the faculty's role in supporting progressive research in science.

I thank the organizing committee comprising the postgraduate coordinators from the seven departments, for undertaking the task of getting the abstracts reviewed on time and for finalizing them.

I wish the symposium every success.

# POSTGRADUATE COORDINATORS / ORGANIZING COMMITTEE OF THE FACULTY OF SCIENCE

| | |
|---|---|
| Prof. CD Wijayarathna | Department of Chemistry |
| Dr. DR Jayewardene | Department of Mathematics |
| Dr. KGSU Ariyawansa | Department of Plant Sciences |
| Dr. JMDR Jayasundara | Department of Physics |
| Dr. G. Galhena | Department of Zoology & Environment Sciences |
| Dr. RV Jayatilake | Department of Statistics |
| Dr. J Jeyasugiththan | Department of Nuclear Science |
| Prof. Mayuri Wijesinghe | Director, Postgraduate Studies |

| Technical Sessions - Faculty of Science<br>PROGRAMME | | | |
|---|---|---|---|
| | 8.30 - 9.00 a.m. | Opening Talk<br>**Approaches that mitigate learning challenges in preparing for progressive science research in higher education**<br>by Professor SUK Ekaratne<br>**Venue:** Auditorium ILC Building | |
| **TEA** | | | |
| **CLT - TECHNICAL SESSION 1**<br>**Session Chair: Dr. Sashiprabha M. Vithanarachchi** | | | |
| **Department of Chemistry** | | | |
| 1 | 9.30 - 9.45 a.m. | Physicochemical study of Progesterone with Steroids using Molecular Docking and Molecular Dynamics Simulations | Illangasinghe, S. Weerasinghe |
| 2 | 9.45 - 10.00 a.m. | Genome sequencing, assembly, annotation and analysis of a heavy metal resistant *Staphylococcus warneri* strain TWSL | D.M.D.C. Dissanayake, M. Wachi, N.V. Chandrasekharan, C.D. Wijayarathna |
| 3 | 10.00 -10.15 a.m. | Screening and characterization of cysteine protease inhibitory activity in seeds of a local variety of *Vigna unguiculate* (Cowpea) | R.M.P. S. Thilakarathne, K.D.K.P. Kumari, C M Hettiarachchi |
| 4 | 10.15 – 10.30 a.m. | Preliminary investigation on physicochemical stability of *Phyllanthus emblica* L. fruit aqueous extract under accelerated storage conditions | S. Pathmaperuma, T.M.S.G.Tennakoon, C.M.Hettiarachchi |
| 5 | 10.30 - 10.45 a.m. | Adipogenesis inhibitory activity of the pigment removed red mold rice water extracts from *Monascus pilosus* NBRC4507 | I.P.Wanninaika, M.N. Kaumal, C.M.Hettiarachchi |
| 6 | 10.45 - 11.00 a.m. | Gold nanoparticle based surface enhanced Raman scattering (SERS) biosensor for detecting albumin: a preliminary assessment | Dulanjali Rodrigo, Vimukthi Moneravilla, Vijanaka Fernando, Pradeep Perera, Sasani Jayawardhana, Siyath Gunewardene, Hiran Jayaweera, Neranga Abeyasinghe |
| 7 | 11.00 - 11.15 a.m. | A Hydrophobic Coating to Prevent Corrosion on Metal Surfaces | Wijani Perera, Hasini R. Perera, K. M. Nalin de Silva, Rohini M. de Silva |

| | | | |
|---|---|---|---|
| 8 | 11.15 -11.30 a.m. | Determination of quinazoline type alkaloid content in various parts of *Adathoda vasica* Nees. plant using high performance liquid chromatography | W.M.V.M. Wijesooriya, T.M.S.G. Tennakoon, S. M. Vithanarachchi |
| **CLT - TECHNICAL SESSIOON II<br>Session Chair: Dr. Neranga Abeyasinghe** | | | |
| 9 | 11.30-11.45 a.m. | Isolation and purification of Graphene Quantum dots using electrochemical approach from Sri Lankan Vein Graphite | Chamali Rajapaksha, Hasini Perera Rohini de Silva, Nalin de Silva |
| 10 | 11.45- 12.00 noon | Electro-spun beads of the Polyethylene oxide and Montmorillonite containing chloramphenicol for an ophthalmic drug delivery | H.I.S. Maddumage, Umayangana Godakande, K.M.N. de Silva, Rohini M. de Silva |
| 11 | 12.00 – 12.15 p.m. | Zeolite/m*ontmorillonite* composite beads for the removal of calcium and magnesium | A.K.D. Veromee Kalpana Wimalasiri, M. Shanika Fernando, D. P. Dissanayake, K. M. Nalin de Silva, W. Rohini M. de Silva |
| **Department of Nuclear Science** | | | |
| 12 | 12.15 – 12.30 p.m. | Dosimetric Comparison of Intensity Modulated Radiation Therapy and Volumetric Modulated Arc Therapy for Treatments of Thyroid Cancer | B.M.A.T Banneheka, J. Jeyasugithan, K.V. A. W Kumara |
| 13 | 12.30 – 12.45 p.m. | Establishment of Institutional Diagnostic Reference Levels (DRLs) for Computed Tomography in National Hospital of Sri Lanka. | K. S. Hettiarachchi, Dr. J. Jeyasugiththan, Aruna S. Pallewatte |
| 14 | 12.45 – 1.00 p.m. | Wireless, Portable, Intelligent and Real Time Cardiac Arrhythmia and Patients' Vital Signs Monitoring System | K.A.Hiruni Madusha Dasanayaka, J.Jeyasugithan, Susantha Herath |
| 15 | 1.00 – 1.15 p.m. | Noise, Dose and Pitch Relationship in Non-Cardiac Multi-Detector Row Computed Tomography (MDCT) Scanner | I.Mayuran, J. Jeyasugiththan, D.M. Satharasinghe |
| **LUNCH** | | | |
| **PLT - TECHNICAL SESSION III<br>Session Chair: Prof. I.M.K. Fernando** | | | |
| **Department of Physics** | | | |
| 16 | 9.30 - 9.45 a.m. | A fluorescence-based chemometric method for distinguishing black tea varieties of Sri Lanka | Amal Pattividana, Siyath Gunewardene, MK Jayananda, Hiran Jayaweera |

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|---|---|---|---|
| 17 | 9.45 - 10.00 a.m. | Fabrication and characterization of flexible interdigitated electrodes using an office inkjet printer | RM Manamendra, DL Weerawarne |
| 18 | 10.00 -10.15 a.m. | Study the connection between orbital and superorbital flux of the LS I +61° 303 object | K. L. Isuru Gunawardhana, K.P.S.C. Jayaratne, A.U. Abeysekara |
| 19 | 10.15 – 10.30 a.m. | The Dynamicity of Vegetation Distribution against the Land Surface Temperature in the Colombo Metropolitan Area from 1988-2019 | Saumya Chathuranga, K. P. S. C. Jayaratne |
| 20 | 10.30 - 10.45 a.m. | Sensitivity Analysis of Simulating Severe Weather Events over Sri Lanka using WRF | T.D. Gamage, D.U.J. Sonnadara |
| 21 | 10.45 - 11.00 a.m. | Radiofrequency pollution levels in Colombo city area due to cellular networks and Wi-Fi sources | S.A.T.U.W.K. Suraweera, K.P.S.C Jayaratne |
| 22 | 11.00 - 11.15 a.m. | High Energy Gamma-ray fluxes in MeV and GeV regions of six BL-lac Objects during the period of 2008 – 2012 | L.P.M.I. Randu, K.P.S.C. Jayaratne |
| 23 | 11.15 -11.30 a.m. | Development of electrically conductive graphite thin films on flexible polymer substrates | GC Wickramasinghe, DL Weerawarne, DR Jayasundara |
| 24 | 11.30 – 11.45 a.m. | Assessment of a Raman spectroscopy based chemometrics method for differentiating coconut oil varieties | Vimukthi Moneravilla, Sasani Jayawardhana1, Pradeep Perera, Hiran Jayaweera1, Siyath Gunewardene |
| **PLT - TECHNICAL SESSION IV<br>Session Chairs: Dr. Jinendra Dissanayake & Dr. H.A.S. Gayan Dharmarathne** | | | |
| **Department of Mathematics** | | | |
| 25 | 11.45-12.00 noon | Reciprocal cost allocation model for service firms | M H K M Hameem |
| **Department of Statistics** | | | |
| 26 | 12.00 – 12.15 p.m. | Modeling and forecasting the unemployment rate in Sri Lanka with missing values imputation | N.N Ranasinghe, R.A.B Abeygunawardana |
| 27 | 12.15 - 12.30 p.m. | A Comparison of ARIMA Time Series Model and Machine Learning LSTM Model to Forecast Paddy Production in Sri Lanka | I.B.I. Sandaruwani, R.A.B. Abeygunawardana |
| **Department of Plant Sciences** | | | |
| 28 | 12.30 – 12.45 p.m. | Effect of *Aspergillus japonicus* based phosphate biofertilizer formulation on soil phosphorous availability and crop growth of Chilli (*Capsicum annum* L.) | W.A.G.A.B. Chandrasena, C.M.Nanayakkara, H.N.Sumanasena, H.A.N.M. Waidyathilaka, R. K. Maddumage |

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|---|---|---|---|
| 29 | 12.45 – 1.00 p.m. | Using *Aspergillus japonicus* to manage soil phosphorus in pepper cultivation | W.A.G.A.B. Chandrasena, C.M.Nanayakkara, H.N.Sumanasena, E.S. Karunarathna |
| 30 | 1.00 – 1.15 p.m. | Evaluation of conservation status of Sri Lankan *Syzygium* species | H. D. Jayasinghe, S. W. Ranasinghe, H. S. Kathriarachchi and D. S. A. Wijesundara |
| 31 | 1.15 – 1.30 p.m. | Preliminary assessment of endophytic fungal diversity in *Piper nigrum* accessions from Ratnapura and Matale Districts in Sri Lanka | W.G.N.A. Wimalarathna, K.G.S.U. Ariyawansa A.M. Wickramasuriya, H.D.D. Bandupriya, T.D. Silva |
| **Department of Zoology & Environment Sciences** | | | |
| 32 | 1.30 – 1.45 p.m. | Wetland transformation: A case study of Land Use and Land Cover changes in Muthurajawela Wetland Complex | Harsha Dias Dahanayake, Deepthi Wickramasinghe, D.D.G.L Dahanayaka, Paul Hudson |
| **LUNCH** | | | |

## KEYNOTE SPEAKER

**Professor SUK Ekaratne**

Prof. SUK "Suki" Ekaratne obtained his B.Sc. in Zoology from the University of Colombo and his PhD from the School of Ocean Science, University of Wales, United Kingdom. On his return to University of Colombo, his aquatic ecology research ranged from the waters of Horton Plains to estuaries, lagoons, salterns, inter-tidal habitats, scuba- diving and growing of bleached coral reefs as well as to deep-sea research in manned submersibles. His view that university teaching should develop student skills, rather than only rote-learnt knowledge, led him to establish the first Sri Lankan Staff Development Centre at University of Colombo and staff training courses to redesign university teaching, while still teaching at the Department of Zoology. Through these interests, he co-founded the Field Ornithology Group of Sri Lanka (FOG), the Sri Lanka Association for Improving Higher Education Effectiveness (SLAIHEE). He has been able to hold professorial positions in the widely different fields of Zoology and Higher Education in several countries, as well as to have received several international Fellowships and Awards. He continues as a Higher Education staff training and change management specialist.

# ABSTRACT OF KEYNOTE ADDRESS


## Professor SUK Ekaratne


**Approaches that mitigate learning challenges in preparing for progressive science research in higher education**


Plentiful challenges present themselves to all learners as they 'grow'. Those considered fortunate to enter Higher Education (HE) would next become inculcated into the ways of thinking and practice/s (WTP's) that are in use in conventional HE, including in its examination systems. Whereas HE teaching and learning environments and practices should 'scaffold' to lessen the challenges facing learners who come with hopes of preparing themselves for developing Higher Order Thinking Skills (HOTS) needed also for progressive science research and which university education should target, this remains very distant from what is happening in the design and delivery of university curricula and related assessments. Since learners may enter HE with preformed habits that are not so conducive to developing a "re-search" mentality, preparation for progressive research, specially for a sustainable future, becomes further challenging. Mitigating these challenges may require us to remove being limited to teaching our students to learn new subject-related research methods only, as is commonly done, but also to include explicitly disrupting 'old' WTP's to make possible impactful new learning, which then make possible the 'far-transfer' of research skills to future research situations, yet unknown. For example, such an approach would make a 'competent' researcher in science to become a 'good' researcher in almost any field, even if yet unanticipated. Towards this end, the new educational curricula that are being developed include Social Emotional Learning aspects also. The Keynote will include a discussion of approaches, such as the above-mentioned, that can be used in curricula design and mapping to address learner-challenges for developing a progressive science research HE mindset and practices. It will draw extensively on the speaker's experiences as a science researcher and on his lecturer training roles in several countries such as a Director of Academic Programmes of a high-ranked research-intensive university.

# ABSTRACTS

## Physicochemical study of Progesterone with Steroids using Molecular Docking and Molecular Dynamics Simulations

J. Illangasinghe, S. Weerasinghe

Department of Chemistry, Faculty of Science

University of Colombo, Sri Lanka

Breast cancer (BC) is one of the most prevalent cancers in females worldwide. The progesterone receptor (PR) is an essential protein receptor of cells in the prostate gland to induce proliferation. Thus, PR is one of the primary targets in the development of new chemotherapeutic for BC and ovarian cancer. Seven steroidal alkaloids of plant origin, with structural similarities to natural progesterone, were selected from "Sri Lankan flora" information system to investigate the potency to develop cytotoxic drugs for treating cancer targeting PR using molecular docking technique. Mifepristone (RU486) and progesterone were selected as reference compounds for this research. Molecular docking results showed that two out of seven steroids, chonemorphine (-25.2 kJ $mol^{-1}$) and stigmasterol (-34.0 kJ $mol^{-1}$) steroids have a close binding affinity to the reference molecules (-35.1 kJ $mol^{-1}$ and −28.6 kJ $mol^{-1}$). Moreover, molecular docking analysis revealed that these two natural steroids interact with the active site residue Arg766 of PR. Molecular dynamics simulation performed on these complexes with the GROMACS software, provided a strong support for the stability of protein–ligand complexes. The results from various analyses including root-mean-square deviation (RMSD) and radius of gyration showed the stability and compactness of all protein–ligand complexes. In addition, the results of binding mode analysis showed that various interactions, including hydrogen binding, hydrophobic and electrostatic interactions may be important for the optimal binding with PR. Exploration of solvent accessible surface area showed the relative expansion of all complexes. Free energy analysis conducted by applying MM-PBSA method on all the complexes showed the stability of PR with stigmasterol (-70.7 kJ $mol^{-1}$) relatively more stable than the chonomorphine complex (-59.6 kJ $mol^{-1}$). The overall results of the study provided clear insights to the dynamic and structural information about PR-ligand interactions with natural steroids. Based on this in silico results, with confidence, investigations could be extended to develop novel drugs for breast cancers with minimal side effects.

Keywords: Breast cancer, molecular-docking, molecular-dynamics, steroids, drugs

**Genome sequencing, assembly, annotation and analysis of a heavy metal resistant *Staphylococcus warneri* strain TWSL_1**

D.M.D.C. Dissanayake[1], M. Wachi[2], N.V. Chandrasekharan[1], C.D. Wijayarathna[1]

[1]Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka

[2]Department of Life sciences and Technology, Tokyo Institute of Technology, Japan

A bacterial strain TWSL_1, isolated from a textile effluent, was found to be resistant to heavy metals such as Cu, Cd, and Pb. The 16S rRNA gene of the strain TWSL_1 was sequenced and nucleotide BLAST analysis revealed it to be closely related to *Staphylococcus warneri* strain RED5B (Accession No MW144878.1). Whole genome sequencing was performed on Illumina sequencing platform and the sequencing library was prepared by using Nextera XT library preparation kit. To identify the insert size of raw data and how many reads were used in assembly, raw data reads were mapped to an assembly result, and the total number of mapped reads were 8,577,627(97.52%) with a coverage of 99.98% of the total read bases. The sequence of TWSL_1 was assembled into 39 contigs by de novo assembly using SPAdes (v3.15.0) with a N50 contig of 774,837 bp. The longest contig assembled was 883,704 bp and the shortest 1021 bp. The genome was composed of a complete chromosome of 2.662 Mbp and no plasmids were detected. The G+C content was 32.78 %. BLAST analysis revealed the genome to be similar to *Staphylococcus warneri* (GCF_018401035.1) with a 99.76% nucleotide identity. Gene prediction was carried out using Prokka (v1.14.6) and, InterProScan and EggNog databases were used for functional annotation. The genome was found to contain 2635 genes of which 2567 were protein coding sequences. Among the non-protein coding genes, were genes for 59 tRNAs and 08 rRNAS. The functional annotation data revealed, the genome of TWSL_1 to encode proteins responsible for Cd, Zn, Co, and Cu tolerance such as zinc transporter (ZupT), cadmium, cobalt, and zinc/$H^+$-$K^+$ antiporters, cadmium resistance transcriptional regulatory protein (CadC), copper-exporting P-type ATPase, copper chaperone (CopZ), copper-sensing transcriptional repressor (CsoR), copper-exporting P-type ATPase B, and also a few antibiotic resistance genes. The TWSL_1 genome data is to be used for the development of biotechnological tools such as biosensors and biosorbents for heavy metal detection and removal.

Keywords: *Staphylococcus warneri*, Heavy metals, Metal resistance, Genome, Sequencing

**Screening and characterization of cysteine protease inhibitory activity in seeds of a local variety of *Vigna unguiculate* (Cowpea)**

R.M.P. S. Thilakarathne, K.D.K.P. Kumari, C M Hettiarachchi

Department of Chemistry, University of Colombo,

Colombo, Sri Lanka

Cysteine proteases are involved in the pathogenesis of various diseases. The discovery of cysteine protease inhibitors may lead to the development of novel therapeutic agents. The present study was conducted to investigate the cysteine inhibitory activity (CIA) of seeds of a local variety of *Vigna unguiculate* (cowpea) known as Dahawala. Seeds were collected from the field crops research and development institute of Sri Lanka. A concentration gradient of aqueous seed extract was screened for CIA. The seed extracts were incubated with L-cysteine in phosphoric acid buffer (pH 7.5) and then casein was added as the substrate. Following incubation at 37ºC, trichloroacetic acid was added and the absorbance of the supernatant was measured at 280 nm. Then the percentage cysteine inhibitory activity (CIA%) was calculated. The effect of physio-chemical parameters including temperature, pH, metal ions, detergents, oxidizing and reducing agents was evaluated. Among tested concentrations, the maximum CIA% was exhibited by 10% seed extract (65.50 ± 0.03%) and it was used for further characterization. The highest CIA% was shown at 37°C (69.52 ± 0.03), while it was 39.44±0.07% at 60 $^0$C. The extract did not exert any activity beyond 80 $^0$C. According to the results, the highest CIA% was indicated at 6.4 pH (88.17 ± 0.07%). The CIA% was significantly ($p<0.05$) increased in the presence of NaCl (75.57 ± 0.2%), while it was significantly reduced ($p<0.05$) in the presence of $Ba^{+2}$, $Fe^{+3}$, $Zn^{+2}$, $Cu^{+2}$ and Na ions tested. The CIA of seed sample was significantly increased ($p<0.05$) in the presence of the detergent, Triton X 80 (73.75 ± 0.01%) and the reducing agent, β-mercaptoethanol (80.97 ± 0.02%). Oxidizing Agent, DMSO (67.12 ± 0.03%) did not exert a significant change in the CIA. The results of the present study revealed that the tested local variety of *V. unguiculate* exerts considerable cysteine inhibitory activity and characterization data will be useful for further studies on purification and isolation of active compounds.

Keywords: Proteases, Cysteine inhibitors, legumes, *Vigna unguiculate,* Dahawala

**Preliminary investigation on physicochemical stability of *Phyllanthus emblica* L. fruit aqueous extract under accelerated storage conditions**

S. Pathmaperuma[1,2], T.M.S.G.Tennakoon[2], C.M.Hettiarachchi[1]

[1]Department of Chemistry, University of Colombo, Colombo, Sri Lanka

[2]Link Natural Products Pvt. Ltd., Malinda, Kapugoda, Sri Lanka

Stability studies of herbal extracts are required to ensure quality, safety and efficacy, throughout their intended shelf life, prior to the manufacturing of finished herbal products. This study was conducted to investigate the physicochemical stability of two types of *Phyllanthus emblica* L. (Nelli) fruit aqueous extracts (SSE - semi solid extract, DPE – dry powder extract), stored under accelerated storage conditions. Extracts were packed in triple laminated aluminium pouches and stored in a stability chamber maintained under 40 ± 2 °C and 75 ± 5% relative humidity. Selected physicochemical parameters were analyzed at times zero, 6 and 12 weeks. Loss on drying of SSE changed from 33.38 ± 0.81 % w/w to 31.59 ± 0.81 % w/w after 12 weeks. Loss on drying of DPE changed from 5.65 ± 0.46 % w/w to 5.96 ± 0.41 % w/w after 12 weeks. Water soluble extractives of SSE exhibited gradual increment compared to DPE during the study period. Both extracts exhibited acidic pH values and it was not changed significantly with time. Total phenolic content of SSE and DPE decreased from 36.27 ± 0.35 % w/w to 34.90 ± 0.76 % and 36.26 ± 1.07 % w/w to 33.68 ± 0.32 % w/w, respectively, after 12 weeks. Gallic acid content of SSE increased from 9.24 ± 0.38 % w/w to 10.36 ± 0.17 % w/w after 12 weeks. DPE exhibited slight variation of gallic acid content from 9.05 ± 0.21 % w/w to 9.07 ± 0.12 % w/w, after 12 weeks. Physicochemical parameters of *P. emblica* fruit aqueous extracts varied under experimental conditions. DPE exhibited better stability than SSE. Dry powder form may be more suited for the long-term storage than a semi solid form. Therefore, further stability testing is recommended to understand overall stability of extracts.

Keywords: *Phyllanthus emblica* L., herbal extracts, stability studies, accelerated storage condition

**Adipogenesis inhibitory activity of the pigment removed red mold rice water extracts from *Monascus pilosus* NBRC4507**

I.P.Wanninaika, M.N. Kaumal, C.M.Hettiarachchi
Department of Chemistry, University of Colombo
Colombo, Sri Lanka

Water-soluble secondary metabolites from *Monascus*-fermented red mold rice (RMR) have been drawn attention as an alternative medication for overweight and obesity. In our previous studies, it was found that the water extracts from RMR produced by *Monascus pilosus* NBRC4507, is free from both lovastatin and citrinin, and inhibited lipid accumulation in 3T3-L1 adipocytes as assessed by oil red staining. The current study was conducted to examine the effect of the pigment removed RMR water extracts on adipogenesis inhibition. The pigment removed water extracts of RMR was prepared by mixing 50 mL of 14 days cultured RMR extracts with 1 mg of activated charcoal. The visible absorbance spectrum for pigment removed RMR extracts showed no major peak at around 400 and 500 nm wave lengths confirming that the pigment removed RMR water extracts are free from red, yellow or orange pigments. The pigment removed RMR water extracts showed a mild inhibitory activity at a final concentration 0.1 mg/mL, and a significant inhibitory activity at 1, and 10 mg/mL (48.36 ± 0.064, and 47.74 ± 0.532 respectively) compared to the 5 μM lovastatin positive control. Moreover, these results confirmed that the lipogenesis suppression components are present in the pigment removed (colorless) RMR extracts and this would be useful in food industry as they would not incorporate any color to the ultimate product This is the first time reporting that the colorless water-soluble RMR components inhibit lipid accumulation; however, further studies are needed.

Keywords: Adipogenesis inhibition, *Monascus pilosus*, pigment removed water extracts

**Gold nanoparticle based surface enhanced Raman scattering (SERS) biosensor for detecting albumin: a preliminary assessment**

Dulanjali Rodrigo[1,2], Vimukthi Moneravilla[2], Vijanaka Fernando[2,3], Pradeep Perera[4], Sasani Jayawardhana[2], Siyath Gunewardene[2], Hiran Jayaweera[2], Neranga Abeyasinghe[1, 2]*

1 Department of Chemistry, Faculty of Science, University of Colombo

2 Center for Instrument Development, Department of Physics, Faculty of Science, University of Colombo

3 Department of Physics, Faculty of Science, Open University of Sri Lanka

4 Zymergen Inc., Horton Street, Suite 105, Emeryville, CA, USA

*Correspondence: Neranga Abeyasinghe- neranga@chem.cmb.ac.lk

Detection of protein-based biomarkers are critical for assessing prognosis of proteinuric kidney diseases such as the Chronic Kidney Disease (CKD). Minor increases in urinary albumin has been discovered as one of the diagnostically sensitive indicators of CKD. Ability to detect such biomarkers at lower concentrations compared to existing diagnostic techniques is therefore important. Current detection schemes rely upon in-vitro biochemical assays, which lacks sensitivity and often requires elaborated sample preparation leading to higher cost per test. Alternatively, optical biosensors offer rapid, non-invasive and selective detection of biomolecules and in particular Raman spectroscopy-based methods are intensely researched. In this study size controlled spherical Au nanoparticles having diameters of ~ 40 $\pm$8 nm were synthesized using a chemical reduction route and were subsequently utilized as a surface-enhanced Raman scattering (SERS) substrate in order to achieve high sensitivity. Raman spectra of albumin, several constituent amino acids of proteins; L-phenylalanine, L-cysteine, L-tryptophan and SERS spectrum of L-phenylalanine indicate the preliminary study for SERS analysis on protein biomarkers. SERS measurements confirmed that the spectral contribution from L-phenylalanine will provide an effective route for detecting albumin using SERS.

Keywords: Raman, SERS, albumin, amino acids, Au nanoparticles

**A Hydrophobic Coating to Prevent Corrosion on Metal Surfaces**

Wijani Perera, Hasini R. Perera, K. M. Nalin de Silva, Rohini M. de Silva
Department of Chemistry, University of Colombo
Colombo, Sri Lanka

Metal corrosion has become one of the most serious and challenging problems in the world due to its severe impact on economic development and social stability. Adverse impacts of corrosion can be avoided by the application of proper corrosion prevention techniques. This study focused on developing a hydrophobic coating to prevent metal corrosion.

In this investigation, a hydrophobic surface with micro-nano hierarchical structures was fabricated by combining the phase separation process of polyvinyl chloride (PVC) with silica nanoparticles without introducing low surface energy substances. The developed coating has improved the hydrophobicity by achieving a maximum water contact angle of 143.9°. The SEM micrograph of the coating with the highest water contact angle endorses the uniform and rough morphology with a topography of hierarchical micro/nano binary rough structures. The strong FT-IR bands at 1110 $cm^{-1}$, 3409 $cm^{-1}$, and 650 $cm^{-1}$ confirm the successful incorporation of silica nanoparticles and PVC in the coating. The EIS and weight loss results indicated the success of the coating in preventing metal corrosion. The polarization curves illustrate much noble corrosion potential for the coated metal ($E_{corr}$ = -1.02 V) compared to the bare metal ($E_{corr}$ = -1.33 V) and a lower corrosion current density for the coated metal ($i_{corr}$ = 0.285 $mA/cm^2$) compared to the bare metal ($i_{corr}$ = 0.928 $mA/cm^2$). These results indicated a significant increment in the corrosion resistance of the metal substrate by applying this coating. Hence, the developed coating is a good choice for preventing metal corrosion.

Keywords: corrosion prevention, hydrophobic coating, phase separation process, polyvinyl chloride, silica nanoparticles

**Determination of quinazoline type alkaloid content in various parts of *Adathoda vasica* Nees. plant using high performance liquid chromatography**

W.M.V.M. Wijesooriya[1,2], T.M.S.G. Tennakoon[2], S. M. Vithanarachchi[1]

[2] Research and Development Centre, Link Natural Products (Pvt) Ltd, Dompe, Sri Lanka

[1]Department of Chemistry, Faculty of Science, University of Colombo, Colombo, Sri Lanka

*Adathoda vasica* Nees. is a valuable medicinal plant used in traditional medicine. It is widely used in many herbal medicinal preparations. The whole plant of *A. vasica* contains several biologically active chemical compounds. Among these compounds, quinazoline type alkaloid vasicine is the major biologically active chemical constituent present in *A.vasica*, especially in leaves, stem and root of the plant. Hence, this study is focused on isolation and quantification of vasicine content in different parts of the plant. *A. vasica* plant samples were collected from the Dambukanda estate of Link Natural Products (Pvt) Ltd, located at Dompe, Sri Lanka and authenticated. Samples were dried (50 °C), ground, and sieved. Vasicine was isolated from fresh leaves of *A. vasica* using Soxhlet extraction method. Methanolic extracts were refluxed in acidic medium (5% HCl) and aqueous layer was partitioned with chloroform. Concentrated chloroform extracts were purified by recrystallization with methanol (yield on dry basis = 0.35% w/w), and characterized by melting point, UV and IR spectroscopies. Purity of isolated compound was checked by thin layer chromatography and high-performance liquid chromatography (HPLC). Quantification of vasicine content in different parts of the plant was performed using HPLC. Alkaloid extracts of other plant parts were prepared following a similar method as for leaves. A calibration plot of standard vasicine was used to determine the vasicine content in extracts isolated from different plant parts. Percentages of vasicine found in leaves (n = 9), stems (n = 9) and roots (n = 9) were 0.32 %w/w, 0.15 %w/w, and 0.13 %w/w, respectively. Majority of vasicine was found to be in leaves compared to the other parts of the plant. Further analysis is required to study if there is a variation of vasicine content of *A. vasica* growing under different geographical and ecological conditions, and at different maturity stages.

Keywords: Vasicine, High performance liquid chromatography, Isolation, Alkaloid extracts, *Adathoda vasica* Nees.

**Isolation and purification of Graphene Quantum dots using electrochemical approach from Sri Lankan Vein Graphite**

Chamali Rajapaksha, Hasini Perera Rohini de Silva, Nalin de Silva

The Center for Advanced Materials and Devices (CAMD) Department of Chemistry, University of Colombo

Graphene Quantum Dots (GQDs), a new group of quantum dots, represent exciting properties that can be functional in many applications. In this work, the electrochemical preparation of graphene quantum dots was performed through two main steps which include electrochemical exfoliation to obtain exfoliated graphene (EG) followed by the modified Hummers method to synthesize graphene oxide (GO). Oxidation of exfoliated graphite followed by reduction results in reduced graphene. Various characterization techniques are used to characterize EG, GO, and GQDs.

During this study, an eco-friendly, electrochemical exfoliation method was used to convert Sri Lankan vein graphite into graphene sheets. Graphene powder obtained from the upper layer of the electrochemical exfoliation setup shows 3.439 Å d spacing while exhibiting 31% of crystallinity as determined via Brags's equation using the X-ray diffraction (XRD) technique. EG collected from the bottom layer was utilized to prepare GO via the modified Hummers method. This work led to the development of a novel method for preparing GQDs, which give off strong green luminescence, by electrochemical treatment of graphene oxide at room temperature with LiCl in propylene carbonate (PC) as the electrolyte. The images obtained through Transmission Electron Microscopy illustrated that as-produced GQDs are in the size range of 20- 30 nm and are 1−10 atomic layers thick. GQDs developed during this study are promising candidates for humidity sensors, chemical sensors, nano-electronic devices, and biomarkers.

Keywords: Electrochemical exfoliation, Graphene oxide, Graphene quantum dots

**Electro-spun beads of the Polyethylene oxide and Montmorillonite containing chloramphenicol for an ophthalmic drug delivery**

H.I.S. Maddumage, Umayangana Godakande, K.M.N. de Silva, Rohini M. de Silva

Center for Advanced Materials and Devices (CAMD),

Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka

Bacterial eye infections are the most common types of eye ailments that occur among humans. One reason for this occurrence is direct exposure of the anterior segment of the eyes to the external environment. Chloramphenicol (CAP) is an antibiotic that is widely recommended by physicians as a medication for severe bacterial eye inflammation. There are advantages and drawbacks when administrating CAP in the form of eye drops. In eye drops the ocular bioavailability of the drug is lower due to the elimination of the drug with tear turnover. Therefore, frequent administration of medication is needed. Hence, to achieve the sustained release of the drug, we thought of incorporating CAP into the Polyethylene Oxide (PEO) polymer and Sodium Montmorillonite (Na-MMT) clay matrix using the electrospraying technique. Montmorillonite has been investigated for decades for its structural properties and potential use in pharmaceuticals. In this work, a mixture of electro-sprayed beads and fiber combination was successfully made at a concentration of 2% by wt at a voltage of 14 kV and temperature of 18 ºC with a flow rate of 1 mL/h. To obtain homogeneous forms of beads and fibers with CAP, 3% MMT clay was introduced to the solution mixture. Synthesized electro-spun beads showed 2θ values at 20.23˚, 25.1˚, 29.42˚, 43.24˚, and 56.07˚ in XRD analysis confirming the presence of CAP. Bands at 2876 $cm^{-1}$, 1464 $cm^{-1}$, 1346 $cm^{-1}$ 1283 $cm^{-1}$ 1096 $cm^{-1}$ 951 $cm^{-1}$ 842 $cm^{-1}$ in the FT-IR spectrum further confirmed the presence of all ingredients in the developed polymer beads. Scanning electron and optical micrographs showed spherical and spindle-shaped forms, ranging from 1 to 10 µm. According to drug loading capacity results, CAP can be loaded into the MMT: PEO mixture with a loading capacity of 23.6%. The final product can be administrated onto the eye surface as an ocular insert.

Keywords: Sustained release, electrospraying technique, ocular inserts

**Zeolite/m*ontmorillonite* composite beads for the removal of calcium and magnesium**

A.K.D. Veromee Kalpana Wimalasiri [a,b], M. Shanika Fernando [a], D. P. Dissanayake [a], K. M. Nalin de Silva [a], W. Rohini M. de Silva [a]

[a]Centre for Advanced Materials and Devices (CAMD), Department of Chemistry, University of Colombo, Colombo 00300, Sri Lanka.

[b]Department of Biochemistry, Faculty of Medicine, University of Ruhuna, Galle, Sri Lanka.

Water hardness has become a very important parameter in the recent past due to its connectivity with chronic kidney diseases of unknown etiology (CKDu). Hence, many methods have been developed to remove calcium and magnesium from the storage water tanks. In this aspect, aluminosilicates have been found to be an excellent candidate due to the occurrence of a net negative charge on the surface of aluminosilicate. Therefore, in our study, we developed Zeolite/m*ontmorillonite (MMT)* composite beads using sodium aluminosilicate, and MMT to remove water hardness. The prepared composite was characterized using a scanning electron microscope (SEM), energy dispersive X-Ray analysis (EDX), and Fourier transform infrared spectroscopy (FT-IR). The morphological studies performed using the SEM show the presence of cubical-shaped zeolite particles other than the MMT-layered structures. FT-IR bands that appeared at 962 $cm^{-1}$, 1001 $cm^{-1}$, 1196 $cm^{-1}$ and 1104 $cm^{-1}$ corresponding to Si-O-Si and Si-O-Al bridge stretching vibrations confirmed the formation of the zeolite/MMT composite. The net proton surface charge density of the composite beads was measured by the surface titration method, and it showed 1.74 mol/g of proton surface charge density. Synthesized Zeolite/MMT beads showed more than 90% removal of water hardness for a very broad concentration range from 15 ppm to 1500 ppm. Hence it can be concluded that zeolite/MMT is a promising material for the removal of water hardness.

Keywords: Zeolite, MMT, Calcium, Magnesium, Water hardness

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**Dosimetric Comparison of Intensity Modulated Radiation Therapy and Volumetric Modulated Arc Therapy for Treatments of Thyroid Cancer**

B.M.A.T Banneheka[*], J. Jeyasugithan[*], K.V. A. W Kumara[**]

[*]Department of Nuclear Science, University of Colombo, Colombo, Sri Lanka,

[**]Department of Physics, National Cancer Institute, Maharagama, Sri Lanka

This study aims to compare volumetric modulated arc therapy (VMAT) treatment techniques against intensity modulated radiation therapy (IMRT). Planning target volume coverage, doses to the organs at risk, dose to the normal tissues, the number of monitor units (MUs) and the gamma passing rate at the endpoint of the treatment were considered for the comparison. CT data of twenty thyroid cancer patients already treated via Elekta synergy linear accelerator at the National Cancer Institute Sri Lanka in 2021 were used. For comparison, two VMAT plans with one arc and double arc and two IMRT plans with seven and nine fields were used for each patient. 6MV photon energy beams with Monte Carlo algorithm used for planning in Elekta Monaco TPS. The clinically estimated PTV coverage was achieved from all four plans at the same constraints, with superior average coverage of PTV from the IMRT nine fields plan. The better homogeneity, conformity indexes and the lowest maximum doses at PTV were recorded in the IMRT plan with nine beams. Spinal code and parotid glands were spared better in the IMRT plan with nine fields than in other plans. Regarding the number of monitor units, both VMAT plans were minimal compared to the other two modalities. Considering the low dose to the normal tissues, 50% of the prescribed dose received to the patient was minimal at the IMRT plan with nine fields The gamma passing rate of the patient-specific quality assurance VMAT double arc plans passed better than IMRT plans. VMAT with double arc had the highest normal tissue irradiation compared to other plans. Considering all the results of the dosimetric parameters, such as PTV coverage and sparing OAR considered here, the IMRT plan with nine beams was better than other plans. According to the MU calculation, the gamma passing rate index VMAT with a double arc plan was suitable for thyroid cancer.

Keywords: volumetric modulated arc therapy (VMAT), intensity modulated radiation therapy (IMRT), Dosimetric Comparison

**Establishment of Institutional Diagnostic Reference Levels (DRLs) for Computed Tomography in National Hospital of Sri Lanka**

K. S. Hettiarachchi[1,2], Dr. J. Jeyasugiththan[1], Aruna S. Pallewatte[2]
[1]Department of Nuclear Science, University of Colombo, Colombo, Sri Lanka
[2]Department of Radiology, National Hospital of Sri Lanka, Colombo, Sri Lanka

The institutional DRLs for the National Hospital of Sri Lanka were established by considering the most frequent computed tomography (CT) examination performed by three CT units in the Department of Radiology. CT dose volume index (CTDIvol) and dose–length product (DLP) were collected from 1200 patients who have faced 30 different types of frequent CT examinations related to nine anatomical regions. The facility reference levels (FRLs) were separately initiated per each CT unit, and the institutional DRLs were established. The established DRLs based on CTDI (mGy) and DLP (mGy.cm) are 10.80 mGy/486.86 mGy.cm for the Non-contrast (NC) abdomen, 7.25 mGy/1061.25 mGy.cm for NC/duel phase abdomen, 8.53 mGy/1358 mGy.cm for NC/triple phase abdomen, 11.73 mGy/1566.3 mGy.cm for abdomen prone, 10.58 mGy/1712.05 mGy.cm for Chest to pelvis NC/CE dual phase, 9.08 mGy/1721 mGy.cm for NC/CE(Contrast Enhancement) triple phase, 6.66 mGy/398.8 mGy.cm NC HRCT chest Inspiration/Expiration, 6.68 mGy/354 mGy.cm for Thoracic HRCT, 2.5 mGy/103.60 mGy.cm for NC chest, 8.20 mGy/347.40 mGy.cm CE chest, 11.30 mGy/283.80 mGy.cm for Pulmonary CTA, 70.90 mGy/1229.60 mGy.cm for Brain HCT, 56.12 mGy/794.00 mGy.cm for Brain(Head), 7.38 mGy/193.00 mGy.cm for Pelvis, 15.52 mGy/402.00 mGy.cm for Lumbar spine, 15.75 mGy/397.50 mGy.cm for Cervical spine, 8.44 mGy/219.50 mGy.cm for Spine routine, 8.72 mGy/165.50 mGy.cm for Extremities and 6.53 mGy/2084.80 mGy.cm for Peripheral angiography. The established institutional DRLs were compared with the NDRL of Sri Lanka as well as the NDRLs of the countries such as Australia, Japan, Turkey, USA, UK, Greece, Canada, Ireland, Indonesia, Italy and European commission reference levels. It was concluded that the CTDI and DLP parameters obtained for Brain HCT, NC/CE chest and NC abdomen studies were less than that for the National DRLs of Sri Lanka. The effective comparison of DRLs with the international benchmark confirmed that the initiated DRLs are under the recommended dose limits. Finally, the patient's data in one week are cross-checked with the established DRLs to ensure that the institution uses the optimal CT procedures by avoiding unnecessary high doses being delivered to patients, resulting in diagnosable image quality.

Keywords: Computed Tomography, Diagnostic Reference Level, Dose Length Product

**Wireless, Portable, Intelligent and Real Time Cardiac Arrhythmia and Patients' Vital Signs Monitoring System**

K.A.Hiruni Madusha Dasanayaka[1], J.Jeyasugithan[1], Susantha Herath[2]

Department of Nuclear Science, University of Colombo, Colombo, Sri Lanka

Division of Biomedical Engineering Services, Ministry of Health, Colombo, Sri Lanka

This study describes the development of a wireless, portable, intelligent, and real-time cardiac arrhythmia and patients' vital signs monitoring system that could sense the irregular heartbeat rate and how it has been related to other health parameters. Monitoring of other health parameters such as saturation ($SPO_2$), temperature, etc. is also considered in this study. This idea arose as a preventative measure to reduce the unexpected fatality rates caused by abnormal cardiac rhythm. The failure to observe this sudden fluctuation in the ECG and heart rate poses a grave risk to human life. The proposed technology would be linked to the mobile phones of caretakers or physicians. It will display the heart patient's state in real-time. The primary benefit of the developed technology in diagnosis and treatment via telecommunication (GSM technology) method was the ability to monitor cardiac arrhythmia parameters in real-time, even from a long distance, utilizing wireless technology. The network issue and the inaccessibility of the ECG waveform are significant drawbacks of this type of device, as the waveform can provide exact information on the state of the heart rhythm. Furthermore, this system's scalability is enhanced by adding many additional health monitoring sensors, resulting in a more precise arrhythmia output. The complete system has been tested with an ECG simulator for all its functions. The whole system can be upgraded by designing a machine learning algorithm so that it can read and analyze the ECG waveform.

Keywords: Wireless, Portable, Intelligent, Real-time, Cardiac arrhythmias, Vital signs, Heart rhythm, GSM technology

# Noise, Dose and Pitch Relationship in Non-Cardiac Multi-Detector Row Computed Tomography (MDCT) Scanner

I.Mayuran[1,2], J. Jeyasugiththan[1], D.M. Satharasinghe[1]

[1]Department of Nuclear Science, University of Colombo, Sri Lanka

[2]Department of Biomedical engineering, Ninewells Hospital, Narahenpita

Among diagnostic radiological procedures, a CT study should use relatively higher exposure while still meeting the image quality needs of the exam. Radiation professionals can adjust the patient's dose by manipulating the exposure factors such as kVp, mAs and Pitch. However, the gap in knowledge about dose parameters and equipment's internal software adjustments would not produce the results expected. This study aims to identify the noise, dose, and pitch relationship of multi-detector row CT scanners in both manual and auto mode dose selection criteria. The dependency of noise and dose on tube mAs was investigated by performing the measurements on Polymethyl methacrylate (PMMA) body phantom with tube currents from 10 mA to 260 mA at 25mA intervals. The dependence on the Pitch was investigated by running the same scan with different pitch values of 0.984, 1.375, and 1.531. All above-selected parameters were set manually, and scanned was performed in manual mode. The results prove that the tube mAs should be increased by four times for a particular pitch value to reduce the image noise by half. Also, the absorbed dose increases linearly with mAs. With increasing Pitch, the noise tends to increase, and the dose tends to decrease. However, with an auto preset mode, increasing the Pitch will not reduce the dose as expected, as the equipment automatically increases the tube current proportionately to the Pitch, as modern multi-detector row CT scanners are accompanied by noise and dose optimization algorithms in their software resulting in the pitch variation not affecting image noise and dose. Still, the operators can take control by utilizing the manual tube parameters adjustments, resulting in the desired outcome as in the literature. However, the operator should know the noise and dose behavior of the particular scanner.

Keywords: CT Dose, CT Noise, Pitch relationship, MDCT Scanner, noise index

**A fluorescence-based chemometric method for distinguishing black tea varieties of Sri Lanka**

Amal Pattividana[1], Siyath Gunewardene[1], MK Jayananda[1], Hiran Jayaweera[1*]

[1]Center for Instrument Development, Department of Physics, University of Colombo

[*]Correspondence: hiran@phys.cmb.ac.lk

Sri Lanka is the world's largest orthodox black tea producer and exporter. There are seven tea growing agro-climatic districts yielding produce having distinct taste, colour, aroma, and appearance. Authentication of produce requires Geographical Indication certification (GIC). Current methods for GIC relies predominantly on sensory tests by highly trained personnel limiting its use beyond the source of the supply chain. Tea adulteration persistently harms the brand of pure 'Ceylon Tea', while abuse and misinterpretation of GICs are often reported. In an effort to introduce an objective analytical method able to distinguish black tea varieties of Sri Lanka, a fluorescence-based chemometric method was developed. Tea samples obtained from Nuwara Eliya, Ruhuna, Matale, Dimbula, and Uva agro-climatic districts were brewed for five minutes in boiling water, and the extracts were used for subsequent analysis. Fluorescence spectra were collected by exciting the samples by a 532 nm laser, which also minimized optical bleaching. The spectra were compressed using singular value decomposition and the extracted features were clustered using the Euclidean hierarchical clustering algorithm. It was found that all five agro-climatic data sets were distinctly clustered. The cluster validity index Silhouette coefficient was found to be 0.51. The analytical method can be easily extended to a portable device.

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**Fabrication and characterization of flexible interdigitated electrodes using an office inkjet printer**

RM Manamendra, DL Weerawarne*

Department of Physics, University of Colombo, Colombo 03, Sri Lanka

*dweerawa@phys.cmb.ac.lk

A comb-type interdigitated electrode is the main building block of a flexible chemi-resistive sensor that has the potential to transform the tremendous developments in sensing materials into next-generation flexible sensors. Fabricating technologies for flexible interdigitated electrodes are highly complex, expensive, and need specialized instruments such as dedicated inkjet printers specifically designed for printing electronics. In this regard, assessing the potential of an economically viable regular office inkjet printer to yield flexible conductive interdigitated electrodes needs further exploration. Such systematic assessments and resulting technological know-how would accelerate the development of materials for chemi-resistive sensing, which at this stage suffers from the lack of access to instrumentation to fabricate cost-effective interdigitated electrode platforms. In this study, we evaluate the capabilities of an office inkjet printer to fabricate a flexible conducting interdigitated electrode by depositing a conductive metal nanoparticle ink on a flexible polymer substrate. A coupon with test patterns of different dimensions, rotations, and line intensities was designed and printed on a PET substrate with a commercially available silver nanoparticle ink via a regular office inkjet printer. The printed coupons were imaged using a digital microscope and the images were analyzed to identify critical design parameters including line width, line spacing, and edge quality/roughness. In the current study, we observed that 200 µm wide lines with 200 µm spacing could be printed with greater accuracy and repeatability using a line intensity of 100%. Lines narrower than 200 µm could also be printed provided that the line width was an integer multiple of 30 µm. Lines wider than 200 µm printed with 100%-line intensity had better edge quality than narrower ones. Lines printed across the width of the paper (0° rotation) and horizontal rotation of about 0°-30° and 150°-180° produced line widths close to the designed widths.

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**Study the connection between orbital and superorbital flux of the LS I +61° 303 object**

K. L. Isuru Gunawardhana[1], K.P.S.C. Jayaratne[1*], A.U. Abeysekara[2]

[1]Astronomy and Space Science Unit, Department of Physics, University of Colombo, Sri Lanka

[2]Department of Physics and Astronomy, University of Utah, USA

*chandana@phys.cmb.ac.lk

The LS I +61° 303 is a binary system located 2 kpc away from the Earth that consists of a giant B0Ve Star and a Compact Object. The nature of the compact object remained unknown, and the two possibilities are a neutron star or a black hole. The variable nature of LS I +61° 303 in Radio wavelengths was discovered in 1978 and the energetic outbursts from LS I +61° 303 are visible in X-Rays and Gamma-Rays.

The GeV (0.1 GeV – 350 GeV) Gamma-Ray flux of the LS I +61° 303 has been studied as a function of Orbital and Superorbital flux using a two-dimensional Matrix (100 Bins). Here, we used the GeV Gamma-rays observed by the Fermi-LAT Space Telescope between year 2013 and 2018. Fermi-LAT is the paramount scientific instrument on the Fermi Gamma-ray Space Telescope.

The Compact object of LS I +61° 303 is moving in an eccentric orbit interacts with the Be star circumstellar disk, then produces strong orbital modulation in the emission across the electromagnetic spectrum: Radio, Optical, X-Rays and Gamma-Rays. The Orbital and Superorbital periods of the compact object of LS I +61° 303 are equal to (26.496 ± 0.0028) days and (1667 ± 8) days respectively.

Still, we don't know about the Superorbital trajectory of the Compact object of LS I +61° 303 and if it is a circle (eccentricity = 1) then the superorbital flux cannot vary throughout the Surperorbit. According to the results obtained in this study, we observed that it has superorbital Gamma-Ray flux variation throughout the Surperorbit. So, the Superorbtial trajectory of the Compact object of LS I +61° 303 can not be a circle. The results obtained in this study suggests that the compact object have a trajectory with eccentricity less than one, an ellipse. Further more the observations suggest that the main axis of the elliptical trajectory is rotating with time.

Keywords: binary system, flux, Gamma-Rays, neutron star, black hole, orbital, superorbital

# The Dynamicity of Vegetation Distribution against the Land Surface Temperature in the Colombo Metropolitan Area from 1988-2019

Saumya Chathuranga[1], K. P. S. C. Jayaratne[1*]

[1]Astronomy and Space Science Unit, Department of Physics, University of Colombo, Sri Lanka.

[*]chandana@phys.cmb.ac.lk

The Colombo Metropolitan Area (CMA) is the highest population growth with the most economic and industrial city in Sri Lanka. In such areas, vegetation cover shifts drastically with man-made constructions over time. This research focuses on the time series evaluation of vegetation distribution and correlation to Land Surface Temperature (LST) via Landsat images. The 6 satellite images which were taken in the dry season of CMA were selected from 1988 – 2019. Based on pre-determined Normalized Difference Vegetation Index (NDVI) ranges, there were 6 types of vegetation covers recognized as water bodies, built-up areas, barren lands, shrub and grassland, spares vegetation, and dense vegetation in maps. The LSTs had statistically significant ($p < 0.001$) and negatively correlated with NDVIs in each year. The mean of LST was gradually increasing over time. The coastal line is a well-known highly populated and undergoing construction zone. Monitoring the highest LST pockets along with the coastal belt, the contribution of industrialization was a significant fact to the rise of surface temperature. Moreover, the highest LSTs were located in built-up areas and lower LSTs were noticeable in water bodies as well as densely vegetated areas. The densely vegetated area decreased by 10.87% from 6.11% and built-ups increased by 13.77% from 19.82% while LST mean values can be present as 24.2℃ to 34.3℃. These actions lead to microclimatic phenomena like heat waves and heat islands that cause to extreme health difficulties and more adverse. Hence, further studies need to be done to predict microclimatic scenarios to prevent such adverse in CMA.

Keywords: LST, NDVI, Dense Vegetation, Built-up Areas, Microclimates

**Sensitivity Analysis of Simulating Severe Weather Events over Sri Lanka using WRF**

T.D. Gamage [1,2]* and D.U.J. Sonnadara[2]

[1]Department of Electrical and information Engineering, University of Ruhuna, Sri Lanka

[2]Department of Physics, University of Colombo, Sri Lanka

* tharindu@eie.ruh.ac.lk

In this research, the sensitivity of Weather Research and Forecasting (WRF) model was analyzed by simulating the rainfall connected to reported severe weather events. The simulation results are highly sensitive to the underlying physics schemes in the WRF model. The main aim of this research work is to experiment the sensitivity of microphysics (MP) and cumulus (CU) physics schemes in simulating the rainfall. Thirty such combinations are evaluated by comparing the pattern correlations in rainfall data obtained using Global Precipitation Measurement (GPM). The calculations were carried out by simulating the daily rainfall over the selected domain for a period of four days.

According to the results, the combinations with the "WRF Double–moment 6" MP scheme has simulated the rainfall well compared to other schemes. The combinations with "New Tiedtke" CU scheme have only simulated the "Day 1" rainfall well. "Kain–Fritsch" and "New Simplified Arakawa–Schubert" CU schemes have simulated the rainfall of "Day 2" and "Day 3" well compared to other schemes. When the MP scheme and CU schemes are considered in combination "WRF Double–moment 6" MP scheme and the "New Simplified Arakawa–Schubert" CU scheme produced the best results. Since Global Forecast System (GFS) data is used with the lateral boundary conditions, it is concluded that the same physics options can be used to forecast severe weather events over Sri Lanka.

Keywords: WRF, extreme events, heavy rainfall, Sri Lanka

**Radiofrequency pollution levels in Colombo city area due to cellular networks and Wi-Fi sources**

S.A.T.U.W.K. Suraweera, K.P.S.C Jayaratne*
Astronomy and Space Science Unit, Department of Physics, University of Colombo, Sri Lanka

Technology is a key fact to develop a country, requiring improvements of many fields. Cellular communication and other wireless communication systems are crucial in this scenario. But most of these wireless communication systems use radiofrequency (RF) electromagnetic radiation which could be harmful when over exposed. International organizations such as ICNIRP (International Commission on Non-Ionizing Radiation Protection) and FCC (Federal Communication Commission) have published limitations for these wireless networks based on thermal effects induced by this RF radiation. Scientists have, however, conducted studies on non-thermal effects such long-term, cumulative, synergistic, and biological consequences as science has advanced. Due to these effects of RF radiation, it is convenient to measure background RF levels due to most abundant wireless networks frequently to make sure the safety of the general public. This study is designed to monitor and analyse background plane wave equivalent power density levels by GSM900, GSM1800, UMTS, LTE2.6 and WLan2.4 frequency bands and data were collected from 67 locations throughout the Colombo city area at the daytime. SPECTRAN HF6065 spectrum analyser was used to measure the plane wave equivalent power density with an accuracy of $\pm 0.01\ \mu W\ m^{-2}$ . All the data were collected in January 2022. Based on the results of the study the calculated mean plane wave equivalent power density values were 223.96 $\mu W\ m^{-2}$ (GSM900), 752.56 $\mu W\ m^{-2}$ (GSM1800), 478.92 $\mu W\ m^{-2}$ (UMTS), 180.28 $\mu W\ m^{-2}$ (LTE2.6) and 2.85 $\mu W\ m^{-2}$ (WLan2.4). Among the collected data GSM1800 cellular frequency band shows maximum equivalent plane wave power density level of 10220.00 $\mu W\ m^{-2}$ at a location on Galle road, Kollupitiya (Lat:6.909918, Long:79.85006) and this was corresponds to 0.113% (for f=1800 MHz, Maximum permissible exposure level 9 $W\ m^{-2}$). Authors found comparatively elevated RF levels in Bambalapitiya and Kollupitiya areas when comparing with the rest of Colombo, but all the measured values are well below the maximum permissible levels published based on thermal effects. However, more low altitude antenna structures found in this area which may lead to a greater risk for the people who exposed daily.

Keywords: Radiofrequency pollution, Non-Ionizing radiation protection, cellular networks
*chandana@phys.cmb.ac.lk

**High Energy Gamma-ray fluxes in MeV and GeV regions of six BL-lac Objects during the period of 2008 – 2012**

L.P.M.I. Randu, K.P.S.C. Jayaratne

Astronomy and Space Science Unit, Department of Physics, University of Colombo, Sri Lanka

The activity of high-energy flares of active galactic nuclei (AGN) is one of the most exciting areas in modern astrophysics. A blazar is an AGN in the line of sight of the earth. Blazars have large spectral energy distribution (SED) caused by four non-thermal processes. These non-thermal processes produce two peaks in the SED. The low energy peak ranges from radio to UV (ultraviolet), sometimes up to soft X-rays, and the high energy peak ranges from X-rays to Gamma rays, sometimes up to TeV energy range. The process called synchrotron radiation is the cause of the low energy peak of SED, and radiation from Inverse Compton (IC) effect is the cause of the high energy peak of SED. Usually, a blazar has two relativistic jets opposite each other. The charged particles of these jets are moving at velocities almost equal to the speed of light. That is why they are known as relativistic jets. BL-Lacerate objects are one of the most commonly used types of blazars in high-energy astrophysics. From 2008 to 2012, a group of BL Lac objects all over the universe were activated. The analysis has been carried out for fifteen years, but the activity of all BL lac objects has been found from 2008 to 2012. The activity pattern of these blazars is also similar in morphology. This observation opens new doors to identify the reasons for the activity of blazars, such as Lorentz Invariant Violation (LIV) and the involvement of dark matter.

Keywords**:** Gamma rays, BL-lac objects, active galactic nuclei

* chandana@phys.cmb.ac.lk

**Development of electrically conductive graphite thin films on flexible polymer substrates**

GC Wickramasinghe, DL Weerawarne, DR Jayasundara*

Department of Physics, University of Colombo, Colombo 03, Sri Lanka

*dilushanj@phys.cmb.ac.lk

Recently graphite/graphene derived inks have received significant attention for fabricating electronics on flexible substrates such as polyimide (PI) and polyethylene terephthalate (PET). Even though graphite has high electrical conductivity, and flexibility in graphene form, the main challenge is the production of adhesive graphite/graphene inks on flexible substrates without modification of inherent chemical and physical properties. In the current study, the adhesive graphite thin films on PI and PET sheets were obtained using a graphite ink formulated by mixing purified Sri Lankan vein-type graphite (99.9% Carbon) with deionized water. The graphite ink was deposited on precleaned flexible substrates by doctor-blading at ambient temperature. The initial graphite coat on the flexible substrates were cured in an oven to controllably evaporate adsorbed water. Then loosely bound graphite particles were removed using mechanical methods to obtain a stable coating of graphite on above flexible substrates with improved adhesion properties. The initial and final graphite coats were characterized for electrical conductivity and adhesion by measuring sheet resistance using four-point probe coupled to a source meter and crosshatch testing method according to ASTM D3359-78 standard respectively on PI and PET substrates. Preliminary results indicate lower sheet resistance and improved ink adhesion on PI compared to that reported in literature for the same substrate. However, on PET large variations in both sheet resistances and adhesion were observed that need further investigation. The results therefore are indicative of incremental development towards a cost-effective and easily scalable process to synthesize conducive graphite ink for printing flexible electronics.

"This work was carried out with the aid of a grant from UNESCO-TWAS and the Swedish International Development Cooperation Agency (Sida). The views expressed herein do not necessarily represent those of UNESCO-TWAS, Sida or its Board of Governors."

**Assessment of a Raman spectroscopy based chemometrics method for differentiating coconut oil varieties**

Vimukthi Moneravilla[1], Sasani Jayawardhana[1], Pradeep Perera[2], Hiran Jayaweera[1], Siyath Gunewardene[1,*]

[1] Center for Instrument Development, Department of Physics, Faculty of Science, University of Colombo

[2] Zymergen Inc., Horton Street, Suite 105, Emeryville, CA, USA

*Correspondence: siyath.gunewardene@phys.cmb.ac.lk

Due to high sensitivity, selectivity and non-destructive detection of analytes, Raman spectroscopy based chemometrics have attracted much interest for in-situ food quality testing. This study assesses the feasibility of utilizing Raman spectroscopy combined with principal component analysis (PCA) to differentiate selected varieties of domestically available coconut oils. A clustering chart was developed based on the Gaussian mixture clustering. The clustering chart is able to clearly distinguish domestically extracted virgin coconut oil from the market available coconut oils. Furthermore, market-available virgin coconut oils were also distinguishable from both regular coconut oils produced from local mills and the domestically extracted virgin coconut oil.

Keywords**:** Raman spectroscopy, Chemometrics, Coconut oil, Food quality testing

**Reciprocal cost allocation model for service firms**

M H K M Hameem

Department of Mathematics, University of Colombo, Srilanka

hameem@maths.cmb.ac.lk

The primary objective of this study is to establish an allocation ratio for the total cost of service firm in order to ascertain the costs that ought to be allocated among its service departments when reciprocal services take place within those departments. It is assumed that all service departments offer services to at least two other service departments. This model is entirely governed by the following cost allocation matrix:

$A = (\mu_{ij})_{n\times n}$, $0 \leq \mu_{ij} < 1$ where $n$ is the number of departments and $\mu_{ij}$ is the proportion of service department $j$ overheads assigned to service department $i$. Matrix $A$ has each column sum equal to one. Hence the transpose of $A$ is a stochastic matrix. The transpose of most service cost allocation matrices are positive column stochastic matrices or a direct sum of positive column stochastic matrices. Here the service departments are categorised into two types: Type I departments that charge outsiders for their services, they provide reciprocal services within type I departments, and may receive services from type II departments. Type II departments do not sell their services to outsiders but offer services to type I departments. Type II departments are the support services in a profit-oriented firm or departments of a charity firm. Allocation ratios for firms with "only type I departments" and those with "type I and type II departments" are discussed as separate cases. As a main result, the allocation ratio in both cases are proved to be the fixed point of $A^T$. To establish this proof the following result has been proved first; "If $M$ is a positive-column stochastic matrix then $\lim_{n\to\infty} M^n = E$, where each row of $E$ is the same probability vector $\underline{e}$. Furthermore, $EM = E$ and $\underline{e}$ is a unique fixed point of $M$". The second result is when $A^T = A_1^T \oplus A_2^T \oplus \cdots \oplus A_k^T$, a direct sum of $k$ positive-column stochastic matrices. Here, there are $k$ independent groups of service departments with $k$ different total costs. The allocation ratio of each group is found as in the main result above.

Keywords: allocation matrix, allocation ratio, stochastic, positive-column, direct sum.

**Modeling and forecasting the unemployment rate in Sri Lanka with missing values imputation**

N.N Ranasinghe, R.A.B Abeygunawardana

Department of Statistics, Faculty of Science, University of Colombo, Sri Lanka

Unemployment rate is a key measurement in labor analysis because it indicates both economic status and social well-being. This study is based on unemployment rate data published by the Department of Census and Statistics from the 1st quarter of 2004 to the 2nd quarter of 2021. Unemployment rate data are not available for eight quarters in this period. The first part of this study is missing value imputation. Missing values imputation was done using nine imputation algorithms in the package "*imputeTS*" in software R. A time series devoid of missing values was selected for the simulation study to compare the missing value imputation algorithms. Missing values were randomly generated using Bernoulli distribution under four missing rates with thirty random seeds. Error calculation was done using imputed values and actual values. Two error metrics of mean root square error (MRSE) and mean absolute percentage error (MAPE), were used to measure the effectiveness of the imputation algorithms. Considering patterns of MAPE and MRSE values in error metrics, linear weighted moving average method was selected as the best imputation algorithm with minimum errors. The data series was divided into two. Accordingly, the first 66 data points were categorised as the training set and the remaining 4 were categorised as the test set. Trend, seasonal and random components of training data were identified using the *"decompose()"* function in R software. Forecasting was done using Holt winter's and ARIMA methods. Optimum Holt Winter's model was fitted using the function "*hw()"* in the library "*forecast*". Different order ARIMA(p,d,q) models were fitted using the function "*arima()*'' and "*auto.arima ()*". Best ARIMA model was selected considering the minimum AIC value and significance of coefficients using the function "*coeftest()*" in the library "*lmtest*". The accuracy of forecasted values was measured using the test data and forecasted values from both models. By comparing the AIC values and MAPE and RMSE values of fitted values, ARIMA (0,1,0) without a drift model (Random walk model) was selected as the best model. It can be predicted that the unemployment rate will remain at 5.4% in the last quarter of 2022.

Keywords: Unemployment rate, Imputation.

# A Comparison of ARIMA Time Series Model and Machine Learning LSTM Model to Forecast Paddy Production in Sri Lanka

I.B.I. Sandaruwani, R.A.B. Abeygunawardana

Faculty of Science, University of Colombo, Colombo, Sri Lanka

Forecasting time series data has been an important subject in agriculture related studies in recent times. The Autoregressive Integrated Moving Average (ARIMA) family of models are one of the most popular classical approaches for univariate time series forecasting. But with the recent development of more sophisticated machine learning algorithms, Long Short-Term Memory (LSTM) modeling approach has garnered a lot of interest in the research sector due to its extremely accurate forecasting outcome characteristics. For the sake of country planning, it is necessary to forecast paddy production, and rice import policies should be based on such forecasts. Especially considering Sri Lanka's current economic crisis, the prices of imported basic food items are high, and spending on the rice industry has been steadily rising mostly because of inorganic fertilizers, agro-chemical and fuel shortage. Therefore, having a very accurate forecast on the production of main food in the country for importing requirements is much significant at this moment to ensure food security. The objective of the study was to identify the best model from ARIMA modelling approach and LSTM modelling approach for forecasting annual paddy production of Sri Lanka. For this study annual paddy production data of Sri Lanka from 1952 to 2021 were used. Based on the RMSE, MAE, and MAPE values, the results demonstrated that the selected LSTM model's estimated error is extremely small compared to the best selected ARIMA (2,1,1) model. Hence LSTM model outperforms for forecasting the paddy production of Sri Lanka compared to ARIMA (2,1,1) model. The forecasts for paddy production from 2022 to 2024 were 4.92, 4.89 and 5.34 million Mt respectively according to preferred LSTM model. This LSTM model can be used by the researchers to forecast Sri Lanka's annual paddy production, and it should be continuously updated with new data.

Keywords: Time series, Forecasting, ARIMA, LSTM, Paddy production

**Effect of *Aspergillus japonicus* based phosphate biofertilizer formulation on soil phosphorous availability and crop growth of Chilli (*Capsicum annum* L.)**

W.A.G.A.B. Chandrasena[1], C.M.Nanayakkara[1], H.N.Sumanasena[2], H.A.N.M. Waidyathilaka[1], R. K. Maddumage[1]

[1]Department of plant Sciences, University of Colombo, Sri Lanka

[2] School of Agriculture and Environment, Massey University, New Zealand

*Aspergillus japonicus* has been identified as an effective P solubilizer during early experiments and hence was employed in the development of a low-cost environment friendly carrier based biofertilizer formulation. Fifteen carrier material combinations were tested using Eppawala Rock Phosphate (ERP®), talc, soil, rice straw, coir dust, maize and rice husk and the shelf life was determined by dilution and plating, for six months. The highest shelf life was shown by the formulation contained ERP® and 10% rice straw (B9), recording $5.2 \times 10^7 \pm 4 \times 10^6$ cfu/g of material followed by B8 containing ERP® alone ($2.3 \times 10^7 \pm 3 \times 10^6$ CFU/g) and by B1 containing rice straw + maize at a ratio of 2:1 ($7.8 \times 10^6 \pm 4 \times 10^5$ CFU/g). Hence B9 formulation was selected to test the effectiveness in a pot experiment using chilli as the indicator crop. Completely Randomized Design (CRD) was employed with six treatments and four replicates. Each replicate pot contained two plants. Potting mixture characteristics were: 1.82% total nitrogen, 400.5 mg/kg available phosphorous (Olsen), 2790.0 mg/kg exchangeable potassium, 2.11% organic matter and a soil pH of 7.06. The treatments employed were bio fertilizer formulation- B9 (T1), recommended $P_2O_5$ 100% quantitatively replaced by ERP® (T2), Triple Super Phosphate (TSP) (T3), zero P fertilizer (T4), no fertilizer (T5) and a commercial chilli fertilizer (T6). Urea and muriate of potash were applied as per the Department of Agriculture (DoA) recommendation to all the treatments except for T5 and T6. ANOVA indicated no significant treatment effect on growth parameters: plant shoot height, number of leaves, tap root length, shoot dry weight, root dry weight and relative chlorophyll content. As per the repeated measures analysis, available soil P content was higher in T1 (331.0±1.0 mg/kg), than its non-inoculated counterpart, T2(328.0±1.0 mg/kg) and shoot P content followed the same trend recording 6.27±0.09 mg/kg and 6.16±0.02 mg/kg for T1 and T2, respectively. Further, formulation B9 successfully established the biofertilizer in soil recording $10^3$ CFU/g soil after $4^{th}$ month of application till the end of the experimental period. Even though the yield fresh and dry weights were significantly different among treatments, the effect of biofertilizer treatment and fertilizer recommendation was similar. Therefore, the application of biofertilizer can replace TSP application by 100 % with a 19.2 % dry yield loss, which was not statistically significant. Hence, the developed biofertilizer formulation showed a promise in replacing TSP application successfully in chilli cultivation and warrants an extension of applicationfor other short-term crops as well.

Keywords: *Aspergillusjaponicus*, Biofertilizer, Chilli, Soil available phosphates

Financial assistance given by the University of Colombo is greatly acknowledged.

**Using *Aspergillus japonicus* to manage soil phosphorus in pepper cultivation**

W.A.G.A.B. Chandrasena[1], C.M.Nanayakkara[1], H.N.Sumanasena[2], E.S. Karunarathna[1]
[1]Department of plant Sciences, University of Colombo, Sri Lanka
[2] School of Agriculture and Environment, Massey University, New Zealand

*Aspergillus* spp. have been identified as potential soil phosphate solubilizers. In a previous study, *Aspergillus japonicus* applied with 50% of ERP® showed the potential to be used as a phosphorus biofertilizer for perennial crops such as pepper and hence it was aimed to investigate the utilization of *A. japonicus* to manage soil phosphorus (P) by increasing the solubility of ERP® in pepper field cultivation.The experiment was conducted at Kennapalassa, Hasalaka (7.3780860º N, 80.9497440º E). Randomized Complete Block Design (RCBD), with nine treatments in each of the three blocks was employed. A total of 27 plots accommodated six plants per plot. Mass production of the P biofertilizer employed rice straw and maize at 2:1 (w/w) ratio. Inoculum was applied at the rate of 75 g of inoculum per pit. The treatments were: Inoculum in carrier material (T1), Inoculum in carrier material + Eppawala rock phosphate (ERP®) Recommendation (T2), Inoculum in carrier material + 50% of ERP® Recommendation (T3), Carrier material (T4), Carrier material + ERP® Recommendation (T5), Carrier material + 50% of ERP® Recommendation (T6), No phosphorus (T7), ERP® Recommendation (T8) and 50% of ERP® Recommendation (T9). Urea and muriate of potash were added as per the recommendation of Department of Export Agriculture (DEA). ERP and inoculum was applied as a basal application and thereafter N, P, and K fertilizers were added once in six months while inoculum was added after two months of fertilizer application.Field preparation, management of the field and yield harvesting was done as per DEA recommendations. Soil samples were collected once in three months and analyzed for soil available P using Olsen method (1965) for extraction and Murphy and Riley method (1962) for the colour development. No significant difference was observed among treatments ($P \geq 0.05$) at any sampling point. In general, the available P were in the range of 1.3 to 4.59 mg/ kg. At all sampling times except month 9, the highest soil P was observed in the treatments with recommended levels of ERP® (T2, T5 and T8). This was supported by the significant difference among treatments ($P \leq 0.05$) reported by repeated measures analysis. Accordingly, the mean soil P was significantly higher in T2 (3.69±0.21 mg/kg), which contained the inoculum + recommended ERP application evidencing the solubilization effect of the inoculum. This was followed by T5 (3.38±0.21 mg/kg), which contained Carrier material + ERP® Recommendation (T5). Further, the available soil P of the treatments with the inoculum was higher than their counterparts with no inoculum. This clearly shows the ability of the inoculum to release adequate amounts of available P to the rhizosphere from the general P pool.Therefore, *A. japonicus* has a potential to be used as a biofertilizer in pepper cultivation.

Keywords: *Aspergillus japonicus*, Biofertilizer, Pepper, Soil available phosphates
Financial assistance given by the University of Colombo is greatly acknowledged.

**Evaluation of conservation status of Sri Lankan *Syzygium* species**

H. D. Jayasinghe[1,3], S. W. Ranasinghe[2], H. S. Kathriarachchi[1] and D. S. A. Wijesundara[3]

[1] Department of Plant Sciences, University of Colombo

[2] National Herbarium, Department of National Botanic Gardens, Peradeniya

[3] National Institute of Fundamental Studies, Hanthana, Kandy

Taxonomic data provides basic information in evaluation of conservation priorities. A recently conducted detailed taxonomic study on the genus *Syzygium* in Sri Lanka revealed certain conflicts with previous treatments. This study was focused on deviation of red list categories due to these taxonomic alterations. Conservation status of all the indigenous *Syzygium* species of Sri Lanka was evaluated using the IUCN red listing Criteria B (geographic range in the form of extent of occurrence and/or area of occupancy) with the consideration of regional evaluation aspects. Newly collected specimens during this study were authenticated and utilized in this evaluation. In addition, specimens collected during last five decades, house at the National Herbarium, Peradeniya (PDA) and at some foreign herbaria were included. Co-ordinates of the specimens collected during this study were taken from a GPS. Location data of the herbarium specimens were geo-referenced based on Digital Gazetteer, fine-tuned using 'Google earth Pro' and the information provided digitally in the www.protectedplanet.net. Specific microhabitat conditions of each species were considered in assigning co-ordinates for 'broader' localities. From these data, 'area of occurrence (AOO)' and 'extent of occurrence (EOO)' were calculated using QGIS (ver. 3.20.3). The secondary conditions need to be evaluated under Criteria B were assigned based on the protected area network map and on the field experience on the treats faced by the species. A total number of 1323 data points for 33 *Syzygium* species were utilized. The AOO and EOO values and assigned conservation status for each species were compared with the findings of the previous national evaluation completed in 2020. Considerable number of species found to suggested drastic deviations for the calculated values from the previous study, mainly due to misidentification of the specimens and due to assigning erroneous co-ordinates for the historical collections. The new evaluation placed eight species in higher threaten categories and four species in lower threaten categories than the previous. Altogether 23 species (70%) were placed under threatened categories, where *S. cyclophyllum*, *S. montis-adam*, *S. potamicum*, *S. sclerophyllum* and *S. hemisphericum* were identified as 'critically endangered'(CR) species. All these species are restricted to montaneareas where the latter species is not reported from natural habitats during last 4 decades and currently known only from the trees at Royal Botanic Garden, Peradeniya. This study highlights the importance of the accuracy of the basic science: taxonomy in applied sciences.

Keywords: red list, critically endangered, *Syzygium*, Sri Lanka

**Preliminary assessment of endophytic fungal diversity in *Piper nigrum* accessions from Ratnapura and Matale Districts in Sri Lanka**

W.G.N.A. Wimalarathna[1], K.G.S.U. Ariyawansa[1] A.M. Wickramasuriya[1,] H.D.D. Bandupriya[1], T.D. Silva[1*]

[1]Department of Plant Sciences, University of Colombo, Colombo 03, Sri Lanka

*Corresponding Author: tara@pts.cmb.ac.lk

*Piper nigrum* L. (black pepper) belongs to the family Piperaceae. It is one of the most widely used spices in the world. Endophytic fungi are important components of plant micro-ecosystems known to enhance the growth of host plants, increase fitness, strengthen tolerances to both biotic and abiotic stresses and promote the accumulation of secondary metabolites.To study the diversity and community structure of endophytic fungi in *P. nigrum* growing in selected localities in Sri Lanka, endophytes were isolated from six host plants; three plants each from Ratnapura and Matale Districts. Asymptomatic leaves, stems, roots and berries were surface sterilized, placed on three different growth media and incubated at room temperature until hyphae emerged. Each isolate was purified five times on potato dextrose agar (PDA) using hyphal tip transfer technique. A total of 1775 putative endophytic strains were isolated from the six host plants using PDA, maltose agar and Czapek-dox agar and subsequently coded using colony morphology and growth rate. A total of 136 different morphotypes were identified during the study. The Shannon-Weiner diversity indices and the Simpsons dominance index of the endophytic fungi from the six plants ranged from 2.44 to 3.26 and 11.14 to 19.66 respectively indicating a highly diverse community. Colonization frequency (CF) of the host plants varied from 3%-9%. The endophytic infection rate (EIR) among the plants ranged from 71.6% -80.2%. A host plant from the Ratnapura District showed the highest community heterogeneity having the highest EIR (80.2%) and CF (9%) values. EIR was highest in leaf tissues compared to other tissue types in all six plants ranging from 86.8%-97.2%. Results showed that; plants from the Ratnapura District had a higher endophytic fungal diversity than plants from the Matale District. According to Sorenson's coefficient calculated for the two Districts (0.161), the two fungal communities have a moderate level of overlap or similarity. Fungal diversity observed in the regional species pool could be due to the environmental heterogeneity across the sampled sites in two districts. Molecular characterization of isolated fungi using sequence-based data is recommended to deepen the understanding of the fungal community assembly in *P. nigrum.*

Keywords: *P. nigrum*, Endophytic fungi, Morphological characterization, Diversity analysis

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**Wetland transformation: A case study of Land Use and Land Cover changes in Muthurajawela Wetland Complex**

Harsha Dias Dahanayake[1*], Deepthi Wickramasinghe[1], D.D.G.L Dahanayaka[2], Paul Hudson[3]

[1] Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka

[2] Department of Zoology, Open University of Sri Lanka

[3]Depatment of Environment and Geography, University of York, York, England

*harsha.dahanayake@gmail.com

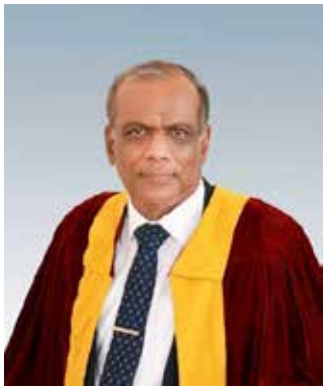
Urban wetlands are increasingly facing threats due to anthropogenic impacts which affect the overall functionality and delivery of ecosystem services. This study attempted to investigate the Land Use Land Cover (LULC) changes in Muthurajawela Wetland Complex (MWC) which is situated in highly urbanized Gampaha district. A part of the area has been declared as a Sanctuary where a limited human interventions are allowed. In the recent past, however, land uses have been altered due to developmental pressure. The change of different LULC categories, namely; waterbody, bare land, open area, thick vegetation, agricultural area, wetland vegetation and settlement, were investigated from 2006 to 2020 using Landsat 5 TM and Landsat 8 OLI TIRS images downloaded from USGS website. The ISO Cluster unsupervised classification method was utilized and field work was composed of ground truthing and the accuracy assessment. Buffer zones (BZ) were marked at 1km, 3km and 5km distances from the wetland boundary and change detection analysis was performed using ArcGIS version 10.8. During the study period, the overall trend was the transformation of natural and semi natural habitats into anthropogenic areas. Nearly a 30 % of the agricultural areas (paddy fields) inside the wetland has transformed to other categories such as thick vegetation, wetland vegetation and bare lands. In addition, extent of water bodies has reduced by 13.8 %. In contrast, in the buffer zones, transformation of bare land into human settlements were notable: 1km BZ (12.8%); 3km BZ (20.39%) and 5km BZ (15.1%). Another prominent change in the buffer zones was the loss of thick vegetation (15.2% in 1km BZ, 13.6% in 5km BZ). According to the literature and community survey, several decades ago, productive paddy fields existed in the area. Muthurajawela (as implied by the name - Raja wela = massive paddy field) water bodies and paddy fields co-existed as a colossal habitat which has now become rudimentary. These findings highlight the possible impacts of LULC on the wetland function and ecosystem services. Specially in the recent past, solid waste dumping and coconut cultivation were evident in the buffer zones. The results call for integrated and effective actions for conservation of MWC with robust policy and legal tools as well as enhanced community participation.

# Faculty of Technology

***The Role of Technology in Mitigating Challenges in Higher Education Sector***

02nd November 2022

# MESSAGE FROM THE DEAN



**Senior Professor J. K. D. S. Jayanetti**
Dean, Faculty of Technology
University of Colombo

The Annual Research Symposium of the Faculty of Technology (FoT), University of Colombo is a significant event in the Faculty calendar showcasing its strength of research and development. This year's symposium, the 6th Annual Research Symposium, 2022, is conducted under the theme "The Role of Technology in Mitigating Challenges in the Higher Education Sector", a timely topic for the higher education system that is going through challenging times locally and globally.

As a Faculty that aims to produce technology professionals for national and global needs, it is imperative that the Faculty maintains a research culture of high standards in order to provide confident technologists who can actively contribute to society. Despite being a new Faculty, and the pandemic situation in the past 2 years, it is very encouraging to note that the researchers of the Faculty are scheduled to present twelve peer reviewed scientific research papers. As the final outcome of these presentations, I expect that there will be citation indexed high quality publications or patentable products. Also featuring in the symposium are keynote speeches by two eminent scientists from Sri Lanka and abroad.

The Faculty of Technology being a part of the University of Colombo, the highest ranked university in the higher education sector in the country, is currently in the process of enhancing its research and innovation culture by acquiring competent academic and technical staff, establishing laboratories complying with international standards and establishing state-of-the-art infrastructure facilities. Its researchers have already initiated collaborations with national universities, research institutions and similar organizations abroad. These efforts will no doubt increase the research and innovation output of the Faculty to enhance its reputation and thereby pave the way to attract foreign researchers and students at undergraduate and postgraduate level, an objective the university is striving to achieve through its strategic plan.

I take this opportunity to express my sincere appreciation to the Vice Chancellor, the symposium chair and his team for providing leadership and guidance, keynote speakers and

the faculty symposium committee that made an untiring effort to make this event a success. Further, I would like to congratulate all the presenters, express my sincere best wishes in their future endeavors and thank them for contributions they made to take the research and innovation culture of the FoT to greater heights.

Thank you.

02nd November 2022

# MESSAGE FROM THE SYMPOSIUM CHAIR

**Dr. W. K. S. M. Abeysekera**
Senior Lecturer
Faculty of Technology
University of Colombo

**Mrs. G. W. A. S. Lakmini**
Lecturer (Probationary)
Faculty of Technology
University of Colombo

We are privileged and delighted to pen this message for the 6th Annual Research Symposium, 2022 of the Faculty of Technology (FoT), University of Colombo. The theme of this year's symposium, the "Role of Technology in Mitigating Challenges in the Higher Education Sector" which is in line with the theme of the university, "Digital Transformation and Innovative Approaches to Mitigate Challenges in the Higher Education Sector" aptly suits the current challenges in higher education. The success of the Annual Research Symposium of the Faculty is largely due to many members of the FoT. The organizing committee received constant guidance and assistance from the Vice Chancellor of the University of Colombo, Senior Professor H. D. Karunaratne and the Dean of the FoT, Senior Professor J. K. D. S. Jayanetti. The symposium is graced by two keynote speakers, namely, Emeritus Professor Gamini Senanayake, Former Vice Chancellor, University of Ruhuna and Professor Chandana L. C. Goonetilleke, Professor of Mathematics, Rutgers University, New Jersey, USA, two eminent scientists who have gained recognition nationally and internationally. Being a new Faculty and the youngest Faculty in the University of Colombo, it is very encouraging that twelve technical papers have been accepted for presentation at this year's symposium. We are confident that the outcome of the symposium will greatly contribute to enhancing the research and innovation culture of the Faculty while helping it to expand and flourish in the years to come.

# ORGANIZING COMMITTEE

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# Annual Research Symposium 2022

## Faculty of Technology

## University of Colombo

**02nd November 2022 from 8.15 a.m. to 4.00 p.m.**

## Programme

| | |
|---|---|
| **08.15 a.m.** | **Registration** |
| **08.30 a.m.** | **National Anthem** |
| **08.35 a.m.** | **Lighting of the Oil Lamp** |
| **08.40 a.m.** | **Welcome Address**<br>Senior Professor J.K.D.S. Jayanetti<br>*Dean, Faculty of Technology, University of Colombo* |
| **8.50 a.m.** | **Video clip**<br>Overview of the Annual Research Symposium Activities<br>*Faculty of Technology, University of Colombo* |
| **9.00 a.m.** | **Address by the Chief Guest**<br>Senior Professor (Chair) H.D. Karunaratne<br>*Vice Chancellor, University of Colombo* |
| **9.10 a.m.** | **Tea Break/ Exhibition of Mini Projects** |
| **9.55 a.m.** | **Keynote Address**<br>*Reshaping the Higher Education Landscape in Sri Lanka to fit into the Age of Technology*<br>Emeritus Professor Gamini Senanayake<br>Former Vice Chancellor, University of Ruhuna<br>Chairman, Sri Lanka Council for Agricultural Research Policy |
| **10.55 a.m.** | **Keynote Address**<br>*Breaking Free from the "One Size Fits All" Model of Education: The Role of Technology*<br>Professor L.C. Goonetilleke<br>Professor of Mathematics, Department of Mathematics,<br>Rutgers University, New Jersey, USA |

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| **11.55 a.m.** | **Vote of Thanks**<br>Dr. W.K.S.M. Abeysekera<br>Faculty Symposium Chair |
| **12.00 p.m.** | **Lunch Break** |
| **1.00 p.m.** | **Technical Sessions** |
| **04.00 p.m.** | **Concluding Remarks** |

# INTRODUCTION TO THE KEYNOTE SPEAKER

**Emeritus Professor Gamini Senanayake**
Former Vice Chancellor, University of Ruhuna
Chairman, Sri Lanka Council for Agricultural Research Policy

Emeritus Professor Gamini Senanayake graduated in 1979 from the University of Peradeniya, Sri Lanka. In 1983 he was awarded a Danish Government "DANIDA" scholarship for postgraduate studies in Denmark. He completed his Ph.D. in Plant Science in 1988 at the Royal Veterinary and Agricultural University in Copenhagen, Denmark.

Just after the graduation from the University of Peradeniya, Prof. Senanayake joined the University of Ruhuna as an Assistant Lecturer and he gradually ascended to the post of Senior Professor. In addition, he has held many academic-administrative posts such as Head of the Department, Deputy Vice Chancellor and Vice Chancellor of the University of Ruhuna. At present he is the Chairman of the Sri Lanka Council for Agricultural Research Policy, Ministry of Agriculture. In addition, he holds many national level positions. Chief Consultant of the City University Project, Ministry of Skills Development, Vocational Education, Research and Education, Visiting Consultant, Sri Jayewardenepura University of Sri Lanka, Member of the Directors of the Rubber Research Board of Sri Lanka and Council Member of the University Vavuniya are a few positions he holds at present.

Further he has served as an advisor and consultant in many national development programmes in Sri Lanka. Ministry of Agriculture, National Physical Planning Department, Ministry of Rural Development, Southern Province Development Authority, Ministry of Planning & Implementation, Ministry of Irrigation, Integrated Rural Development Programme (IRDP), Ministry of Forestry & Environment and Southern Development Authority are some of the institutions in Sri Lanka to receive his service.

His services are not limited only to Sri Lanka. He has served as an advisor for International Atomic Energy Authority on "the use of Isotopes in Studies to Improve the Yield and Nitrogen Fixation of Grain Legumes in the Tropics and Sub-tropics of Asia" and as a Visiting Research Fellow at the National Grassland Research Institute, Japan, University of Reading, UK and Universiti Pertanian Malaysia.

As a result of his excellent academic and research career, he has won many prestigious awards locally as well as overseas. He won the President of Sri Lanka Research Award for contributing to the reputation of the country in a wider context of the global advancement of science and human knowledge in 2001. Further he has won awards from the Royal Society of United Kingdom, Commonwealth and the International Atomic Energy Agency, Austria. He is the first Lankan to win the Science and Technology Award of Japan.

Although he served in many administrative positions, he continued his research work on Plant Science. He has published over 100 peer reviewed scholarly articles in reputed journals and has presented his work at numerous academic forums locally as well as overseas.

# KEYNOTE ADDRESS

## Emeritus Professor Gamini Senanayake

### Reshaping the Higher Education Landscape in Sri Lanka to fit into the Age of Technology

The higher education sector worldwide is presently experiencing a massive transformation as a result of the digital revolution. Higher education in Sri Lanka is also reaching a new paradigm. The use of digital technology in learning and teaching processes has become a common phenomenon. The forces of Augmented Reality (AR) and Virtual Reality (VR) are pushing higher education into a new experiential realm. But the main challenge higher education faces today is figuring out how to use the tremendous advances in technology as a means of engaging students in authentic learning experiences. Therefore, to make use of the power of modern technology, it is imperative to reshape the higher education landscape to fit into the age of technology. In order to achieve fruitful results, it is not enough to be limited to the codes and cables of a device, but to be extended into the ways students and teachers interact with one another and their environment. Unfortunately, at present, most academics are trying to teach the same old curricula which is prepared for physical teaching, through virtual mode. Because of this mismatch between curricula and the technology it is impossible to use technologies like virtual reality to help students explore complex relationships within ecosystems.

To reshape the higher education landscape in Sri Lanka, to fit into the new era of technology, first it is necessary to identify the major issues and challenges prevailing in the present higher education system and thereafter to find strategies to face these issues and challenges. During this process, many changes in the high education sector need to be enacted. One of the biggest challenges is the vast variation with respect to the physical infrastructure and quality among higher education institutes in Sri Lanka. To minimize this discrepancy, it is necessary to introduce cost effective technology-based innovations instead of high-cost physical infrastructure developments. The present curricula in almost all universities are developed for physical teaching and learning process. Therefore, they are obsolete and do not fit with the new technology. Hence, all universities should pay serious attention to revise their curricula to fit into the new era of technology. It is the bitter truth that some academics are not accountable for what they deliver. This is mainly due to the lack of performance-based appreciation and incentives. Due to the maximum utilization of new technology by world reputed universities and their offshore campuses there is an increased mobility of good students to those campuses. In order to capture these good students, state universities need to dramatically transform their

study programs to increase their competitive and comparable advantages. There is a tendency to emerge for "invisible higher education institutes" through the use of information technology. Therefore, state universities need to orient their distant education programs to face this challenge. Most of the students prefer to study while working. But unfortunately, most of the study programs in state universities do not permit studying while working due to their inflexibility. Therefore, reshaping the higher education landscape in Sri Lanka is much needed.

# INTRODUCTION TO THE KEYNOTE SPEAKER

**Professor L. C. Goonetilleke**

Professor of Mathematics, Department of Mathematics, Rutgers University, USA

Lasantha Chandana Goonetilleke received his B.Sc. (Hons) degree in Mathematics from the University of Colombo and obtained his PhD in Mathematics from Purdue University. After doing further research in theoretical physics for a few years, he left academia for the corporate world and spent nearly two decades in the IT industry. He returned to teaching mathematics in 2015. Currently he serves as Associate Teaching Professor of Mathematics at Rutgers University. With his IT background he is especially interested in incorporating technology into his teaching.

# KEYNOTE ADDRESS

## Professor L. C. Goonetilleke

**Breaking Free from the "One Size Fits All" Model of Education: The Role of Technology**

The current higher education model is built upon the industrial revolution mindset where the objective was to prepare students for a lifetime of work. Two hundred years later we are into the fourth industrial revolution and much has changed. To paraphrase Joseph Aoun, then man learned to use machines as a substitute for physical labor and now we are learning to use machines as a substitute for intellectual labor. These and other byproducts of the times have significantly changed the higher education needs of the new generations. In this talk I will discuss two broad types of challenges faced by educators and how technology helps us face those challenges.

The number of students seeking higher education has increased and keeps rising. Not all of them learn and retain information in the same way or at the same speed, and they all have different learning styles. A one-size-fits-all model of teaching, or of assessment, will no longer suffice. Technology allows educators to differentiate instruction, and to modify information to create and support new alternative approaches. It also facilitates better forms of assessment. I will present examples from my classroom experience in using a wide range of tools for teaching and assessment. These include curated video collections with AI enhanced transcripts and embedded questions, computer algebra systems, live scripts and notebooks, and mastery-based grading methods supported by technology.

Technology can also be used to facilitate discussion, to make the learning process more interactive, and to help educators receive constant feedback on the learning process of their students. This is particularly important today as the rapid flow of large amounts of information makes the development of critical thinking and analytic skills of the students a necessity. Again, the real challenge is to be able to observe a large number of students, to recognize their different needs, and to offer individualized help. I will point out features of learning management systems, and grading tools such as Gradescope, which can serve as a third eye for an educator.

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8. **Raman spectroscopy analysis of Bovine Serum Albumin using electrodeposited copper on Indium Tin Oxide as a SERS substrate**

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10. **A Robust Multi Factor Authentication Method for Securing Electronic Payment Transactions**

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# ABSTRACTS

## Identification of Molecular Expression Markers and Development of Primers for Variety Screening against *Colletotrichum musae* Resistance in Banana

U.M. Aruna Kumara[1], N.V.T. Jayaprada[1], N. Thiruchchelvan[2], D.M. De Costa[3]

[1]Department of Agricultural Technology, Faculty of Technology, University of Colombo

[2]Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka

[3]Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Sri Lanka

*Colletotrichum musae* is a destructive plant pathogen primarily affecting the genus *Musa*, which includes bananas and plantains. This is considered one of the most important diseases of banana and also a major constraint to banana production. It lowers the quality and nutritive value and makes them unfit for marketing and consumption, thereby causing severe loss to farmers and traders. Molecular markers prove to be the best alternative for screening against disease resistance. In our study, we utilized expression sequence tags (ESTs) derived from moderately resistance banana cultivar (Seenikesel) after inoculation with destructive post-harvest fungal pathogen *C. musae.* The first objective of this study was to select known ESTs as biotic and abiotic stress induced expression molecular markers based on their homologous gene function to screen banana cultivars for *C. musae* infection. The second objective of this study was to develop primers for selected expression markers so they can be used for screening based on RT PCR associated expression profiles. Twenty biotic stress induced expression molecular markers and thirteen abiotic stress induced molecular expression markers were identified. Among the selected biotic markers, eight gave similar function for germin-like protein (GLPs) which are validated in plant responses against pathogens infections. Endochitinase and ubiquitin conjugating enzyme were among the other frequent expressed biotic markers. Most of the selected abiotic markers were responsible for the up-regulation of proteins related to cold, drought and heavy metal stress resistance. cDNA amplification primers for all the selected markers were given as well. This study concludes that monitoring the expression of these identified molecular markers of different defense related pathways using developed respective primers can be used to screen Musa cultivars against resistance to *C. musae* infection.

Keywords: Molecular expression markers, primers, *C. musae*, resistance, Musa cultivars

# Antimicrobial activity of brans of selected traditional and new improved rice *(Oryza sativa L.)* varieties of Sri Lanka

A.T. Liyanage[1], D.U. Rajawardhana[2], W.P.K.M. Abeysekera[1], W.K.S.M. Abeysekera[3]

[1]Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Sri Lanka

[2]Industrial Technology Institute (ITI), Malabe, Sri Lanka

[3]Department of Agricultural Technology, Faculty of Technology, University of Colombo, Sri Lanka

Rice (Oryza sativa L.) is the staple food of over half of the world's population including Sri Lanka. The country harbors many traditional and > 60 new improved (NI) rice varieties (RV). Rice bran, a by-product of the rice milling process is well known for its therapeutic properties including antimicrobial activity. However, studies addressing antimicrobial activity of Sri Lankan rice is still limited. The present study evaluated antimicrobial activity of brans of five popular traditional (Sudu heenati, Goda heeneti, Rathu heeneti, El wee and Thatu wee) and five widely cultivating NI (Bg 300, Bg 352, Bg 360, At 362 and At 373) RV in Sri Lanka. Seventy % ethanolic extracts of selected RV at 3, 5, 10, and 15 mg/ml were studied for antimicrobial activity against Bacillus cereus, Staphylococcus aureus, Enterococcus faecalis, Salmonella enterica, Escherichia coli and Candida albicans using agar well diffusion method (n=3 each). Results clearly showed that traditional red RV namely Sudu heenati, Goda heeneti, Rathu heeneti & Thatu wee and a NI red rice variety, At 362 had antimicrobial activity against B. cereus (all concentrations; except 3mg/ml of At 362), S. aureus (except 3mg/ml), and E. faecalis (only 10 and 15 mg/ml). However, none of the traditional and NI white RV had antimicrobial activity against B. cereus, S. aureus, and E. faecalis at all tested concentrations. Further, none of the selected RV showed antimicrobial activity against E. coli, S. enterica and C. albicans at all tested concentrations. The order of potency of tested RV for antimicrobial activity was B. cereus > S. aureus > E. faecalis. It is concluded that among all RV studied, only red RV had antimicrobial activity only against B. cereus, S. aureus, and E. faecalis at studied concentrations.

Keywords: Sri Lankan rice, traditional rice, new improved rice, rice bran, antimicrobial activity

**Anti-glycation and glycation reversing activity of *Costus speciosus, Coccinia grandis* and *Gymnema sylvestre* freeze-dried leaves**

C.M. Peries[1], W.K.S.M. Abeysekera[2], S.B. Navaratne[3], A.P. Henagamage[1]

[1] Department of Science &Technology, Faculty of Applied Sciences, Uva Wellassa University, Sri Lanka

[2]Department of Agricultural Technology, Faculty of Technology, University of Colombo, Sri Lanka

[3]Department of Food Science & Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka

Diabetes mellitus is a prevalent metabolic disorder characterized by elevated blood glucose levels in which the body does not produce enough or respond to insulin. There is a growing demand for using herbal medicine to treat diabetes due to complications and the ineffectiveness of existing methods of controlling the disease. Therefore, this study focused on determining the anti-glycation and glycation reversing activity of leaves of selected medicinal plants which are well known for the management of diabetes mellitus in traditional knowledge. The leaves of Costus speciosus, Coccinia grandis, and Gymnema sylvestre were subjected to a freeze-drying process (−80 °C, 0.005 psi). Then, the freeze-dried leaves were ground and the leaf powder was extracted in 95% ethanol. The anti-glycation and glycation reversing activities were studied for freeze-dried crude ethanolic extracts via Bovine Serum Albumin (BSA)-glucose model using 96 well assay protocols (n=3 each). Rutin was used as the standard. The results clearly showed that freeze-dried leaf extracts of all selected medicinal plants had significant ($P<0.05$) and dose-dependent anti-glycation and glycation reversing activities. The Costus speciosus showed the highest ($P<0.05$) anti-glycation activity (IC50: 100.76+5.99 µg/ml) compared to Coccinia grandis (290.74 + 3.19 µg/ml) and Gymnema sylvestre (340.52+4.96 µg/ml). However, the IC50 value of Costus speciosus was approximately five times higher than the rutin (21.88 ± 2.82 µg/ml). The highest ($P<0.05$) glycation reversing activity was also shown by Costus speciosus (EC50:147.24 + 3.86 µg/ml). The EC50 values of Coccinia grandis and Gymnema sylvestre for glycation reversing activity were 271.29 +2.63 µg/ml and 395.73 + 4.15 µg/ml respectively. It is concluded that Costus speciosus freeze-dried leaves are more effective at preserving the bioactive compounds that are responsible for anti-glycation and glycation reversing activity than the other two types of leaves. The potential uses of the freeze-dried leaves of Costus speciosus are being investigated further for the treatment of diabetes mellitus.

Keywords: Medicinal plants, Anti-glycation activity, Glycation reversing activity, Diabetes mellitus, Herbal medicine

**The levels of nitrite in locally produced fresh and preserved Asian Black Tiger Prawn *(Penaeus monodon)***

E.V. Peiris[1], J. Wewalwala[2], S.R. Gunathilake[1]

[1] College of Chemical Sciences, Institute of Chemistry Ceylon, Sri Lanka

[2] Department of Agricultural Technology, University of Colombo, Sri Lanka

Penaeus monodon, or the Black Tiger prawn is a crustacean widely caught and farmed for the food industry. In today's seafood market, the P. monodon is a food product in much demand. Many seafood exporters may opt to use unacceptable methods to preserve seafood. Sodium nitrite is an important chemical additive used with meat and seafood products to prevent discoloration and spoilage which, if used in excess, may cause adverse toxic effects. The present study is a quantification of the sodium nitrite level found in the flesh of P. monodon. The samples were collected in triplicates from 9 sampling sites. Three locations where the P.monodon is commonly harvested, three supermarkets and three export companies. A total of 27 samples were analyzed in this work. The mean nitrite concentration for each sampling site was determined using the Griess Assay method. Matrix effects were negligible, hence a direct Griess spectrophotometric analysis was carried out. The permissible level of nitrite in meat and seafood is 200 ppm according to the FDA standards and the present study has used the same. The nitrite analysis methodology had LOD and LOQ values of 7.00 µg/kg and 2.33 µg/kg respectively. The mean nitrite concentrations determined were: Chilaw – 0.49±0.50 ppt, Jaffna – 1.01±0.34 ppt, Nilaweli – 2.21±0.99 ppt, Supermarket A, B and C – 1.16±0.79 ppt, 0.92±0.30 ppt, and 0.84±0.21 ppt respectively, and Export Company D, E and F – 1.07±1.24 ppt, 0.90±0.27 ppt, and 1.70±0.50 ppt respectively. There was no significant statistical difference in the concentrations between preserved and fresh prawns ($p>0.05$). All concentrations were well below the permissible standard nitrite level of 200 ppm as defined by the FDA.

Keywords: P. monodon, Griess Assay, Sodium Nitrite, Spectrophotometry

**Assessing greenhouse gas emission of low country orthodox black tea manufacturing process in Sri Lanka**

M.D.N.D. Perera[1, 2], A.W.D.R. Kalpani[3], C.M. Navaratne[3], G.Y. Jayasinghe[3], S.B. Navaratne[2]

[1]Department of Agricultural Technology, Faculty of Technology, University of Colombo

[2]Department of Food Science and Technology, University of Sri Jayawardenepura

[3]Department of Agricultural Engineering, Faculty of Agriculture, University of Ruhuna

Tea plays an important role in the Sri Lankan economy, contributing 1.1% of the Gross Domestic Production (GDP) and accounting for 19% of the foreign exchange earnings of the country. Black tea manufacturing process contributes to the releasing of nitrous oxides (N2O), carbon dioxide (CO2) and methane (CH4) to the atmosphere. Acting on carbon could produce new commercialism points for products and services supplied to the market. It will assist to sell products with high environmental standards at a premium price and several research studies were conducted to assess the carbon footprint of tea manufacturing process in Sri Lanka. However, recommendations have not been based on the area therefore, LCA (Life Cycle Assessment) is an essential part in low country tea manufacturing process being the highest black tea producers (more than 65%) in the country. With this background, this study was conducted (1) to analyse Specific energy consumption and (2) to calculate GHG Emissions (kg CO2e/kg) of low country tea manufacturing factories at each processing stage. Three orthodox tea factories in the low country were selected for the study. Life Cycle Assessments were conducted for the three factories and "one kg of made tea" was considered as the functional unit for the assessment. The highest Specific Energy Consumption was recorded from factory I, (1.036kWh/kg made tea) and the average was recorded as 0.808±0.202kWh/kg made tea for low country tea manufacturing process. The highest emission was reported for the withering stage (0.1942 kg CO2eq/kg made tea) and total average emission for the gate-to-gate orthodox black tea production process was 0.5734±0.1432 kg CO2eq/kg of made tea in low country tea manufacturing process. The highest emissions were identified at the withering and drying stages and those ranged 26%- 35% from the total emission of orthodox black tea production process. The highest emission was reported from firewood use which was 4.4725±1.9102 kg CO2eq/kg of made tea and the emissions due to diesel was recorded as 0.0380±0.0329kg CO2eq/kg of made tea for low country tea manufacturing process. Consequently, the gate-to-gate carbon footprint of the low country orthodox black tea manufacturing process in Sri Lanka is 5.0839±2.0817kg CO2eq/1kg made tea.

Keywords: CFP, Energy, GHG emission, Orthodox black tea

**The quality of wet type cat food available on the Sri Lankan local market: A nitrite analysis and *Escherichia coli toxicity analysis***

S.K. Sooriyaarachchi[1], Jayani J. Wewalwela[2], Vajirapani De Silva[3], Sameera R. Gunathilake[1]

[1] College of Chemical Sciences, Institute of Chemistry Ceylon, Sri Lanka

[2] Department of Agricultural Technology, University of Colombo, Sri Lanka

[3]Gene Tech Research Institute, Sri Lanka

Cats are the second largest group of domestic pets around the world. Addition of sodium nitrite to preserve food is being done as a means of market survival by manufacturers. It acts as a curing agent to give color to meat products, inhibits lipid oxidation and acts as an antimicrobial agent, thereby increasing the shelf life of the said products. Incorporation of improper amounts of sodium nitrite into this food exceeding the permissible level of 20 mg/kg as per The Association of American Feed Control Officials, may cause numerous ill effects such as cancer and diarrhea in cats. Moreover, the raw meats can facilitate the growth of the Escherichia coli, a bacterium commonly associated with meat-based food and also known to create toxicities in the host. Four-brands of wet-type cat food commercially available on the local pet food market were chosen as samples for analysis. The study focuses on the analysis and quantification of nitrite levels in samples and the analysis for the presence of E. coli in the samples. Recoveries for the Griess Assay protocol were as: the low spike recovery 29.02% and the high spike recovery 115.61%. All the sample matrices had shown considerable matrix effect greater than 11% and thus, the nitrite content in the samples was evaluated using the standard addition protocol. The nitrite detection method had LOD and LOQ values of 7.00 µg/kg and 23.33 µg/kg respectively. The final nitrite levels recorded for all brands showed nitrite levels within regulatory limits. Therefore, it can be concluded that the tested wet-type cat food products of the said brands are of good quality considering nitrite contents. However, it is recommended that further studies be carried out to confirm the level of positive observations for the presence of E. coli.

Keywords: Wet-type cat food, Sodium nitrite, Griess assay, E. coli

**A low cost optical design for a surface plasmon resonance (SPR) sensor using a Cu/graphene/ITO substrate**

L.M. Samarathunga[1], M.W.I. Chanilka[1], M.D.R. Dewasumithra[1], J.L.K. Jayasingha[1,2], K D.R.N. Kalubowila[1,2], M.S. Gunewardene[1], H.H.E. Jayaweera[1], J.K.D.S. Jayanetti[1,2,*]

[1]Center for Instrument Development, Department of Physics, Faculty of Science, University of Colombo

[2]Department of Instrumentation and Automation Technology, Faculty of Technology, University of Colombo

* Correspondence - email: sumedhajayanetti@gmail.com

Simpler and low cost designs for surface plasmon resonance (SPR) sensing is an active area of research. We propose a novel angle modulated SPR sensor design inspired by Kretschmann geometry that utilises a water-based semi-circular prism. An electrodeposited Cu thin film covered with many layer graphene on an indium tin oxide coated glass substrate is proposed as the sensor device. A SPR simulation environment (WINSPALL) was used to generate SPR curves based on the Fresnel formalism. The freeware simulator provided sufficient provision to input thickness and dielectric constants of the substrate material. Analysis of the output SPR curves showed that the sensor was most sensitive when the Cu thin film thickness was 40 nm±2 nm. The angle of maximum sensitivity was at 53°±1° independent of the indium tin oxide substrate thickness. Analysis further revealed a significant decrease in SPR sensitivity when a graphene cover of greater than 1 nm was introduced over Cu to reduce oxidation of Cu. The low cost optical design is mainly inspired by the water-based semi-circular prism and a substrate made out of a Cu thin film electrodeposited on indium tin oxide. A linear CCD is proposed for the detection, making the device independent of moving parts.

Keywords: Surface plasmon resonance, Kretschmann geometry, Cu thin film, grapheme

Acknowledgement

This research was supported by the grant AHEAD-DOR2-No 40 of the Accelerating Higher Education Expansion and Development (AHEAD) Operation of the Ministry of Higher Education funded by the World Bank and the University of Colombo infrastructure development grant.

**Raman spectroscopy analysis of Bovine Serum Albumin using electrodeposited copper on Indium Tin Oxide as a SERS substrate**

S.P.N.N. Senadeera[1], U.D. Rodrigo[2,3], L.M. Samarathunga[3], J.L.K. Jayasingha[3,4], K.D.R.N. Kalubowila[3,4], N.I. Abeyasinghe[2,3 *], D.U. Kottahachchi[1], J.V.P. Fernando[5], J.K.D.S. Jayanetti[3,4 *]

[1] Department of Medical Laboratory Sciences, Faculty of Allied Health Sciences, General Sir John Kotelawala Defence University

[2] Department of Chemistry, Faculty of Science, University of Colombo

[3] Center for Instrument Development, Department of Physics, Faculty of Science, University of Colombo

[4] Department of Instrumentation and Automation Technology, Faculty of Technology, University of Colombo

[5] Department of Physics, Faculty of Natural Sciences, The Open University of Sri Lanka

*Correspondence: neranga@chem.cmb.ac.lk, dean@tec.cmb.ac.lk,

*Correspondence: sumedhajayanetti@gmail.com

Bovine Serum Albumin (BSA) is a commonly used standard to calibrate high-order instruments that are used in biomolecular analysis as it is stable, and the results are reproducible. Moreover, BSA is compatible with a wide range of chemicals and reagents used in various instruments. Recently, analysis of proteins using spectroscopic techniques such as Raman spectroscopy (RS) has received significant interest. Although RS provides a characteristic fingerprint of molecules, the signals can be weak. Therefore, the optical properties of Surface Enhanced Raman Spectroscopy (SERS) substrates such as gold and silver, which are regarded as the gold standards, can be used to produce enhanced Raman signals. However, because of the exorbitant cost of such metals, researchers are now working on copper-based substrates as substitutes. This study is an attempt made to detect Raman spectra of standard solutions of BSA using electrodeposited copper (Cu) on Indium Tin Oxide (ITO) as a SERS substrate using a custom-built research grade Raman spectrometer with an incident laser wavelength of 532 nm. First, Cu was deposited on an ITO glass plate by electrodeposition, followed by applying BSA standard solution on to the Cu-coated ITO thin films. The Raman spectra were obtained with a laser wavelength of 532 nm. Initially, the Raman bands obtained from the BSA standard were identified using the previously reported values. As confirmed by the literature, our results also showed Raman bands at 1002, 1450, and 1650 cm-1, respectively. Furthermore, we have observed an enhancement of the Raman

peaks of Albumin in the presence of electrodeposited thin Cu. These initial results warranted the use of Cu deposited on ITO as a SERS substrate for the analysis of standard BSA solutions. This could be extended to optimize the system for further applications.

Keywords: Bovine serum albumin, Raman spectroscopy, surface enhanced Raman spectroscopy, copper substrates

Acknowledgement

This research was supported by the grant AHEAD-DOR2-No 40 of the Accelerating Higher Education Expansion and Development (AHEAD) Operation of the Ministry of Higher Education funded by the World Bank and the University of Colombo infrastructure development grant.

**Instantaneous plant growth dynamics reveals Ozone sensitive intrinsic nanometric fluctuations in growth rate**

B.L. Sanjaya Thilakarathne[1], Uma Maheswari Rajagopalan[2], Hirofumi Kadono[3]

[1] Department of Instrumentation and Automation Technology, Faculty of Technology, University of Colombo, Sri Lanka

[2] Laboratory for Integrative Neural Systems, RIKEN Brain Science Institute, Japan

[3] Graduate School of Science and Engineering, Saitama University, Japan

Ozone ($O_3$) causes wide range of different effects including visible leaf injury, growth and yield reductions, accelerated senescence and altered sensitivity to biotic and abiotic stress in plants. Previous studies found that different crops have different responses against $O_3$. Exposure to $O_3$ causes a reduction of growth and yield in crops. Investigation of growth dynamics under $O_3$ exposure with currently available techniques take time from days to months. However, with a real-time and non-invasive robust optical interferometer having a resolution of 0.1 nm, growth was measured every 0.5 sec with 3 hours of $O_3$ exposure at ppb levels of 0, 120, and 240 enough to identify different stress conditions in cultivars and crops. This experiment was carried out for three crops such as Rice (*Oryza sativa* L.*cv.* Koshihikari or Fusaotome), Soybean (*Glycine max* (L.). cv. Enrei) and Radish (*Raphanus sativus*. cv. Kometto). The growth rate calculated every 5.5 sec over the period of seven hours showed nanometric intrinsic fluctuations (NIF). NIFs were found to be sensitive enough that they decreased on exposure to $O_3$ for both 120 ppb and 240 ppb concentrations. Koshihikari showed a 50% reduction in NIF compared to Fusaotome in 240 ppb. Our results suggest that NIF discovered here, could also distinguish the cultivar's tolerance to $O_3$. This significant change would provide much faster ways of distinguishing $O_3$ tolerance of cultivars. Further NIF of Soybean and Radish leaves showed 42% and 56% reduction in ambient condition. The fluctuations discovered here were also observed in leaves and roots of other plants. Nanometric fluctuations may be an intrinsic property of plants, possibly resulting from both the metabolic and the hydraulic control mechanisms and is environment sensitive.

Keywords: Crop, plant growth measurement, atmospheric pollution, optical interferometric technique, ozone, environmental effects, instantaneous nanometric growth

**A Robust Multi Factor Authentication Method for Securing Electronic Payment Transactions**

N.R. Samarasinghe, N. N. Thillakarathne
Department of Information and Communication Technology, Faculty of Technology,
University of Colombo, Sri Lanka

Owing to the profits that can be gained by compromising online and non-online electronic payment methods, many intruders attempt to compromise credit /debit cards, as they can gain financial benefits. Due to this inherent vulnerable nature of these transaction methods many payment institutions are putting more efforts in to strengthen the security of these electronic payment methods. On the other hand, this also results in loss of billions of dollars, while making payment transactions which clearly necessitates rigid and robust security designs towards securing underlying electronic transaction methods. In this regard we introduce a novel geo location based multifactor authentication method towards improving the security of electronic payment transactions especially for Automated Teller Machine (ATM) and Point of Sales (POS) transactions and a novel design approach towards further controlling the ownership of transactions that are being made. Credit/debit card theft has evolved dramatically in recent years and some of the common ways of compromising the security of this electronic transaction methods are depicted as stealing the information from the database, Sniffing / Packet intercepting, Shoulder surfing, skimming and keypad overlays. In order to prevent the compromising of electronic payments, banks / financial institutions have introduced ways of authenticating users when they are executing ATM / POS transactions. Such authenticating methods include both single factor and multi factor authentication methods such as username and password, OTPs, and PINs. However, most of these methods are highly vulnerable and put the cardholder at risk. Single-factor authentication is no longer deemed sufficient for user authentication and is regarded insecure for high-risk financial transactions involving access to customer information or online fund transfers to third parties using web browsers or cell phones/PDAs. We propose a solution to overcome all these issues through our authenticator app which will only require the user's location and check if the user's mobile phone is within a 5 Meter radius of the ATM or POS to authorize the transaction. The user will receive a push notification for each transaction based on their geo location. Only approved transactions via the app will be valid and any transactions that are not approved, will be void. As per our proposed solution our smart mobile app will be available across both Android and iOS platforms which provides accessibility to a larger audience. We implemented our system in a test environment in a bank ATM and POS and simulation environment generated requests and response codes with higher level of accuracy compared to the industrial financial solutions.

Keywords: Authentication, security, Mobile App

**Social Engineering Techniques and Mitigation Approaches**

Navod Neranjan Thilakrathne*, N.R. Samarasinghe
Department of Information and Communication Technology, Faculty of Technology,
University of Colombo, Sri Lanka
*Correspondence: navod.neranjan@ict.cmb.ac.lk

Cybersecurity is an essential component of computer systems, especially in today's world where data is the most valuable asset a company or individual can have. The number of cyberattacks is growing, as are the attacks, both in terms of advancement and quantity targeting various industries and people owing to the benefits that can be gained. Without proper protection, an individual or a company runs the risk of losing data to cyberattacks hence having robust security measures are essential. Social engineering techniques are a type of cyber-attack that does not target the vulnerabilities of technology, but rather the susceptibility of human emotions. Further this social engineering techniques rely on gaining human trust and exploiting the assets later. In general, the human element is the weakest link in security systems, not the technology. Thus, the attacker always tries to exploit the weakest point in the system and gain control over the system. By doing so it will provide an easy way for the attacker to compromise a system within a shorter time. Further, it is evident that we have been the target of numerous cyber-attacks and want to educate ourselves to protect ourselves from future social engineering attacks. On the other hand, there is a necessity to develop specific methods that allow individuals or businesses to protect themselves from attacks based on social engineering techniques so that future attacks can be avoided. As human emotions and psychology are exploited in social engineering it entails conducting victim research, establishing trust, seeking vulnerabilities, and attacking. Hence in this research we present an overview of social engineering attacks, mitigation approaches and challenges associated with them towards ensuring better safety for everyone in the world.

Keywords: Cyber Attacks, Social Engineering Techniques, Cyber security

**IoT Security: Overview, Challenges and Countermeasures**

Navod Neranjan Thilakrathne*, N.R. Samarasinghe
Department of Information and Communication Technology, Faculty of Technology,
University of Colombo, Sri Lanka
*Correspondence: navod.neranjan@ict.cmb.ac.lk

The Internet of Things (IoT) is a vast concept that is spreading rapidly throughout the world today. IoT devices are more vulnerable to cyber-attacks than other endpoint devices, such as smartphones and laptops, owing to their inherent nature. In a typical IoT system four different types of layers can be identified. Those layers can be specified as: application layer, data processing (software) layer, network layer, and sensing (physical) layer. According to this architecture, each layer operates under different technologies. Thus, various challenges and vulnerabilities related to security have emerged and exist. Thereby extant and forthcoming IoT applications must comply with standard cyber security guides and regulations to guarantee safety; otherwise, they will jeopardize the lives of people who are using these IoT applications, resulting in chaos. Building an ever-evolving advanced world demands privacy, authentication, heightened security, and quick recovery from attacks. To achieve this, IoT applications can create environments with end-to-end security by adding security measures along with the required adjustment, so both security and privacy can be guaranteed. By bearing this in mind, this research studies the different types of security challenges such as access control attacks, physical security attacks found in each of the four layers of the IoT architecture and how the security reference architecture can be used to find solutions to them. As the main objective of this research is to examine underlying security challenges pertaining to the standard IoT architecture, we examine and categorize IoT vulnerabilities and outline methods used for ensuring safety of such IoT systems. Further we present future directions in terms of security and privacy of IoT too.

Keywords: IoT, Cyber security, Internet security, Security attacks, Privacy

# Sri Palee Campus

***Creative and Innovative Approaches in Mass Media and Performing Arts***

18th November 2022

## MESSAGE FROM THE RECTOR

**Dr. Prathibha Mahanamahewa**

Rector
Sri Palee Campus,
University of Colombo

It is my great pleasure to welcome you to the Annual Research Symposium 2022 (ARS) at the Sri Palee Campus, University of Colombo. This year the theme of the symposium is "*Creative and Innovative Approaches in Mass Media and Performing Arts*" and the Keynote Speaker will be Professor Xu Lifang from the School of Information Management, Wuhan University, P.R China. I have to express my sincerest gratitude to the Chairman and Secretary of the conference along with the organizing committee for their encouragement and support. I also thank the Organizing Committee, with participants from within and outside the Sri Palee Campus, for their efforts in ensuring the success of this Conference and for their dedication in ensuring that we carry out our endeavours in a manner that is exemplary and that will see to the fulfilment of our ambitious goals. Another goal set forth by these events is the exchange of knowledge and experience by inviting exemplary and well-known speakers from outside and within the Sri Palee Campus. I certainly believe that the Conference will bear fruitful results and lay firm groundwork for future development of public human resource management. We look forward to seeing you in Sri Palee Campus on 18$^{th}$ November 2022.

# MESSAGE FROM SYMPOSIUM CHAIR

**Ms. Ruvini Batuwangala**

Senior Lecturer
Department of Performing Arts,
Sri Palee Campus,
University of Colombo

On behalf of the organizing committee, I am greatly honoured to welcome you all to the inaugural and technical sessions of the Annual Research Symposium of the Sri Palee Campus, University of Colombo. The Research Symposium 2022, just as the others before it, is yet another reminder of the continued efforts by all academic members of the Sri Palee Campus to provide a conducive platform for knowledge exchange and intellectual growth at both national and international levels.

With the existing global socio-economic and political environment, the symposium "*Creative and Innovative Approaches in Mass Media and Performing Arts*" enables rich and honest conversations on the role of creativity and innovation in how the concerned discipline/s engage(s) with society. Thus, directly or implicitly, this symposium gives us a chance for self-introspection and accords us the opportunity to engage with our own creative experiences by connecting the events around us with our own beliefs, values, and practices.

Through the concepts of creativity and innovation, the symposium is a chance for deeper insights as well as new perspectives on Mass Media and Performing Arts as relevant academic disciplines in both Sri Lanka and the world. As the two words foretell, our interactions should lead to a birth of new ideas that ought to challenge and extend our boundaries of thought, and indeed of our creativity and innovation as regards to how we function in relation to Mass Media and Performing Arts.

However, we must not attempt to place our understanding of the theme of this symposium solely within one individual's perspective. As equal participants, the onus rests on all of us to individually and collectively decide how we want to interpret the conversations generated at

this symposium. That is what a rich and open intellectual environment entails, and the Sri Palee Campus strives to be the institutional embodiment of such intellectual prowess.

Considering the utmost importance this symposium carries, it was only ideal that we work as a team to see it to fruition. You will be pleased to learn, therefore, that the symposium is a result of a constant work of commitment and dedication from a team of academic and non-academic staff members of the Sri Palee Campus. Allow me to offer my sincere gratitude to these highly committed people for ensuring the symposium's success through their various roles.

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# Annual Research Symposium 2022

## Sri Palee Campus

## University of Colombo

## 18th November 2022 from 9.00 AM to 3.00 PM

## *Programme*

| | |
|---|---|
| **9.00 AM – 9.05 AM** | **Inauguration of the Annual Research Symposium 2022** |
| **9.05 AM – 9.10 AM** | **Lighting of the Oil Lamp and National Anthem** |
| **9.10 AM – 9.20 AM** | **Introduction to Annual Research Symposium 2022**<br>*Dr. Prathibha Mahanamahewa*<br>*Rector, Sri Palee Campus, University of Colombo* |
| **9.20 AM – 9.30 AM** | **Address by the Chief Guest**<br>*Senior Professor H. D. Karunaratne*<br>*Vice Chancellor, University of Colombo* |
| **9.30 AM – 9.35 AM** | **Screening of a Video Introduction of the Keynote Speaker** |
| **9.35 AM – 9.55 AM** | **Keynote Address**<br>***Non-Fungible Rights (NFR) in China: Dynamics and Trends***<br>*Professor Xu Lifang*<br>*Professor, Department of Publishing Science,*<br>*School of Information Management, Wuhan University, Republic of China* |
| **9.55 AM – 10.00 AM** | **Concluding Remarks of Inauguration Ceremony**<br>*Ms. Ruvini Batuwangala*<br>*Symposium Chair 2022* |
| **10.00 AM – 10.25 AM** | **Tea Break** |
| **10.25 AM – 10.30 AM** | **Screening of a Video Introduction of the Plenary Speaker** |
| **10.30 AM – 11.00 AM** | **Plenary Speech**<br>*Professor S. Raguram*<br>*Head, Department of Media Studies,*<br>*Faculty of Arts, University of Jaffna, Sri Lanka* |
| **11.00 AM – 12.00 PM** | **Technical Sessions 01** |
| **12.00 PM – 1.00 PM** | **Lunch Break** |
| **1.00 PM – 2.30 PM** | **Technical Sessions 02** |
| **2.30 PM – 3.00 PM** | **Symposium Closing Remark and Vote of Thanks** |

# INTRODUCTION TO KEYNOTE SPEAKER


## Professor Xu Lifang

Professor, Department of Publishing Science,
School of Information Management, Wuhan University, China


Prof. Xu Lifang is the Director of the Institute of Digital Publishing at Wuhan University and the former Head of the Department of Publishing Science at the School of Information Management of WHU. She was entitled as the "*New Century Talents Program*" of the Ministry of Education of China, "*Leading Talents Program in the National Press and Publishing Industry*", the national "*Four Batches' of talents*" and the national "*Ten Thousand Talents Program*". She is the deputy director of the academic committee of the "*Semantic Publishing and Knowledge Services Key Laboratory*" and the "*Trusted Digital Copyright Ecology and Standards Key Laboratory*" of the State Press and Publication Administration; one of the drafters of the *National Standard of Publication Distribution Terminology* and the *Guide to Construction and Service of Knowledge Resources of Press and Publishing Knowledge Services*; a member of the First Terminology Review Committee of Editing and Publishing under the National Review Committee of Scientific and Technical Terminology. From 2003 to 2004, she was a visiting scholar at Pace University in the United States; and from 2005 to 2008, she worked as a postdoctoral researcher in the field of digital publishing and scientific communication at Wuhan University. Her main research areas are: digital publishing and new media, digital media narratives, STM publishing and scientific communication, digital educational publishing and communication. She is one of the pioneers in the fields of digital publishing and new media, digital media narrative in China. She has been Principal Investigators of projects sponsored by the National Social Science Foundation of China, the National Natural Science Foundation of China etc. She has published more than 20 monographs and textbooks, and about 180 papers in journals both in Chinese and in English, and has extensive academic connections and influence in the publishing academia and industry at home and abroad.

# ABSTRACT OF KEYNOTE ADRESS

## Professor Xu Lifang

### Non-Fungible Rights (NFR) in China: Dynamics and Trends

The global NFT market is growing rapidly; China has started and developed rapidly as well since 2021. In this paper, we analyze the dynamics and trends of NFR development in China based on combing NFT/NFR related literature. First, it introduces the background of the birth of NFR and compares its similarities and differences with NFT, which is a unique digital object certified on a blockchain or distributed ledger with the characteristics of uniqueness, indivisibility, immutability and verifiability, and can provide digital Proof-of-Asset for unique assets; NFR has similar characteristics and functions with it. However, NFR is minted on Consortium Blockchains rather than Public Blockchains; the value is determined by the issuers rather than by market consensus; it does not have the nature of a token and can only be transacted in RMB or digital RMB; and all counterparties must be authenticated in their real names. Second, it reviews the development history and status of the NFR industry and its value chain. The Chinese NFT industry started in April 2021, but as the Chinese government has been imposing strict controls on cryptocurrencies, "*Non-Fungible Rights (NFR)"* was proposed as an alternative concept to sever its connection with cryptocurrencies. After nearly a year of wild growth, NFR development in China has entered a cooling-off period. At present, NFR is mainly focused on the digital collectible industry, which has formed a complete industry chain including infrastructure providers, transaction platforms, project creation and distribution parties and users; technology companies, publishers and media organizations, collection institutions, art creators, etc. have participated in it. Third, it expounds the application of NFR in China's mass media industry and performing arts industry - which is currently being used in these industries in the form of digital collectibles, NFR tickets, etc. As digital Proof-of-Asset, NFR can enhance the copyright value of mass media and performing arts industries to create new revenue opportunities; and it can also expand the distribution channels of media and performing content and increase the young-audience reach. Finally, it analyzes the drivers of NFR development and the future development trend of NFR in China. NFR development is based on blockchain technology, driven by market supply and demand, and governed by policies and laws and regulations. In the future, NFR will further improve trustworthiness and openness, enrich copyright attributes, expand more physical application scenarios, and move towards compliance development under stricter regulation.

# ABSTRACTS

## Analysis of Film Sound as A Storytelling Technique in Contemporary Cinema (With Special Reference to Daran Aronofsky's "Requiem for A Dream")

D.C.V. Fernando
Department of Performing Arts, Sri Palee Campus, University of Colombo, Sri Lanka
chathuravimarsha@gmail.com

Sound is the theatre of the mind; film sound design is one of the key elements in film language. The major focus of a film is always on the frame, but sound contributes heavily to developing scenes and the cinematic experience. Sound is used to develop some meanings in film storytelling. Sound in film can be both diegetic, and non-diegetic, and also can be acousmatic sound. The five elements of film sound design (dialogue, background sound, foley, music and sound effects) contribute to creating powerful sequences. Film sound is used in a creative and innovative way beyond the realistic approach to illustrate the psychology of the characters. The use of film sound as a storytelling technique in contemporary cinema is discussed in this research with special reference to Daran Aronofsky's "Requiem for a Dream". The research problem is: "how could one analyse the use of sound as a storytelling technique in contemporary cinema in the movie 'Requiem for a Dream?" The research is based on content analysis following a qualitative research method. Understanding and analysing cinematic sound treatment, critically studying film sound, analysing the sound design of movies, and creating awareness about the film sound-based study in Sri Lanka are the objectives of this research. In the discussion, the movie sound is used as a storytelling technique in Daran Aronofsky's movie "Requiem for a Dream" especially as an element to express the psychology of the characters and to illustrate powerful sequences.

Keywords: psychology of sound design, exaggeration, film language, elements of film sound, sound technology

**Social Media and its effects on Dance in Sri Lanka with Reference to TikTok**

Ruvini Batuwangala
Department of Performing Arts, Sri Palee Campus, University of Colombo, Sri Lanka
ruvini@spc.cmb.ac.lk

By now social media has had a powerful impact on the lives of people across the world. It now plays a critical role in shaping public opinion, thoughts, and attitudes. The impact of social media can be felt in every aspect of life and every industry, including the dance industry. Consequently, there has been developing interest by researchers to examine the pros and cons of social media on various spheres of life. In the same light, this study focuses on the impact of social media on dance in Sri Lanka. The interest emanates from the cognizance of social media's popularity in Sri Lanka. Amongst the social media apps and sites that have enjoyed the most patronage is TikTok and its short videos. This is because through short videos people can express their ideas, feelings, messages, concepts, and funny content in a very limited timeframe. With its interactive aspects such as sharing, liking, and commenting, users have found TikTok a very convenient tool for attracting people's attention. To achieve this, most Sri Lankan consumers use rhythmic movements or dance. In order to attain its main objective, the research relies on dance discourses on social media platforms to gauge the public sphere's knowledge construction of dance. This is important to study because public constructions of the meaning of dance help determine whether or not dance is promoted or ignored in a society. From these discourses, the study discusses the positive and negative effects of social media and how it affects the dance industry. Data for the study will be collected through interviews, watching TikTok videos, and observing the quality and quantities of comments, likes, and sharing of relevant videos, ratings, and available information on TikTok Technology.

Keywords: social media, TikTok, ratings, popularity, attention

# The Impact of The Newspaper Infographic on Public Health Communication During the COVID-19 Pandemic in Sri Lanka

H.M.D. Malinda[1], K.P. Gamage[2]
Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka
[1]dmherath@gmail.com
[2]k.prabhashini@gmail.com

The concepts of infographics, data visualization, and information visualization, which are visual communication strategies, can be used effectively to present more information to the readers in fewer words, especially in the newspaper. The purpose of this study was to explore that how the newspaper infographic impacted public health communication during the COVID-19 pandemic in Sri Lanka. The reporting of the COVID-19 epidemic using visual tactics in local newspapers was examined. Qualitative methodology was used as the research methodology. Eight Sinhala, English and Tamil newspapers from both government and private publishing houses in Sri Lanka were selected for this study. Conclusions were arrived at following content analysis. Findings revealed that young newspaper readers in Sri Lanka prefer to use infographics, but traditional newspaper readers do not. It was also revealed that the majority of page designers who are working in the newspapers are engaged in traditional journalism and are not willing to adapt to this new technological strategy. Moreover, it was revealed that the majority of newspaper readers are attracted to reading infographic news articles. Accordingly, it was concluded that the use of infographics by local newspapers have more impact on the Sri Lankan readers and that awareness programmes regarding infographics need to be conducted for traditional newspaper journalists in Sri Lanka.

Keywords: impact, infographic, visual communication, newspaper readers, Sri Lanka

**Digital Reading Behaviour in Sri Lankan Secondary Education: Cases on Digital Textbook Reading**

N.W.W.G.K. Prabhashini

Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka

k.prabhashini@gmail.com

The reading behaviour of senior secondary school education transformed from print media texts to hypertext with the advent of digital textbooks. According to Mangen's research (2013), shallow reading behaviours like scanning and skimming are prevalent in digital reading, which causes us to read less intently and shallowly. The easiest way to define the idea of "digital textbooks" is as any digital resource used to improve student learning. This study aimed to investigate the effects of digital reading behaviour on Sri Lankan secondary school education. The study's major goal was to determine how secondary school students' digital reading habits affect them when they use digital textbooks. This study was based on a survey approach, and 325 senior secondary school students in the Western Province of Sri Lanka were given access to an online questionnaire. Of the 323 respondents, the raw data was accurate. *Google doc* was used to produce the questionnaire, which was then shared via WhatsApp. The survey data showed that 115 students still utilized printed textbooks while 188 students stated they used both digital and conventional textbooks. Only approximately 25% of pupils favour using the digital textbook exclusively. 60.7% of students access digital textbooks using a smartphone. The principles of searchability, portability, and accessibility provide the basis for the usage of digital textbooks. Due to technological limitations, a preference for reading only printed books, Internet vulnerabilities, and an inability to read screens, digital textbooks are not widely used. This sample shows that students' perceptions are influenced by their reading behaviour when reading on a digital device. Speedy internet facility, awareness programs on digital textbooks, and increase in infrastructure facility for digital reading can be suggested as recommendations.

Keywords: digital reading, reading behaviour, digital textbook, secondary education, Sri Lanka

# *A Doll's House*: An Analysis from a Sri Lankan Perspective

Dr. Jayantha Wannisinghe
Department of Languages, Sri Palee Campus, University of Colombo, Sri Lanka
Jayantha258@yahoo.com

The image of the woman in literary work is often created as a domesticated and private woman with little courage to decide based on her consideration. Most social instructions and conventions are enemies of every individual, especially women, because they restrict the characters' identity and freedom. The woman is under the control of the invisible hands and the pressures of patriarchal society; therefore, she is socially, biologically, and psychologically stereotyped. In *A Doll's House*, the playwright shows how a woman, despite being domestically confined, can emerge as a heroic individual to challenge inimical societal norms instead of being something she doesn't care for. By challenging stereotypes and winning her freedom for self-development, the protagonist becomes a person in her own right. The protagonist's final decision to leave her home and give up her husband and children can be considered a bold decision as such a decision cannot be taken by an average woman in a patriarchal society. Further, a legitimate emancipation and empowerment of women apart from patriarchal authority would require that women liberate themselves from the co-dependence on patriarchal authority. This research applied the theory of otherness put forward by Simone de Beauvoir and relied on qualitative research in which content analysis was administered through a thematic approach to compare and contrast western and Asian women's struggle against patriarchal strongholds. When compared to the Sri Lankan context it was found that the protagonist's move towards her would-be emancipation or autonomy cannot be generalized as a norm to be followed. Western and Asian women think differently in terms of individuality and family but in the west, most women seek individual freedom in addition to family requirements, while in most third world countries, most women prioritize improving their own families. Specifically, gender relations in traditional Sri Lankan society have sustained close ties and cooperation between the two sexes, despite the carefully maintained distinctions between the two genders. Accordingly, family relationships became strong and the woman began to occupy a core position in the family. The marital relationship was also a reciprocal one with mutual rights and obligations. As the gender roles allocated to husband and wife were complementary the subject/object dichotomy between husband and wife was inconsequential. So, what is important for Sri Lankan women is not just individual emancipation but the improvement of the family.

Keywords: personal identity, freedom, self-development, family

**Islamic Womanhood and Victimization: A study of Sri Lankan Literature in Tamil**

Anusha Shivalingam

Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka

anusha@spc.cmb.ac.lk

According to feminist literature, literature is a way to find liberation for women by highlighting the impact that society created on women and how a woman is stereotyped in society. In the 1980s, women became more aware of their social presence in Sri Lanka. The Tamil-speaking community also includes Muslims. They were identified as a different ethnic group in terms of culture, politics, and religion which highlighted this Muslim identity. Tamil has been chosen as the Moor community's mother tongue. It can be seen that the varieties contained in Sri Lankan Tamil literature exist due to unique reasons. In that, the intervention in which the emancipation of the Muslim woman is found has also been built as a unique genre. The main objective of the study was to identify the Sri Lankan Tamil literature derived by Muslim women to portray victimization in society. This research was carried out by applying the qualitative methodology through content analysis of women in the Moor community affected by the hegemony of the Moor community and the hegemony of society, which have been discussed through poetry. Poetry written by Muslim women discuss common issues in history because they do not have the minimum freedom. Thereafter, the woman has somewhat intervened to speak freely and boldly about these unique issues. It is reflected in the use of poets like Anar and Najeepa Rufi that violence against women should be countered by creating policies. Mahima Jahan, Masoora, and Majeet discussed losing freedom in life as women and being Muslim women through poetry. It has been proven through the poems that the poets have tried to question and socialize the rights of women including early marriage, dowry, deprivation of education, cultural violence, sexual freedom, sexual violence, and domestic violence.

Keywords: Sri Lankan Tamil literature, Sri Lankan Tamil poetry, victimization, feminism, Muslim literature

**Gender in The Portrayal of Female Characters in Sri Lankan Cinema**

M.D.N.D.M. Bandara

Department of Performing Arts, Sri Palee Campus, University of Colombo, Sri Lanka

maddu81@gmail.com

The art of cinema deals with highly complicated human relations prevalent in society, and is a remarkable exposition on the social, political and cultural portrayal of the woman and the man. In the study of mutual relationship between the art of cinema and human society, studying how the social existence of the woman and the man is recreated by the art of cinema is an important research approach. The fundamental significance of the research is to study the portrayal through the Sri Lankan Cinema, of how gender defined by Contemporary Social Theory and the cultural study has impacted basic human needs for the cultural wellbeing of the woman. The woman and man centered gender is executed in the political structure, social structure and also in the cultural structure of human society. In terms of each of those structures, the cultural power centered execution of gender is distinctive. The fundamental objective of this research is to study gender as depicted in Sri Lankan cinema.

Study on "Has gender affected the well-being, identities, and freedom of the woman portrayed in the Sri Lankan cinema?" shall be the main research problem of this research, and "What are the cultural power structures and cultural divisions that are against human dignity, and intrude the characterization of woman as a human being?", "What is the impact of gender on basic human needs, wellbeing, identities, and the freedom of women?", "What is the nature of cultural power, division possessed by gender?" have been identified as research questions applicable to the main research problem. In this research, under qualitative research methodology, Narrative Study will be used to study the research problem. As the research sample, out of the films screened in Sri Lanka within the decade of 1990 to 1999, ten films shall be selected, one from each year. There, the ten films shall be selected under the method of Purposive Sampling, based on the theme in accordance with the research topic. Also, in this research, the method of data collection includes multiple data collection methods and data is expected to be collected from multiple sources. Data collection techniques include interviews, observation, questionnaires, and related documents, and data will be analysed qualitatively using narrative analysis.

Keywords: Sri Lankan cinema, basic human needs, gender, woman, culture

# University of Colombo School of Computing

## *ICT for Emerging Regions*

16th November 2022

# MESSAGE FROM DIRECTOR

**Dr. Ajantha Atukorale**
Director,
University of Colombo School of Computing

We are delighted to have you join us for the 22nd International Conference on Advances in ICT for Emerging Regions (ICTer 2022), which will take place from 30th November to 1st December, 2022. The ICTer conference is hosted by the University of Colombo School of Computing (UCSC) with the support of local and international partners. For the last 22 years, the UCSC has been organizing an international conference which was titled "International Information Technology Conference (IITC)" since 1998 and later rebranded as ICTer from 2010. This year we will be organizing the ICTer Conference as a blended conference allowing participants to attend the conference physically or online. Based on the last two years' experience, the organizing committee is planning to host the conference as an open conference, allowing the public to watch the conference through YouTube webcasting. All participants are invited to watch last year's conference proceedings at www.icter.org/conference. The physical conference will be held at the Prof. V. K. Samaranayake Auditorium, University of Colombo School of Computing.

The ICTer Conference has served as a forum for the dissemination of academic work from other universities, including those outside of Sri Lanka, as well as work that addresses pressing issues in developing regions conducted at the cutting edge of computing research and development. According to Google Scholar, publications in ICTer have accepted citations from other indexes throughout the most recent years (h-index and i10-index). The high standards of the ICTer conference are well known. Over the years, these standards have been raised by the UCSC, other institutions of higher learning, and the Sri Lankan IT sector.

The ICTer2022 has been organized and supported by a committed team. I would like to take this opportunity to thank the conference co-chairs for their leadership as well as all of the committee members who are a part of the young academic team at the UCSC. I would also like to express my gratitude to the session chairs, keynote speakers, paper presenters, and reviewers. In closing, I want to express my gratitude to all of our sponsors, without whose help this conference would not have been possible.

I hope ICTer 2022 conference is both fruitful and memorable.

# MESSAGE FROM SYMPOSIUM CHAIR

**Dr. Asanka Sayakkara**
Senior Lecturer,
University of Colombo School of Computing

It is my pleasure as one of the co-chairs to write this message on the 22nd International Conference on Advances for ICT for Emerging Regions (ICTer) this year. The ICTer 2022 conference will be held on 30th November and 1st December, 2022 as a hybrid event bringing both in-person and online audiences together. ICTer 2022 is organised with the technical co-sponsorship of IEEE Sri Lanka Section. This means, all accepted full papers presented at the ICTer 2022 conference will be submitted to the IEEE Xplore digital library.

ICTer is the successor to the seminal International Information Technology Conference (IITC) held in Sri Lanka since 1998. The ICTer conference is a unique opportunity for researchers and practitioners alike to present research results and practical deployment in the Computer Science and Information Technology domains. Annually, academics, students, and researchers from various universities in Sri Lanka and around the world submit their papers to the ICTer conference.

This year, the conference consists of 10 specialised tracks on various topics, namely machine learning, physical computing, distributed computing, human computer interaction, applications of IT, industry R & D, information security, natural language processing, open track, and digital transformation and innovation. Among these tracks, the last one is dedicated to the theme of this year's Annual Research Symposium (ARS) of the University of Colombo, called "Digital Transformation and Innovative Approaches to Mitigate Challenges in the Higher Education Sector". In addition to research paper presentations, this year's event consists of 4 keynote speeches by distinguished speakers from various fields in computing, and pre- and post-conference workshops.

As one of the co-chairs of the ICTer 2022 conference, I would like to thank our organising committee, the reviewers, authors and speakers, financial and technical sponsors, and everybody who has contributed to the success of this year's event.

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# Programme of Sessions

| AGENDA – 31st November 2022 | | |
|---|---|---|
| 08.00 AM | Registration | |
| 08:00 AM | Welcome Address by the Conference Co – Chairs | |
| 08:10 AM | Address by the Vice Chancellor of the University of Colombo | |
| 08.20 AM | Address by the Director of UCSC | |
| 08.30 AM | Keynote 01: Prof. Wen Hu | |
| 09.30 AM | Platinum Sponsor Speech | |
| 10.00 AM | Tea Break | |
| 10.10 AM | *Sponsor Advertisement* | |
| *10.20 AM - 11.40 AM* | **Session 1-A** | **Session 1-B** |
| | **open** | **Machine Learning** |
| 12.00 Noon | *Sponsor Advertisement* | |
| 12.15 PM - 1.15 PM | **Session 1-C** | **Session 1-D** |
| | **Machine Learning** | **Human computer interaction / Industry** |
| 1.25 PM | *Sponsor Advertisement* | |
| 01.30 PM | Lunch Break | |
| 01.50 PM | *Sponsor Advertisement* | |
| 02.00 PM | Keynote 02: Data-Driven Paradigm Shift: Evolution of Digital Transformation (DX) with advances of ICT in Higher Education Prof. K. P. Hewagamage | |
| ***03.00 PM - 04.00 PM*** | **Session 2-A Applications of IT** | **Session 2-B Physical Computing** |
| 04.10 PM | *Tea break* | |
| 04.20PM | *Poster Presentations* | |
| 05.00 PM | End of the first day of the Conference | |

| AGENDA – 1st of December 2021 | | |
|---|---|---|
| 08:00 AM | Registration | |
| 08:20 AM | Keynote 03: Smell, Taste, and Haptic Interfaces to Inspire a New Age of Experience Media<br>Dr. Nimesha Ranasinghe | |
| 9.20 AM | *Sponsor Advertisement* | |
| 09:30 AM | Tea Break | |
| 09.40 AM | *Sponsor Speech* | |
| *10.00 AM - 11.00 AM* | **Session 3-A** | **Session 3-B** |
| | **Machine Learning /NLP** | **Application Of IT** |
| **11.20 AM** | *Sponsor Advertisement* | |
| 11:30 AM | **Session 3-C** | **Session 3-D** |
| | **Poster Session 4*** | **Poster Session 5*** |
| **12.05 PM** | *Sponsor Advertisement* | |
| 12.15 PM | Panel Discussion | |
| 01:15 PM | *Sponsor Advertisement* | |
| 01.25 PM | Lunch Break | |
| 02.00 PM | *Sponsor Advertisement* | |
| 02.10 PM - 3.20 PM | **Session 4-A** | **Session 4-B** |
| | **Machine Learning / NLP** | **NLP** |
| 3.40 PM | Keynote 04: Dr. Primal Wijesekara | |
| 4.40 PM | *Sponsor Advertisement* | |
| 04.50 PM | Awarding of the Best Paper | |
| 05.20 PM | *Sponsor Advertisement* | |
| 05.30 PM | Vote of Thanks by Conference Co-Chair | |

## INTRODUCTION TO KEYNOTE SPEAKERS

**Prof. Wen Hu**

School of Computer Science and Engineering

University of New South Wales (UNSW)

https://research.unsw.edu.au/people/professor-wen-hu

Wen Hu is Professor at the School of Computer Science and Engineering, University of New South Wales (UNSW). Much of his research career has focused on novel applications, low-power communications, security and compressive sensing in sensor network systems and Internet of Things (IoT). Hu published regularly in top rated sensor network and mobile computing venues such as ACM/IEEE IPSN, ACM SenSys, ACM MobiCom, ACM UbiCOMP, IEEE PerCOM, ACM transactions on Sensor Networks (TOSN), IEEE Transactions on Mobile Computing (TMC), and Proceedings of the IEEE.

Hu was a principal research scientist and research project leader at CSIRO Digital Productivity Flagship, and received his Ph.D from the UNSW. He is a recipient of the prestigious CSIRO Office of Chief Executive (OCE) Julius Career Award (2012 – 2015) and multiple research grants from the Australian Research Council, CSIRO and industries.

Hu is a senior member of ACM and IEEE, and is an associate editor of ACM TOSN and the general chair of CPS-IoT Week 2020. He also serves on the organizing and program committees of networking conferences including ACM/IEEE IPSN, ACM SenSys, ACM MobiCom, ACM MobiSys, ACM/IEEE IOTDI, IEEE ICDCS.

**Prof. K. P. Hewagamage**
University of Colombo School of Computing
https://ucsc.cmb.ac.lk/profile/kph/

Prof. Hewagamage was the Director of the University of Colombo School of Computing from 2016 to 2022. Prof. K. P. Hewagamage serves as a Professor in Software Engineering at the University of Colombo School of Computing (UCSC) and the coordinator of the e-Learning Centre at UCSC. He holds a Bachelor's degree in Computer Science with First Class Honors from the University of Colombo and a doctorate in Information Engineering from Hiroshima University.

Prof. Hewagamage has a wide variety of research interests centered around Human-Computer Interaction and Software Engineering, namely, e-Learning, situated computing, HCI in mobile computing, object-oriented and pattern-oriented software development and multi-model interaction. Hence, he has led several research groups and supervised a considerable number of undergraduate, masters and doctoral students in these areas. He has more than 80 international publications in international proceedings, journals and book chapters. He won the Faculty research award twice during the last 16 years. At the same time, several of his research outcomes have won national and international awards. A few of them are the Best Paper Awards at IEEE and other conferences, UNESCO award, NBQSA awards from British Computer Society, e-Swabhimani Awards from ICT Agency of the government of Sri Lanka.

**Dr. Nimesha Ranasinghe**

Assistant Professor at the School of Computing and Information Science, University of Maine

http://www.nimesha.info/

Nimesha Ranasinghe is an Assistant Professor at the School of Computing and Information Science, University of Maine and Co-founder of FlaVR Labs Inc. Dr. Ranasinghe's research interests include Multisensory Computing, Human-Computer Interaction, and Augmented and Virtual Reality. Nimesha is particularly interested in exploring the concept of 'Flavor Interfaces' where computing technologies can be applied to augment the traditional human-food interactions at the dining table.

He is well-known for his Digital Taste (a.k.a. Virtual Flavors) and Virtual Cocktail (Vocktail) inventions and has been featured in numerous media around the world, including New Scientist, New York Times, Time Magazine, BBC Radio, Discovery Channel, and Reuters. Furthermore, he has published his work in several prestigious academic conferences and journals, including the ACM Conference on Human Factors in Computing Systems (CHI), the ACM conference on Multimedia, and the Journal of Human-Computer Studies. In addition, he has received numerous awards for his research work in 2014, his work on Digital Lollipop was selected as one of the ten best innovations in the world by the netexplo forum at the UNESCO HQ, Paris.

**Dr. Primal Wijesekera**
Research Scientist,
ICSI - University of California, Berkeley
https://www.icsi.berkeley.edu/icsi/people/primalw

Primal Wijesekera is a staff research scientist at ICSI, a UC Berkeley-affiliated research institute, and an affiliated researcher with the Electrical Engineering and Computer Science Department at UC Berkeley. He is also one of the founding members of Bug Zero. His primary research interests are privacy and security on mobile, vulnerability management in organizations, privacy and security issues in ad networks, supply chain security, privacy and security in health tech, and regulatory privacy regimes (COPPA, HIPAA, CCPA).

Dr. Primal has extensively worked on building tools to analyze mobile apps, and their work is featured in New York Times, Washington Post, and other global news outlets. His prior work has also resulted in legal actions against Google and is being taught worldwide as part of Undergrad and Grad curricula on security and privacy. He has published in top-tier security venues (IEEE S&P, Usenix Security) and usable security and privacy venues (ACM CHI, SOUPS, PETS). He has received many accolades for this research, including Usenix Security Distinguished Paper Award (2019), Data Protection Agency Privacy Award (Spain, 2022), CNIL-INRIA Privacy Award (France, 2021), and the Caspar Bowden PET Award (2020).

# ABSTRACTS OF KEYNOTE ADDRESSES

## Professor K. P. Hewagamage

### Data-Driven Paradigm Shift: Evolution of Digital Transformation (DX) with advances of ICT in Higher Education

Three stages of digitization, digitalization, and digital business model have built the foundation of Digital Transformation (DX). In fact, it is the main achievement of the Industry 3.0 revolution, which will reach its end in a few years. The new era of Industry 4.0 has already started, and it will bring a new culture that will radically affect and influence every function in society. Simply, the culture, workforce, and technology, which are forces of transformation, may undergo another cycle of change with respect to the objective of a data-driven paradigm in the new era. Hence, the fourth dimension of transformation, which we name as the data-driven transformation, will be the governing principle for digitization, digitalization, and digital business model. The data-driven transformation is directly linked with several frontier technologies in ICT, namely Robotic Process Automation (RPA), Artificial Intelligence, Blockchain, Internet of Things, Cloud Computing, Virtual Reality, 3D Printing, Big Data and Data Science/Engineering, and so on. Technology provides opportunities to find solutions for problems/constraints in many processes. However, the success of solutions depends on the innovativeness of applying the technology to automate the process. Hence, the data-driven paradigm will become the architecture of those solutions.

Higher education develops the frontier workforce of society to take development forward. The workforce should be capable of handling the challenges caused by the revolution of digital transformation. Hence, the process of digital transformation in higher education must be initiated as early as possible to develop workforce that could contribute to sustainable development in society. Digital Transformation does not occur in an organization as a part of a natural evolution due to the social context and development. It is very important to initiate projects after identifying key areas.

Data-driven paradigm will have to affect all three below stages in the digital transformation. Digitization means more than converting to digital form since data needs meaningful annotation to utilize in intelligent systems. How to manage human bias in the intelligent systems of digitalization will be the second challenge since one system needs to behave

differently depending on the context. Digital business models are not developed in advance, and they will be dynamic models derived based on the data set.

In this keynote address, a few projects will be presented to justify the importance of data-driven digital transformation in a higher education institute. These projects will bring the benefits of digital governance to the organization while establishing the path to sustainable development. However, DX projects have higher risks due to many challenges, and coordinated efforts are required with the support of all stakeholders to avert them.

## Dr. Nimesha Rahasinghe

**Smell, Taste, and Haptic Interfaces to Inspire a New Age of Experience Media**

When humans interact with the outside world or one another, all of the senses are engaged; a true conversation is considered a full sensory experience. From early ages to the present world, people desire multisensory experiences in every aspect of their lives. From trying different foods, going to different places to playing games in virtual reality, they continuously seek sensory stimuli to be a wholesome experience. Yet, the current technology lacks the inclusion of many essential sensory channels. This talk highlights several research works focusing on "Experience Media" that explore possibilities for novel multisensory interactive digital media technologies towards achieving total immersion in day-to-day digital interactions. This talk also emphasizes the need to look beyond the current 'age of information' and step into a new 'age of experience.'

# Abstracts

## Towards Improving Early Learning Capabilities of Students Through a Gamified Learning Tool During COVID-19

Hirasha Pooliyadda, Charini Peiris, Dinithi Kurukulasuriya, E.Hettiarachchi, K.P. Hewagamage
University of Colombo School of Computing
Colombo, Sri Lanka

There is a growing concern to find an effective teaching and learning methodology during a social distancing situation as well as to address the drawbacks in the current educational system of Sri Lanka for students in Key Stage 1. Gamification has proved to make a positive impact on the concentration level, motivation and educational capabilities of students. Although previous research has been successful in introducing various gamified tools, very few are available in the local language. In this study, a gamified learning tool named "Punchi Nanasala" was introduced targeting Grade 1 and 2 students which focused on the subjects Mathematics, Sinhala language, and Environmental studies. The main objective of the study was to transform the traditional face-to-face learning method into a remote learning method through the proposed web-based gamified tool which can also be used as a distant learning tool to keep the students engaged and focused on learning. A user-centered design approach was used in developing the tool and gaming elements such as a leaderboard, coins, stars, and other audio and visual effects were used to enhance the learning experience. Two sample groups recruited as experimental and control groups were given a pretest to measure their current knowledge capacity and a post-test to evaluate their knowledge capacity after the gamified treatment was given. Positive results were obtained from the multiple evaluation techniques. Emotion detection, mouse click monitoring, performance analysis, interviews, and surveys suggested that the tool was successful as a learning approach and that it was successful in maintaining the concentration of the students while improving their early learning capabilities.

Keywords: Gamification, Key Stage 1, Social Distancing, Pandemic, Distant learning, Remote evaluation techniques

**A Hybrid Approach for Detection of Fake News in Sinhala Text**

Lalinda Udurawana, A.R. Weerasinghe, Randil Pushpananda
University of Colombo School of Computing
Colombo, Sri Lanka

The impact of technology in people's lives has grown continuously. Consumption of online news is one of the important trends as the share of population with internet access grows rapidly over time. Global statistics has shown that the internet and social media usage has an increasing trend. Recent developments like the Covid 19 pandemic have amplified this trend even more. However, the credibility of online news is a very critical issue to consider since it directly impacts society and people's mindsets. A majority of users tend to instinctively believe what they encounter and come to conclusions based upon them. It is essential that the consumers have an understanding or prior knowledge regarding the news and its source before coming to conclusions. This research proposes a hybrid model to predict the accuracy of a particular news article in Sinhala. The model combines the general news content-based analysis techniques using machine learning classifiers with social network related features of the news source to make predictions. A scoring mechanism is utilized to provide an overall score to a given news item where two independent scores – Accuracy Score (by analysing the news content) and Credibility Score (by social network features of the news source) are combined. The hybrid model containing the Passive Aggressive Classifier has shown the highest accuracy of 88%. Also, the models containing deep neural networks have shown accuracy around 75-80%. These results highlight that the proposed method could efficiently serve as a Fake News Detection mechanism for news content in Sinhala Language. Also, since there's no publicly available dataset for Fake News detection in Sinhala, the dataset produced in this work could also be considered as a contribution from this research.

Keywords: Fake News, Content-Based, Social Network-Based, Hybrid Approach

**Multi-modal Deep Learning Approach to Improve Sentence level Sinhala Sign Language Recognition**

Naveen Tennakoon, Sachini Haputhanthri, Sachini Wijesekara, Randil Pushpananda, Thilini Nadungodage

University of Colombo School of Computing

Colombo, Sri Lanka

Sign language is used across the world for communication purposes within hearing-impaired communities. Hearing people are not well versed in sign language and most hearing-impaired are not good in general text, creating a communication barrier. Research on Sign Language Recognition (SLR) systems have shown admirable solutions for this issue. In Sri Lanka, machine learning along with neural networks has been the prominent domain of research in Sinhala SLR. All previous research is mainly focused on word-level SLR using hand gestures for translation. While this works for a certain vocabulary, there are many signs interpreted through other spatial cues like lip movements and facial expressions. Therefore, translation is limited and sometimes the interpretations can be misleading. In this research, we propose a multi-modal Deep Learning approach that can effectively recognize sentence-level sign gestures using hand and lip movements, and can be translated to Sinhala text. The model consists of modules for visual feature extraction (ResNet), contextual relationship modeling (transformer encoder with multi-head attention), alignment (CTC) and decoding (Prefix beam search). A dataset consisting 22 of sentences used for evaluations was collected under controlled conditions for a specific day-to-day scenario (a conversation between a vendor and a customer in a shop). The proposed model achieves a best Word Error Rate (WER) of 12.70 on the testing split, improving over the single-stream model which shows a best WER of 17.41, suggesting a multi-modal approach improves overall SLR.

Keywords: Sign language, Sinhala Sign Language, Continuous Sign Language Recognition, Deep Learning, Multi-modal fusion

**Sinhala Hate Speech Detection in Social Media Using Machine Learning and Deep Learning.**

Siumi Fernando, A.R. Weerasinghe, E. R. A. D. Bandara
University of Colombo School of Computing
University of Colombo, Faculty of Science
Colombo, Sri Lanka

Communication and presentation of beliefs became easier than in previous decades due to the rapid rise of information technology and computer science. Because social media is accessible worldwide via the internet, anyone can simply target someone or a group who adheres to a different culture or belief. While everyone has the freedom to express their own opinions, it should not be destructive, and everyone has the right to be free of hate speech. Because there are no automatic mechanisms for detecting hate speech on social media, anyone can be readily targeted. Because social media service providers do not have extensive linguistic expertise of some languages, such as Sinhala, it may take a few days for them to delete hate-related comments from the material after they become aware of them. As a result, detecting hate speech in the Sinhala language is an urgent and crucial task. Machine learning and deep learning based algorithms were employed in this study to automatically recognize Sinhala hate speeches broadcast on social media. Bag of words, Tf- idf, Word2Vec, and FastText feature extraction methods were used to extract features from the comments. Logistic Regression, Multinomial Naïve Bayes, Support Vector Machine, XGBoost, Random Forest machine learning models and CNN, RNN, LSTM deep learning models were trained using two pre-collected datasets with different sizes. The best six models were then chosen and test set performances were shown. According to this study, FastText with RNN has the greatest AUC ROC 0.71 with 70% accuracy for the test set.

Keywords: Hate speech detection, Sinhala, Machine Learning, Deep Learning, Natural Language Processing

**Context Aware Back-Transliteration from English to Sinhala**

Rushan Nanayakkara, Thilini Nadungodage, Randil Pushpananda
University of Colombo School of Computing
Colombo, Sri Lanka

Sinhala is a language that is widely used in social media, but this is done by representing the Sinhala words using the English alphabet. This process of representing texts of one language using the alphabet of another language is called transliteration. Since the standard script of the English language is the Roman script, these transliterated Sinhala texts are referred to as Romanized-Sinhala texts. The availability of these texts in large amounts provides a potential solution to the issue of Sinhala being a low resource language in Natural Language Processing (NLP). However, it is impossible to use the existing Sinhala text processing tools to process Romanized-Sinhala texts, as those systems can only process Sinhala scripts. Therefore, in order to be processed using the existing Sinhala NLP tools, these texts need to be transliterated back to their original Sinhala scripts. This process of transliterating texts backwards using their native alphabet is referred to as back-transliteration.

In this study, we present a Transliteration Unit (TU) based back-transliteration system for Romanized-Sinhala texts and a novel algorithm to convert the Romanized-Sinhala scripts into TU sequences. Any sequence of Roman scripts that represent a single character of the Sinhala mixed alphabet is considered to be a TU. The proposed algorithm preprocesses the texts using a rule base in order to normalize the texts and generate TU sequences. Then the TU sequences are processed by a sequence to sequence model that uses Long Short-Term Memory (LSTM) encoder-decoder architecture in order to generate the target Sinhala texts. The system was trained using a primary data set and evaluated using an unseen portion of the trained dataset and a secondary data set of a different context. The proposed model has achieved 0.81 in BLEU score and 0.78 in METEOR score on the primary data set, while achieving 0.57 in BLEU score and 0.47 in METEOR score on the secondary data set.

Keywords: Back-transliteration, LSTM, Encoder-decoder, Transliteration-Unit, Context-awareness

**An Augmented Reality Interface for Fashion Design with Artistic Content Generated Using Deep Generative Models**

Chamodi Jayathilaka, Sandamini Aththanayake, Thisara Pannala, Prabhash Kumarasinghe, U.D.I. Perera, Kasun Karunanayaka
University of Colombo School of Computing
Colombo, Sri Lanka

Fashion design is an art that reshapes the designers' imagination into visible content. This requires a significant amount of time and expertise. The assistance provided by the available design tools and frameworks is limited and the existing tools do not provide the capability for the visualization of generated cloth on the body. In this paper, ARGAN - an Augmented Reality (AR) based Fashion Design system to generate a new dress when a sketch and a theme image are provided into a Controllable Generative Adversarial Network and to visualize the virtual 2D apparel in real-time with AR - is proposed. Compared to existing works in Augmented Reality-based fashion design prototypes, this work focuses on generating new, artistic fashion designs using Deep Generative Models for a novel AR-based fashion designing experience and generating artistic content aligned to a theme and rough 2D sketch that are input by the designer. To the best of our knowledge, this work is the first attempt at utilizing Deep Generative Models (e.g. GANs) in an Augmented Reality prototype for fashion design for generating creative fashion content in 2D and exploiting the possibility of Deep Generative Models to generate fashion designs to a theme. Our primary contribution is to provide a combined solution for synthesizing fashion from sketches and themes and visualizing them on a human body by assisting fashion designers in decision making. The proposed approach is presented to the user as a proof of concept prototype that was evaluated using a usability evaluation experiment based on fashion designers' design sketches and themes. The findings show that the use of the proposed ARGAN proof of concept prototype in the field of fashion designing supports fashion designers in their designing process.

Keywords: Augmented Reality, Media Pipe, Deep Generative Models, Generative Adversarial Networks, Control GANs, Fashion Designs

**Categorizing the IPv4 Address Space Based on Services Running on IPs**

S.R. Kalutarage, Kasun De Zoysa
University of Colombo School of Computing
Colombo, Sri Lanka

This study aims to categorize the service types of IP addresses based on running services. The service types can be categorized into Proxy, VPN, Cloud, CDN, and Hosting. The reason for this classification is, that by using these insights one can build better intrusion detection systems. For example, if the IP addresses of the daily users of the websites are mostly VPNs and proxies then owners can be aware of the traffic and IP addresses of the visitors. Another advantage is that one can build better IP blacklists and understand the nature of the ASNs (Some ASNs contain more VPN IPs, and some contain more cloud IPs).

The data gathering was done using many methods such as Internet-wide scanning, ASN data collection, and Whois data collection. By using these techniques millions of IP addresses were collected. Many well-known cloud vendors have officially published their IP addresses and this study takes these published IP ranges as the ground truth. About 130,000 IP addresses were collected as the ground truth. By merging these ground truth IPs, with the datasets which are collected by various techniques, the final ground truth IP dataset was constructed. By using this dataset the most important features were identified and trained in various machine learning models. From these trained machine learning models Random Forest Classifier was chosen as the best classifier for this classification since it achieves 94.71% of accuracy and a 95% F1 score.

Keywords: IPv4, IPv4 Classification, VPN, Proxy, Cloud

**Enhancing Source Camera Identification through Higher-order Wavelet Statistics**

Dulangi Gamage, Kasun De Zoysa, Asanka Sayakkara
University of Colombo School of Computing
Colombo, Sri Lanka

In digital forensics, source camera identification (SCI) is an emergent problem that focuses on determining the camera that has been used to capture a given image. Unique characteristics of cameras, such as photo response non-uniformity (PRNU) noise, has been demonstrated to be useful in distinguishing between very similar cameras. Building on existing work, this study introduces a method to uniquely identify source cameras by using statistical features of PRNU noise embedded in images. Here, the PRNU noise is estimated by taking the difference between the camera output and a denoised image. Afterwards, higher order wavelet statistics extraction (HOWS) features are extracted to identify statistical relations between the images taken from the same camera. The proposed method is evaluated under 3 scenarios on the data collected from cameras of smartphones. When distinguishing between cameras from different brands and models, the proposed method produces an accuracy of 95%. In the case of identifying between cameras of different models of the same brand, an accuracy of 92.5% was achieved. In the extreme case of distinguishing between cameras of the same make and model, an accuracy of 85% was achieved. The results also indicate that the proposed method is robust against basic image manipulations.

Keywords: image forensics, source camera identification, higher order wavelet statistics, photo response non-uniformity noise

**Semi-Supervised Learning of Individual Elephants from Visual Data**

Gagana Weerasinghe, Kasun Karunanayaka, U.D.I. Perera, Carlos Trenado
University of Colombo School of Computing, Colombo, Sri Lanka
Heinrich Heine University, Düsseldorf, Germany

This paper presents a novel method to discover and identify unseen Asian elephants that are not previously captured or identified in available data sets and re-identify previously seen Asian elephants using images of elephant ears, leveraging a semi-supervised learning approach. New ear patterns of unseen elephants are learnt for future re-identification. To aid our process, elephant ear patterns are used as a biomarker to identify individual Asian elephants, each of which is attached a descriptor. The main challenge is to learn and use a clustering technique to identify new classes (i.e., elephants) in unlabelled elephant ear image sets and leveraging this data in verifying the labelled images. This study proposes a systematic approach to address the problem to uniquely identify elephants, where we developed: (a) a self-supervised learning approach for training the representation of labelled and unlabelled image data to avoid unwanted, bias labelled data, (b) rank statistics for transferring the models' knowledge of the labelled classes when clustering the unlabelled images, and, (c) improving the identification accuracy of both the classification and clustering algorithms by introducing a optimization problem when training with the data representation on the labelled and unlabelled image data sets. This approach was evaluated on seen (labelled) and unseen (unlabelled) elephants, where we achieved a significant accuracy of 86.89% with an NMI score of 0.9132 on identifying seen elephants. Similarly, an accuracy of 54.29% with an NMI score of 0.6250 was achieved on identifying unseen elephants from the unlabelled Asian elephant ear image data set. Findings of this research provides the ability to accurately identify elephants without having expert knowledge on the field. Our method can be used to uniquely identify elephants from their herds and then use it to track their travel patterns which is greatly applicable in understanding the social organization of elephant herds, individual behavioural patterns, and estimating demographic parameters as a measure of reducing the human-elephant conflict in Sri Lanka.

Keywords: semi-supervised learning, Asian elephants, identification, biomarkers, clustering, visual descriptor

**Employing Super Resolution to Improve Low-Quality Deepfake Detection**

Anjana Perera, Ajantha S. Atukorale, Prabhash Kumarasinghe
University of Colombo School of Computing, Colombo, Sri Lanka

The rapid progress in deepfake content generation has now come to a point where it raises significant concerns about its implications for society. Therefore, a new challenge of detecting deepfakes arises to protect individuals from potential misuse. Even though introduced detection algorithms perform well on high-quality deepfakes, detecting low-quality deepfakes has been challenging. As a remedy, researchers try to feed more training data to increase detection ability. However, providing more data and processing them is not always feasible in a practical scenario. Thus, for the first time in this domain, we propose the employment of super-resolution (SR) as a preprocessing step instead of feeding more data to improve low-quality deepfake detection. Extensive experiments were conducted on the FaceForensics++ deepfake dataset. Initially, three baseline models, Meso-4, MesoInception-4, and XceptionNet, were trained and tested on the dataset without any preprocessing mechanism. XceptionNet outperformed with 90.54% accuracy revealing that deeper networks detect low-quality depfakes adequately. Then those baseline models were trained with SR preprocessing. To do that, we employed two SR networks, called VDSR and RESRGAN. RESRGAN+XceptionNet outperformed the previous baseline models by obtaining 96.05% accuracy, showing SR preprocessing usefulness in low-quality deepfake detection. Further experiments utilizing performance metrics, statistical tests, and visualization of activation maps showed that SR preprocessing is promising when applied to deepfake detection networks and detection algorithms experience a significant performance.

Keywords: deepfake, deep learning (DL), detection, lowquality, super-resolution (SR)

# Institute for Agro-Technology and Rural Sciences

## *Exploring Path for Sustainable Agriculture through Integrative Research*

28th June 2022

## MESSAGE FROM THE DIRECTOR

**Prof. Asanga D. Ampitiyawatta**
Director
University of Colombo Institute for Agro-Technology and Rural Sciences (UCIARS)

I am delighted to issue a congratulatory message to the proceedings of the 3rd National Symposium on Agro-Technology and Rural Sciences (NSATRS 2022) as the Director of the University of Colombo Institute for Agro-Technology (UCIARS).

The conference is organized under the theme of "Exploring Path for Sustainable agriculture through Integrative Research". Today, the agriculture environment is changing rapidly due to excessive use of inputs and environmentally unfriend practices so the whole sector may face a huge threat in the near future. In this sense, sustainable agriculture becomes more important to protect the precious natural environment, maintaining agricultural productivity and profitability in the long run. The incorporation of rural and traditional knowledge into modern agricultural technologies through integrative research may play a vital role in this trajectory.

To make a common platform for researchers from various agricultural disciplines for eye-opening integrative research is the aim of this conference. Organizing such an event in the present situation of the country is challenging and it discloses our commitment towards the development of the agriculture sector.

I take this opportunity to extend my sincere appreciation and congratulation to the organizing committee, keynote speakers, paper presenters and the participants of the conference and wish them all success.

# MESSAGE FROM THE CHAIRPERSON

**Dr. N. P. Vidanapathirana**
Senior Lecturer
Department of Agro-Technology, UCIARS

It is with great honor and privilege for me to convey this message on the occasion of Third National Symposium on Agro Technology and Rural Sciences 2022 (NSATRS 2022) on "Exploring Path for Sustainable Agriculture through Integrative Research". The symposium will provide a comprehensive overview of the research conducted in the field of Agro-Technology over the past years.

Main purpose of organizing this symposium is to present research findings, dissemination of technology and formulation of future research program for increasing the agriculture productivity in perspective of national and global needs. The diversity of specializations and related themes will enable us to achieve our targeted mandate and vision. The hard work and dedication of all the members of organizing, scientific, technical and financial committees during the preparation for this symposium is highly appreciated. Without them the event would not have been possible. A note of appreciation is offered to the academia for their thorough and timely reviewing of the papers.

On behalf of the organizing committee, let me express my sincere gratitude to the Chief Guest of the event; Senior Professor H. D. Karunarathne, Hon Vice-Chancellor, University of Colombo, the Guest of Honor of the event; Senior Professor S. Subasinghe, Faculty of Agriculture, University of Ruhuna, Director of UCIARS; Dr. A. D. Ampitiyawatta, Keynote speakers of the symposium, Professor Paul A, Iji, Dean College of Agriculture, Fisheries and Forestry, Fiji National University and Emeritus Professor Upali Samarajeewa, Faculty of Agriculture, University of Peradeniya.

Most of all, I thank you, the presenters, for enriching the symposium by your presence. I congratulate to the organizing committee of the NSATRS 2022 and wish today's symposium a grand success.

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### Track: Smart Farming and Advanced Agriculture

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## Track: Empowering Rural Community through Agribusiness and Entrepreneurship

**Chair**

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# Programme of Sessions

| Agenda – 28th June 2022 | |
|---|---|
| 08:00 AM | Inauguration of the NSATRS 2022 Conference |
| 08:00 AM | Welcome Address by the Symposium Coordinator |
| 08:05 AM | Inauguration Address by the Symposium Chairperson |
| 08.10 AM | Address by the Director of UCIARS |
| 08.20 AM | Address by the chief guest, Vice Chancellor of University of Colombo |
| 08.30 AM | Keynote Speech I<br>Professor Paul A. Iji – Dean – College of Agriculture, Fisheries and Forestry Fiji National University, Fiji. |
| 09.00 AM | Keynote Speech II<br>Emeritus Professor Upali Samarajeewa |
| 09.30 AM | Address by the Guest of Honour<br>Senior Professor Ranjith Senaratne – Chairman of National Science Foundation |
| 09.40 AM | Vote of Thanks by Symposium Secretary |
| | Tea break |
| 10.00 AM – 11.40 AM | Technical Session 01 – Innovation for Sustainable Agriculture |
| 11.45 AM – 12,35 PM | Technical Session 02 – Smart Farming and Advance Agriculture |
| 12.35 PM – 1.00 PM | Lunch Break |
| 1.05 PM – 2.35 PM | Technical Session 03 – Food Science and Technology |
| 2.40 PM – 3.30 PM | Technical Session 04 – Empowering Rural Community through Agribusiness and Entrepreneurship |
| 3.30 PM – 4.00 PM | Closing Session |

# INTRODUCTION TO KEYNOTE SPEAKERS

**Professor Paul A. Iji**

College of Agriculture, Fisheries and Forestry

Fiji National University

Koronivia Campus, Suva

Fiji Islands.

Professor Paul A. Iji is currently the Dean of the College of Agriculture, Fisheries and Forestry at the Fiji National University (FNU), Suva, Fiji. He is also an Adjunct Professor at the University of New England, Australia and University of KwaZulu-Natal, South Africa. He studied in Australia (PhD and Graduate Certificate in Higher Education), Scotland (MSc) and Nigeria (BSc Honours, First Class). He has been involved in research and tertiary education since 1987, working first at Ahmadu Bello University, Nigeria, and later in South Africa, Australia, and currently Fiji. He has been involved in teaching and research in several areas of animal science, including nutrition and animal production systems. Prof Iji has graduated close to 40 PhD, Masters and Honours students and currently supervises other postgraduate students at Fiji National University.

He has published more than 150 journal papers, and presented over 180 conference papers, 27 of them on invitation. His research is highly cited, and he has a large following on LinkedIn, ResearchGate and other academic social media. Recently, he was listed among the Top 2 % of more than 8 million researchers globally. To date, Prof Iji has secured research and scholarship funding of more than US$5.54m. Prof Iji has been a consultant to companies involved in the animal feed industries and is on the editorial board of scientific journals, along with his role as a reviewer for other journals. He is also the author of Writing and Publishing Your Research, a booklet aimed at developing the writing skills and publication record of early-career researchers.

# ABSTRACTS OF KEYNOTE ADDRESSES

**Professor Paul A. Iji**

## Exploring Path for Sustainable Agriculture through Integrative Research

Professor Paul A. Iji, the Dean College of Agriculture, Fisheries and Forestry of Fiji National University, and Adjunct professor of the University of New England and Australia and University of Kwazulu-Natal, South Africa, delighted the National Symposium of Agro-Technology and Rural Sciences 2022 on the theme of "Exploring Path for Sustainable Agriculture through Integrative Research" by making the Keynote speech on the theme of Agriculture and Food Security. In summary, Professor Paul aligned his speech on the sub-topics of what is food security, pillars of food security, global food supply, threats to global food security and how to secure the global food supply. He mentioned that the largest proportion of world cereal production in 2020 was given by Asian region followed by Europe and North America which were having equal amounts of production. The milk supply per capita per day was highest in Northern America followed by South America and Oceania in 2020. The meat supply per capita per day was highest in Oceania followed by South America and Northern America in 2019. In conclusion, Professor Fiji mentioned that a sizable proportion of the world is food secure but there is a fine line between food security and insecurity plus the developing world seems to be more insecure compared to developed regions and the best solution to overcome this is agricultural development.

# ABSTRACTS

## Effects of different weedy rice control methods on at 362 in ampara district

K. M. Aafir*, H. Rohanadheera and M. S. A. Kalees

Department of Agro-Technology, University of Colombo Institute for Agro-Technology and Rural Sciences, Hambantota, Sri Lanka

Weedy rice is the rice weed that mostly collapses the farmer's to identify rice from weedy rice at their early stage in the paddy field, and it leads to increase cost of cultivation since both crop and weed are fighting for nutrients, water, space etc. The lack of a selective herbicide or other effective means to manage weedy rice has made its control a national priority. Hence, considering this, an experiment was conducted to evaluate the effects of different weed control methods in paddy fields by controlling the weedy rice population to enhance the growth and yield of paddy in the Ampara district. It is one of the prominent problems in Sri Lanka, and farmers are suffering from the high cost of production. With five treatments and four replications, the trial was set up in a randomized complete block design. The treatments were as follows: T1-Control, T2-Hand weeder, T3-Mechanical weeder, T4-Herbicide, and T5-Hand weeding. The parameters of plant number, tiller number, panicle number, panicle length, spikelet number, filled grain, and 1000 seed weight were evaluated for both paddy and weedy rice at the same time. SAS 9.1.3 statistical software was used to analyze the acquired data, and DMRT was used to conduct the mean separation at a significance level of 5%. The data revealed that for plant height in paddy, T5 was recorded as the maximum valued one and showed a significant difference (p 0.05) with all other tested treatments. In the infilled grain of paddy, T3 and T5 showed significant differences (p 0.05) with T4 and T1, and the maximum value was recorded for T3 and T5 (205.75 and 223.50). In the 1000 seed weight test, T5 was recorded as the maximum value (27.47 g) and showed a significant difference with all other treatments. At spikelet number, panicle length, and filled grain, T5 showed lowest value and showed a significant difference with all other treatments. It was concluded that Hand weeding performed better to eradicate the weedy rice population at the field level.

Keywords: Growth, Paddy, Weed control, Weedy rice, Yield

This abstract was published in the 2022 Proceedings of the 3rd National Symposium on Agro-Technology and Rural Sciences organised by the IARS, University of Colombo

**Oreochromis niloticus and Cyprinus carpio integration with organically grown paddy: *Oryza sativa* (AT362)**

R. T. Lokuhetti[1], H. K. R. S. Kumara[1*], K. S. S. Atapaththu[2] and S. S. Herath[3]

[1]Department of Agrotechnology, Institute for Agrotechnology & Rural Sciences, University of Colombo, Weligatta

[2]Department of Limnology & Water Technology, Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna, Matara

[3]Department of Fisheries and Aquaculture, Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna, Matara

This experiment was conducted to examine the impact of rice fish integration on rice fish productivity using *O. sativa* (AT 362), *O. niloticus*, and *C. carpio*. The four treatments in the RCBD were as T1: Paddy + Tilapia(T), T2: Paddy + Carp (C), T3: Paddy + (Carp and Tilapia, (C+P; 1:1 ratio) and T4: Paddy only (Control). Each treatment with three replicates was randomly allocated into twelve experimental plots ($4 \times 4$ m$^2$). Planting space was 25cm, with 60 fingerlings per plot. Initial fish weight and length were 1.11g and 4.21cm respectively. The experiment lasted 105 days. Fish were given commercial diet at 5% body weight per day. Plant growth was monitored every 14 days. Manual weeding was done. Fish were harvested at the end of experiment. The number of leaves per plant was significantly higher in paddy cultivated with *O. niloticus*, but there was no significant difference ($p > 0.05$) in plant height among the different treatments. The plants grown with *O. niloticus* showed the highest number of tillers followed by (T+C), carp (C), and control treatment respectively. There was a significant difference ($p<0.05$) observed in collar width of plants, where *O. niloticus* integrated two treatments had the highest value. The highest number of panicles per plant was also found in *O. niloticus* treatment followed by mix (T+C), carp (C), and control respectively. The weight of *O. niloticus* was significantly higher than that of *C. carpio*. Root area diameter (RAD) was ($p<0.05$) significantly affected by the fish integration where the highest RAD was found in tilapia integrated treatments. Reproductive and feeding behaviour of tilapia could explained the increased RAD, which ultimately increased the nutrient uptake and consequently a higher yield. Average final weight of *O. niloticus* grown in T and T+C treatments were $111.3 \pm 3.8$ g and $109.6 \pm 3.1$ g respectively. The highest survival rate of fish among treatments was observed in *O.niloticus* (75.6 %). According to present findings, it can be recommended to integrate *O. sativa* (AT362) with Nile tilapia (*O. niloticus*).

Keywords: *C.carpio, Growth, O.niloticus,,* Rice-fish integration, yields

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# Growth and yield performances of *Evolvulus alsinoides.* Linn (Visnukkranthi) as affected by different methods of irrigation and weed management

P. G. Samarawickrama[1], S. L. Nawarathna[1*], S. Subasinghe[2]. and N. P. Vidanapathirana[1]

[1]Department of Agro-Technology, Institute for Agro-Technology and Rural Sciences, University of Colombo, Sri Lanka.

[2]Department of Crop Science, Faculty of Agriculture, University of Ruhuna, Sri Lanka.

*Evolvulus alsinoides* Linn is extensively used as traditional medicine in various culture including Sri Lanka. It is commonly known as 'Vishnukranthi' and it widely use for various pharmacological activities due to its chemical constituents. Therefore, Sri Lanka spend huge amount of foreign exchange for herbal raw material importations, because of no systematic cultivation has been developed so far even though this plant can be seen in natural habitat. Preliminary studies showed that weed management and irrigation as serious constraints for mass scale cultivation. So, this study is focused on identification of appropriate weed management method and irrigation system for mass scale cultivation. Experiment was designed according to split plot design with 03 replicates. According to that two main plots as Manual Irrigation (M1) and Sprinkle Irrigation (M2). Also five sub plots as control treatment (T1), polyethene mulching (T2), rows seeding and use weeder for weed management (T3), two inter cultivation after bed preparation before planting in weekly interval (T4) and transplanting (T5). Sprinkler irrigation or manual irrigation are not significantly affected to the *Evolvulus alsinoides* Linn cultivation while weed management practices significantly alter the yield and growth parameters of the *Evolvulus alsinoides* Linn. Transplanting was showed highest significant plant growth, no. of leaves and no. of branches. Also, polyethene mulching, rows seeding and use weeder for weed management, two inter cultivation after bed preparation before planting in weekly interval and transplanting are showed significantly highest fresh weight, dry weight and root weight. Therefore research concluded that, all four weeding methods are positively impacted on harvest.

Keywords: Commercial production, Evolvulus alsinoides, Linn, Irrigation system, Weed management

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# Manufacturing of turmeric powder using the turmeric grown in semi-arid zone of Sri Lanka

D. M. C. C. Gunathilake*

Department of Agro-Technology, University of Colombo Institute for Agro-Technology and Rural sciences, Hambantota

This research study was conducted to identify correct powder manufacturing procedure for making of high-quality turmeric powder using semi-arid zone grown turmeric of Sri Lanka. Processing steps namely, harvesting, sorting, cleaning, curing (boiling), cutting in slices, drying, grinding and sieving were identified as correct turmeric powder processing steps. Harvesting was done when, turmeric leave's colour changed to yellow and start drying. After harvesting, damaged rhizomes were separated. Good rhizomes were washed ×clean thoroughly and carefully removed all impurities attached to rhizomes. Cleaned rhizomes were boiled for 50 min to proper gelatinization. Boiled rhizomes were cut manually into 2mm - 4mm size slices. Cutting pieces (2mm -4mm size) were dried in solar dryer until moisture content reach to 9% and it took 4 days. Dried turmeric slices were ground using pin-mill and sifting through 400µm sieves. Ground powder was packed in poly-propylene bags. In this experiment, turmeric powder was produced as SLS: 613:1983 standards, accordingly, moisture content (MC) and particle size of turmeric powder were kept 9.00%wb and 400µm respectively. (MC should be 9.00% or less and particle size should be less than 425µm as a SLS: 613:1983 standards). Storage MC of the powder under ambient condition was evaluated and found that it was increased from 9.00%wb to 13.96%wb for 6 months' storage under ambient condition of Hambantota, Sri Lanka.

Keywords: Powder, Powder quality, Processing steps, Turmeric

This abstract was published in the 2022 Proceedings of the 3rd National Symposium on Agro-Technology and Rural Sciences organised by the IARS, University of Colombo

# Impact of covid-19 pandemic on access to foods, dietary habits and nutrient intake of adults in sri lanka

U. R. Chandimala[1*], V. S. Jayamanna[2] and S. Dhushane[1]

[1]Institute for Agro-Technology & Rural Sciences, University of Colombo, Weligattha New Town, Hambantota, Sri Lanka

[2]Department of Food Science & Technology, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka

Most of the countries over the world have been establishing firm actions such as lockdowns or curfews with the declaration of novel coronavirus outbreak as a pandemic by WHO. An online survey was piloted using 14200 respondents from 11 districts in Sri Lanka representing various socio-economic backgrounds to study the impact of COVID-19 pandemic on dietary habits, access to food items and nutrient intake of adults in Sri Lanka. Simple random sampling, stratified sampling and cluster sampling were adopted to choose the sample based on the population in 440 Grama Niladhari divisions. Non-parametric statistical approaches (Wilcoxon Signed Rank test and Mann Whitney test) were used to analyze the data at 5% significant level. Increase in consumption of home-made foods, fresh foods, immunity boosting foods and nutritional supplements along with a decrease in consumption of processed foods were considered as positive changes in dietary habits of the adults in Sri Lanka. Increased consumption of snacks additional to three main meals while spending a sedentary lifestyle has increased the risk of diet related non-communicable diseases. Food inflation was increased during the pandemic period. People have cut down the consumption of some food items due to increased prices and substituted some foods due to unavailability. Home delivery facility aided in maintaining the access of public to foods. The study revealed that the daily nutrient intake of Sri Lankan adults was not up to a satisfied level when compared with the nutritional guidelines for a healthy life. In summary, COVID-19 pandemic period had caused repercussions in the food supply, access of public to the foods and utilization within the country.

Keywords: COVID-19, Dietary habits, Food access, Nutrient intake, Socio-economic

This abstract was published in the 2022 Proceedings of the 3rd National Symposium on Agro-Technology and Rural Sciences organised by the IARS, University of Colombo

# Development of nutritious curry cubes by using mung bean (*Vigna radiata)* and cowpea (V*igna unguiculata*)

B. P. Siriwardena[1*], R. W. M. R. L. Warnasooriya[1], S. M. A. C. U. Senarathne[2], N. P. Vidanapathirana[1] and K. G. Ketipearachchi[1]

[1]Department of Agro-Technology University of Colombo Institute for Agro-Technology and Rural Scieneces, Weligatta New Town, Hambantota

[2] Food Research Unit, Department of Agriculture, Gannoruwa, Peradeniya

Mung bean (*Vigna radiata*) and cowpea (*Vigna unguiculata*) are two legumes that have nutritional properties useful for humans. Although it is nutritious, cowpea and mung bean are less popular among people due to the time taken for prolonged soaking and cooking. Thus, this research was directed to create a novel, value-added, ready to cook, nutritious curry cube by using mung bean and cowpea. The experiment was conducted at the Food Processing Laboratory, Food Research and Development Unit, Gannoruwa. The ingredient combination was selected using preliminary studies and several sensory assessments after carried a 5-point hedonic scale by 30 panelists for sensory parameters such as aroma, taste, appearance, and overall acceptability. Curry cubes have been prepared through the method of steaming and deep-frying. Five mixing ratios (w/w) of mung bean and cowpea (100:0, 75:25, 50: 50, 25:75, 0: 100) were evaluated for sensory properties after preparation of curry cube (30 g) integration with other ingredients (chopped onion (10 g), curry powder (2.5 g), turmeric powder (1 g), chili powder (2.5 g) and salt (3g)). Friedman's Non-parametric analysis method was used to analyze data. Curry cube prepared by mixing mung bean 50 % (w/w) and cowpea 50% (w/w) with the other ingredients was selected as the best proportion according to the sensory evaluation. The most acceptable product was vacuum-packed and evaluated the shelf life up to 3 weeks at ambient environmental conditions. Proximate evaluation was carried out and results were recorded. Values for moisture, total fat, crude fiber, total ash, and crude protein contents were 14.05%, 20.38%, 3.74%, 3.75%, and 20.38 % respectively. Corresponding to the microbiological outcomes, the product was microbiologically secure for consumption up to 2 weeks after storage period. This study revealed that there is a great possibility to producing nutritious curry cubes using mung beans and cowpea.

Keywords: Cowpea, Curry cube, Mung bean, Nutritious, Sensory evaluation

This abstract was published in the 2022 Proceedings of the 3rd National Symposium on Agro-Technology and Rural Sciences organised by the IARS, University of Colombo

# Extraction of yellow colorant from the peel of banana (*Musa spp*.) And determination of carotenoids

K. Y. Gallage [1], S. Weerasinghe[1], U. R. Chandimala [1*] and H. Weerathunga [2]

[1]Institute of Agro Technology and Rural Sciences, University of Colombo, Hambantota, Sri Lanka

[2]Industrial Technology institute, Colombo, Sri Lanka

Banana (*Musa spp.*) is grown worldwide mainly as a fruit crop. Peels form about 18–33% of the whole fruit and are discarded as waste. Banana peel is enriched with many bioactive compounds along with color pigments such as carotenoids. The total peel waste resulting from high banana production is not utilized in a proper manner in Sri Lanka. This study was conducted to extract natural yellow colorant from banana peel. Ambul (A), Puwalu (P) and Cavendish (C) varieties were selected and yellow colorant was extracted using the solvents; T1: (hexane+acetone) and T2: ethanol. The dehydrated extracts were dissolved in ethanol to calculate the total carotenoid pigment concentration. The highest carotenoid pigment concentration was observed in T2 extract of (A) ($0.43\times10^{-3}$ ±0.10 g /mL), followed by T1 extracts of (A) ($0.30\times10^{-3}$ ±0.08 g /mL), (P) ($0.17\times10^{-3}$±0.06 g /mL) and (C) ($0.13\times10^{-3}$±0.04 g /mL) varieties. β-carotene level of each variety was measured using the spectrophotometric method at optimum extraction conditions. The β-carotene level among samples was in a range between $1.03\times10^{-4}$ to $2.45\times10^{-4}$ mg/mL. The highest β-carotene level was observed in (A) variety. Antioxidant activity of each variety was calculated using DPPH assay and values were in a range between 0.01 to 3.29 mg Trolox/g. According to Chroma meter values, the most intense yellow color was recorded in (A) variety under T1 treatment. The study concludes that Ambul banana peel is a highly potential source for the extraction of natural industrial yellow colorant. Also, this can be identified as a sound method of managing banana peel waste in Sri Lanka.

Keywords: Banana peel, Carotenoid, Extraction, Yellow colorant

This abstract was published in the 2022 Proceedings of the 3rd National Symposium on Agro-Technology and Rural Sciences organised by the IARS, University of Colombo

# INSTITUTE OF BIOCHEMISTRY MOLECULAR BIOLOGY AND BIOTCHNOLOGY

***Multidisciplinary Research for Sustainable Development in the Post Genomic Era***

06th & 7th April 2022

# MESSAGE FROM THE DIRECTOR-IBMBB

**Professor Prasanna Galhena**
Director,
Institute of Biochemistry, Molecular Biology and Biotechnology

On behalf of all the academics and students of the IBMBB, University of Colombo, I would like to extend our warmest welcome to all the delegates and participants for the 3rd International Conference on Frontiers in Molecular Life Sciences (ICFMLS), 2022 organized by IBMBB, University of Colombo.

This is one of the key events that facilitate interaction, sharing of knowledge, expertise, and experiences among academics and students. I am confident that ICFMLS 2022 will play an important role in addressing key issues of multidisciplinary research and developments in the country with a perspective of their practical deliveries. The broad scope of this event is to initiate an interactive platform to accommodate diverse activities in the field of Molecular Life Sciences.

The blend of symposia, from precision oncology to populational genetics and advances in immunotherapies in response to the current COVID-19 pandemic, clearly indicates the diversity of the event and I'm confident that the two day conference proceedings will give a very productive outcome for all our registered participants.

I would like to express my sincere gratitude to all the distinguished invited speakers for their presence and contribution to the conference. I also thank all the resource persons who have contributed in numerous ways to make this event successful.

Finally, I would like to make a note of appreciation to the dedicated team at the IBMBB who worked tirelessly in bringing you a productive conference despite all the challenges during this difficult time.

# MESSAGE FROM THE 3RD INTERNATIONAL CONFERENCE CO-CHAIRPERSONS

**Prof. Nimal Punyasiri**
Professor of Biochemistry
Institute of Biochemistry, Molecular Biology and Biotechnology

**Prof. Shiroma Handunnetti**
Professor of Immunology
Institute of Biochemistry, Molecular Biology and Biotechnology

We are pleased to send this message to the 3rd International Conference on Frontiers in Molecular Life Sciences (ICFMLS) organized as a hybrid event to mark the 18th Anniversary of the Institute of Biochemistry, Molecular Biology and Biotechnology (IBMBB), University of Colombo. The theme of the 3rd ICFMLS held on 6th-7th April 2022 is "Multidisciplinary Research for Sustainable Development in the Post-Genomic Era" which focus on the contribution of Molecular Life Sciences to sustainable development in Sri Lanka and also globally. This provides a forum for Sri Lankan students and scientists to gain cutting edge knowledge from renowned world authorities on a wide variety of topics including those that are highly pertinent in the current contexts.

We are extremely grateful for the support of Professor Pradeep Dharmadasa, Acting Vice Chancellor, University of Colombo being the Guest of Honour. The keynote speaker for the 3rd ICFMLS is Senior Professor Raj Somadeva, Professor of Archeology, Postgraduate Institute of Archeology, University of Kelaniya. This year, IBMBB is holding the International conference along with the events that are held annually. Thus we will have the Professor Stanley Wesner Memorial Lecture at the Inauguration of this conference. *Vidya jothi* Professor Vajira Dissanayake, Dean, Faculty of Medicine, University of Colombo will deliver the Professor Stanley Wijesundera Memorial Lecture. There are seven symposia organized for the 3rd ICFMLS to cover themes ranging from Plant Metabolomics, Biotechnology, Population Genetics and Bioinformatics, Natural Products for therapeutics, Immunopathogenesis &

Immunodiagnostics, Novel Vaccination & Drug Development Strategies and Molecular Genetics & Genomic Medicine. We are very grateful to the eminent speakers from Canada, India, Italy, Sri Lanka, United Kingdom and United States of America who will contribute to these symposia and share their knowledge with us to make this conference a success.

The 3rd ICFMLS will have 27 oral presentations and 21 poster presentations made by students and scientists from Sri Lanka (from the IBMBB and from other Higher Educational Institutes) and from overseas. We are very pleased that this conference will provide a platform for the students and scientists to interact with eminent speakers to discuss research findings.

On behalf of the IBMBB and the Organizing Committee, we thank Professor Pradeep Dharmadasa, Acting Vice Chancellor, University of Colombo, family members of late Professor Stanley Wijesundera, the Keynote speaker, Stanley Wijesundera Memorial Lecturer, symposia speakers, chairpersons and judges for different Scientific Sessions, oral and poster presenters, all our sponsors and all the members of the organizing committee. We sincerely hope that this conference will be intellectually stimulating to all the participants.

# ORGANIZING COMMITTEE

| | |
|---|---|
| Professor Prasanna Galhena | Director-IBMBB |
| Professor Nimal Punyasiri | Co-Chairperson |
| Professor Shiroma Handunnetti | Co-Chairperson |
| Dr. Sumadee De Silva | Joint Secretaries |
| Dr. Sudeshini Hewage | Joint Secretaries |
| Dr. Nadeesha Lewke Bandara | Co-Editor |
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| Dr. Nilupa Guneratna | Dr. Kanishka Senarath |
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| Mr. Raveen Perera | |

# PROGRAMME

| Day 1 – 6th April 2022 | | |
|---|---|---|
| | **Room 1** | **Room 2** |
| 09.00 – 9.45 h | Inauguration ceremony | |
| 9.45 – 10.45 h | **Prof. Stanley Wijesundera memorial lecture**<br>**by**<br>**Vidya Jyothi Prof. Vajira H. W. Dissanayake**<br>Dean, Faculty of Medicine, University of Colombo. | |
| 10.45 – 11.15 h | Tea break | |
| 11.15 – 13.00 h | **Symposium I : Precision Oncology** | |
| 13.00 – 13.45 h | Lunch +Industry talks | |
| 13.45 – 15.00 h | **Oral Presentations - session 1**<br>Natural products for therapeutics | **Oral Presentations - session 2**<br><br>Immunopathogenesis & immunodiagnostics |
| 15.00 – 16.45 h | **Symposium III**<br>Trends in drug screening and development | **Symposium II**<br>COVID-19 updates |
| 16.45 – 17.15 h | Tea | |
| 17.15 – 18.15 h | **Poster session 1** | |

| Day 2 – 7th April 2022 | | |
|---|---|---|
| | **Room 1** | **Room 2** |
| 08.00 – 09.00 h | **Oral Presentation - session 3**<br><br>Natural products for therapeutics | **Oral Presentation - session 4**<br><br>Natural products for therapeutics |
| 09.15 – 10.00 h | **Keynote address**<br>**Prof. Raj Somadewa**<br>Senior Professor of Archaeology<br>Postgraduate Institute of Archaeology<br>University of Kelaniya | |
| 10.00 – 10.15 h | Tea break | |
| 10.15 – 12.00 h | **Symposium IV**<br>Peopling and evolution of languages<br><br>**Oral Presentation - session 5**<br>Population Genetics and Bioinformatics | **Symposium V**<br>Natural products as immunity boosters |
| 12.00 – 13.15 h | **Oral Presentation - session 6**<br>Molecular genetics and genomic medicine | **Oral Presentation - session 7**<br>Natural products for therapeutics |
| 13.15 – 14.00 h | Lunch +Industry talks | |
| 14.00 – 15.00 h | **Plenary lecture**<br>**Prof. Eric Bongcam Rudloff**<br>Professor of Bioinformatics<br>Swedish University of Agricultural Sciences<br>Uppsala, Sweden | |
| 15.00 – 16.45 h | **Symposium VI**<br>Plant genetic resources and Biotechnology | **Symposium VII**<br>Trends and needs in immunodiagnostics and immunotherapeutics |
| 16.45 – 17.00 h | Tea Break | |
| 17. 00 –18.00 h | **Poster session 2** | |
| 18. 00 –18.30 h | **Award ceremony and closing remarks** | |

# PROFESSOR STANLEY WIJESUNDERA MEMORIAL LECTURE

**Vidya Jyothi Professor Vajira H. W. Dissanayake**

**MBBS, PhD, FNASSL, FIAHSI**

Dean, Faculty of Medicine

Chair and Senior Professor, Department of Anatomy,

Genetics and Biomedical Informatics

University of Colombo

Sri Lanka

Chairperson - Global Genomic Medicine Collaborative (G2MC)

vajira@anat.cmb.ac.lk

## Genetics and Genomics in the Sri Lankan population - Insights from Four Decades of Service and Research

Genetics and genomics play a vital role in clinical practice today. Genetics refers to the study of genes and the way that certain traits or conditions are passed down from one generation to another. Genomics describes the study of all the genes of a person (the genome). Over time genetic and genomic technologies have advanced from tests that enabled testing of chromosomes (in the 1960s), to tests that enabled testing individual genetic variants (in the 1980s), to tests that enable testing of chromosomes for microdeletions and duplications, and to tests that enable testing of genes, gene panels, exomes and genomes (today). As such now it is possible not only to establish the genetic aetiology of conditions of which the phenotype clearly indicates a well-known monogenic disorder through single gene testing but also the genetic aetiology of conditions where the phenotype is not clear but there is a suspicion of an underlying genetic aetiology through gene panel, exome or genome testing. In addition advances in the understanding of genetic variants as predictors of treatment outcomes have enabled the use of such knowledge in treatment decision making and prognostication. Furthermore advances in the understanding of the role of genetic variants in absorption, metabolism, excretion and distribution of drugs (pharmacogenomics) have made it possible to use such knowledge in treatment decision making.

The Human Genetics Unit in the Faculty of Medicine, University of Colombo established in 1983 has been in the forefront of genetic and genomic research in the country for four decades.

The Unit conducts service and research using cytogenetic, molecular genetic, and molecular cytogenetic techniques. This work has enabled us to catalog the spectrum of cytogenetic abnormalities and microdeletion syndromes in children; the genetic aetiology of a range of conditions including Duchenne Muscular Dystrophy, Spinocerebeller Ataxia, Huntington Disease, Tuberous Sclerosis, Hereditary Haemochromatosis, and Hereditary Thrombophilia to name a few; and the diversity of pharmacogenomic variants in the Sri Lankan population and to compare it with other global populations.

The advent of the genomic medicine era saw the Human Genetics Unit taking leadership in sequencing a Sri Lankan genome and implementing genomic medicine technologies to diagnose Inherited Cancer Syndromes and Undiagnosed Rare Genetic Disorders. Up to date the Unit has sequenced and analysed over 500 exomes. This work has led to the discovery of a range of novel variants contributing to the aetiology of these conditions.

Several large-scale research projects conducted by the Unit resulted in new discoveries. Among this work is the pioneering discovery of the contribution of variants in the EGF gene to the aetiology of pre-eclampsia and the weight of babies at birth; the description of the microbiome of the placenta in a subset of women with pre-eclampsia; conclusively showing that Y-chromosome microdeletions do not contribute to recurrent pregnancy loss, and discovery of the contribution of several genetic variants in the aetiology and the pathophysiology of sporadic breast cancer in post menopausal women.

The work described above has enabled the Human Genetics Unit to become one of the leading centres for genetic and genomic service and research among Low and Middle Income Countries (LMICs) and the orator being appointed as Chairperson of the Global Genomic Medicine Collaborative an organisation dedicated to advancing genomic medicine in LMICs established by the participants of the Meeting of the Global Leaders in Genomic Medicine convened by the National Genome Research Institute of USA in Washington, DC, USA in January 2014.

In this oration I shall describe in detail the work mentioned above.

## KEYNOTE LECTURE

**Professor Raj Somadeva**
Postgraduate Institute of Archaeology
University of Kelaniya
Sri Lanka

### Archaeology meets Genomics: New avenues of population prehistory

Dispersal patterns of ancient languages have been considered as a strong indicator of prehistoric population distribution all over the world. Archaeological evidence provides parallel clues as complementary to elaborate the relationship held between linguistic dispersal and population diversity. Such diffusions occurred in a time which was far beyond the past well before the written records emerged and therefore narratives are absent about the prehistoric linguistic interactions held. Most of the histories belonging to the diverse nations in the world have memories of such immigrations. Memories of migrations related to their ancestral populations appear in different forms. The stories pertaining to the peopling of Sri Lanka are also enmeshed by such a story that is strongly rooted in the public consciousness of identity. The arrival of a gang who had a north Indian cultural origin and their subjugation of the native then inhabiting the island is the major content of that story. The idea of population migration associated with mainland India brings us a sound theme to be analyzed scientifically. Any attempt to be focused on the study of the composition of the prehistoric population in Sri Lanka has to scrutinize the population dynamics in South Asia from a broad biological point of view. Perhaps it might be spatially incorporated further into mainland Southeast Asia. Analysis of the complexity of the composition of the lingua franca in mainland India is an important point of departure to formulate a conceptual framework on the biological inheritance of the prehistoric population in Sri Lanka. On one hand, the language family of Indo-Aryan derived from the Central Asian wave of linguistic influence that occurred 3.5ka ago dominated in most part the northern part of mainland India even including Pakistan and Bangladesh. On the other hand, the South Indian Peninsula was dominated by Dravidian languages. This was a result of a high level of endogamy triggered by strict social boundaries and a high degree of genetic drift encouraged by long-term isolation. The investigations carried out using mitogenome analysis of autosomal data and Y-chromosome lineages on the population history for mainland India suggest that maternal lineages emerged 55-65ky ago and a major population

shift triggered in the late Pleistocene. Linguistic information provides a beacon to resolve the problems relate to those characteristics. The inspirations of the rises and falls of such dynamics might shed light on determining some of the dilemmas posited on the genetic inheritance of the prehistoric population by the recent archaeological findings in Sri Lanka.

*keyword: Sri Lanka, population history, archaeology, south Asia*

## PLENARY LECTURE

**Professor Erik Bongcam-Rudloff**
Professor of Bioinformatics
Department of Animal Breeding and Genetics
Swedish University of Agricultural Sciences
Uppsala
Sweden

### From Precision Agriculture to Personalised Medicine: A wholistic view of future and present research in the Life Science

For the past several decades, agricultural technology has made tremendous progress in new technologies that leads to increased crop yields and more efficient use of inputs such as water and fertilizer. An increased and more efficient production of food is needed for the world population that is expected to reach 10 billion by 2050. Precision agriculture and food production technologies go hand-in-hand and face new challenges.

The phrase 'You Are What You Eat' means that it is important to eat proper food to be healthy and fit. More and more evidence suggests that there is a connection between the microbiome, the host genome, food intake and health. One issue that will be discussed during my presentation is the problem concerning the development of diseases in animals and humans due to effects of the preservation and the processing of food. Another topic I will discuss is the impact that processed food has on the microbiome.

Scientific research produces more and more complex data to address the above-mentioned issues. My talk will mention some of the trends in Artificial Intelligence dealing with those multidisciplinary based studies.

# Institute of Human Resource Advancement

***"Digital Transformation of Employee Education under COVID - 19 Pandemic"***

19th November 2022

## MESSAGE FROM THE DIRECTOR

**Professor W. S. Chandrasekara**
Director
Institute of Human Resource Advancement
University of Colombo

Covid-19 pandemic has made significant differences in the routines and activities of people all over the world. The pandemic has created adverse changes in the education system and styles, employments, demand for labor, conducting business, governing and many more economic, social, cultural, health, and environmental aspects of human resource development and management. However, Information Communication Technology has immensely intervened to minimized the impact of the Covid-19 pandemic on human live. Therefore, there is a necessity to conduct an International Conference on Digital Transformation of Employee Education under COVID - 19 Pandemic. The Institute of Human Resource Advancement (IHRA) of the University of Colombo has taken an attempt to create and disseminate scientific knowledge on this theme through this 3rd International Conference of IHRA. It was a privilege and honor for me to serve as the Director of the Institute and the Conference Chair for IC3-IHRAUOC to be held on 19th November 2022. IC3-IHRAUOC is designed to address the Digital Transformation of Employee Education under COVID - 19 Pandemic in six relevant fields of study, 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 Nalin Abeysekara 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 thank goes to Senior Professor H.D. Karunarathne, Vice Chancellor of the University of Colombo for his kind assistance us and the keynote Speaker, Professor Nalin Abeysekara, Dean Faculty of Management, Open University. Finally, I wish to express my thanks to the coordinator and organizing team of the Conference.

Thank you very much.

# MESSAGE FROM THE CONFERENCE COORDINATOR

**Ms. K. P. S. Sandamali**
Lecturer
Institute of Human Resource Advancement
University of Colombo

As conference coordinator, I write this message to the 3rd International Conference of IHRA-UOC 2022 on Digital Transformation of Employee Education under COVID - 19 Pandemic. It is indeed a great privilege for me to serve as the conference coordinator of this research conference. What is significant of this research conference is it brings researchers who work in different fields of studies yet are rooted in the common ground together in one place to discuss and debate while appreciating their roots in fields of business and public management, service management, social sciences, Disaster Management, Science and Technology, Library and Information Science, language and literature. I believe this research conference is significant in the Sri Lankan Research landscape since it brings researchers of different fields together into one place.

This conference is made possible by the hardworking of many people, though I may not be able to thank through this message. I wish to extend my sincere appreciation to Senior Professor H.D. Karunarathne, Vice Chancellor, University of Colombo. Further I extend my sincere gratitude to Professor W.S. Chandrasekara, Director, Institute of Human Resource Advancement, University of Colombo. As well, I thank the track chairs and the organizing committee for their contribution for working this research conference successful. I, on behalf of the organizing committee, wish to extend my appreciation to the staff members of the Institute of Human Resource Advancement, University of Colombo. While I gratefully recall the contribution of all reviewers and session chairs, I thank all of them for their intellectual contribution. In concluding note I would like to remember and thank all the authors for sending sharing their knowledge with a larger committee.

## CONFERENCE TRACKS

Empirical and conceptual papers were called under the following tracks;

| | |
|---|---|
| Track 01 | Business and Public Management |
| Track 02 | Service Management |
| Track 03 | Social Sciences |
| Track 04 | Disaster Management, Science and Technology |
| Track 05 | Library and Information Science |
| Track 06 | Language and Literature |

## ORGANIZING COMMITTEE

The names of the following individuals have been assigned with the following responsibilities;

| | |
|---|---|
| Conference Chair | Prof. W.S. Chandrasekara |
| Conference Coordinator | Ms. K. P. S. Sandamali |
| Track Chairs | |
| Business and Public Management | Prof. M.G.G Hemakumara |
| Service Management | Ms. K. P Mathotaaraachchi |
| Social Sciences | Ms. R.M.S. Ratnayake |
| Disaster Management, Science and Technology | Mr. K.D.N Hewage |
| Library and Information Science | Ms. R.M.S Ratnayake |
| Language and Literature | Ms. K.P.S Sandamali |

| Agenda for 19th November 2022 | |
|---|---|
| 10. 00 AM | Commencement of the Inauguration |
| 10. 05 AM | Welcome Speech by the Conference Chair |
| 10. 15 AM | Speech of the Chief Guest |
| 10. 30 AM | Keynote Speaker's address |
| 11. 30 AM | Speech of the Conference Coordinator |
| 11. 45 AM | Tea break |
| 12. 30 PM | Session 01<br>Session 02 |
| 1.30 PM | Lunch |
| 2.30 PM | Session 03 |
| 3. 30 PM | Tea Break |
| 4. 00 PM | Awarding for the Best Paper |
| 4. 30 PM | Closing remark for the Conference |

# Abstract

**Situational factors influencing on purchase intention of residential property: With special reference to private sector employees in Colombo, Sri Lanka**

K.Dilakshi Madushani Kularathne[1] and Chamari Edirisinghe[2]

[1]Management Service Assistant, Department of Social Services Western Province, Health Ministry

[2] Lecturer, Institute of Human Resource Advancement, University of Colombo

madushanikularathne@gmail.com

This study examines the effect of situational factors (i.e., attributes of location, attributes of neighbors, attributes of property, attributes of surrounding, and attributes of visual quality) on private sector employees' purchase intention of residential property. From the point of view of the demand for residential property in Colombo district, Sri Lanka, depend mostly on attributes of the decision-maker and set of alternatives that faces. From the point of view of the supply will depend on the demand and on the market conditions that shape or constrain both the type of supply and its location within the city. However, Department of Census and Statistics, Sri Lanka stated that, purchasing a residential property in Colombo district is challenging since Colombo is the most densely populated district which is nearly 11 times higher than the national figure. Questionnaires were used to collect data from 381 private sector employees in Colombo district, Sri Lanka. The results support that attribute of surrounding and attribute of neighbors positively impact on individuals purchase intention of residential property. However, attribute of location and attribute of property did not impact on individuals purchase intention of residential property. Contrary to expectation, attribute of visual quality negatively impacts on individuals purchase intention of residential property. Study provide insightful information for marketers and researchers to understand perceived value of customer purchase intention of residential property. The tested model will be of great utility to property developers to meeting the homeownership needs and policy makers to take the decision for economic development.

Key words: attributes of location, attributes of neighbors, attributes of property, attributes of surrounding, attributes of visual quality, and purchase intention of residential property

# Institute of Indigenous Medicine

***"Vishav AYUSH Arogayam"***

***Global AYUSH Wellness"***

$7^{th}$ – $9^{th}$ October 20

## Message from Vice Chancellor, University of Colombo

**Senior Professor H.D. Karunaratne**
Vice Chancellor
University of Colombo

It is my great pleasure to issue this brief message for the "6th International Conference on Medicinal Plants, Herbal Products & Hydroponics (ICMPHP-6)" links with the 8th International Conference on Ayurveda, Unani, Siddha, and Traditional Medicine (8th iCAUST)" organized by the Institute of Indigenous Medicine (IIM), University of Colombo in Collaboration with the Department of Plant Sciences, University of Colombo and the Industrial Technology Institute (ITI), Sri Lanka. I understand that this year's conference is facilitated by the Research-cum-Facilitation Centre North Region India (RCFC-NR-I), National Medicinal Plants Board, Ministry of AYUSH, Government of India Joginder Nagar and Co-Host by the Prince of Songkla University (PSU), Thailand, Universitas Abdurrab, Indonesia in Collaboration with Department of Botany Sri Venkateswara University, Tirupati, India, University of Bengkulu, Indonesia; with the Industrial collaboration of Urban Kisaan, Hyderabad along with the support of NMPB, New Delhi.

It is well noted that IIM has been encouraged to organize the conference this year as well due to the success achieved from the past conferences. IIM has also successfully organized many national and international conferences in the fields of Traditional Medicine and Ayurveda. The Main objective of these conferences is to provide and share knowledge and thereby to encourage the scientists, academia, researchers, physicians, traditional medical practitioners, technologists, policymakers, entrepreneurs and relevant other stakeholders who engage with the business.

Traditional medicine at present is a widely discussed subject not only in the east but also in the west. The international market is exponentially increasing in this area due to its effectiveness in health. As a national policy, the government of Sri Lanka also encourages traditional medicine and health tourism. Due to the significant improvement in health tourism, traditional medicine is rapidly increasing with the demand in the globe. The deliberation of this conference

no doubt contributed to the strategies and approaches to addressing health issues globally and especially in the region.

I take this opportunity to express my sincere appreciation to the Conference Chairman, Professor G. Sudarsanam, S.V University, Tirupati, India, and Co-Chairperson, Senior Professor Priyani Paranagama, Director, Institute of Indigenous Medicine, Sri Lanka for their commitment and leadership to make this conference a success. I further extend my thanks to all the members of the Organizing Committees for their hard work in organizing a successful event.

I am confident that the international participants will have a pleasant and memorable time with us. I wish you success in the conference for their dedicated efforts to make this conference a success. I am sure that the participants will have a fruitful conference that is beneficial to their desired fields.

## Massage from the Chief Organizer

**Hanshi Prof. G. Sudarsanam (Retired)**
8th Dan Black Belt
304, Anand Somu Pristine,
9th block Extension, Gottegere Road,
Golahalli, Anjanapura Twp, J.P. Nagar,
Bengaluru- 560062, INDIA

Ever since the dawn of Civilization, man has identified valuable plant wealth for managing innumerable ailments which struck the physical body. Ancient civilizations throughout the world have accumulated a vast wealth of knowledge in medicinal herbs and promulgated several forms of traditional medical systems (e.g. Ayurveda in India. Similarly, ancient Greeks, Chinese Egyptians and Romans developed their respective traditional healing systems using medicinal plants). The use of the medicinal flora for curing disease has been documented in the history of all civilizations The ultimate aim of all these traditional healing systems is to lessen the suffering of humans from disease and to promote health. At present, the rich diversity in medicinal plants finds application globally in pharmaceutical, cosmetic, agricultural and food industries.

During the past few decades, extensive research on medicinal plants has been carried out. New findings, experiences and methods have become available worldwide and several plant-based herbal products have been tried, patented and documented. With increasing interest in herbal medicines worldwide, the discovery of new plant-based medicinal products, and management of medicinal plant genetic resources have assumed considerable importance. Herbal products are gaining increased applications in drug discovery and development. A concerted effort to utilization of the valuable wealth of biological, human and financial resources, which considers sustainable and equitable development, is the need of the hour. We have included the technique for growing plants without soil known as hydroponics, aquaculture or soilless culture also. The varied heritage of traditional medicinal flora around the world is threatened due to various abiotic and biotic stresses including climate change factors coupled with technological advancement.

Realizing the value and importance of the medicinal plants, five International Conferences on Medicinal Plants & Herbal products were organized in Tirupati (2008 & 2010) and ICMPHP3 at the University of Colombo, Sri Lanka (2011), ICMPHP4 at John Hopkins University, Maryland, USA and ICMPHP5 at Manipal College of Pharmaceutical Sciences, Manipal University, Manipal, India during 2013 respectively, which served as a platform for the deliberations on the aspects like new products, active principles, genomics, databases, participatory approaches, gender and ethical issues, regulatory measures and benefit sharing mechanisms in the CBD regime. Further, these conferences helped to bring out the latest information in the diverse fields and action plans for solving various issues related to the area which facilitated the formulation of a network of researchers around the globe. All five conferences received an overwhelming response around the world in bringing a wide range of stakeholders on one platform to discuss a large number of issues on the role of medicinal plants and herbal products for human health on a sustainable basis for millions of people.

The abstracts are from diverse fields (like in the first international conferences) with a common objective of effective utilization and harnessed use of the medicinal plants. During the first international conferences, it is unanimously recommended that such events shall be conducted on an annual basis to bring out recommendations for bringing quality herbal products with scientific background for improved human health.

In line with the above recommendation and support of several well-wishers and collaborators, "Vishav AYUSH Arogyam/Global AYUSH wellness " the 6th International Conference on Medicinal Plants, Herbal products & Hydroponics (ICMPHP6) is being hosted physically & virtually / online by ERA & Khalsa College, Amritsar in India and co-hosted by Institute of Indigenous Medicine (IIM) & Department of Plant Sciences, University of Colombo, Sri Lanka, Industrial Technology Institute (ITI), Colombo, Sri Lanka, Prince of Songkla University (PSU), Thailand; University of Colombo, Sri Lanka; Universitas Abdurrab Indonesia and with the collaboration of University of Bengkulu, Indonesia & Department of Botany, Sri Venkateswara University, Tirupati and with the Industrial collaboration of Urban Kisaan, Hyderabad along with the support of NMPB, New Delhi to be held from 7th to 9th October 2022. with the idea of bringing international scientists, manufacturers of Plant-based Medicines and farmers onto a common platform for discussion and exchange of scientific ideas and for formulating strategies to achieve common goals. World HERBAL EXPO – 2022 & B2B & B2C will be also organized as part of the conference.

Institute of Indigenous Medicine (IIM) & Department of Plant Sciences, University of Colombo, Sri Lanka, Industrial Technology Institute (ITI), Colombo, Sri Lanka, will provide a platform for eminent researchers, academicians, physicians, traditional medical practitioners, manufacturers & exporters of herbal products, members from the corporate sector, marketing consultants, farmers and NGOs from all over the world to further deliberate upon the recent happenings in the sector and to bring out concerted efforts in medicinal plants research and development. It is hoped that the discussions in the present conferences on varied topics viz., agro techniques, Traditional Medicine, ITK, Organic farming, Aeroponics, Aquaponics and Hydroponics, Conservation a) Access Benefit Sharing (ABS), b) Certification c) Patents & IPR issues d) Biodiversity Loss, e) wild medicinal plant conservation and f) Legal Procurement Certificate (LPC ), Novel trends in drug development, Translational research in complementary & alternative medicine; Pharmacology and Advanced Clinical Research on medicinal plants; Herbal formulations & Nutraceuticals; Quality Control, Regulatory aspects, Supply Chain and marketing of Herbal Products; Ayurvedic AAHAR, Start-up, Entrepreneurship etc. would create new vistas in the field of medicinal plants research. It is expected that some novel solutions to lifestyle diseases like obesity, diabetes etc. would emerge out of the conference deliberations.

I am confident that this conference will meet its set agenda, and I in my capacity as Chairman, wish that the deliberations be a grand success.

## Message from the Director, Institute of Indigenous Medicine

**Senior Professor P. A. Paranagama**
Director
Institute of Indigenous Medicine,
University of Colombo,
Rajagiriya,
Sri Lanka

As the Chairperson of the 8th International conference on Ayurveda, Unani, Siddha & Traditional Medicine (8th ICAUST-2022) organized by the Institute of Indigenous Medicine (IIM), University of Colombo, and Co-Chair of the 6th International Conference on Medicinal Plants, Herbal Products and Hydroponics (ICMPH6) I am delighted and honored to forward this message today. This year has been a significant year, as the IIM has decided to hold this prestigious conference in collaboration with ICMPH6 as a request was received from the Chairperson, Professor G. Sudarsnam from Sri Venkateswara University, India. Further, IIM was given the opportunity to strengthen the collaborative activities with Industrial Technology Institute, Colombo and Plant Science department, University of Colombo. Hence this year our annual research conference has provided a platform to showcase innovative research that are conducted from medicinal plants, herbal technology and hydroponics. I am sure this conference will help to strengthen the networking of participants from other countries as we expect a record number of participants from other parts of the world.

IIM has emerged as a premier Institute imparting medical education in indigenous medicine and high priority is accorded to activities that would result in the practical application of recent advances in the indigenous medical field. I am extremely glad to welcome the chief guest, Senor Professor, D. N. Karunarathne, Vice Chancellor of the University of Colombo, all the distinguished guests and well-wishes to the 8th ICAUST 2022 and 6th ICMPH6. I also wish to emphasize that this conference is a platform to gather new knowledge, find new possibilities, enhance ability of advance research skills in indigenous medicine, medicinal plants, herbal technology and hydroponics.

Support and guidance given by the Vice chancellor of the University of Colombo, Senior Professor D N Karunarathne and the Chairperson of Annual Research Symposium of the

University of Colombo, Professor K P Hewagamage are greatly appreciated. I extend my heartfelt appreciation for all keynote and plenary speakers. As a conference chair, I am highly indebted to the organizing committee, session chairs and other committees of the 8th ICAUST 2022, all the academic and non-academic staff for the support and effort for the success of the conference. A note of appreciation to the academia for their thorough and timely reviewing the abstracts.

I wish all a very pleasant and fruitful, knowledge gaining experience from the 8th International conference on 8th ICAUST and 6th ICMPH6.

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# Programme of Sessions

**SCIENTIFIC SESSION AGENDA**

7th OCTOBER 2022

**SESSION- 01**

Date : 07.10.2022

| | | |
|---|---|---|
| Duration | : | 1.30 p.m. to 5.00 p.m. |
| Chair | : | Prof RDH Kulathunga |
| Co-chair | : | Dr. (Mrs.) AG Samarawickrama |
| Rapporteur | : | Dr. (Ms.) RLYU Rathnayake |
| Session Coordinator | | Dr. (Mrs.) LAWJ Chaturika<br>Dr Dr. SM Palathiratne<br>Dr. (Mrs.) JMDRC Jayamaha |
| Keynote Speech | : | Prof. Kamal Nayan Dwivedi |
| Time | : | 2.00 p.m. – 2.30 p.m. |

No of Abstract presented (Oral) : 07

**SESSION-02**

Date : 07.10.2022

| | | |
|---|---|---|
| Duration | : | 1.30 p.m. to 5.00 p.m. |
| Chair | : | Prof. Radhika Samarasekara |
| Co-chair | : | Dr. (Mrs.) Menuka Aarawwawala |
| Rapporteur | : | Dr. (Ms) URSRK Senarathne Session Coordinator |
| : | | Dr.(Ms.) JID Diddeniy |
| Keynote Speech | : | Dr. Rani Vajravelu |
| Time | : | 2.00 p.m. to 2.30 p.m. |

No of Abstract presented (Oral): 11

8TH OCTOBER 2022

**SESSION-03**

| | | |
|---|---|---|
| Date | : | 08.10.2022 |
| Duration | : | 8.30 a.m. to 12.00 p.m. |
| Chair | : | Prof SMS Samarakoon |
| Co-chair | : | Dr. (Mrs.) KPKR Karunagoda |
| Rapporteur | : | Dr. DAL Munasinghe |
| Session Coordinator | : | Dr. (Ms.) MACL Muthukuda |
| | | Dr. (Mrs.) PLTC Liyanage |
| | | Dr. (Mrs.) SSR Somathilaka |
| Keynote Speech | | Dr. Sairam Reddy |
| Time | : | 9.00 a.m. to 9.30 a.m. |

No of Abstract presented (Oral): 10

**SESSION -04**

| | | |
|---|---|---|
| Date | : | 08.10.2022 |
| Duration | : | 8.30 a.m. to 12.00 p.m. |
| Chair | : | Professor MSM Shiffa |
| Co-chair | : | Dr. MCM Maheez |
| Rapporteur | : | Dr. MMM Nifras |
| Session Coordinator | : | Dr. (Mrs.) MIF Nafla |
| | | Dr MAF Bushra |
| Keynote Speech | : | Dr. K.T. Ajmal |
| Time | : | 9.00 a.m. to 9.30 a.m. |

No of Abstract presented (Oral): 10

**SESSION-05**

| | | |
|---|---|---|
| Date | : | 08.10.2022 |
| Duration | : | 1.30 p.m. to 5.00 p.m. |
| Chair | : | Dr. Pathmasiri Ranasinghe |
| Co-chair | : | Dr. Chandima Wijesiriwardena Rapporteur : |
| | | Dr. BSMN Sooriyaarachchi |
| Session Coordinator | : | Dr. SPAS Nishan |
| | | Dr.(Ms.) RMDA Amarasiri |

| | | |
|---|---|---|
| | | Dr. (Mrs.) RMR Gunawardhana |
| Keynote Speech | : | Dr. J. L. N. Sastry |
| Time | : | 2.00 p.m. – 2.30 p.m. |

No of Abstract presented (Oral): 10

**SESSION-06**

| | | |
|---|---|---|
| Date | : | 08.10.2022 |
| Duration | : | 1.30 p.m. to 5.00 p.m. |
| Chair | : | Associate Prof. SD Hapuarachchi |
| Co-chair | : | Dr. HGSP Hewageegana |
| Rapporteur | : | Dr. (Mrs.) KNA Dharmasena |
| Session Coordinator | : | Dr. (Mrs.) NVY Diloopa |
| | | Dr. (Ms.) RADP Perera |
| | | Dr. (Mrs.) HRMP Peiris |
| Keynote Speech | : | Hanshi Prof. G. Sudarsanam |
| Time | : | 2.00 a.m. – 2.30 p.m. |

No of Abstract presented (Oral): 10

9TH OCTOBER 2022

**SESSION-07**

| | | |
|---|---|---|
| Date | : | 09.10.2022 |
| Duration | : | 8.30 a.m. to 12.00 p.m. |
| Chair | : | Prof. R.M. Dharmadasa |
| Co-chair | : | Dr. Selvaluxmy Chelvendran |
| Rapporteur | : | Dr. (Ms.) PASN Silva |
| Session Coordinator | : | Dr. HLNR Pradeep |
| | | Dr. (Ms.) NG Madhubhashini |
| | | Dr Dr.(Mrs.) TWNABK Nissanka |
| Keynote Speech | : | Dr Ranee Prakash |
| Time | : | 9.00 a.m. to 9.30 a.m. |

No of Abstract presented (Oral): 10

**SESSION-08**

| | | |
|---|---|---|
| Date | : | 09.10.2022 |
| Duration | : | 8.30 a.m. to 12.00 p.m. |
| Chair | : | Professor MUZN Farzana |
| Co-chair | : | Dr. MHM Hafeel |
| Rappoteur | : | Dr. (Mrs.) AFF Shifra |
| SessioCoordinator | : | Dr. (Mrs.) JFS Juhair |
| | | Dr MRF Rifna |
| Keynote Speech | : | Professor S. Nafees Bano |
| Time | : | 9.00 a.m. to 9.30 a.m. |

No of Abstract presented (Oral): 10

**SESSION-09**

| | | |
|---|---|---|
| Date | : | 09.10.2022 |
| Duration | : | 8.30 a.m. to 12.00 p.m. |
| Chair | : | Associate Prof SP Molligoda |
| Co-chair | : | Dr. KIWK Somarathna |
| Rapporteur | : | Dr. (Ms.) PAGN Perera |
| Session Coordinator | : | Dr. (Mrs.) NDP Ishara |
| | | Dr.(Mrs.) RDDT Ariyarathna |
| | | Dr.(Ms.) HBD Kaushalya |
| Keynote Speech | : | Prof. Sudheera M. W. Ranwala |
| Time | : | 9.00 a.m. to 9.30 a.m. |

No of Abstract presented (Oral): 10

## Plenary Speakers

**Prof. Kamal Nayan Dwivedi**
Department of Dravyaguna
Faculty of Ayurveda
Institute of Medical Sciences
Banaras Hindu University, Varanasi - 221005, INDIA

**Hanshi Prof. G. Sudarsanam (Retired)**
8th Dan Black Belt
304, Anand Somu Pristine,
9th block Extension, Gottegere Road,
Golahalli, Anjanapura Twp, J.P. Nagar,
Bengaluru- 560062, INDIA

**Prof. Sudheera M W. Ranwala**
B.Sc. (Colombo), Ph.D. (Aberdeen)
Professor in Plant Ecology and Biodiversity Conservation
Department of Plant Sciences, Faculty of Science
University of Colombo, PO Box 1490, Colombo, Sri Lanka

**Prof. S. Nafees Bano**
Head, Department of Obstetrics and Gynecology & Ex-Principal,
Hakim Syed Ziaul Hasan Government Unani Medical College & Hospital,
Bhopal, India.

**Dr. Ranee Prakash**
Senior Curator
Dept. of Life Sciences
The Natural History Museum
Cromwell Rd
London SW7 5BD, U

**Dr. Rani Vajravelu**
Department of biological sciences
University of Central Florida
Orlando, Florida 32816

**Dr. K.T. Ajmal**
Director, Calicut Unani hospital and Research center
Managing Director, Harmas Unani Pharmaceuticals
Calicut Unani Hospital and Research Centre, Near Kallai
Road, Calicut, Kerala 673602, India.

**Dr. Sairam Reddy**
Co-founder and Chief Scientific Officer in Urban Kisaan Farms, India
Director, Heartfulness Institute, India

**DR. J. L. N. Sastry**
CEO - Jatas herbals ltd.;
Managing Partner, \Jatas ayurvedic healthcare systems llp.;
Chief Physician,
Ayushman Ayurvedic Center,
KAKINADA, India.

# ABSTRACTS

## Investigating the phytochemicals and *in vitro* antioxidant activity in *Coscinium fenestratum* (Gaertn.) Colebr. fresh juice

A. U. Hewageegana , L. D. A. M. Arawwawala and H. G. S. P. Hewageegana
Faculty of Science, University of Colombo, Sri Lanka.
Industrial Technology Institute (ITI), Colombo 07, Sri Lanka.
nstitute of Indigenous Medicine, University of Colombo, Sri Lanka.

*Coscinium fenestratum* (Gaertn.) Colebr. (family: Menispermaceae) is an endangered vine commonly found in Western Ghats of India and Sri Lanka. Previous studies revealed that *C. fenestratum* has promising wound healing, hypotensive, antigonococcal, anti-hyperglycemic, antiacne, anticancer, neurotoxicity, antioxidant, and anti-hepatotoxic activities. However, very few scientific experiments on tetanus. The objective of the present study was to investigate the (a) secondary metabolites and (b) *in vitro* antioxidant activity (by DPPH assay, ABTS assay, total phenolic content, and total flavonoid content) in *C. fenestratum* stem juice. Standard phytochemical screening methods were carried to detect the presence or absence of secondary metabolites. In DPPH (2-diphenyl-2-picrylhydrazyl) free radical-scavenging assay, absorbance was measured at 517 nm while in ABTS (2,2-azino-bis (3-ethylbenzthiazoline-6-sulfonic acid) radical-scavenging assay absorbance was measured at 734 nm. Results revealed the presence of alkaloids, phenols, flavonoids, steroids, sesquiterpenes, saponins, and tannins in the fresh juice of *C. fenestratum.* Resulted $IC_{50}$ values for DPPH assay and ABTS assawasre 5.80±0.10 µg/ml and 8.65±0.17 µg/ml respectively. The total polyphenol content was 450.16±5.2 mg of galic acid equivalents/ml of juice, whereas the total flavonoid content was 232.96±2.30 mg of quercetin equivalents/ml of juice. In conclusion, the stem juice of *C. fenestratum* was rich in secondary metabolites and antioxidant properties.

**Keywords:** *Coscinium fenestratum*, secondary metabolites, antioxidants

This abstract was published in proceedings of 6th ICMPHP & 8th iCAUST held on 7th -9th October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

# *In vitro* antioxidant capacity of *Kaluduru tippili leha*: A Sri Lankan traditional herbal lincture

E.D.T.P. Gunarathna, P.A. Paranagama, S. Pilapitiya, G.D. Liyanaarachchi and L.D.A.M. Arawwawala

Institute of Indigenous Medicine, University of Colombo, Sri Lanka.

University of Kelaniya, Sri Lanka.

Faculty of Medicine and Allied Sciences, Rajarata University, Sri Lanka.

Industrial Technology Institute (ITI), Colombo 7, Sri Lanka.

*Kaluduru tippili leha* is a compound herbal lincture from Sri Lankan traditional medicine comprised of *Nigella sativa* L. seeds and *Piper longum* L. fruits (main ingredients), Bees honey, and fresh juice of *Punica granatum* L. seeds (minor ingredients). It has been used to combat speech problems due to disturbances in neuromuscular control by stroke. Study, evaluated *in vitro* antioxidant activities of cold water and cold ethanol extract of test drug by six *in vitro* assays [DPPH, ABTS , FRAP, ORAC], Total polyphenol content and total flavonoid content] using standard protocols. It was observed that $IC_{50}$ of DPPH was 2416.0±33.0 and 2168.0±41.0 µg/mL for cold water and cold ethanolic extract respectively and $IC_{50}$ of ABTS was 575.2±8.3 and 445.5± 2.4 µg/ml for cold water and cold ethanolic extract respectively. It was observed that the scavenging ability of the drug was weak. In FRAP assay, high antioxidant activity was observed in cold water extract (130.05±4.48 mg Trolox equivalents/ g of extract) of the drug compared to that of cold ethanolic extract (11.01 ±1.35 mg Trolox equivalents/ g of extract). Moreover, peroxyl radicals scavenging ability of the cold water extract and the cold ethanol extract were 2.82±0.21 and 1.04 ±0.04 mg trolox equivalent/g extract respectively. TPC of cold water and cold ethanolic extracts of the drug were 2.93 ±0.02 and 2.00±0.04 mg gallic acid equivalent/g of extract respectively while TFC of cold water and cold ethanolic extracts of the drug were 37.40±0.82and 11.67±1.64 mg quercetin equivalent/g of extract respectively. It revealed that the antioxidant potential of cold-water extract was higher than that of cold ethanol extract. In conclusion, traditional herbal lincture is shown moderate antioxidant properties. However, DPPH and ABTS scavenging abilities were low in cold extracts of the drug.

**Keywords:** Phyto-medicine, Antioxidant potential, Traditional medicine, ethanol extracts

This abstract was published in proceedings of 6th ICMPHP & 8th iCAUST held on 7th -9th October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

# Distribution pattern of *Deha prakriti* (Body constitution) and its association with Inflammatory markers in patients with Chronic Kidney Disease (CKD): Western Province, Sri Lanka

S. Weersekara, M.V.M.L. Jayasundara, P.R. Waratenne, E.S. Wijewickrama, and N.P. Sunil Chandra

Institute of Indigenous Medicine, University of Colombo, Sri Lanka.

Faculty of Medicine, University of Kelaniya, Sri Lanka.

Faculty of Medicine, University of Colombo, Sri Lanka.

*Deha prakriti* is an Āyurveda concept that can be utilized effectively to approach chronic kidney disease (CKD) in an integrated manner. Although the concept has diverse applications in the clinical field, no scientific evidence-based studies have been conducted to date to evoke the concept and its associations with different aspects of CKD. Therefore, the study was designed to assess the distribution pattern of *Deha prakriti* and its association between selected serum inflammatory markers, i.e., Erythrocyte Sedimentation Rate (ESR), C Reactive Protein (CRP), Interleukin 6 (IL - 6) and Tumor Necrosis Factor alfa (TNF - α) in patients with CKD - Western Province, Sri Lanka. Ethical approval was obtained under ERCIIM/20/103. The study included 134 diagnosed CKD patients and the *Deha prakriti* of each subject was assessed using AyuSoft software. The Westergren and CRP latex slide agglutination methods were used to determine ESR and CRP levels accordingly. The serum levels of IL – 6 and TNF – α were quantitatively determined by ELISA kits based on the sandwich ELISA principle. It was observed that *Pitta* (35.1 %) and *Vata* (33.6 %) dominant *Prakriti* types were most commonly associated with CKD. The patients with *Kapha* dominant and *Sama doshaja prakriti* types were uniquely confined to CKD stage 1. The majority of patients with *Vata* dominant *Prakriti* types represented CKD stages 4 and 5, whereas the majority of *Pitta* dominant types represented CKD stages 2 and 3. Moreover, the study revealed that the increased levels of inflammatory markers; ESR, CRP, IL- 6 and TNF – α in the serum of CKD patients' show a significant ($P < 0.05$) association with the types of *Deha prakriti*.

**Keywords:** CKD, *Deha prakriti,* Distributionb-pattern, Inflammatory markers, Association

This abstract was published in proceedings of 6th ICMPHP & 8th iCAUST held on 7th -9th October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

**Evaluation of the anti-oxidant activity of two Sri Lankan traditional formulae - *Nagaradi* decoction (N5) and *Dharuparpatadi* decoction (D10)**

P.R. Waratenne, A.P.A. Jayasiri and M.I. Manuha

Institute of Indigenous Medicine, University of Colombo, Sri Lanka.

Ploy-herbal formulae (a) *Nagaradi* decoction (N5) consisting of five ingredients and (b) *Dharuparpatadi* decoction (D10) consisting ten ingredients are well known two recipes mentioned in Ayurveda pharmacopeia. These decoctions are widely used in Sri Lankan traditional medicine, especially for cough, cold and fever. The aim of this research was to evaluate the antioxidant properties of the water extract of two poly herbal formulae and their fractions (hexane, ethyl acetate and ethanol) which were obtained from sequential fractionation. Herbal ingredients of both formulae were washed; shade dried, finely powdered and subjected to extraction an process. Antioxidant activity of extracts and fractions were evaluated using two in vitro assays: 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical-scavenging assay and ferric reducing antioxidant power (FRAP) assay. In addition, the total phenolic contents of the extracts and fractions were measured. Ethyl acetate fraction of D10 and ethanol fraction of N5 displayed the highest DPPH radical scavenging activity with an $IC_{50}$ value of 25.68 ± 0.53 µg/mL and 248.09±1.74 µg/mL respectively. Ethanol fraction of D10 and aqueous extract of N5 showed the highest absorbance in the FRAP assay. The highest total phenolic contents of D10 and N5 were found to be in the ethyl acetate fractions. Results can be concluded that different extracts and fractions of D10 and N5 consist with antioxidant activities due to the presence of various phytochemicals that may be extracted to each solvent.

**Keywords:** Decoctions, Herbal formulae, Antioxidants, DPPH, FRAP

This abstract was published in proceedings of 6th ICMPHP & 8th iCAUST held on 7th -9th October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

# Quantitative phytochemical analysis of *Amurthashtaka kwatha*: An Ayurvedic polyherbal formulation

L.P.S. Vinodani, W.J.A.B.N. Jayasuriya, H.M.D.R. Herath, S.D. Hapuarachchi., P. Dantanarayana and T.S. Suresh

Faculty of Allied Health Sciences, University of Sri Jayewardenepura, Sri Lanka.

Institute of Indigenous medicine, University of Colombo, Sri Lanka.

State Pharmaceutical Manufacturing Corporation, Dehiwala-Mount Lavinia,

Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

Ayurveda is one of the traditional medicinal systems using single or multiple herbs (polyherbal) for treatment. In Ayurveda, the concept of polyherbalism is highlighted to achieve greater therapeutic efficacy. *Amurthashtaka kwatha* is an Ayurvedic polyherbal formulation widely used to treat fever associated with inflammation. The '*Amurthashtaka kwatha*' formulation consists of eight ingredients, namely *Azadirachta indica* (Neem), *Holarrhena antidysenterica* (Coneru), *Santalum album* (Sandalwood), *Tinospora cordifolia* (Guduchi), *Trichosanthes cucumerina* (Wild gourd), *Cyperus rotundus* (Nut grass), *Picrorhiza scrophulariiflora* (Kutki) and *Zingiber officinale* (Ginger).The study is aimed at quantitative determination of phytochemicals of *Amurthashtaka kwatha*. The plant materials to prepare three kwatha preparations were purchased from three Ayurvedic medicine shops and authenticated. Aqueous extracts were prepared according to Ayurvedhic pharmacy and the total phenolic content of the extracts was determined by the Folin-ciocalteu spectrophotometric method using gallic acid standard. Total flavonoid content was determined by aluminium chloride method using quercetin standard. *Amurthashtaka kwatha* was subjected to determine the percentages of alkaloids and saponins using standard protocols. According to the results, total phenolic and total flavonoid contents were obtained as 8.58 ± 0.54 (mg/kg Gallic Acid Equivalents) and 3.68 ± 0.77(mg/kg Quercetin Equivalents), respectively. Percentages of alkaloid and saponin contents were calculated as 2.29 ± 0.54 % and 1.89 ± 0.40 % respectively. The results showed that Amurthashtaka kwatha is a source for all tested phytoconstituents, and these phytochemicals beneficial are for the pharmacological activities of *Amurthashtaka kwatha.*

**Keywords:** *Amurthashtaka kwatha*, Phytochemistry, Total phenolic content

This abstract was published in proceedings of 6th ICMPHP & 8th iCAUST held on 7th -9th October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

**Evaluation of pharmacognostic parameters of a new formulation of *Trijata* incorporating *Cinnamomum zeylanicum* Blume.**

S.D. Hapuarachchi, P.D.S.A. Silva, and N.D. Kodithuwakku
Institute of Indigenous Medicine, University of Colombo, Sri Lanka.
Faculty of Allied Health Sciences, University of Ruhuna, Sri Lanka.

*Trijata* is a polyherbal Ayurveda preparation which is existing in Sri Lankan Ayurveda Pharmacopeia. It is containing *Twak* (*Cinnamomum verum* syn. *Cinnamomum zeylanicum* Blume), *Ela* (*Eletteria cardamomum* and *Pathra* (*Cinnamomum tamala*) and is also documented in authentic Ayurveda texts. This study aimed to evaluate the pharmacognostic parameters of a novel preparation of *Trijata* (NT) incorporating *C. zeylanicum* leaves substituting *C. tamala,* due to its unavailability in Sri Lanka. Hot and cold aqueous extractions of NT were subjected to qualitative phytochemical screening. *In-vitro* antioxidant activity was determined using DPPH and ABTS assays, microscopical analysis, heavy metal content, and physicochemical parameters. The content of phytochemicals including Phenols, flavonoids, tannins, alkaloids, saponins, terpenoids, reducing sugars, and cardiac glycosides were determined in the NT aqueous extracts. The physicochemical parameters include; 4.6±0.2% of total ash, 3.1±0.1% of water-soluble ash, and 0.6±0.2% of acid-insoluble ash on a dry weight basis. *In-vitro* antioxidant activity as shown by the DPPH and ABTS assays was dose-dependent and the highest activity was obtained using the $IC_{50}$ value of the hot aqueous extract. The extractability was high for hot extraction. NT had high total phenolic and flavonoid content which was exhibited through promising antioxidant activity. The microbiological limits and heavy metal content were within the standard acceptable limits. This study would rationalize the use of *C. zeylanicum* leaves as a substitute for *C. tamala* in the preparation of NT. The results of this study could be useful in setting diagnostic indices for the identification, and authentication of NT incorporating *C. zeylanicum* leaves substituting *C. tamala*, and further studies are recommended to evaluate its biological activities for proper indications.

**Keywords:** *Trijata, Cinnamomum zeylanicum* Blume, *Elettaria cardamomum*, *Cinnamomum tamala*, antioxidant, pharmacognostic parameter

This abstract was published in proceedings of 6th ICMPHP & 8th iCAUST held on 7th -9th October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

**Comparing the effect of two Ayurveda dosage forms on the treatment of Allergic rhinitis**

J.M. Dahanayake, P.K. Perera and P. Galappaththy

Institute of Indigenous Medicine, University of Colombo, Sri Lanka.

Faculty of Medicine, University of Colombo, Sri Lanka.

Allergic rhinitis (AR) is an immune response of the nasal mucosa to airborne allergens and significantly affect a patient's quality of life. *Tamalakyadi* decoction (TMD12) is a formulation in Ayurveda as a remedy for allergic rhinitis. This study was designed as an open-label non-inferiority randomized controlled clinical trial to compare the safety and efficacy of TMD12 and its freeze-dried powder form (TMD12-FD) against the antihistamine loratadine. AR patients of arm I (*n*=32), arm II (n=31) and arm III (n=31) were treated with TMD12, TMD12-FD and loratadine respectively, for four weeks. The efficacy was evaluated by Total Nasal Symptom Score (TNSS), Non-Nasal Symptom Score (NNSS) and Quality of Life Questionnaire (QLQ). There was no significant difference between the 3 arms but the reduction of 4 main nasal symptoms in each arm separately showed the significant reduction ($P<0.001$) from week 0 to 4 and during the follow up period. Symptoms decreased gradually at the end of $12^{th}$ week in all 3 arms and the mean value of sneezing symptoms was increased in $12^{th}$ week than the mean value of week 4 in all 3 arms. The treatment with TMD12 and TMD12-FD was safe as loratadine, as shown by renal and liver function safety results obtained from blood analysis. TMD12 and TMD12-FD were effective as loratadine in improving nasal symptoms and Quality of life in AR patients. However, TMD12 and TMD12-FD caused fewer side effects especially, drowsiness, dry mouth, dry throat, and constipation. Therefore, TMD12 and TMD12-FD could be used as effective treatments for patients with AR.

**Keywords**: *Tamalakyadi* decoction, Freeze dried powder, Loratadine, Allergic rhinitis, Clinical trial

This abstract was published in proceedings of 6th ICMPHP & $8^{th}$ iCAUST held on $7^{th}$ -$9^{th}$ October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

**Study the bioactivities of bees' honey in animal model**

W.A.S.S. Weerakoon, P.K. Perera, D. Gunasekera and T.S. Suresh

Institute of Indigenous Medicine, University of Colombo, Sri Lanka.

Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

The bees' honey (BH) is one of nature's most amazing gifts to mankind. Honey has been given a valued place in traditional medicine for centuries. The usage of bees' honey as a medicine is referred to in the most ancient Ayurveda medical records. In Ayurveda, honey is used for therapeutic and nutritional purposes for many centuries both internally and externally. Honey is used as *Anupama* due to its synergistic effects. It is externally used for the treatment of eye diseases, cutting, and burning conditions Internally used with other herbal preparations, especially for respiratory disorders such as fever, cough, asthma, phlegm, and fever. These records reveal the of *Jawara nashana* ( Antipyretic effects ) *Vedana nashana* (Analgesic effect), *Asadana nashana* (Anti-inflammatory) and *Asathmikata nasha* (Antihistamine effects) effects of bees honey. Following ethical clearance, studies aimed to evaluate the above-mentioned effects of bees' honey in Wistar rats. Antipyretic activity of BH was measured by using Brewer's yeast-induced pyrexia model in rats, Analgesics effects on BH were determined using the carrageenan-induced paw oedema model, Acetic acid-induced writhing response, and adjuvant-induced arthritis rats' model. The anti-histamine potential of the BH was investigated by a histamine-induced wheal test. The results of the present studies demonstrate that the BH exerts significant ($P<0.05$) effects on the above studies in Wistar rats. Therefore, bees' honey is scientifically provided a traditional rationale for the treatment of the above conditions.

**Keywords:** Bees' honey, Wister rats, Effects

This abstract was published in proceedings of 6th ICMPHP & 8th iCAUST held on 7th -9th October 2022, ref: https://iim.cmb.ac.lk/icmphp6/]

# National Institute of Library and Information Sciences

## *Innovative Approaches to Mitigating Challenges in LIS Education*

29th December 2022

# MESSAGE BY THE DIRECTOR AND SYMPOSIUM CHAIR

**Dr. Pradeepa Wijetunge**
National Institute of Library and Information Sciences (NILIS)
University of Colombo

The Annual Research Symposium of NILIS, is a significant component of the series of annual symposia of the University of Colombo. This year, we selected the theme *Innovative Approaches to Mitigating Challenges in LIS Education* in conformity with the main theme of the university symposium, "Digital Transformation and Innovative Approaches to Mitigate Challenges in the Higher Education Sector". This symposium is unique because it is the first time a full research symposium is dedicated for Library and Information Science education in Sri Lanka. We strongly believe that the opportunity will generate a timely discourse on the contemporary issues and concerns of the LIS education in Sri Lanka. It is a pleasure to have the Department of Library and Information Sciences, University of Kelaniya and Sri Lanka Library Association, as collaborators. In keeping with the tradition, some select abstracts are presented here, while the complete volume of the NILIS symposium will include all national and international abstracts presented.

I am thankful to the Chief Guest, Vice-Chancellor of University of Colombo, Senior Prof. H.D. Karunaratne and the Guest of Honour, Senior Prof. Premakumara De Silva, the Chairman of the Board of Management of NILIS, for gracing this occasion and their immensely valuable guidance, motivation and inspirations, and to the keynote speaker, Prof. Rong Tong of School of Library and Information Science, Simmons University, USA for the enlightening address, and to Prof. K.P. Hewagamage, Chairperson of the ARS 2022 for his constructive guidance, to all the presenters, to the Director and staff of UCSC, to the collaborating organisations, to Acting Librarian Dr. D.C. Kuruppu and all the academic staff of the university library for their extensive support, and to all the academic staff of NILIS, visiting staff, the reviewers, and the other staff lead by the SAR Mr. J. Wipularathne and the Acting SAB Mr. Charitha Bandara for their continuous dedication and commitment to NILIS.

# PROGRAM COMMITTEE

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Ms. I. R. Shyamalie

Mr. A. K. Haddawage

# PROGRAM

| | |
|---|---|
| 09.00 | Registration |
| 09.30 | Lighting Of The Oil Lamp |
| 09.35 | National Anthem |
| 09.40 | Welcome Address By Dr. Pradeepa Wijetunge, Director – NILIS, University Of Colombo, Sri Lanka |
| 09.45 | Keynote Address |
| 10.15 | Address Of The Guest Of Honor: Senior Professor Premakumara De Silva, Chair Professor Of Sociology/UGC Member, Sri Lanka. |
| 10.30 | Address By The Chief Guest: Senior Professor H.D. Karunaratne, Vice Chancellor, University Of Colombo, Sri Lanka. |
| 10.45 | Launch Of The Symposium Proceedings And Presentation Of Mementos |
| 11.00 | Vote Of Thanks. |
| 11.05 | Tea Break |
| 11.30 | Lead Paper And Technical Session 01 |
| 12.30 | Lead Paper And Technical Session 02 |
| 13.30 | Lunch Break |
| 14.00 | Lead Paper And Technical Session 03 |
| 14.50 | Technical Session 04 (NILIS Graduate Research) |
| 15.45 | Plenary Discussion |
| 16.15 | Concluding Remarks |

## KEYNOTE SPEAKER

**Prof. Rong Tang**

Professor and Co-Director PhD Program

School of Library and Information Science

Simmons University, Boston, MA 02115, USA

Rong Tang received her doctorate from the School of Information and Library Science, University of North Carolina, Chapel Hill and currently a Professor at the School of Library and Information Science, Simmons University. Her research interests center on usability and UX research, mobile news information behavior, research data management services, open government data, mobile news information seeking behavior and paradigm shift in the field of information science. Published in top-ranked journals, Rong Tang teaches primarily in areas of evaluation of information services, digital information services and providers, research methods and design, leadership and collaboration, leadership during crisis, theories of information science, and usability and user experience research.

Since 2018, Rong Tang has been a Co-Leader for the Research Data Management Librarian Academy (RDMLA), which currently has more than 7,000 learners from around the world. She is the founding Director of Simmons Usability Lab and serves as the Director of the PhD Program at SLIS. Rong has received multiple grants including a WGBH subcontracted grant from NEH (National Endowment of the Humanities) in 2017, IMLS grant in 2019 on developing interprofessional informationist (IPI) post-master's certificate program. Within Simmons SLIS, Rong is the founding and current Co-Director of the UX and Emerging Technologies Lab. She is a faculty co-advisor for Simmons ASIS&T Student Chapter. Professionally, Rong Tang has served as the Director for External Relations for Association for Library and Information Science Education (ALISE) from 2017 to 2020 and serves as the President of ALISE for 2022-2023.

# ABSTRACTS

## A critical analysis of the selected research topics of the MTL students of NILIS: from 2004 to 2020

Uditha Alahakoon

National Institute of Library and Information Sciences

NILIS was established especially under a World Bank project, to train school and teacher librarians and to fulfill this responsibility, NILIS commenced a range of academic programs including Masters in Teacher Librarianship (MTL) in 2003. MTL consists of seven taught modules and a dissertation with a research component. From 2004 to 2020, hundred and seventy-one (171) students have engaged in research related to their MTL dissertations. However, examination of these topics indicated that some themes are overly popular among the students while some others have never been researched. The main objective of current research was to identify the thematic variations of these dissertations. Content analysis was used to identify the major themes from a list of dissertation titles submitted to NILIS. Twenty-three (23) thematic areas were identified and of that, higher percentages are skewed towards four themes (information literacy (17%), role of teacher librarian (16%), Reading promotion and interest (12%) and ICT (12%). The study established that management and administrative aspects such as records management (2%), public relations (0.6%), marketing (0.6%) have received the least attention. Though MTL course work consists of seven modules, students have inclined to select their topics only from three modules: Teacher Librarianship, Information literacy and ICT. Further analysis of the titles revealed that the students select the same topic with a variation only in the educational zone. To avoid this imbalance of research areas, close guidance by the academic staff and more involvement of the school authorities in selecting their dissertation topics are recommended. A critical and strong dialog among the students, the academic staff, and the education administrators (i.e., Zonal Directors) is also recommended, to enable the students to place their research in the broader picture, contributing to the development of the school library system.

**Key words**: School libraries, Teacher Librarianship, Research; Dissertation, Sri Lanka

# Contribution of Sri Lanka to the Library and Information Education in the Maldives: A Review

R. C. G. Gamage[1] and A. Riyaz[2]

National Institute of Library and Information Sciences[1] and The Maldives National University[2]

Maldives is a small country in the SAARC region, with a population of less than 400,000. According to the Maldives Library Association, the country had 294 libraries in 2012. Literature reveals that qualified LIS professionals in the country are still extremely few. Most of the literature on Maldives LIS education highlight the contribution of Sri Lanka in developing library human resources in the Maldives. Therefore, the study reviews to what extent Sri Lanka has contributed to LIS education in the Maldives. The library profession in the Maldives is still in the development stage. Therefore, the study assists policymakers in making informed decisions in designing knowledge transfer in the future. Literature confirms that formal training was started after the establishment of the 'National Library of Maldives' in 1982. Therefore, this study reviewed literature published from 1982 to 2022 on librarianship in the Maldives. Twenty papers published in journals and one monograph on the subject were reviewed. The authors observed that out of fifty-one (51) training programs conducted in the Maldives during the period 1987-2012, a LIS organization or an individual from Sri Lanka had directly contributed to 12. This includes the three-tier distance mode Diploma in Library and Information Science conducted by the Sri Lanka Library Association (SLLA) However, there had not been a direct focus on the specialized needs of school library staff. The first local long-term LIS program was initiated in 2010 by the Maldives College of Higher Education, which was renamed as the Maldives National University in 2011. However, due to the shortage of local experts to teach these programs, the initial years of the program were taught with the contribution of LIS professionals from Sri Lanka, Bangladesh, and Canada. The results suggest that a close relationship had been maintained between Sri Lanka and the Maldives in terms of capacity building through LIS education and training. The content delivered mainly focused on general librarianship. The Maldives authorities may obtain further assistance from outside the country to develop its school library programs.

**Keywords:** Library and Information Science Education, Maldives, Collaboration, Knowledge Transfer, Capacity Building

# Perception of Tamil Medium Students of National Institute of Library and Information Sciences (NILIS) towards Online Courses

T. Ramanan

Faculty of Technology, University of Colombo

Though NILIS moved to online mode of delivery from the conventional classroom, due to COVID-19, there have been no studies about what and how students thought about the online mode of LIS programmes. The objective of the study was to survey the students of two Tamil medium programs: Diploma in School Librarianship (DSL) and Higher Diploma in Library and Information Management (HDLIM-1) regarding their perception towards online LIS education. A semi-structured questionnaire was administered to the total population (61), and 42 (64.6%) responded. Majority are in the age groups of 21 – 25 (32%) and 31 to 35 (24%), and majority reside in Badulla (38%), Ampara (16%) and Kandy (10.5%). Of the total respondents, 31.6% consists of library employees, 10.5% of teachers, 26.3% unemployed, 10% of other occupations, and 8% of trainees while 7.8% did not disclose. Of the employed, 60% work in schools. Related to the advantages of online learning, Cramer's V analysis shows that, the respondents have strong relationships with the availability of sufficient resources (0.073), more attendance (0.458), freedom (0.091), work-life balance (0.497), easy understanding of lessons (0.399), satisfactory LMS access (0.407), and confidence in learning (0.362). Affordability (0.117), possibility of group studies (0.220), and sitting for examinations (0.214) have weak relationships. Difficulty to focus on the screen (0.378), unfamiliarity with the LMS (0.260), inability to clear doubts (0.373), and decreasing motivation (0.301) are the challenges that have strong relationship with them. Weak Internet connection (0.175), inadequate technical skills (0.168), language barriers (0.231), difficulty of examinations (0.197), and high level of exam violations (0.168) have weaker relationship. In conclusion, students have exhibited strong admiration for online learning despite the challenges they encounter. Respondents suggested increasing the resources available in the LMS, sharing the pdf files via WhatsApp, and reducing the class run-time to one-hour. Overall, they appreciated the online mode of education. NILIS will take these findings into consideration to improve its program structure in future.

**Keywords:** Online Education, Library and Information Science, LIS education, Sri Lanka

# NILIS STUDENT SECTION

## Developing a blueprint to assess the digital literacy skills of Visually Impaired (VI) undergraduate-library users in Sri Lanka

Madhushan Lankathilake[1] and T. Ramanan[2]

Main Library[1] and Faculty of Technology, University of Colombo [2]

With the increased move towards online education, the contemporary undergraduates use more digital sources than their predecessors. A study at University of Colombo on the use of online/digital library resources by visually impaired (VI) undergraduates revealed that they face several challenges directly related to lack of digital literacy skills (DLS). There is a profound gap in the knowledge about DLS of the Sri Lankan VI undergraduates, and the recent shifting toward online education intensified the challenges faced by them. This study was conducted to develop a blueprint to assess the DLS of VI library users. Literature survey and preliminary discussions were conducted with ten selected VI undergraduates, four staff members at the Center for the Disability Research, Education and Practice (CEDREP) at the University of Colombo, which provides special services for the VI students, and five library experts to identify the factors that are connected to developing an appropriate tool. In this regard an interview schedule was identified as a blueprint. Gender, age, vision loss level, frequency of using the Internet, age of starting to use technology, previous training, and availability of needed resources were identified as the factors which affect the digital literacy of VI undergraduates. With the exploration of literature and discussions, 41 variables were identified under the self-evaluation of DLSs. The identified variables were further divided into eight categories: information searching skills, communication, content creation, problem-solving, ability to work with computers, use of social media, digital learning resources, and ability to use audio devices. The tool developed to assess the digital literacy of VI students was based on their technical skills, social and demographic factors, cognitive skills, and availability of resources. The study recommends incorporating special modules of digital literacy for the VI undergraduates in their library training programs and make libraries buildings and collections more user-friendly for those with special needs including the VI undergraduates.

**Keywords:** Visually Impaired Users, Digital Literacy, Internet, Online Resources, Sri Lanka

# Postgraduate Institute of Medicine

# University of Colombo

## *Promoting Scholarship in Postgraduate Medical Education*

1st December 2022

## MESSAGE FROM THE DIRECTOR

**Professor Senaka Rajapakse**
Director
Postgraduate Institute of Medicine
University of Colombo

As the sole institute responsible for specialist training of medical doctors in Sri Lanka, the Postgraduate Institute of Medicine (PGIM) also plays a pivotal role in expanding the research capacity within the medical field in Sri Lanka. Each year, more than 400 trainees undertake research work at the PGIM in part fulfillment of their training in becoming a Board Certified Medical Specialist. In addition, many trainees at master's level also undertake research projects, which contribute not only to the personal attainment of the degree, but also towards strengthening the national health system.

Thus, the PGIM has recognised research as an important component in the development of a competent and an evidence-based practitioner. We have undertaken many initiatives to expand and improve the quality of the research work carried out by trainees of the PGIM including conducting regular training workshops. We have also provided more opportunities for the trainees to publish their research in reputed journals including the Journal of the Postgraduate Institute of Medicine (JPGIM).

The Annual Research Symposium of the PGIM is a celebration of the research excellence and academic progress achieved by the trainees and the trainers of the PGIM. The ARS 2022 is an opportunity to share their experiences as well as to learn together transforming the future postgraduate medical education in the country.

Therefore, I take this opportunity to thank the organising committee for their effort and wish all the participants a memorable academic experience.

# MESSAGE FROM THE DEPUTY DIRECTOR

**Professor Chandanie Wanigatunga**
Deputy Director
Postgraduate Institute of Medicine
University of Colombo

Over the years, the PGIM has gained recognition not only in Sri Lanka but also across the globe as a centre of excellence in postgraduate training for medical doctors, particularly in terms of specialist training. It has forged networks with Professional Colleges in UK, Australia and other countries in view of providing PGIM trainees with foreign exposure culminating into producing a highly qualified specialist doctor who can uplift the quality of the medical care provided to all Sri Lankans.

The Annual Research Symposium of the PGIM is therefore a platform for all stakeholders of postgraduate medical education in the country including universities, professional colleges, alumni and trainees to learn and share their knowledge with each other, creating one of the most enriching learning experiences.

I wish to thank the organizing committee for their effort and would like to invite both trainers and trainees to experience the event and contribute towards its success.

# MESSAGE FROM THE SYMPOSIUM CHAIR

**Dr Pandula Siribaddana**
Senior Lecturer
Postgraduate Institute of Medicine
University of Colombo

The Sri Lankan healthcare system has achieved many accolades over the years for achieving higher level health indicators sometimes even comparable to most of the developed countries. However, there are many gaps within the Sri Lankan health system, which would require high quality evidence to overcome effectively.

Therefore, the theme selected for this year's Annual Research Symposium, "promoting scholarship in Postgraduate Medical Education" reflects the importance assigned by the PGIM to the research carried out by the trainees as well as the trainers. The PGIM believes the research work carried out by the trainees and trainers of the PGIM will lay the foundation for national level studies and practice related decisions within the health system in Sri Lanka. Therefore, it is vital that the trainees and trainers of the PGIM have an opportunity 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. The ARS 2022 therefore will be the perfect opportunity for such interaction.

Thus, it is a pleasure for me to chair the Annual Research Symposium of the PGIM for the year 2022 and I believe that in the years to come, the ARS of the PGIM will play a central role in disseminating medically related scientific knowledge in Sri Lanka.

## ORGANISING COMMITTEE

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Dr. Chandima Lilangani De Silva (MBBS, MD(Radiology), PCME, CCPR(Col), Fellow Rad (NUH Sing)

Dr Kamani Samarasinghe (MBBS, DPath, MD(Histopathology), FCPSL)

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Dr Rizka Ihsan (MBBS, MMEd, PGDip(Col), MBA)

Mrs. Dilhani Munasinghe BA.Hons.(UoK), MSSc(UoK), ASLLA,CTHE

Mrs Chandima Wadasinghe (BA(Hons), MA, MSSc(UoK)

# PROGRAMME

## Agenda: Online Inauguration Ceremony

| | |
|---|---|
| 08.30 am | Commencement and National Anthem |
| 08.35 am | Celebration of the lighting of the oil lamp |
| 08.40 am | Welcome Address: Director, PGIM |
| 08.45 am | Address by Vice Chancellor<br>Senior Professor H.D Karunaratne |
| 08.50 am | Introduction of the orator: Deputy Director, PGIM |
| 08.55 am | PGIM ORATION 2022<br>Dr Nurad Joseph |
| 09.35 am | Vote of Thanks<br>Symposium Secretary |
| 09.40 am | Conclusion of the Inauguration |

## Agenda: Academic Programme

Trainees' Track

| | |
|---|---|
| 09.45 – 10.30 | It's your choice \| Selecting a specialization and reaching the full potential |
| 10.30 – 11.15 | The recipe for becoming a prolific researcher \| Problem identification to dissemination of research findings |
| 11.15 – 12.00 | Becoming the 'editors pick' \| Key strategies in drafting manuscripts for publication |
| 12.00 – 12.45 | You are ageing faster than you think \| Tips on healthy living for PG trainees |
| Lunch | |
| 13.30 – 15.30 | Free papers |

Trainers' track

| | |
|---|---|
| 09.45 – 10.30 | Using the closed-mark system for Postgraduate assessments \| Respecting trainee performance and protecting the service users |
| 10.30 – 11.15 | How to talk effectively to a 'blind wall' \| Conducting productive online teaching sessions |
| 11.15 – 12.00 | How to teach your trainee to self-reflect \| Walking the talk |
| 12.00 – 12.45 | Difficult trainee Vs trainee in difficulty \| How trainers should react? |
| Lunch | |
| 13.30 – 15.30 | Free papers |

## INTRODUCTION TO THE ORATOR

**Dr. Nuradh Joseph**
MD MRCP FRCR
Consultant Clinical Oncologist

Dr. Nuradh Joseph is a Consultant Clinical Oncologist currently working at the District Hospital of Hambantota Ministry of Health, Sri Lanka. Having graduated from the Faculty of Medicine of the University of Colombo in 2006 with honours and distinctions in Clinical Medicine and Microbiology, Dr Joseph completed his MD in Clinical Oncology in 2012. He has also obtained the MRCP(UK), the Specialty Certificate in Medical Oncology and the Fellowship of the Royal College of Radiologists (FRCR) in Clinical Oncology. Currently, as the Vice Chair of the Sri Lanka Cancer Research Group, Dr Joseph leads many multidisciplinary collaborative studies. With more than 30 publications including several in high impact factor journals such as Lancet Oncology, Journal of Thoracic Oncology and Annals of Oncology, Dr Joseph has also co-authored five book chapters in addition to over 40 scientific communications in local and international scientific meetings. Dr Joseph serves as the Chair and lead author of the national guidelines on the "Management of early and locally advanced breast cancer in Sri Lanka" published by the Ministry of Health.

A reviewer for many national and international journals, Dr Joseph serves on the Editorial Board of Clinical Oncology, the Journal of the Royal College of Radiologists and Radiation Oncology's highest impact journal - the International Journal of Radiation Oncology, Biology and Physics as an Associate Senior Editor for Genitourinary Cancers. Dr Joseph has been involved in teaching postgraduate courses in Radiation Biology and Clinical Oncology for the Christie School of Oncology, University of Manchester, UK, He has led the imaging for oncologists e-learning initiative of the Royal College of Radiologists, UK between 2015-2016 and serves on the Education and Training Committee of the Federation of Asian Societies of Radiation Oncology. Dr Joseph was the Secretary of the Sri Lanka College of Oncologists in the year 2018 and has been a member of its Council continuously from 2018.

Dr Joseph has received the Helen Patterson Research Award from the British Uro-oncology Group, the Presidential Award for Scientific Publication, Translational Research Fellowship by the European Society of Medical Oncology and was awarded the prestigious Kumar Weerasekera Memorial Oration by the Sri Lanka College of Oncologists in recognition of his contributions to cancer research.

# ABSTRACT OF THE ORATION

## Dr. Nuradh Joseph

**An enemy within? - the immune effects of radiotherapy**

There are three main forms of cancer treatment: Surgery, Radiotherapy and Systemic agents such as chemotherapy and targeted agents. But when it comes to curing cancer, contrary to popular belief, it is mainly surgery and radiotherapy that play a major role. Systemic treatment receives a disproportionate amount of funding and focus but only 6% of all cancers are actually cured by it.

External beam radiotherapy is the commonest form of radiotherapy given as a beam of high energy X-rays generated by a linear accelerator or as gamma rays produced by Cobalt machines. But radiotherapy can also be delivered internally using a radioactive source, known as brachytherapy, or even engineered into a radioisotope that can be ingested or administered as an infusion.

Tumour cells divide rapidly, relentlessly and abnormally. Radiotherapy attempts to stop this by damaging DNA, because in the presence of damaged DNA, cell division cannot happen properly. The damage induced by radiotherapy to DNA can occur directly or indirectly through free radicals generated by it.

Along with cancer cells, there are billions of normal cells in the body that are also dividing. Any treatment that targets DNA and cell division should be able to preferentially spare normal cells in the body. This is achieved in two ways - the first is by focussing the radiotherapy beam very tightly to the tumour and the second is by splitting the treatment into fractions spreading over several days.

In this example of an oropharyngeal cancer, the tumour lies in front of the spinal cord and between the two parotid glands. With the older techniques of radiotherapy we could only give rectangular beams of radiotherapy which meant that the spinal cord and both parotid glands also got a significant dose of radiation. But by using a modern technique called intensity modulated radiotherapy, it is now possible to limit the dose to the parotid glands and the cord and focus the beam more closely to the tumour.

There have been further developments in the quest to achieve greater spatial precision. Some

newer “toys” such as cyberknife, MR Linac and proton therapy have entered the armamentarium of the oncologist. And we are indeed getting cleverer in focusing the radiotherapy beam to the tumour and away from normal tissues as far as possible.

Irradiation of a larger volume of tissue to lower doses. But with all these techniques, the radiotherapy beam enters from outside the body, and precision is achieved by actually irradiating a larger volume of normal tissues to lower doses resulting in a “low dose bath”. This is in effect a means of dose retribution and it has long been assumed that apart from the small risk of increased second malignancy, this strategy is safe from a toxicity perspective.

There has been recent interest has shifted to the role of the immune system in both impeding and driving tumour progression. Genomic instability is now recognised as a “hallmark” of cancer, which leads to the expression of many abnormal proteins on the surface of a tumour. These neoantigens should, at least in theory, provoke an anti-tumour response from a competent immune system. However, tumour cells employ numerous strategies to evade and suppress the immune response against it. This could occur by inhibiting effector immune cells such as cytotoxic T cells and natural killer cells as well as by activating regulator T cells which lead to a suppressed immune response. Tumour cells could also induce apoptosis of effector immune cells by expressing the programmed-death ligand-1 (PD-L1) on its surface.

The interaction between radiotherapy and the immune systemic is indeed complex. In many ways, it can actually stimulate an antitumor immune response by exposing more tumour antigens to the immune system and by engineering the release of cytokines that activate antigen presenting cells. However, since effector immune cells such as cytotoxic lymphocytes are highly radiosensitive, radiotherapy can lead to its depletion both in the circulation as well as in the tumour microenvironment.

The high radiosensitivity of lymphocytes would suggest that these cells are prone to radiotherapy induced apoptosis even at exposure to very low dose as which occurs in the regions of the low-dose bath. While modern technology has permitted greater precision in the delivery of radiotherapy by redistributing dose, the collateral damage to lymphocytes and effector immune cells have been underestimated. In addition irradiation of a larger volume of tissues to low dose could lead to secretion of pro-inflammatory cytokines by immune cells that lead to increased toxicity of treatment.

In this oration, 4 studies will be showcased to highlight the impact of this strategy of dose redistribution on the immune system as well as alternative strategies for dose escalation. All of them have been ground-breaking since they have been the first-ever studies to investigate each aspect.

## Selected free paper titles

| No. | Title* |
|---|---|
| 01 | **Utility of HbA1c as a tool for Diagnosis of Gestational Diabetes Mellitus and to study the correlation between HbA1c and OGTT in a tertiary care setting in Sri Lanka.**<br>*Jayasinghe I N, Hewa S P* |
| 02 | **Internet Addiction Disorder and its Associated Factors among 15-19-Year-Old Adolescents in Colombo District, Sri Lanka**<br>*Ariyadasa HGGLP, De Silva C, Gamagedara NS* |
| 03 | **Work life balance and its association with job satisfaction among government medical officers in Ampara district**<br>*Fouzad ASM, Munaz MMMM* |
| 04 | **Assessment of leprosy training program in Eastern Province**<br>*Sasikumar T, Mayuran N, Sasikumar S, Dharshini K* |
| 05 | **Assessment of availability of internet connections in healthcare institutions at regional directorate of health services, Batticaloa**<br>*Sasikumar T, Mayuran N, Sasikumar S, Dharshini K* |
| 06 | **Prevalence of Quality of Work Life and associated factors among the elderly workers in a selected district of Sri Lanka**<br>*Gunathilaka MNJ, Weerasinghe MC, Samaranayake DBDL* |
| 07 | **Does the Incident Reporting System (IRS) in healthcare system, a requirement for improving patient safety? A Review**<br>*Fernando GHS, Bandara WVRTDG* |
| 08 | **Role of heath care leaders in the digitalization of health system: A Review**<br>*Fernando GHS* |

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| 09 | **An Assessment of Healthcare Utilization in the Rural Villages of Kilinochchi District**<br>*Fernando HC, Dabrera TME, Jayasundara Bandara JMW* |
| 10 | **Tooth loss and associated factors among janitorial workers employed in government hospitals in Colombo Municipal Council area**<br>*Perera KLMM, Nanayakkara NKV* |
| 11 | **COVID-19 vaccine compliance among nurses: a cross-sectional study in a tertiary care hospital in Sri Lanka**<br>*Karunaratne HDLS, Seneviwickrama KLMD* |
| 12 | **Prevalence and Dependency to Betel quid chewing among 20- to 45-year-olds in Kalutara District, Sri Lanka**<br>*Nanayakkara NAR, Usgodaarachchi US* |
| 13 | **Psychological distress and its associations among young elderly in Bandaragama Medical Officer of Health (MOH) area**<br>*Jayasinghe AVK, Rathgamage URH., Jayalath JAJU, Sandhyal DLM, Damayanthi BDJ, Sooriaarachi CMD* |
| 14 | **Analyzing the Equipment Maintenance Management Process in a Public Sector Tertiary Care Hospital in Sri Lanka**<br>*Wijekoon WMCR, Wijemanne WMUS* |
| 15 | **Prevalence and genotype distribution of Human Papillomavirus in attendees at Central Sexually Transmitted Diseases Clinic, Sri Lanka**<br>*Samaraweera B et al.,* |
| 16 | **Healthy Mouths – Healthy Kids: Development of a Care giver focused Oral Health Promotion Intervention during early years in life to prevent Early Childhood Caries in Sri Lanka**<br>*Vidanapathirana SP et al.,* |

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| 17 | **Practices of waste management, their associated factors and selected health outcomes among female households in MOH, Millaniya**<br>*Kumara PMC, Goonewardena CSE* |
| 18 | **Prevalence and associated factors of high job strain among the bank employees in the Kesbewa divisional secretariat area during the COVID-19 pandemic**<br>*Shilpeswarage UK, Wickramasinghe ND* |
| 19 | **Burden of Hepatitis B and C infection among high-risk groups and blood donor population in Sri Lanka**<br>*Abeynayake JI, Ruwan DVRG, Mahanama AIK, Edirisinghe D, Hashani P* |
| 20 | **Analysis of Employee-Perceived Bureaucratic Red Tape in a District General Hospital of Sri Lanka**<br>*Wijekoon WMCR, Hewage RA, Ratnasekare WAPP* |
| 21 | **Perceived stress among inward patients in National eye hospital in Sri Lanka - During the COVID-19- Pandemic period**<br>*Warnakulasooriya PH* |
| 22 | **Evaluation of root and root canal morphology of permanent maxillary and mandibular premolars in patients attending to dental hospital Peradeniya – A cone beam computed tomography (CBCT) study**<br>*Navaratne SMBS, Jayasinghe RM, Hettiarachchi PVKS, Fonseka MCN, Jayasinghe RD.* |
| 23 | **Sero-prevalence and factors associated with the past exposure to hepatitis E virus infection in pregnant women attending a major maternity hospital in Sri Lanka**<br>*Akram MAFA, Niyas ARJP, Noordeen F* |
| 24 | **Antibacterial Activity of Silver Graphite Composite Containing Red Clay Beads**<br>*Swarnamali VMR, Amaraweera THNG, Yapa YMSS, Prematthilake MMSN* |

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| 25 | **Utilization of Antenatal Care Services and Pregnancy Outcomes of Women in Advanced Maternal Age in Sri Lanka**<br>*Illangasinghe IMPC, Jayaratne ILK.* |
| 26 | **Factors related to oral health behaviors, awareness on oral health and utilization of oral health services by army soldiers in hardline areas of Jaffna peninsula**<br>*Senadeera PS, Ratnayake NC* |
| 27 | **Prescription Writing Errors Among Intern Doctors in Sri Lanka: A Single Center Experience**<br>*Galappaththi K et al.,* |
| 28 | **Practices of feeding during illness among primary caregivers of children less than 24 months in a ward setting at a tertiary center**<br>*Senavirathne AMJ, Hettige MCCD, Kottage PU, Ganesan S* |
| 29 | **Influence of birth weight and period of amenorrhea on selected nutritional indices of children among the birth cohort of 1st August 2010 to 31st July 2011 in Medical Officer of Health Area, Kopay**<br>*Jeyaseelan T, De Silva SP* |
| 30 | **Indirect Expenditure and Financial Risk Protection in Health among Residents of Kalutara District in 2019**<br>*Soysa HND, De Silva P, Chulasiri P.* |

*The titles and the authors mentioned under selected abstracts may undergo modifications as authors undertake revisions and further review is ongoing.

# The Library

***Digital Revolution and Innovation in Libraries:***

***Expecting the Unexpected***

29th November 2022

# MESSAGE FROM THE LIBRARIAN

**Dr. (Mrs.) D. C. Kuruppu**
Librarian (Acting)
University of Colombo, Sri Lanka

It is a great pleasure to convey this message for the Annual Research Symposium 2022 of the University of Colombo under the theme of "*Digital transformation and innovation approaches to mitigating challenges in the Higher Education Sector.*" In line with the theme of the Annual Research Symposium of the University of Colombo, the Library has also conducted the Library Research Symposium (LRS) under the theme of "*Digital Revolution and Innovation in Libraries: Expecting the Unexpected.*"

In this forum, the Librarians of the University of Colombo are presenting their findings of research studies related to the sub-themes of digital literacy; bridging the digital divide; innovative ways of library marketing; plagiarism; makeshift changes in library operations; blended learning, and social media research which contribute to diversified aspects of future university librarians' roles. I am very much thankful to Senior Professor H D Karunaratne, Vice-Chancellor, University of Colombo, for accepting our invitation to grace the occasion as the Chief Guest. Furthermore, I thank Dr Lynn Kleinveldt, Lecturer, Department of Business and Information Management Administration, Faculty of Business and Management Services, Cape Peninsula University of Technology, South Africa, for joining us to deliver the Keynote Address. Finally, I sincerely thank all distinguished invitees, session chairs and reviewers for their invaluable contribution. I am delighted to express my special thanks to the organizing committee of the Library Research Symposium for their untiring efforts to make this event a success. In addition, I congratulate all the presenters of LRS 2022 for their research contribution.

Thank you
29th November 2022

# MESSAGE FROM THE SYMPOSIUM CHAIR

**Mrs. T. Sritharan**
Senior Assistant Librarian
University of Colombo, Sri Lanka

I am honored to present this message as the Chair of the Library Research Symposium 2022 of the Library, University of Colombo held under the theme of "*Digital Revolution and Renovation in Libraries: Expecting the unexpected.*" The LRS 2022 is a great platform to exchange knowledge and experience in all aspects of library and information sciences, which includes different sub themes, under which ten (10) research abstracts in two sessions were presented by library professionals.

I happily extend my sincere gratitude to the Chief Guest, Senior Professor H D Karunaratne, the Vice-Chancellor of the University of Colombo for his invaluable presence at the LRS 2022. I would like to express my sincere thanks to our Keynote speaker, Dr Lynn Kleinveldt, Lecturer, Department of Business and Information Management Administration, Faculty of Business and Management Services, Cape Peninsula University of Technology, Cape Peninsula, South Africa, for sharing her expertise on "*Striving towards innovative support services with no expectations: is it a blessing in disguise for academic libraries?*" I am immensely grateful to our Acting Librarian, Dr (Mrs) D C Kuruppu, for her guidance and excellent leadership. Meanwhile, I am very thankful to the Convener, members of the organizing committee and all library staff members for their unstinted support in planning and execution of this symposium. I am very grateful to all the reviewers, Session chairs for their knowledge and time committed for this symposium without any financial or other benefits. Finally, I congratulate all authors and co-authors who have submitted their research papers to the LRS 2022.

Thank you
29th November 2022

## LRS 2022

## ORGANIZING COMMITTEE

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# Library Research Symposium

## University of Colombo

### 29th November 2022 from 2.00 p.m. to 6.00 p.m.

### Programme

| | |
|---|---|
| 2.00 - 2.10 p.m. | Inauguration |
| 2.10 - 2.20 p.m. | Welcome Address by the Chair LRS - 2022<br>Mrs. T. Sritharan<br>Senior Assistant Librarian, University of Colombo |
| 2.20 - 2.30 p.m. | Address by the Librarian<br>Dr. (Mrs.) D. C. Kuruppu<br>Librarian (Acting), University of Colombo |
| 2.30 - 2.50 p.m. | Address by the Chief Guest<br>Senior Professor H. D. Karunaratne<br>Vice-Chancellor, University of Colombo |
| 2.50 - 2.55 p.m. | Introduction to the Keynote Speaker |
| 2.55 - 3.20 p.m. | Keynote Address<br>Striving towards innovative support services with no expectations is it a blessing in disguise for academic libraries?<br>Dr. Lynn Kleinveldt<br>Lecturer, Cape Peninsula University of Technology, South Africa |
| 3.20 - 3.30 p.m. | Vote of Thanks by the Convener - LRS 2022<br>Mrs. S. M. Adhikari<br>Senior Assistant Librarian, University of Colombo |
| 3.30 - 4.10 p.m. | Technical Session I |
| 4.20 - 5.10 p.m. | Technical Session II |

## INTRODUCTION TO THE KEYNOTE SPEAKER

**Dr. Lynn Kleinveldt**

Lecturer

Department of Business and Information Administration

Faculty of Business and Management Sciences

Cape Peninsula University of Technology

South Africa

Dr Lynn Tatum Kleinveldt, born in Cape Town, South Africa, obtained her PhD in Philosophy, Science, Cognition and Semiotics in 2018 from the University of Bologna, Italy. She is currently a lecturer in the Faculty of Business and Management Sciences at the Cape Peninsula University of Technology in Cape Town, South Africa, since 2020. Prior to this, she held the position as faculty librarian of Applied Sciences and Health and Wellness Sciences at the Cape Peninsula University of Technology for the period 2009-2019. She has 19 years of experience working in academic libraries. Her research interests are Teaching with Technology in Higher Education; Online Learning Environments; Blended Learning; Emerging Technologies; Library Collaboration; Embedded Librarianship and Social Robotics, Research Data Management, Data Analytics, Artificial Intelligence, Virtual Libraries, Digital Libraries, Library Systems, Academic libraries supporting research, Information Literacy, Knowledge Management, and Knowledge Societies. Some research projects conducted by her include integrating tablet technologies into the information literacy programme and integrating telepresence robots into international librarian collaboration to support reference services and research support services.

Dr Kleinveldt is currently serving as Standing Committee Member of the IT Section in the International Federation of Library Associations and Institutions (IFLA) for the term 2017-2023, and Chairperson of the Library and Information Association of South Africa (LIASA) Higher Education Libraries Interest Group, 2021-2023. She has published several research papers internationally and presented research findings in IFLA and other international conferences.

# ABSTRACT OF THE KEYNOTE ADDRESS

## Dr. Lynn Kleinveldt

**Striving towards innovative support services with no expectations: is it a blessing in disguise for academic libraries?**

Let me begin my talk with a question: what do we expect in return for delivering innovative library support services to our university community? Perhaps, what we need to consider before attempting to answer this question is that we live in a world of disruption and uncertainties. There has been an old saying that the "only constant (in this world) is change." Yet we find ourselves in a dilemma that a huge resistance to change collides with the demands to adapt to the rapid advancements in technology. It was emphasized that the "digital revolution is without a doubt the most significant event in information dissemination since Gutenberg's printing press and arguably marks a much bigger shift in human communication (Clarke, 2021)." In a time where we are driven by new technologies, where society battles with information to data overload, there is pressure to make decisions before trends or new concepts could be grasped. Although the world physically came to a standstill due to the COVID-19 pandemic, we have been under tremendous pressure to be connected 24/7 in response to changing demands. In addition, COVID-19 lockdown restrictions resulted in work processes globally, being transformed overnight completely online and digital. Time to rest, reflect and rejuvenate became almost impossible to consider as the remote work life dominated home/family life. One of the key 21st century skills that higher education graduates need to acquire for workplace preparedness is critical thinking, especially looking at drastic changes that occurred in a short space of time. The need and want for more, but with less, in parallel with constant budget cuts versus inflation. How do organizations prepare for the unexpected, or is the unexpected a blessing in disguise? The aim of this keynote address is to highlight the role academic libraries play in addressing selected aspects such as sustainable technologies, knowledge economy, and digital revolution. I am hopeful that this keynote will set the scene for the symposium on how academic libraries can embrace key technologies to prepare for supporting the unexpected needs of our university communities.

## List of Abstracts

# Analysis of the library website at University of Colombo from user perspectives: a case study

M. A. L. Silva[1], T. Ramanan[2], D. C. Kuruppu[1]

[1]Library, University of Colombo, Sri Lanka

[2]Library, Faculty of Technology, University of Colombo, Sri Lanka

The Library of the University of Colombo declared its digital presence by launching its first-ever website in 2001. Since launching the website, the library has continued to develop content and interactions with stakeholders. However, after 2013, no survey was conducted to investigate whether the users were satisfied with the existing website contents and services. Moreover, the recent economic crisis and COVID-19 pandemic led to reliance on digital interfaces to share and retrieve information. In this regard, a pilot survey was carried out to explore the demand and desire of the library users to examine the need for redesign the library website. Convenient sampling technique was employed, and fifty (50) users were administered semi-structured questionnaires using Google Form. Data extracted were descriptively analyzed using the Pearson Chi-square test and one-way ANOVA. Majority (33.3%) of the students of the Faculty of Science were using the library website more frequently than the students of other faculties. Respondents revealed that the Training Guides (Mean=4.00; SD = ±0.926) and past-paper database (Mean=3.96; SD = ±0.989) accessed via the library website were useful for their studies. Pearson Chi-Square revealed a significant relationship of faculties with article requests (p=0.037) and adequacy of website information for academic work (p=0.036). Similarly, year of study has a significant relationship with Selective Dissemination of Information (p=0.048); usefulness of the training guides (p=0.022); adequacy of research support (p=0.026); and meaningful organization of information (p=0.003). Overall responses reveal that the library website is highly user-friendly (Mean=3.90; SD = ±0.909). One-way ANOVA revealed a significant relationship between the resourcefulness of the website and the respondents' overall satisfaction with the information received from the library website (p=0.021). Hence, the library website must be aligned with users' expectations. Despite the positive results discovered in this initial survey, the need for updating the website was felt through a benchmark of other library interfaces. Therefore, FAQ section and Chat bot are being suggested to assist the users.

Keywords: Library resources, Website design, User satisfaction

**The attitudes towards Online Education and the role of the library in Online Education: a case study of the fresh nursing undergraduates of University of Colombo**

K. I. D. F. Senanayake

Library, Faculty of Nursing, University of Colombo, Sri Lanka

In times of COVID-19 pandemic, access to e-tools and online education platforms in higher education institutions has proven very useful to facilitate the emergency switch to distance learning. Several new ways of storing information emerged and libraries transformed accordingly for the purpose of assisting their online users. The study was conducted at the Faculty of Nursing to assess new undergraduates' attitude towards online education (ATOE) and the attitude towards the role of the library in online education (ATRLibOE). First-year nursing undergraduates were purposively selected for the study, thus the sample size was 89. A self-administered Google questionnaire was used to collect data. The collected data were analysed with Statistical Package for Social Sciences (SPSS) version 21. Majority of the students were female (n=62, 69.7%) and most of the students were Sinhalese (n=77, 86.5%). More than half of the students (n=58, 65.2%) reside in a rural area, and 87.6% (n=78) use Sinhala as their primary language. Majority of subjects (n=48, 53.9%) use both laptops and mobile phones for their online education. 4G router is the most common type of internet access used by majority of the respondents (n=44, 49.4%). Thirty students (33.7%) have no internet access at their residences, and 21 students of them reside in rural areas. The findings revealed that the undergraduates hold a negative attitude towards the online education (M=2.26) as well as the role of the library in online education (M=3.11). The attitude towards the online education was significantly different between male and female groups ($p<0.05$). Positive correlations were significant among the variables of ATOE and ATRLibOE ($p<0.05$). The findings imply that new undergraduates are less likely to accept online education and the online services provided by the library. Hence, it is recommended to conduct more awareness programmes and a qualitative study with the selected group to identify and improve specific online learning needs in future.

Keywords: Undergraduates, Nursing, User attitudes, Online Education

**Preservation of Indigenous Knowledge: a study based on knowledge transmission methods used in the field of Indigenous Medicine in Sri Lanka**

C. K. Gamage

Institute of Indigenous Medicine, University of Colombo, Sri Lanka

Indigenous knowledge (IK) also known as local knowledge or traditional wisdom mainly remains tacit in nature, empirical and resides only within individuals and is difficult to articulate. Sri Lanka has its own unique and remarkable indigenous medical system handed down from generation to generation. The objectives of this study were to explore the methods of IK transmission used in the field of Indigenous medicine in Sri Lanka, to investigate the barriers against the popularity of methods of indigenous medical transmission among the general public, and to suggest recommendations for promoting, dissemination and preservation of the indigenous medical knowledge (IMK). Two research tools were employed for collecting data, namely literary surveys and focus group discussions. Visiting lecturers of the Institute of Indigenous Medicine and special physicians of the National Ayurvedic Teaching Hospital (Borella) and six major branches of indigenous medical fields were treated as the focus group of this study. Although IK extends to a broad spectrum this research was limited only to the field of the indigenous medicine. The results highlight that generational succession is the main method of transformation of IK, especially the relevant IMK expertise. Ola-leaf manuscripts and hand-written manuscripts are the major written methods and Vedageta and incantations as verbal methods. Meanwhile, intangible methods of Dutha Lakshan and Kem have also facilitated the transmission of the IK of indigenous medical field in Sri Lanka. The study enlightened that *Guru Mushtiya* was the major barrier to transmitting IMK to the younger generation. These methods are difficult to understand and expressed in a very authentic manner and they are used in a very secret way which add to further barriers. The majority of the next generation of current indigenous medical practitioners are not involved in practice due to various socio-economic factors. The study has revealed that most of the IK of indigenous medicine have disappeared with the demise of practitioners. It is recommended that remaining IMK has to be preserved at any cost to maintain the present status quo of the present day in Sri Lanka and the responsible authorities should take immediate action to record, manage and preserve this invaluable IMK for the wealth of the coming generation.

Keywords: Indigenous knowledge, Indigenous medical knowledge, Knowledge management, Knowledge preservation

**Evaluating the Article Request Service provided by the Postgraduate Institute of Medicine, University of Colombo, Sri Lanka**

M. P. P. Dilhani[1], F. Rizka Ihsan[2], L. G. C. N. Wadasinghe[1], P. Siribaddana[2]

[1]Library, Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

[2]Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

An overwhelming number of evidence is generated daily in the field of healthcare and timely access to the best available evidence is crucial for effective medical education as well as the delivery of quality patient care. University libraries play an integral role in the higher education system. Libraries are constantly on a quest to support the goals of the parent organization and to meet its user needs and expectation. The library of the Postgraduate Institute of Medicine (PGIM), University of Colombo, established the article request service to optimize library information sharing services. A descriptive- cross sectional study was conducted with the aim of evaluating the article request service of the library of the PGIM. Data was collected using an online, self-administered questionnaire among the users receiving this service and from the internal data stored in the library database from the inception of this service from 2015 to 2021. A descriptive analysis of data was executed using Microsoft Excel. The number of requests received by the library since its inception increased by more than 4 folds by 2021 [n = 1290 (2015), n = 6014 (2021)]. Amidst a plateau in requests in 2018-2019, the majority of requests were received via the Google Form and specified the author names and title of the article. The postgraduate trainers obtained this service most frequently (42%); more than 6 times per semester whereas 21% of trainees and 38% of examiners obtain this service similarly. While postgraduate trainees utilized the resources obtained for education purposes, trainers and examiners used articles and book chapters for clinical decision-making, preparation of exam material and research purposes. Most postgraduate trainers (88%) and trainees (84%) are highly satisfied with the article request service while only 57% of examiners are of the same opinion. The findings demonstrate the increasing use of article request service, and that the library is satisfactorily meeting the needs of majority of its users. However, the dissatisfaction expressed and less frequent use of the service by examiners demonstrates that the library needs to take measures to identify their needs and optimize its services to cater to this cohort.

Keywords: Library resources, Information resources, Article request service, PGIM library, PGIM library services

# Factors affecting the use of online library resources: a case study based on the University of Colombo, Sri Lanka during 2021-2022

S. G. N. C. Senanayake[1], M. A. Lankathilake[2]

[1]Library, University of Colombo, Sri Lanka

[2]Library, Faculty of Science, University of Colombo, Sri Lanka

Libraries in the present era are no longer limited to printed materials. There are different online information resources of the libraries which could be accessed by the users even without visiting the libraries. This study was conducted at the library, University of Colombo with the objectives to identify the online library information sources used by students, to examine the usage of library online resources, and to find out the factors affecting the usage of online library resources. The Study population was the total number of undergraduates who used the university's main library resources during 2021-2022 period. Out of 5456 students a sample of 361 students were selected following stratified random sampling method. Questionnaire survey was conducted to identify the library online resources and the factors that affect the usage of online library resources. Google Analytics data were used to examine the usage of library online resources. The collected data on the usage of online library resources were analyzed using descriptive statistic methods. The factor analysis was used to identify the main factors associated with the usage of online library resources. Findings establish that library website home page, databases, past paper collection in the web, e-books and e-journals are the online resources mostly used by the users. According to the factor analysis, the first six variables represent 87% of the total cumulative values. It indicated first six variables were the most important, it covered 87% of the total cumulative value. Usefulness of online information resources, Awareness, information seeking skills, information quality, easy Access and technical skills and the Internet facility were the factors identified in the study, which affect the use of library online resources. It was recommended that user awareness programmes, sessions on information searching skills and sessions on effective usage of online resources would enhance the use of these resources. Apart from that these factors, google analytic data could be considered when expanding online resources and introducing new services.

Keywords: Online information sources, Internet, E-books, E-journals, Databases

**Assessment of Information Literacy Skills of MD Medical Postgraduate Trainees in the electronic environment: a mixed method approach**

T. Sritharan

Library, University of Colombo, Sri Lanka

This study aimed at assessing the information literacy skills of MD medical postgraduate trainees in the electronic environment. The mixed method approach of both quantitative and qualitative was used and the population of this study was 815 MD medical postgraduate trainees in 32 medical specialties. Applying the 'Lwanga and Lemeshow' method 427 trainees were selected as sample. The questionnaire and the focus group discussions were the data collecting instruments. Data from the questionnaire was analyzed using SPSS ver. 23. QDA Miner lite was used to analyze the data from focus group discussions. Total number of 427 questionnaires were distributed and 380 of them responded at the rate of 89%. Thirty-two (32) participants from 32 medical specialties were invited for the focus group discussions. Findings revealed that 276 males and 104 females responded, respectively. The findings revealed that the majority of respondents (74.5%) required information to prepare them for examinations and 58.7% required information for publications. Out of total respondents, 16.6% and 15.8% stated that their computer and internet literacy were poor and very poor, respectively. Several suggestions were made by the respondents from focus group discussions regarding the training needs for enhancing electronic information literacy. Among them 48.4% stated that they have enough skills and 42.9% have requested for training on accessing electronic resources. However, 22.4% of PG trainees strongly agreed that they have no skills to access electronic resources thus it affects their PG medical education. More than 75% of the respondents highly stressed about the training on searching techniques to narrow down their search to get the most accurate and relevant resources, and to save their time. Based on the findings, study concluded that information literacy skills play a vital role in the use of electronic information resources and a proper training is needed in information literacy skills. Findings of the study recommend that the library of PGIM should provide proper training on information literacy skills and should enhance efficient Internet services in the library.

Keywords: Information literacy skills, electronic resources, Postgraduate medical trainees, Electronic environment.

# Research publications in the Journal of University Librarians Association of Sri Lanka between 2012 and 2021: a scientometric analysis

S. S. Johoran

Library, University of Colombo, Sri Lanka

A scientometric analysis was conducted on 102 research articles published in the Journal of the University Librarians Association of Sri Lanka (JULA). Nine volumes of the journal containing 18 issues from 2012 to 2021 have considered for the present study. The objectives of the study were, to find the year-wise distributions of articles, examine the authorship patterns, determine the degree of collaboration between authors, identify author contributions based on affiliation and map the collaboration among universities/institutes. To determine the degree of author collaboration, K. Subramanyam's (1983) formula on the degree of collaboration in quantitative terms was used. The highest number of research articles were published in 2020 with 16 research articles followed by 13 articles in 2018. Out of 102 contributions, 50 papers (49%) are single-authored and the rest 51% are multi-authored articles. Only one research article was published by four authors between 2012 and 2021. During the study period, most of the research publications in the JULA are multi-authored. The highest number of multi-authored papers (12) was published in the year 2020. The average degree of collaboration is 0.51 during the study period which indicates that there was a high level of collaboration between authors. The highest number of author contributions (26) was from the University of Peradeniya. Further, authors from countries such as India, China, Canada, and Malaysia have made their contributions to this journal. And authors from two local institutes have made their contributions to this journal during the study period. When considering the collaborations between universities/institutes, University of Ruhuna has made the highest collaborations with foreign universities. And, Eastern University of Sri Lanka, University of Peradeniya, and University of Kelaniya have engaged in foreign collaborations. The University of Colombo and Open University of Sri Lanka have demonstrated the highest collaborations among state universities. General Sri John Kotelawala Defense University and Wayamba University of Sri Lanka have not made collaboration with other universities/institutes. This assessment would be a valuable resource to the scientific community, funding agencies and policymakers. This study may help those who wish to map the scientometric patterns of journals.

Keywords: Scientometric analysis, Authorship pattern, Degree of collaboration, Journal of University Librarians Association of Sri Lanka

**A Research Support Services for University Libraries in Sri Lanka: Preliminary Web Survey based on Research Lifecycle**

P. G. M. P. Gamage

Library, University of Colombo School of Computing, Sri Lanka

University academic libraries around the world are increasingly inclined to implement various research support services (RSS) to make it easier for researchers to access quality services. Ideally, libraries should provide RSS addressing researchers' information needs, embedded in the research lifecycle (RLC). The term "research lifecycle" refers to different stages of the research process, starting from conceiving idea to implementation and to dissemination. An examination of the research literature in Sri Lanka reveals, although some RSS were implemented by university libraries in SL, there was a lack of attention to conducting studies relevant to categories of research support services in Sri Lankan University libraries. Accordingly, the overall aim of this study was to evaluate the RSS of university libraries in SL while investigating the services and its alignment with the RLC. Data were analyzed descriptively and it was concluded that all Sri Lankan university libraries provide RSS, covering all stages of the RLC. Most libraries mainly focused on the 1st (Conception, 100% (n= 15)) and 4th (Preservation and curation, 99.33% (n=14)) stages of the RLC. Under 2nd stage, only one library (University of Colombo, 3, 10%) provided more than two services for "Data processing and analysis" (data analysis guides- webinars, places/ equipment Facilities) and 4 libraries do not offer any services. All libraries surveyed mainly focused only on workshops and webinars, nevertheless, the services such as research data management, GIS support, and supplying tools for data analysis and data management planning were not implemented. Under 3rd stage of the RLC "Publication and sharing" (publication support, citation management guide, providing tools, ORCID and DOI), 9 (24%) and 8 (21%) services are offered by the libraries attached to the University of Kelaniya and University of Colombo respectively. It is worth mentioning that three university libraries do not provide any services under the 3rd stage of the RLC. Therefore, the study concluded that university libraries of Sri Lanka should focus on implementing Research Support Services such as helping to find funding agencies, Special Research Alert services, Digital Mapping and GIS Support, Guides and support for scholarly publications, and ORCID/DOI services. The findings of this study could be used as a guide to improve the research support services of university libraries and make a strong contribution to the research environment.

Keywords: Research Support Services, Research Lifecycle, University libraries

**Relationship between undergraduates' University-Library Usage for Academic Purpose and their Academic Performance in Sri Lankan Universities**

N. M. Karannagoda

Library, University of Colombo, Sri Lanka

Most of the Sri Lankan government university libraries are maintained in a complicated and broad space incurring a great expense with the assistance of a big carder. Though the situation is this, the present-day undergraduates do not effectively use the university library for their education, and they tend to extract information from untrusted information sources. As public funds maintain these libraries, library authorities are responsible for demonstrating their value, contribution and effectiveness for the academic success of the undergraduates since the main requirement of maintaining university libraries is to support undergraduates' academic success. Therefore, this research study focuses on finding a relationship between undergraduates' university library usage for academic purpose (AP) and their Academic Performance (APE) in Government Universities in Sri Lanka. This research is basically quantitative in nature and has employed the survey method. Further the research philosophy is positivism and research approach is deductive. When collecting the data, undergraduates of three academic years, two universities, five faculties and eight library usage types were used. Time horizon for this research study is cross sectional. According to the findings, this study concluded that there is a significant weak positive relationship between the undergraduates' UL usage and their APE for all undergraduates. But this relationship varies when the gender, faculty and the library usage types are considered separately. When it is considered the faculty wise relationship, Undergraduates' of Faculty of Management and Education demonstrate a strong positive relationship between UL usage and APE while Faculty of Arts demonstrates a weak positive relationship. However, for Faculty of Science and Law there is no significant positive relationship between undergraduates' UL usage and their APE. Finally, this study proved that there is a significant difference between the GPAs of the UL users and UL non-users for AP. This is one of the first attempts to find a relationship between undergraduates' university library usage for educational activities and their APE by using three academic years, five faculties, two universities and eight library usage types.

Keywords: Academic performance, Academic purpose, Undergraduates, University library usage

# Investigating the use of online information resources by visually impaired undergraduates during the pandemic period: a case study at University of Colombo

M. A. Lankathilake[1], T. Ramanan[2], W. P. G. L. Perera[3]

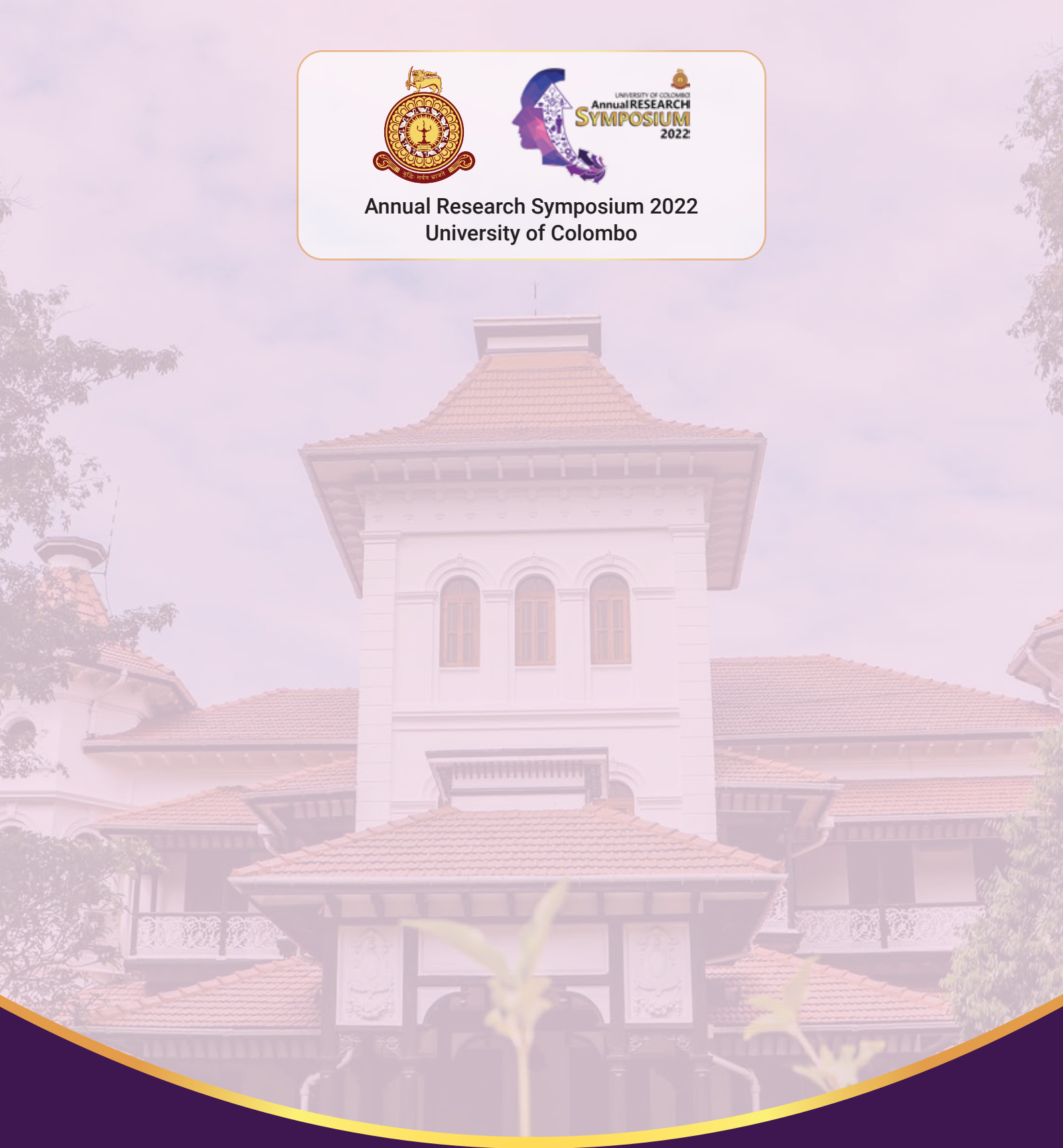
[1]Library, Faculty of Science, University of Colombo, Sri Lanka

[2]Library, Faculty of Technology, University of Colombo, Sri Lanka

[3]Library, University of Colombo, Sri Lanka

During the pandemic period, undergraduates were not able to access library resources physically; therefore, they were heavily depending on online resources. All students faced challenges to access online resources provided by Library. Students with visual impairment were not exception facing these challenges. This study was conducted with the objectives of identifying the online information resources used by the visually impaired (VI) undergraduates, their awareness of resources and challenges faced by them. Total number of 37 undergraduates in all four years at University of Colombo were selected as sample. Interviewer-moderated questionnaire survey was conducted to collect data and the data collected were descriptively presented and conclusions were drawn based on thematic content analysis. Out of 37, total number of 27 undergraduates participated in the interview at the rate of 73%. There were 15 female students and 12 male students. Majority of the respondents (18) were in age group of 23-26 years. Online Public Access Catalogue (OPAC), Library online helpline facility, Online databases, Library webinar series, Single Sing On (SSO) facility to download articles, library website, library Facebook and library YouTube channel were identified as the online resources used by the VI undergraduates. Among these identified resources majority of the respondents stated that they were aware about library OPAC (33%) and the least known resources were Webinar Series (7%). Online journal databases (26%) and library website (26%) were the online resources highly used by the VI undergraduates. The least used resource was the library YouTube (4%). Lack of awareness, issue in accessing several web contents, lack of suitable assistive devices, lack of skills in using the Internet, and lack of proper Internet connectivity were main challenges stated by the respondents. Accordingly, conducting awareness on library online resources, training on the Internet literacy and information literacy skills, and verifying whether the content could be read by screen readers when developing web pages have been recommended. Visually impaired students should be made aware more of help line service or Ask a Librarian services since they are more helpful in times of restricted physical access to library resources. These proactive approaches and improvements may help VI users tap their necessary information during inaccessible times like pandemic lockdowns.

Keywords: Visually impaired undergraduates, Library online resources, Internet



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94, Cumaratunga Munidasa Mw,
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