



UNIVERSITY OF COLOMBO
SRI LANKA
ANNUAL RESEARCH SYMPOSIUM 2019



Health and Well-Being

PROCEEDINGS

22 November 2019

PROCEEDINGS
ANNUAL RESEARCH SYMPOSIUM 2019
UNIVERSITY OF COLOMBO, SRI LANKA

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UNIVERSITY OF COLOMBO, SRI LANKA

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'Buddhi Sarvathra Bhrajate'

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**MESSAGE FROM THE VICE CHANCELLOR
UNIVERSITY OF COLOMBO**

Senior Professor Chandrika N. Wijeyaratne



It is my privilege and pleasure to pen this message of felicitation for the flagship event in our annual calendar – the Annual Research Symposium. Teaching, research and scholarship are the fundamental constituents that reveal the quality and relevance of any seat of higher learning. The Annual Research Symposium of our university provides an ideal opportunity to highlight the research capability and potential of our own academic staff and students. This year's symposium portrays these attributes with a greater magnitude in scope and outlook, by being conducted as the culmination of the two key events of the Asian Universities Alliance (AUA). The University of Colombo is the only Sri Lankan university among the fifteen-member consortium that comprises this esteemed alliance. Our university has the added privilege of holding the Executive Presidency in 2019, which brings with it the responsibility of hosting the Executives' Meeting and the Youth Forum of the Alliance. Our symposium this year is centred around the chosen theme "Health and Well-Being" that serendipitously provides the perfect platform to celebrate the 150th anniversary of the birth of this institution in the form of the Ceylon Medical College. Therefore, the symposium and the AUA events that are occurring simultaneously give us an opportunity to truly celebrate our university and its potential. Almost all the events are scheduled to take place within the university precincts, with College House – a symbol of our cultural heritage – as the focal point.

Our events are strengthened by the support and collaboration of the Ministry of Higher Education and the World Health Organisation. This indeed has raised the bar of our academic profile with a clear validation of the relevance of our outputs from a national context. We are honoured by the presence and participation of the Presidents and key decision makers of the best universities in Asia, who are our partners in the AUA.

Their contributions have added value to our programmes. It is my fervent wish that the initiatives taken at these fora will not be confined to fostering closer ties between our institutions, but will also lead to effective networking and more productive collaborations that would benefit the wider society in which we live and serve.

I also take this opportunity to felicitate the organizing team of academics, researchers, administrators and students, so ably led by Chairperson Prof Naazima Kamardeen and by the administrative lead for research and development Ms Tharushika Pathiranage, and the multitude of administrators and support staff alike. I thank our sponsors and well-wishers, chief among them our alumni.

My very best wishes for fruitful deliberations go out to all of you.

**MESSAGE FROM THE SYMPOSIUM CHAIR
ANNUAL RESEARCH SYMPOSIUM 2019**

Professor Naazima Kamardeen



It is with great pleasure that I pen these words on the occasion of the Annual Research Symposium of the University of Colombo for 2019. This annual event showcasing the research capabilities of our staff has taken a new dimension this year, as it coincides with the Executives Meeting and Youth Forum of the Asian Universities Alliance, which our University is proud to host. In keeping with the timely theme “Health and Well-Being” which connects meaningfully with the 150th anniversary of our university’s oldest institution, the Faculty of Medicine, our annual research symposium this year promises a stimulating array of events that highlight the role of the University of Colombo as the premier research institution in Sri Lanka, as well as its regional outlook in promoting strategic partnerships for learning, teaching and research.

In recognition of the presence of the executives of our partner institutions of the Asian Universities Alliance, our inaugural session comprises a panel discussion with their involvement, in favour of the traditional keynote address. I thank all those eminent personalities for enhancing our inauguration with their wisdom and insight.

An event of such magnitude, never before held in our university, has become a reality due to the astute leadership and guidance of our Vice-Chancellor, Senior Professor Chandrika Wijeyaratne. I remain grateful to her for her support in organising this event.

My task as Conference Chair was made easy because of my dedicated and hardworking colleagues. I am grateful to all the academic, administrative and non-academic staff who voluntarily worked in various committees to ensure the success of this event. Dr. Chathuranga Ranasinghe chaired the Youth Forum committee and Dr. Sashika Manoratne headed the Executive Meeting committee. I am thankful to them both. Special thanks are due to Ms. Tharushika Pathiranage, the SAR / Academic Publications Branch, for convening the Symposium Committee. I wish you all a

productive and fruitful academic session and thank you for your participation.

**MESSAGE FROM THE MINISTER
MINISTRY OF CITY PLANNING, WATER SUPPLY
& HIGHER EDUCATION**

Rauf Hakeem MP, LL.M

Attorney-at-Law

Leader, Sri Lanka Muslim Congress

Ministry of City Planning, Water Supply and Higher Education



It gives me great pleasure to send this message as the University of Colombo conducts its Research Symposium for 2019. The University of Colombo bears the distinction of being the only Sri Lankan university to be part of the prestigious Asian Universities Alliance (AUA), and has the honour of holding the Presidency this year. In this setting, it is a befitting recognition for the University of Colombo to be chosen to host the inaugural ceremony of the symposium to coincide with the Executive Meeting and the Youth Forum of this consortium. Such events, I am sure, will help raise the profile of the University of Colombo as an esteemed hub of research and innovation, and also enhance networking and collaboration among scholars and students in the Asian region.

In view of the 150th anniversary of the University of Colombo next year, it is furthermore rewarding to celebrate its pioneering status as one of the oldest centres of higher education in the Asian region, by hosting this key academic event in Sri Lanka. My ministry is gratified to support this endeavour and appreciates the leadership taken by the University for the promotion of greater visibility of higher learning and academic prowess.

The overarching theme “Health and Well-Being” chosen for these events, hints at areas with substantial scope for research and development, as it directly affects every member of the society in which we live. This theme brings home the idea that research and development must promote the overall health and well-being of society, and is aligned with Sustainable Development Goal 3 (Good Health and Wellbeing) of the United Nations. I am pleased to note that the World Health Organisation has acknowledged the significance of this theme and lent its credentials as a collaborator, enhancing the overall profile of the event.

I wish the organisers and all stakeholders of the University of Colombo’s Annual Research Symposium, as well as the affiliated AUA events, every success. I believe that these

events will highlight the great potential in Sri Lanka's higher education sector, and bring about the much needed partnerships for research and development within the county and globally.

**MESSAGE FROM THE SECRETARY
MINISTRY OF CITY PLANNING, WATER SUPPLY
& HIGHER EDUCATION**

M. M. P. K. Mayadunne

Secretary

Ministry of City Planning, Water Supply & Higher Education



It is with great pleasure that I send this message on the occasion of the University of Colombo's Research Symposium for 2019. I understand that the symposium, which is an annual event of the university, is being held this year to coincide with two other events of regional importance in the Higher Educational sector; namely, the Executive Meeting and the Youth Forum of the Asian Universities Alliance, of which The University of Colombo has the distinction of holding the Presidency in the current year. The University of Colombo, as a founding member of the Asian Universities Alliance (AUA), and a pioneer institution in higher education in Sri Lanka, fittingly undertakes this great responsibility as it celebrates its 150th jubilee, marking an important milestone in its service to society.

The Ministry of City Planning, Water Supply and Higher Education is proud to support the symposium as well as the events connected to the AUA, which have been recognised as being of national importance by various prestigious entities such as the World Health Organisation and the Sri Lanka Tourism Promotion Bureau. The Ministry strongly believes in empowering State-Sector Higher Educational Institutions such as the University of Colombo in order to enable higher education to align its goals with the overall needs of society. To this end, collaborations such as the AUA are of unparalleled importance, as they serve to build networks of excellence that help to raise the standards of research and scholarship between the partner institutions. The Ministry hopes that these partnerships would enable the University of Colombo to raise its profile even further, positioning itself, and Sri Lanka along with it, as a research hub in the region.

The theme "Health and Well-Being" that has been chosen, is also timely, because the ultimate goal of all research and development is to promote the overall health and well-

being of society, and to ensure that all members of society have access to resources that would help them to lead happy lives. The theme also aligns with Sustainable Development Goal 3 (Good Health and Wellbeing) of the United Nations.

I wish the University of Colombo's Annual Research Symposium, as well as the affiliated AUA events, all the success. It is my wish that these events would not only highlight the excellent research work that is being carried out by the University of Colombo's academics, but also serve to foster regional partnerships for educational and research excellence. Finally, I would like to convey my heartfelt gratitude to the Vice Chancellor and the academic and non-academic staff of the University of Colombo for their valuable contribution in organizing this significant event.

FACULTY OF ARTS



Humanities and Social Sciences Reflections on Health and Well-Being

27 November 2019

**MESSAGE FROM THE DEAN
FACULTY OF ARTS**

Senior Professor Premakumara de Silva



It is with great pleasure that I write this message on the occasion of the 2019 Annual Research Symposium of the University of Colombo and IConArts 2019. The theme of the Faculty of Arts this year, ‘Humanities and Social Sciences Reflections on Health and Well-Being,’ is intended to align with the broader theme of wellbeing, which has immense relevance to the multitude of topics in our disciplinary areas.

IConArts, the Annual Research Symposium of the Faculty of Arts, is an event that showcases current research produced by our scholars. It also facilitates connections between academics in different disciplines, networking locally and internationally, and most importantly, it acts as a venue for the dissemination of research done by the Faculty of Arts. This conference will highlight this array of academic research, presenting its quality as well as the creative potential of the Faculty of Arts.

This year, we received 42 abstracts for consideration, and after a rigorous review process, we were able to accept 31 abstracts for presentation at IConArts 2019. Presenters this year represent many of the Departments of the Faculty of Arts and present a diversity of research under the theme of ‘wellbeing’. I take this opportunity to thank our Keynote Speaker, Dr Deepika Attygalle, Senior Health Specialist at the World Bank – Colombo for graciously accepting our invitation. She will deliver the keynote speech on “Population Health and Wellbeing”.

The Vice Chancellor of the University of Colombo, Senior Professor Chandrika Wijeyaratne, has supported and guided us in our effort to make the Faculty’s Annual Research Symposium a success and I thank her for this support. I

would also like to thank this year's University Research Symposium Chair, Prof Nazeema Kamardeen, and her dedicated team for supporting us to organize the Symposium. Within the Faculty of Arts, the organization of this symposium was managed by a team of academics and I would like to extend my thanks to the Co-Chairs of the IConArts Organizing Committee and the Chairs of the Editorial and Abstract Committees who were responsible for the review process and the publication of abstracts. For the careful and speedy perusal of the abstracts, I wish to express my gratitude to the review panel. Thanks are also extended to the staff of the Dean's Office for their logistical arrangements and to the Computer Unit for the technical support provided. I would also like to express my gratitude for the contributions made by the sponsors of this event, which include the University of Colombo Research Fund and the Department Development Funds of the Faculty of Arts.

Finally, I would like to place on record my sincere appreciation of the scholars who submitted abstracts to IConArts 2019; I wish to congratulate the presenters and wish them well in their future academic endeavours.

FACULTY OF ARTS

PROGRAMME

27 November 2019

- | | |
|------------|---|
| 8.00 a.m. | Registration |
| 9.30 a.m. | National Anthem and Lighting of the Oil Lamp |
| 9.40 a.m. | Video Presentation |
| 9.50 a.m. | Welcome Address by Senior Professor Premakumara de Silva
Dean, Faculty of Arts |
| 10.00 a.m. | Address by Senior Professor Chandrika Wijeratne
Vice Chancellor, University of Colombo |
| 10.10 a.m. | Keynote Address: “Population Health and Wellbeing”
Dr. Deepika Attygalle, Senior Health Specialist, World Bank |
| 11 a.m. | Vote of Thanks |

INTRODUCTION TO THE KEYNOTE SPEAKER

Dr. Deepika Atygalle

Senior Health Specialist

World Bank - Colombo



Dr Deepika Attygalle is a medical professional specializing in public health. She carries more than 20 years of experience in managing primary healthcare programming, in routine and emergency settings, and among diversified populations as well as in reconciliation and development contexts. She worked as the state coordinator and technical specialist on the maternal and newborn care programme and the national maternal death surveillance system and played a lead role in initiating the national multisector nutrition programme. She was involved as a resource person to develop many policy and strategic documents, guidelines and manuals on MNCH, early childhood care development and nutrition at national and regional levels. Experienced in coaching and mentoring young medical graduates and public health professionals, she has authored and co-authored many articles on maternal newborn health and nutrition, published in national and international journals. She is also a reviewer for national and international journals.

Currently, Dr Attygalle is working at the World Bank - Colombo as a Senior Health Specialist. Prior to this, she has worked as a health and nutrition specialist at the UNICEF country office in Colombo and worked at UNICEF Afghanistan, Kabul office as a Health Specialist. She also worked as Programme manager / Chief of the Child Survival and Development unit in UNICEF Colombo and as the Regional coordinator in the UNICEF South Asia Region for the South South programme for health.

Dr Attygalle has obtained an MD in public health from the Post-Graduate Institute of Medicine, University of Colombo, followed by post-doctoral work at the Center of Health Promotion and Disease Prevention, University of Albuquerque, USA. She holds a Master's degree in Community Medicine from the Post Graduate Institute of Medicine, University of

Colombo. She obtained her undergraduate degree in General Medicine (MD) in Pavlov's 1st medical Institute Leningrad in USSR.

KEYNOTE ABSTRACT

Population Health and Wellbeing

Dr. Deepika Atygalle

Senior Health Specialist, World Bank - Colombo

In understanding concepts of health and wellbeing in modern human society, it is important to look not only at how healthcare services are provided by medical professionals, but also how they are perceived and received by the populations in question. This issue is especially relevant in the context of universal healthcare, based on the principle that “no one should be left behind” in terms of their health and wellbeing. In this sense, it is pertinent to ask the question, are we happy with the healthcare services we receive? To many people, the answer lies not only in the medical aspect of healthcare, but also in the human or personal aspect of it. It is important for a patient to feel that he or she is heard and understood by his or her doctor, and that human dignity is respected in the interaction. It is fair to say that humanity is the cornerstone of a good healthcare system. This is particularly true of primary healthcare systems, which are often the first contact point between patient and doctor.

The human angle of medical science has been placed under greater scrutiny in the recent past, with the rapid developments in medical technology. The growth of diagnostic software tools and telemedicine facilities which enable online diagnosis, for instance, removes the need for human interaction, and we as a society are faced with a possible decline in human interactions and humanity in medical science and services.

Given these developments, this is a crucial time for the reassertion of the importance of humanity and ethics in medical sciences. The need of the hour is to create more effective and efficient public healthcare service delivery mechanisms that are based on meaningful and human centric interactions between individuals and medical professionals. This demands more people centric healthcare, and a call to rethink healthcare service delivery mechanisms.

In Sri Lanka, the changing burden of disease, with the growing focus on non-communicable diseases and an ageing population, has brought about a renewed need for lifelong preventive care. This in turn calls for more meaningful human interactions in healthcare provision that lead

to closer relationships between patients and medical professionals. The reorganization of Sri Lanka's primary healthcare system is in a sense an effort to reestablish the human connections and interactions in our primary healthcare service delivery mechanism. A well-structured, people-centered primary healthcare system should cater to the needs of people and community as well as create the space to rebuild doctor – patient relationships, thereby laying the foundation for continuous care.

FACULTY OF ARTS

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Enabling digital pedagogy: Utilising technology to enhance the learning experience of students with disabilities

S. A. Abayasekara

Department of English, University of Colombo, Sri Lanka

Digital technology is increasingly used to facilitate learning experiences and thereby the wellbeing of the academic community; its inclusivity for those with disabilities is however not always considered. Going beyond medical models of disability which situate impairments in individual bodies, this paper considers the social model that views societal practices as “disabling” individuals and the cultural model which emphasises the role of cultural practices in society and their influence on one’s understanding of disability. Preliminary descriptive investigations were conducted in preparation for a larger action research study combining these models within the field of Digital Humanities, to examine barriers of learning in the digital sphere that students may face due to visual and hearing impairments, and means of support the digital may in turn offer for amelioration. Semi-structured interviews with relevant individuals from the Support Centre for Students with Disabilities (SCSD), the Main Library, and the IT staff of the Faculty of Arts indicate limited participation by students with disabilities in online pedagogical platforms such as LMS, due to insufficient familiarity with digital material. However, the discussions also highlight the lack of student motivation in engaging with available technology and in expending optimum effort towards learning, inadequate guidance in subject selection, and issues of perceived stigma. The paper offers micro-level recommendations to increase student access to, and familiarity with, online material, such as training in navigating LMS and revised methods of lecture delivery and feedback. It is also projected that once the full study is completed, more largescale recommendations could emerge, such as revised curricula and immersive experiences, which, enhanced by digital tools, may contribute towards shifts in social, cultural, and individual views of disability, including the views of those with disabilities themselves. Such changes in practice and mindset could generate accessible and meaningful education, fostering intellectual participation, enjoyment, and growth.

Keywords: *disability, digital, learning, students, technology*

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Corporate governance of private domestic banks in Sri Lanka: The current state

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Though competitive and robust banks have the ability to intermediate savings and investment efficiently, soundness and competency of banks have been questioned due to sudden failures of banking institutions throughout the world. Established global level banks, such as Northern Rock in UK, JP Morgan in USA, Banco Latina in Venezuela and, at a local level, Pramuka Bank, a specialised bank in Sri Lanka, have failed. Practitioners and researchers who were investigating the bank failures identified better corporate governance as a useful tool to improve the financial soundness of banks. In 2002, the Central Bank of Sri Lanka (CBSL) issued a voluntary code of corporate governance to mark the beginning of corporate governance for the banking sector. It was made mandatory for all banks in January 2008. The objective of the study is to critically examine the correlation between the corporate governance codes and the development in compliance by Private Domestic Banks (PDBs) in Sri Lanka. The methodology of the study revolves around computing the Corporate Governance Compliance and Disclosure Index (CGCDI), taking all corporate governance variables into account. Using CGCDI scores, level of compliance by banks will be determined. The period taken for analysis is 2004 to 2015. In relation to CGCDI, the level of compliance in PDBs of Sri Lanka has steadily improved from 2004 to 2015 though the rate of improvement has been volatile. When the adoption of corporate governance principles was not mandatory, the level of compliance had been well below 50 percent. The key to improvement is when compliance is made mandatory.

Keywords: *bank failure, compliance, corporate governance, disclosure, governance index*

Women's wellbeing in Local Government Councils of Sri Lanka: Political engagement and new gains under quota-mandated female representation

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Local government is an important avenue for obtaining practical experience in participating in politics, before moving on to the national arena. Advocates of quota-mandated representation argue that it opens up avenues for women to articulate their interests, enter arenas of political decision-making, and advance women's interests. However, there are negative opinions about the contribution and effectiveness of women in Local Government Councils: women's representation in local government does not guarantee that they will have any substantial influence over policy decisions, or that they will articulate women's interests, and it requires conscious and deliberate action on the part of the women to make a difference. However, the present research revealed a contrasting finding. Women's individual and collective actions showed that they are considerably comfortable and well acquainted with politics. This is because the 25% quota made substantial progress towards reserving political space for women and now women have started delivering their services effectively to society. The prime objective of this study is to examine women's wellbeing in their professional as well as personal lives, across their communities, due to their involvement in politics at local level. To collect qualitative data, in-depth interviews were conducted in the Vavuniya district. This research is confined to two local authorities in the Vavuniya district, namely Vavuniya South (Tamil) Pradeshiya Sabha and Vengala chcheddikulam Pradeshiya Sabha.

Keywords: *local government, political representation, quota system, wellbeing*

Communicative approach to instructions in national-level ESL testing in Sri Lanka

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This study focused on issues in the language used in instructions in the A/L General English examination. It attempted to identify the extent to which language issues occur in test-item-instructions and the degree to which these test-item-instructions adhere to the CLT theories. The format of the examination and instructions have remained the same over the years. For primary data, past papers between 2008 and 2016 and course-book vocabulary were analysed, while questionnaires were administered to stakeholder groups for opinions/attitudes. Secondary data were obtained from the Department of Education. Instructions were analysed through grammar and mechanics of English language. The issues were identified as, ambiguous instructions, grammar, confusing/literary language, punctuation/mechanics, vocabulary, complexity/difficultly and ethicality. Part A of both papers, carrying an average 33% marks contained form-focused instructions. The five factors needed for a communicative test (Rea Dickins, 1991) seemed compromised due to grammatically-explicit information which reduce communicative-purpose. Eight test-item-types revealed that most issues were in the use of vocabulary, grammar, language and expressions, while some instructions were ambiguous due to complex grammatical structures. Words tested extra to the text-book were increasing over the years and vocabulary-related issues were 13% of the total. Vocabulary-testing items were not aligned with the recommended CA theoretical norms, although they carried around 35% of the marks. Thus, by analysing approximately 160 test-items, the study found that use of language caused 64% of the issues. The GE examination was primarily testing students for grammatical form rather than meaning. For example, they use unitary sentences instead of the context-based ones. The study concluded that language-related issues occurred to a considerably high degree and to a significant extent, instructions were not based on CA norms. The recommendations are to better align the test with CLT norms, rather than reproducing old formats, by using contextual and integrative tests able to evaluate a variety of knowledge/competencies simultaneously.

Keywords: *communicative approach, instructions, language, testing*

Justice, wellbeing and peace building: Definitions, practice and critique from a post-war border

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The relationship of justice to wellbeing claims a long history of ideas in philosophy, jurisprudence, and diverse cultural thought and practice. It is a correlation particularly emphasized in transitional justice in which recognition of war time harms and justice (accountability, reparation) for these hurts are positioned as pre-requisites for healing, reconciliation and the emergence of ‘a new political subject, no longer in flight from interiority’ (Rose, 2019). From here, the common extrapolation is that justice, and the wellbeing it enables, is foundational to peace building in post-conflict contexts (Allan and Keller, 4). This paper takes such claims as a point of departure to analyse what happens when war victims refuse offers of justice or rather, the law as justice. Using, as a case study, the experiences of residents from Yakawewa, a border village which suffered a horrific bus bombing in the war, the paper’s objectives are to a) provide a situated analysis of the justice-wellbeing dyad, b) ask how we could deepen our understanding of wellbeing and justice as interrelated concepts and c) build an argument for reconsidering current discourses on transitional justice and peacebuilding in Sri Lanka by centering a peripheral village, defeated rather than victorious in the war and its aftermath. Drawing on affect theory, cultural, gender and critical legal studies, extensive qualitative interviews with Yakawewa villagers and Sinhala film and short stories, the paper argues for a more robust triangulation of justice, wellbeing and peace in Sri Lanka’s post-war context.

Keywords: *gender, justice, peace-building, postwar Sri Lanka, wellbeing*

Better late than never: Sri Lanka's national well-being in nuclear security

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Sri Lanka's nuclear security concerns could be rising from three areas. First, Sri Lanka could be subject to third-party effects of the strategic conduct of nuclear states in the region during conflict escalation. Second, its unique geography renders it vulnerable to the risks emanating from the mismanagement and even smuggling of radioactive and nuclear materials. Third, its geographic proximity to India means that Sri Lanka is susceptible to any spillover effects from accidents at nuclear facilities in southern India. The objective of this research is to study the existing security implications of these three areas. The research will use regional security complex theory to understand and interpret the primary and secondary data pertaining to the Sri Lankan case. The general trend in nuclear research in South Asia is to study the civil and strategic nuclear domains separately. However, the researcher will have a holistic view on both strategic and civil spheres of nuclear domains in South Asia since he argues that these two areas are in a complex web of relations which make them mutually reinforcing. The paper also argues that the nuclear and radiological security concerns have not been given adequate emphasis by researchers and policy makers in Sri Lanka. The paper also brings out the possible reasons for such underplay.

Keywords: *nuclear security, Sri Lanka, strategic jockeying, third party effects*

Elderly suicide in Sri Lanka in 2016: Modes, reasons and nature of occupation

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Elderly people have a higher risk of committing suicide than any other age group worldwide. In Sri Lanka, 60 years and above is considered the demarcation age in identifying the elderly population. Suicides among adult males have significantly contributed to the rise in suicides (Thalagala, 2009). In current suicide trends, an increasing trend in elderly suicide rates in Sri Lanka could be identified. Therefore, the main objective of this study to investigate modes of suicides, reasons for suicides and the nature of occupation of those who commit suicide, with special reference to suicides among the elderly people in Sri Lanka. This study is based on secondary quantitative data obtained from the Department of Police in 2016. Reporting suicides to the police is mandatory in Sri Lanka and these reports are systematically collected in a data base at the Statistical Division of the Department of Police. The sample size is 734 elderly suicide cases including 620 males and 114 females who were above the age of 60. According to the reported suicide cases, a majority of the elderly suicide mode was strangling (45.5%). Most of the suicide cases were reported among male elders (84.5%) with female elderly suicide percentage being 15.5%. Chronic diseases and physical disabilities (29.6%) have been a major reason for elderly suicides. When considering the nature of occupations of the elderly people who committed suicide, a majority of them were unemployed persons (44.3%). 30.9 % of them were not classified by their occupation of whom 26.8 were male and 4.09 percent were female. It is therefore important to address emerging elderly suicide issues in Sri Lanka.

Keywords: *elderly, suicide*

Factors affecting consumers in purchasing of green cars

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The concern about green transportation has been increasing globally due to several environmental issues caused by the transport sector. Moreover, there has been a rapid increase in car usage in private transportation. This research was designed to examine consumer perceptions towards green cars. The general objective of the research was identifying the important factors that affect consumers' purchasing of green cars. The study adopted the Exploratory Factor Analysis (EFA) for analysing the variables identified through a literature review. The study found that salient features of a car, such as eco-friendliness, performance and the outlook of the car, influence the consumer perceptions regarding purchasing a green car. Moreover, the study discovered that the salient features of a car which include conventional factors like power, price, efficiency, design, comfort, and fuel economy are the prominent factors that affect consumers in purchasing a green car. The impact of these salient features that shape consumers' perception of purchasing a green car is highly significant as it explains 35% of the total variance of the model. Though eco-friendliness is the component which explains the second highest variance from the total variance, the study found that the impact of eco-friendly features towards purchasing green cars is comparatively low. The study indicates that the level of awareness about green transportation and environmental concern among Sri Lankan consumers is low. Therefore, educating the public about the necessity of moving towards green transportation is essential. The variables included in salient features should be considered in taking initiatives to promote green cars among Sri Lankans. Strategies such as tax concessions on electric and hybrid vehicles which can make an impact on the price of green cars, and implementation of smart charging systems should be introduced to attract consumers towards purchasing green cars.

Keywords: *consumer perception, eco - friendliness, green cars, green transportation, salient features*

Elders' health and wellbeing in elders' homes in Sri Lanka: An exploratory Study

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This study is the first national level investigation regarding care homes in Sri Lanka. It combines quantitative and qualitative approaches to give an extraordinary insight into the challenges faced by care homes. The study analysed the current situation of elders' homes by capturing the situations of care delivered by these elders' homes and assessing the quality of life of the elderly living in elders' homes. A majority of the elders' homes are just shelters for the elderly who have no relatives to look after them. As a consequence, they have moved into these homes just for shelter. Although there are a few properly managed elders' homes belonging to private owners as well as some located in religious places, it is quite appropriate to introduce an important regulatory mechanism to monitor the status of those homes on a regular basis. Overall, the study recommends that the government, and most importantly, the private sector, develop an aged care industry in order to capture and resolve the issues that Sri Lanka will encounter in relation to the rapid ageing process taking place in Sri Lanka.

Keywords: *ageing, aged care industry, community solutions, elders' homes, health and wellbeing*

The impact of irrigation on agriculture productivity: Evidence from Sri Lanka

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Sri Lanka has a great history of irrigation dating back to 500 BC. During the post-independence era, successive governments launched a number of major and minor irrigation projects aiming at, among other targets, agricultural and rural development. Nevertheless, irrigation-productivity nexus has limitedly been investigated in the context of Sri Lanka. The overall objective of this study is to examine the impact of irrigation on agricultural productivity. This study examines the impact of irrigation on selected crops, namely paddy and maize, by estimating Cobb-Douglas production functions where crop yield is a function of a number of agricultural inputs including irrigation. Data for the study were extracted for the period of 2008 Maha-2017 Yala seasons, from bi-annual surveys on the cost of cultivation of major agricultural crops conducted by the Department of Agriculture. Regression results suggest that agriculture productivity is significantly higher in irrigated systems than that of in the rain-fed systems. Paddy average yield is around 40 per cent higher in irrigated systems than that in the rain-fed systems. Estimated results suggest that maize yield is around 14 per cent higher in irrigated systems than that in the rain-fed systems. Regression results are consistent with both national and international literature. More importantly, our results indicate that public funds invested in irrigation projects in the past have contributed to economic growth and the wellbeing of the general public. A number of other explanatory variables were statistically significant and over 70 per cent of total variation in yield is explained by the regression models. Higher productivity implies that the country could meet its food requirements with less lands thereby reducing pressure on environment. In the light of recent food price increase and expansion of demand for non-agricultural use of land, raising agricultural productivity is more significant than ever for environmental sustainability.

Keywords: *agriculture, irrigation, productivity, production function, Sri Lanka*

Importance of emphasis on fuel efficiency of SLTB: An avenue to support organisational profitability

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Sri Lanka Transport Board (SLTB), the foremost public bus transport provider in Sri Lanka, recorded “financial surplus” in 2017, a rare occurrence for the persistently loss-making organisation. Fathoming the roots of this apparent performance turn-around, one of the most important cost components, namely fuel expenditure, its constituents and their trends over the period from 2009-2017, was subjected to detailed examination. The study used depot-based and region-based data published by the SLTB and deployed analytical techniques such as graphical method and trend analysis. The study outcomes revealed that the surplus recorded in 2017 could in no way be attributable to any gain in fuel efficiency (number of bus kilometers operated per litre of fuel consumed) in that year over the preceding years. The regression results, obtained by normalising the external factors such as traffic conditions (congestion) and road conditions (hilly and curvy roads), yielded that over 59% of depots recorded below average fuel efficiency in 2017. The study results also reflected that the SLTB’s surpluses in 2017 could have been 22% higher than what was actually recorded had the fuel usage efficacy in 2017 been at the same level that prevailed in 2010. Hence, the study concludes that the SLTB management had not adequately focused on this vital aspect of cost management, an avenue to enhance the organisation’s overall profitability.

Keywords: *bus transport, financial performance, fuel usage efficiency, SLTB*

The pressure of population on avifaunal species utilising rice fields

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Much has been written both at global and local level on paddy cultivation, rice production and associated problems, the impact of land-use changes, and biodiversity in rice fields. However, an area that has received little attention in the Sri Lankan context is the avifaunal species utilising rice fields. As a consequence of rapid urbanisation, the extent of paddy lands is decreasing year by year. Thus, this study presents part of an ongoing study with the objective of investigating the pressure of urbanisation on avifaunal species utilising rice field ecosystems in a sub-urban area. The primary data were obtained through a bird survey carried out in rice fields located in randomly selected ten Grama Niladari Divisions (GNDs) in the Kaduwela DSD. The bird survey was carried out using Point Count Method (PCM). Accordingly, five-point counts were placed at each site within a 50-meter radius. Population data for 2001 and 2012 was obtained as secondary data. Arc GIS was used to prepare density maps to distinguish population and bird distribution. A total of 13,320 avian species has enumerated for a period of six months in 2019 while the number of species has significantly reduced from 4994 compared to the avian data for the year 2009. Among the species identified, water birds were dominant. *Ardea alba*, *Ardea cinerea*, *Ardea intermedia*, *Ardeola grayii* and *Bubulcus ibis* were dominant water birds utilising rice fields in the study area. Aranagala and Malabe-East have reported the highest avifaunal density in 2012 where the population was 5506 and 5919, demonstrating the 7th and 6th positions in descending order which were illustrated by the density maps. The correlation between bird count and population shows a considerable relationship in 2012 (0.70). The projected population data for the year 2022 shows a weighty decrease of bird density in relation to population density. Therefore, the future vulnerability of avifaunal species in rice fields has to be considered in order to conserve them.

Keywords: *avifauna, population, rice field, urbanisation, water birds*

A sociological analysis of the institutionalization of the elderly and the requirement for long-term care in non-fee levying institutions in Sri Lanka

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Ageing as a social phenomenon has increasing relevance to the global population in the 21st century including Sri Lanka. Literature on the local context suggests that long term care for the elderly remains a rather elusive concept in the institutionalized health care system although its significance cannot be extinguished. The primary objective of the study was to identify the fundamental requirements for the elderly in long term care in non-fee levying institutions. This entailed an understanding of the present condition of non-fee levying institutions in Sri Lanka and the key challenges faced by the elderly in the need for long term care. The research field for the present study was based on two non-fee levying institutions that care for the elderly located in Colombo and Ratnapura. Of the total population, a purposive sample of 10 participants was chosen from the elderly populations. The primary method of data collection was through in-depth interviews which enabled the researcher to gain an in-depth understanding of the challenges encountered by the elderly in institutionalized long term care, followed by non-participant observations. Findings highlight that institutions for the elderly endorse a total institution concept where normal life becomes inaccessible to an individual. In addition, the life of elderly residents is restricted with the rules and regulations of the administration which disallow the fundamentals of long-term care. Moreover, it was evidenced by the staff and the residents of these homes that religious activities were given more priority and that the principles of autonomy and choice promoted by long term care are alienated in everyday practices.

Keywords: *elderly, exclusion, health-care, institutionalization, normalization*

Assessment of passenger satisfaction in rail transportation in Sri Lanka: A case study on the coastal line from Panadura to Colombo

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Rail transportation in Sri Lanka is government-owned and the one and only massive passenger and freight transport service, identified as an economical and eco-friendly public transport mode. The quality of rail transportation is deteriorating due to the ageing fleet and lack of infrastructure facilities. Upgrading rail transportation is imperative to attract more passengers and determining the factors of passenger satisfaction is a key element to increase the existing rail transport modal share which accounts for 5% of total motorised transportation. The focus of this study is to ascertain the qualitative factors influencing passenger satisfaction in rail transportation, and the coastal railway line from Panadura to Colombo was selected as the case for this study. The study was conducted using primary data which was collected through a structured questionnaire and 150 passengers were selected as the sample. An interview-based survey method was used to collect data and a five-point Likert scale was used in the rating of the questions. 20 service quality factors represented by three aspects - railway stations and platforms, ticketing process, and train service - were considered for this study. The descriptive analysis showed passengers as dissatisfied with the overall service quality of the Panadura-Colombo coastal line railway transportation. Among the overall quality factors, passengers were highly dissatisfied with refreshment facilities, toilet, and waiting room facilities provided in the stations and platforms, and storage facilities available in trains, compared to the other quality factors. The government should implement proper transport policies to upgrade and maintain the standard of facilities with a reasonable fare structure while ensuring a clean and attractive environment in stations, platforms, and inside the trains, to enhance service quality. Further studies need to be conducted comprehensively to evaluate passenger satisfaction in the entire coastal line from Colombo to Matara and Beliatta to generalise the survey results.

Keywords: *passenger satisfaction, quality factors, rail transport, service quality*

Horizontal and backward Foreign Direct Investment spillovers: Evidence from manufacturing firms in Nigeria

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In the last few decades, developing countries across the globe in Africa, Asia, and Latin America have regarded Foreign Direct Investment (FDI) as a good source of capital and technology to fast-track industrial development. In pursuit of this, drastic policy changes in favour of FDI inflows, especially into the manufacturing sectors, were implemented by developing countries, including Nigeria. This has drawn the attention of many researchers; hence, several studies have examined the FDI spillover effects on the productivity of domestic firms in different countries. However, we observe a paucity in FDI spillover studies in the manufacturing sector in Nigeria. Distinct from previous studies in Nigeria, this study is inspired by the standard methodology suggested in the literature by Javorcik (2004) and constructs the horizontal and backward spillover variables to examine the FDI spillover effects. This study uses a rich firm-level panel dataset collected by the World Bank's Enterprise Survey on manufacturing firms in 2007, 2009, and 2014 in Nigeria. The study finds evidence in support of positive FDI spillover effects through the horizontal channels. The result shows that a unit increase in horizontal FDI is associated with an increase of 2.50 units in the productivity of domestic firms. The coefficients are strongly significant at 1% level and the result remains consistent for different estimation techniques. This result may not be surprising in the case of manufacturing firms in Nigeria as there are highly competitive domestic firms on par with, or even better than, many foreign subsidiaries. They react to the competition posed by the foreign multinationals positively. However, there is no evidence of a backward FDI spillover effect possibly due to insufficient backward linkages. The study recommends that a local content requirement policy be made in all industries of the manufacturing sector in Nigeria to enhance domestic linkages and facilitate backward spillover benefits.

Keywords: *backward spillover, FDI, horizontal spillover, Nigeria, productivity*

Exploring wellbeing in the context of family tourism

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In their study on factors affecting subjective well-being Lamu and Olsen (2016) highlight the significance of social relationships as the most important determinant of subjective well-being, surpassing the importance of factors such as health related quality of life and household income. In this context, this paper seeks to explore the notion of wellbeing in relation to family tourism, in an attempt to gain deeper understanding of how social relationships influence one's sense of well-being. This paper attempts to resist the individualised idea of health and wellbeing, arguing that these notions need to be understood as social phenomena. Material for this study will be drawn from data collected at two field sites, Galle Fort in Galle and Galle Face in Colombo, both popular leisure destinations by the beach, where people come to play informal games, have picnics, fly kites, jog, exercise or merely gaze at the sea and take in the air. Paying close attention to the material collected from local families at these locations and from interviews conducted with individuals and families, the paper attempts to lay out experiences of families at leisure and seeks to ascertain their meanings and understandings of wellbeing. This paper draws on the travel paper in McHugh et al.'s (1974) book, 'On the beginning of social inquiry', which introduces the notion of denaturalisation of one's interactions in relation to travel, and the work of Raffel (2014), who, while laying out the connection between intimacy and travel, shows the positive effects of denaturalisation, that travel produces, for relationships. In its analysis, the paper engages with the theoretical understandings of tourism in the scholarly literature which has been heavily influenced by the paradigm of gaze introduced by Urry (1990) and the paradigm of performance (Edensor 2000; Haldrup & Larsen 2010).

Keywords: *family, social relationships, tourism, travel, wellbeing*

Creating effective learning environments for the “Born Digital”: Exploring the process of establishing a Digital Humanities laboratory

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This paper follows the process adopted by the Department of English, University of Colombo in establishing Sri Lanka’s first Digital Humanities (DH) laboratory. The DH laboratory seeks to create pedagogical practices which support learner wellbeing by reflecting on how our students, who operate within multiple technological divides, engage with the digital. As Drucker (cited in Svensson, 2016) posits, no tool is neutral; thus, even the tool of technology must be approached with methodological and epistemic awareness. Although technology is being used in the teaching-learning process (e.g. blended learning), it is mostly as an instrument and fails to speak the language of our students from the Born Digital generation (Palfrey & Gasser, 2008). In the Sri Lankan context, it is important to design pedagogical practices that contribute to creating effective learning environments. With the Born Digital generation of students, technology must be approached as a tool, a medium, as well as a subject (Svensson, 2016). The DH laboratory enables researchers to understand ways in which effective use of technology in the classroom can be reimagined. The paper identifies focus areas to be addressed in the DH laboratory, and analyses the policy level decisions taken in its creation, through an exploratory research design¹ and a critical pedagogical approach. This will enable the re-imagining of technology in the classroom, which will in turn inform pedagogical practices. The various activities conducted through the lab, such as digital performances, lab sessions, and reading sessions, require a policy for an ethical practice. The paper is part of an ongoing discussion that attempts to document the process of dynamic research in DH, specifically in setting up a DH lab in an institutional setting, where both the human subject and the technology are in a state of constant flux.

Keywords: *critical pedagogy, Digital Humanities, humanities laboratory, learning environments*

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¹ Exploratory studies are usually used when a researcher is breaking new ground, especially when working in a previously unexplored area. It is a source of grounded theory that provides new insights. Thus, this type of research design cannot be framed as quantitative, qualitative, or mixed, but borrows from multiple methodologies to create a methodology of its own (Babbie 2010).

Impact of water scarcity on socioeconomic and environmental wellbeing in Karachchi
Divisional Secretariat, Kilinochchi

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Water scarcity has become a serious problem in many parts of the world. The Kilinochchi District, Sri Lanka is not an exception to this scenario and this scarcity is already identified as a main constraint in many parts of the Kilinochchi district. Water scarcity has severely affected the socioeconomic and environmental wellbeing of the resettled communities in the Karachchi DS division. Thus, the main objective of this study was to explore the impacts of water scarcity on the socioeconomic and environmental wellbeing of the study area. Both qualitative and quantitative approaches were applied in this study. Data were mainly collected through a household questionnaire survey. Employing the simple random sampling technique one hundred and six households were selected from five Grama Niladhari Divisions for the questionnaire survey. Moreover, structured interviews were conducted and secondary data were collected from relevant sources. Collected quantitative data were analysed using descriptive statistics while qualitative data were analysed using content analysis. The findings of the study revealed that overcrowded existence, theft of water containers, overconsumption and conflicts among water collectors were the major social issues that emerged due to water scarcity in the study area. Further, nearly 60% of the households mentioned that their daily activities, especially household chores, were interrupted due to lack of water availability. It was also reported that as a result of regular water fetching, nearly 74% and 67% of the respondents often contracted spine and hip pain respectively. Furthermore, approximately 68% and 64% of household food production and livestock activities, respectively, were affected due to water scarcity. Decline of water level of sources, loss of vegetation cover and wild animals, and drought events, were highlighted as adverse environmental impacts of water scarcity in the study area. In conclusion, this study clearly revealed that water scarcity has adversely impacted the socioeconomic and environmental wellbeing of the resettled communities in the study area. Therefore, this issue should be addressed without delay to ensure the sustainable wellbeing of the resettled communities as well as the development of the country.

Keywords: *environmental, socioeconomic impacts, water scarcity, wellbeing*

Wealth management: A Theravada Buddhist viewpoint

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This paper examines the Theravada Buddhist views associated with wealth management. Using English translations by various authors of the Pali Canon, a qualitative content analysis is conducted using a sample of thirty (30) discourses of the Thripitaka which discusses wealth. The Theravada view on wealth is founded upon the principle of ‘rightful wealth’. Wealth is righteous when it is ‘earned through own efforts and enterprise’ and/or when it is ‘justly acquired by right means’. This principle of wealth directly associates wealth with moral underpinnings. This paper finds the Buddhist view on material wealth instituted upon three major aspects: 1) wealth accumulation subjected to the principles of right view and effort, 2) wealth dissipation, and 3) the proper use of wealth and distribution. These elements together bring forth a comprehensive schema on wealth management often found missing in mainstream economic discourses (of classical, behavioural, and institutional economics, and in the socio-economic theory of wealth) which largely remain devoid of ethical considerations, paths to sustainability, and explanations to rising wealth inequalities. The Buddhist discourse makes a strong case between material and spiritual wealth and accentuates that material wealth management cannot be sustained sans spiritual wealth. I find that the Buddhist theory of wealth demonstrates properties of endogeneity as increasing emphasis is placed on one’s savings, reinvestment of savings, and behaviour that leads to accumulation or dissipation of wealth. Wealth sharing is seen as an integral part of its utilisation and results in a fair amount of wealth being transferred or distributed whilst it ensures moderation in consumption. Given the findings of this paper, I argue that the Buddhist economic theory of wealth has the potential to reshape economic thought and has relevance in seeking solutions to issues the ‘dismal science’ has so far failed to address.

Keywords: *accumulation, Buddhist economics, household, wealth, wealth management*

Health and long-term care needs of the ageing population in Sri Lanka: The role of research in making evidence-based social policies

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Demographic transitions followed by a significant change in the age-sex structure of the population and increase in life expectancy that have been observed in Sri Lanka over the last two decades are directly related to the country's current and future ageing population. These demographic dynamics have transformed the country into a rapidly ageing society. Presently, 13 percent of the country's total population comprises older adults (age 60 years and over) and projections show that one in every five persons (20%) will be in the aged category by 2050. With the increase in the number of older adults, those who need health and social care also increase, and it will become a burden not only for the national economy but also for the family and the society. Therefore, the objectives of this paper are (a) to examine the health and disability status of the ageing population in Sri Lanka and to identify long-term care needed; (b) to discuss the measures that have already been implemented to address such issues; and (c) to identify research gaps and the role of research in making evidence-based social policies. This study was based on secondary data obtained from the Population and Housing Census, 2012, and the National Survey on Self-reported Health, 2014, conducted by the Department of Census and Statistics, Sri Lanka. The health status and factors affecting long-term care needs of the elderly were examined by using bivariate and multivariate analyses. Logistic regression was used, with the dependent variable as 'health status', any health problem or functional disability coded as '1', and the absence of health issues coded as '0'. Findings revealed that most health issues among elders were related to functional disability while more than half of the elderly had experienced non-communicable diseases. The prevalence of diseases and disability was significantly associated with socio-demographic and economic factors. Findings suggest that an integration of research evidence is vital in formulating health and social policies on ageing populations.

Keywords: *ageing population, elderly health care, elderly health issues, long-term care*

**The diffusion and socio-economic impact of Thalassemia:
A case study of the Kurunegala district**

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Thalassemia is a genetically transmitted disease in the world related to abnormal morphology of red cells in the human blood. There are two types of thalassemia called major (beta) thalassemia (with symptoms) and minor (alpha) thalassemia (carriers). Thalassemia is spatially diffused from the Mediterranean Sea to Asia including Sri Lanka. The possibility of thalassemia patients to survive from malaria has caused a concentration of thalassemia in the dry zone districts in Sri Lanka. An average of 80 babies with major thalassemia is born every year and there are over 500,000 carriers in Sri Lanka. The highest prevalence of thalassemia in Sri Lanka is reported from the Kurunegala district while the migration of carriers to other districts may have diffused the disease in other parts of the country. This study attempts to explore the diffusion and socio-economic impact of major thalassemia patients in the Kurunegala district. The objectives are to identify the spatial and temporal variations of major thalassemia cases in the Kurunegala district, to analyse the migration pattern of possible thalassemia carriers, and to identify the socio-economic impact of thalassemia. Ten major thalassemia patients, parents, and medical practitioners were interviewed. The National Thalassemia Centre (NTC) Kurunegala and the Department of Census and Statistics provided the essential set of secondary data. The disease was found to be concentrated in the Eastern and Northern quadrants of the Kurunegala district, showing possible diffusion in other districts parallel to the migration pattern. The average of 44 new patients registered in the NTC annually (2003-2017) has increased to 1095 cases by 2017. Thalassemia patients are a burden to themselves, their families, and to the government as well. Major thalassemia can be totally prevented by avoiding marriage between two carriers.

Keywords: *major thalassemia, migration, minor thalassemia, socio-economic impact*

Spatial inequalities of elderly population and homes for the elderly in Sri Lanka: A statistical approach

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Sri Lanka is experiencing a period of rapid ageing, which increases the need of long-term care services in the country. Homes for the elderly have been an important alternative mechanism for dealing with the increase of elderly population in the country, with services supplied by a mix of for-profit and nonprofit providers. The study aims to ascertain the determinants of the geographical location of elderly population living in homes for the elderly in Sri Lanka. This study was based on secondary data obtained from the Department of Census and Statistics. It focused on spatial and statistical analysis tools to identify the concentration of elderly population and population characteristics and to estimate the determinants of availability and coverage of homes for the elderly in the country. The analysis was based on Dissimilarity Index, location quotient, location coefficient and Anova (Analysis of Variance) test. Both the Anova test and the dissimilarity index revealed a spatial inequality of the distribution of elderly population as well as the population in homes for the elderly. Especially the dissimilarity index value of 0.67 demonstrated a significant inequality of elderly population within the districts. Moreover, the Anova test results emphasized the same level of results in the 0.05 significant level. Further, the location quotient results exposed a different level of concentration of elderly population in homes for the elderly compared to the overall distribution of elderly population. The results revealed the clusters of homes for the elderly according to elderly population. Anuradhapura, Kurunegala, Kaluthara, Rathnapura and Galle demonstrate the highest values for homes for the elderly population compared to the overall elderly population. The results reveal the importance of proper regional planning of homes for the elderly to ensure equal opportunities. Further, the results can be used to enhance the quality of the service in homes for the elderly as well.

Keywords: *dissimilarity index, elderly homes, elderly population, location quotient*

A study on stress among ESL teachers at Departments of English Language Teaching and English Language Teaching Units at four state universities in Sri Lanka

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This study investigates the factors that cause stress to ESL teachers and the coping strategies that they follow to reduce stress. Researchers (Kyriacou, 2000, 2001; Al-Fudail & Mellar, 2008) have labeled the profession of teaching as highly stressful. The sample consisted of seventy five ESL teachers from four state universities. Focus group discussions were conducted to formulate the questionnaire. The questionnaire included both open ended and close ended questions. The qualitative data was thematically coded. The study revealed low motivation of students, low achievement level and disruptive behavior of students to be the main stress factors. Moreover, teaching differently abled students was a cause for stress among ESL teachers. Teaching mixed ability classes too caused stress as disclosed from the findings. Additionally, it was revealed that technical issues caused stress for online tutors. All ESL teachers from all four universities experience a low stress level regarding going to a new class with new students. Neglecting domestic chores, being moody, irritated and health issues like headaches and problems in the relationship with coworkers were experienced by ESL teachers in their personal and professional life. This study disclosed that female ESL teachers experience a higher stress level than male ESL teachers. It was found that singing songs, getting consolation from religion, assurance that someone is there to share and understand the problem to be common coping strategies among female ESL teachers. In contrast, some coping strategies common to male teachers were planning ahead and prioritizing work, creating jokes and making others laugh and forgetting incidents that happened at university. It was observed that a considerable number of ESL teachers engage in meditation as a coping strategy. It is recommended that solutions are found to reduce stress among ESL teachers. An equal balance in participation and work allocation is recommended among male and female teachers.

Keywords: *coping strategies, ESL teacher stress, meditation, work overload*

Car users' perspective on motorcyclists on urban roads in Colombo

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Roads are a shared space and inclusivity is vital for ensuring that all road users have equal rights to use roads. Safety comes first whoever uses roads and user behavior is one of the prime areas to be considered in ensuring road safety. Road accidents have become a global health issue and amongst accidents, motorbike accidents rank the highest, and the situation in Sri Lanka is particularly critical with increased numbers of accidents. This research tries to emphasize on using cognitive approaches as a pre-crash cure to ensure road safety by examining the car users' perspective on motorcyclists on urban roads in Colombo. This research is entirely based on primary data and 50 respondents including 30 men and 20 women were randomly selected as the sample for the questionnaire survey and unstructured interviews. Content analysis grids were used to analyze the data. According to the results, a majority of the car users (85%) have developed negative attitudes towards the motor cyclists' behaviors such as weaving around cars, overtaking in blind spots and occupying the road space at color lights during traffic jam. Their behaviour is more challenging for women when compared with males, and for new drivers. Further, annoying travel experiences owing to bikers contributing to jamming conditions are not considered as mentally healthy by both parties (98%-females and 70%-males). On the other hand, the reactions of the car users to the motor cyclists are unhealthy for all road users and the environment as honking is the reaction of more than 85% of the car users against bikers' behaviours. The output of this research will be useful in policy making related to making road spaces more user friendly to ensure safety and well-being of the country since this area poses a challenge to planning authorities and policy makers.

Keywords: *age, behaviour, car users, gender, motor cyclists, urban roads*

Geopolitics of Indo-Sri Lanka relations vis-à-vis Sri Lanka's relations with China in the 21st century

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India and Sri Lanka received independence from the British rulers in the aftermath of the Second World War. India inherited a large country from the British Raj that represented more than three fourths of the land and population of South Asia which provided it with the regional power status. On the contrary, Sri Lanka emerged as a small state within close proximity to India, making the island fall within India's Sphere of Influence. Since the independence era, Indian strategists and policy makers have highlighted the strategic importance of Sri Lanka vis-à-vis its external relations. Sri Lanka's close relations with Britain in the immediate time period after independence, the Non-Aligned Foreign Policy era, tilted towards the West in 1980's and Sri Lanka-China relations in the 21st Century has resulted in Indian foreign policy responses at different levels. At present, the growing Chinese influence on Sri Lanka as part of altered relations to the Belt and Road Initiative (BRI) has made India develop geopolitical concerns regarding Sri Lanka's external relations. India's major concerns are associated with the worry that Sri Lanka may become a part of the 'string of pearls strategy' as it became a base of containment against India in the 21st century. This research will examine the nature and influence of Chinese development projects on Sri Lanka and the strategic concerns and reactions of India.

Keywords: *regional power, small state, sphere of influence*

An analysis of spatial and temporal variability of actual evapotranspiration across the Kelani river basin using remote sensing techniques

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Actual Evapotranspiration (AET) is a major component of the river basin hydrological cycle over land surface and energy balances. More than 60% of input water on land is returned to the atmosphere through evapotranspiration and it greatly influences the water availability on the land surface. Estimation of AET is an essential part in various fields. Thus, this study mainly aims at identification of the spatial and temporal variability of AET over the Kelani River Basin in Sri Lanka. Thornthwaite equation and land use conditions are mainly considered in this study to estimate AET. Average monthly temperature data has been obtained from NASA MOD1C3 and validated using observed temperature data processed by the Meteorological Department in Sri Lanka. Potential Evapotranspiration (PET) was calculated using monthly average temperature and fractional vegetation cover was calculated using Landsat images (TM, ETM and OLI) to identify the land use and land cover changes from 2000 to 2018. Both potential evapotranspiration and fractional vegetation cover are used to estimate the AET. The whole analysis used in this study has been carried out using raster calculator, zonal statistics and pivot tools in ArcGIS 10.1 software. The study revealed that land use and land cover is a major fact that determines AET. Upper catchment of Kalani River basin has shown high AET values due to the vegetation cover. Lower part of the river basin is associated with low values due to build - up areas. Due to rapid urbanization, AET has significantly decreased in 2018 over the Kalani river basin. Reducing AET can be highlighted when considering the temporal changes of AET in Kalani river basin. Evapotranspiration should be considered a major component of water cycle because it can be a significant factor affecting precipitation.

Keywords: *evapotranspiration, fractional vegetation, spatial, temporal*

Illness in *All's Well That Ends Well*

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All's Well That Ends Well can be called Shakespeare's most medical play. It features a female protagonist, Helena, who cures the French King of a fistula and then problematically 'cures' her own 'lovesickness' by pursuing and later tricking her unwillingly married husband Bertram into consummating their marriage. The paper will explore the representation of illness in the play, arguing that illness becomes a rich discursive site upon which the play encodes gendered desire and agency. This is particularly evident in the case of the medically skilled and sexually attractive Helena. The paper will argue that Helena's epistemological privilege, and her sexual desire for Bertram, translate into a complex, contradictory female agency that she mobilises by curing illnesses (her own and others'). It will argue that her (unsatisfactory) final 'cure' of lovesickness is significant in that it ensures that power, and the ability to control the play's narrative, are in her hands. The paper will explore manifestations of illness as both physical disease and lovesickness (the latter of which was held to be a real disease in the early modern period), and will support this with critical literature and contemporary medical theory. It will also pay attention to the King's malady and Bertram's problematic 'sick desires' (4.2.35) for another character, Diana, as points of comparison with Helena's lovesickness.

Keywords: *cure, desire, illness, Shakespeare*

The role of community media for social wellbeing

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Active participation and contribution of marginalised societies can be helpful in achieving social wellbeing as meaningful realisation. The factors which are important to social wellbeing can be identified in five sections. Among these, the most important factor is 'social acceptance'. It is the most effective and significant part of social wellbeing. In the concept of social wellbeing, marginalised groups can be rehabilitated to be active members of the society through the application of different strategies. Communication can be performed as the most relevant strategy in this process. The concept of communication can be defined in light of several tasks such as creating mutual and meaningful relationships with others and providing support to uphold those social relationships. The objectives of the study are to identify the role and tasks of communication in assisting marginalised people to overcome their loneliness and decrease the burden and negative impacts of their unfortunate experiences, to recognise the supportive role of the community media for those traumatised people to get rid of their pathetic past, and to describe the importance of communication to enrich their lifestyles. In the end, these circumstances would reinforce the notion of social wellbeing by physical, mental, and social standards. Case studies and in-depth interviews are used as the main research methods in this study. Rohingya refugee camps in Nepal and Bangladesh were selected as the sample of the study and six in-depth interviews were conducted at each camp with refugees and community media journalists. Data has been subjected to content analysis. The study recognized that traumatised marginalised groups can be empowered by communication. Community media can play an energetic role in this communication process by positively affecting a person's attitude and behavior to ensure the wellbeing of marginalised societies. Considering the findings, it can be suggested that communication strategies of community media would promote the wellbeing of society.

Keywords: *community media, marginalised society, social wellbeing, traumatised people*

Apparel sector productivity as means to development and wellbeing of the nation

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The apparel industry is the core manufacturing industry in the Sri Lankan growth spectrum, with widespread regional distribution of employment and feeding upon thousands of SMIs, providing a myriad of services, all of which form a strong fabric of national development and wellbeing among people. The growth of the apparel sector is fundamentally linked with its gains in the Total Factor Productivity (TFP) front as it faces strong competition in the global apparel supply chain. Having had its beginning as an industry that exploited the labor cost advantage under the Multi-Fibre Agreement (MFA), the apparel sector has been at the receiving end of many challenges from within and outside. With the elimination of the MFA in 1995-2005, the industry underwent unprecedented challenges initially. Through a prism of TFP measures, this study explores key attributes that defined the success of the industry. The research is an investigation into TFP growth in the apparel sector by employing alternative quantitative methods: namely a) growth accounting approach and b) regression approach (firm-level). The study reveals that the industry had made gains in the TFP in distinct periods as a fundamental strategy for its growth and diversification which translated into price competitiveness while it simultaneously embarked upon industry-specific product specialisations leading to collaborative value chain success with leading international brands. Maintenance of social compliances has enabled the local apparel trade to access the end-customer focus successfully. The study reveals that the industry's success is fundamentally linked with its ability to manage TFP growth while other factors were built around its success. The qualitative study revealed that the post MFA success was entirely attributable to the resilience of the industry and the entrepreneurial ingenuity against a backdrop of a prolonged policy and political environment that was unfavorable to exports as a whole. This study envisages that the research findings would shed new light on the status quo of the sector and provide a catalyst for the right policy support to unravel the true potential of the industry as a growth driver, and for broad economic development outcomes, which could decisively promote much-needed national wellbeing.

Keywords: *apparel industry of Sri Lanka, capital, development and national wellbeing, labour, Total Factor Productivity*

Health expectancies of the elderly population in Sri Lanka

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Life expectancy at birth has continuously increased in most countries over the last century. As such, the life expectancy of Sri Lanka's elderly population shows an increasing trend. Therefore, whether the additional years of life are also accompanied by good health has become a subject of intense interest. Healthy life expectancy of older Sri Lankans is an emerging issue due to the prevalence of various chronic diseases among the elderly population. The main objective of this study is to estimate the healthy life expectancy of the elderly population in Sri Lanka. This study was largely based on the healthy life expectancy proposed by the Sullivan Method. It used both primary and secondary data. The morbidity information used in applying the Sullivan method comes from the 2012 Census and healthy life expectancy is calculated using the life tables constructed by the Department of Census and Statistics for the period 2000-2002 and 2011-2013. In order to supplement the analysis, a sample survey of 300 elderly people was carried out in the Gampaha district. Furthermore, the sample survey findings supplemented the analysis performed using secondary data. This study found that both elderly men and women have spent a considerable time living with disability because of deterioration in their health. When the difference between total life expectancy and health expectancy is investigated, the study found that in 2001 men were in a disabled state for 0.8 years compared to 0.94 years for women on average. Furthermore, this difference has drastically increased in 2012, with 5.24 and 7.32 years for men and women, respectively. These results show that women are in a more morbid state compared to men after 11 years. This further reveals that lack of financial security makes elderly people vulnerable to unhealthy situations, especially elderly women.

Keywords: *elderly population, healthy ageing, healthy life expectancy, life expectancy*

Examining the relationship between decent work and female labour force participation in three geographical regions

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Decent work aims to create quality jobs and to increase both material and mental wellbeing of both men and women. In the literature subsequent to the introduction of the composite concept ‘Decent work’ by the International Labour Organisation (ILO) in 1999, a positive association between decent work and female labour force participation is postulated. However, a previous study found an unexpected negative relationship between these two variables in the context of South Asia. Thus, this paper attempts to analyse the relationship between decent work and female labour force participation rate by expanding the scope of the research to three more geographical regions, Sub Saharan Africa, Eastern Asia, and the Pacific, for the time period 2002 to 2015. The methodology used for the study is canonical correlation. Findings suggest that the female labour force participation rate has a negative relationship with decent work in South Asian and Sub Saharan African regions. This may be mainly because in these regions women are predominantly represented in low-skilled sectors such as agriculture, own account working, family work, and export manufacturing industries, which have low decent work conditions such as less access to better pay, labour protection, and social protection. Contrary to this, there is a positive relationship between female labour force participation and decent work in Eastern Asia and the Pacific region, where females are more likely to participate in non-agriculture employment which has better implicit decent work conditions. Also, comparatively, they are employed in more formal and skilled occupations. These can be the reasons for the positive association. The findings of the study suggest that policy makers’ attention is crucial to improve the conditions of female-dominated occupations and sectors. While attempting to increase female labour force participation, increasing decent employment opportunities for women too is important.

Keywords: *canonical correlation, decent work, female labour force participation, vulnerable employment*

FACULTY OF EDUCATION



Education for Health and Well-Being

26 November 2019

**MESSAGE FROM THE DEAN
FACULTY OF EDUCATION**

Dr. L. M. Kapila Bandara



It is with great pleasure that I write this message for the 2019 Annual Research Symposium of the University of Colombo, as the Dean of the Faculty of Education. Thinking, creativity and inventiveness are indispensable tools for a knowledge based society. Hence, the creation of new knowledge, assimilation, dissemination and application of knowledge are the foremost and vital processes that should be taking place in a university, as they are the highest educational institutions of a country. The Annual Research Symposium will be a catalytic event in these processes and will contribute significantly to the enhancement of the research driven environment fostered by the University.

The Faculty of Education, in its role as a leading institution in the field of education in Sri Lanka, is providing a significant contribution to the discipline by training researchers, professionals and policy makers in this domain. Members of our faculty are actively involved in various innovative research activities within the subject of education, covering areas such as management and leadership, assessment, curriculum, language and teaching methodologies. Most of these outstanding research findings will be presented at this symposium under the theme of “Education for Health and Wellbeing”. I am confident that these contributions will help refine perspectives on education and act as a motivation to engage in research activities where academics and postgraduate students are concerned. This will in turn augment the research culture in the Faculty of Education.

I would like to take this opportunity to thank all those who worked hard to make this event a reality and also to convey my best wishes for a successful and productive Annual Research Symposium – 2019.

FACULTY OF EDUCATION

PROGRAMME

26 November 2019

8.30 am – 9.00 am	Registration
9.00 am – 9.30am	Tea
9.30 am – 9.40 am	Lighting of the Oil Lamp/National Anthem
9.40 am – 9.50 am	Welcome Address by Dr. Kapila Bandara Dean, Faculty of Education, University of Colombo
9.50 am – 10.00 am	Address by the Chief Guest - Senior Professor Chandrika Wijerathne Vice-Chancellor, University of Colombo
10.00 am – 10.45 am	Keynote Speech by Professor Devaka K. Weerakoon
10.45 am – 10.50 am	Vote of Thanks by Dr. Sulochana Neranjani Symposium Chair, Faculty of Education
10.50 am – 11.00 am	Short Break
11.00 am – 12.30 pm	Technical Sessions
12.30 pm – 1.30 pm	Lunch
1.30 pm – 3.30 pm	Technical Sessions
3.30 pm – 3.45 pm	Awarding of Certificates to the Presenters
3.45 pm – 4.00 pm	Tea

INTRODUCTION TO THE KEYNOTE SPEAKER

Prof. Devaka Weerakoon.

Dean, Faculty of Nursing, University of Colombo



Devaka Weerakoon graduated from University of Colombo in 1985 with a major in Zoology. He joined the Department of Zoology, University of Colombo as a probationary lecturer in 1986. Thereafter, he left for the US on a Fulbright Scholarship in 1988 where he completed his MSc. and PhD. at Illinois State University. He returned to the University of Colombo in 1995 where he has worked as a conservation biologist for the past two decades. His main research interest is conservation of threatened species in Sri Lanka. In 2009, he was promoted to the post of Professor in Zoology.

Education for Health and Well-being

Devaka K Weerakoon

Faculty of Nursing, University of Colombo, Colombo 3

All animals, big or small, are capable of learning through life experiences, which play an important role in the survival of an individual. What makes human beings different to other animals is that they are able to complement informal learning, through a more formal process called education. In human society, education is used to pass knowledge, values, beliefs, skills, habits and attitudes from one generation to another, unlike among other animals where what an individual learns from birth to death ceases to exist beyond its lifespan. Therefore, education can be considered as a unique human enterprise, which plays an important role in establishing the boundary between humans and the rest of the animal kingdom. Human beings are also unique in the sense that they spend a prolonged period of their early life on education, which is considered as a basic human right. In most countries, education is compulsory up to a certain age or standard. This is due to the belief that education is one of the most powerful and proven vehicles for sustainable development.

Education not only transforms a person to lead a better life but is also important to ensure a person's quality of life. Health and well-being are key determinants in measuring our quality of life. At the same time, a quality education is essential for a person to lead a healthy and productive life, as knowledge will help prevent sickness and disease. Further, there is a growing body of knowledge to support the supposition that attainment of higher levels of education among mothers improves children's nutrition and vaccination rates, while reducing preventable child deaths, maternal mortality and sexually transmitted diseases. Many recent studies also indicate that there is a strong link between human well-being and environmental well-being. Environmental well-being in turn depends on the level of education attained by a given society. Therefore, this presentation explores the nexus between education and human health and well-being.

FACULTY OF EDUCATION

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A study of the teaching-learning process of Estate Tamil students in Sinhala medium schools in the Deniyaya Zone

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This study focused on the nature of the teaching-learning process of Estate Tamil students in Sinhala medium schools in the Deniyaya Zone. The sample of the study comprised Tamil students, teachers, principals and parents in 1C and Type 2 Sinhala medium schools. Research findings demonstrate that the majority of Estate students across the six schools have limited opportunity to study in the Tamil medium as they do not have a Tamil medium school in their division. In addition, they do not have access to a school in their estates. These students do not have any chance to engage in their studies in the Tamil medium. At the same time, they were not satisfied with physical and human resources in their schools. They do not have enough library facilities or enough Tamil medium books in their school library. Students had low achievement levels in education and very poor school attendance. The study shows that their poor attendance directly influences their achievement levels. Another major finding is that their poor Sinhala language skills necessitated additional Sinhala language help from their schools. At the same time, teachers in these multicultural schools need Tamil language training to develop a rapport between teachers and students. Most Tamil students mentioned that they had problems in initiating good relationships with Sinhala students and teachers in their schools. Minimum cooperation was observed between Sinhala and Tamil estate students. The key findings indicate that the majority of Tamil students did not like to engage in co-curricular activities. The research shows how co-curricular activities are important to promote rapport among students with different backgrounds. In addition, teachers revealed that the students' poor attendance and inadequate support from parents were major issues.

Keywords: *achievement levels, estate Tamil students, inter cultural relationships*

ESL writing skills: Mismatch between teacher perceptions and student perceptions

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Writing has always posed difficulties for English as a Second Language (ESL) education. Many teachers do their best but receive little effect; students hardly achieve the expected levels of mastery. This paper, which is a minute component of the PhD study, discusses different perceptions held by ESL teachers and students with regard to writing. The sample consisted of 10 teachers and 21 students drawn from a Type 1C and Type 2 school in the Colombo South Zone. Semi structured interviews with teachers and focus group discussions with students were conducted for an in-depth understanding of the problem and data gathered was qualitatively analysed. It was revealed that teachers and students hold contradictory views regarding students' interest in writing in ESL, their attitude towards out of class activities for writing, their views on learning materials used in writing class, their beliefs about effective strategies to be used in the writing class as well as with regard to sub-skills of writing. The mismatch led to demotivation in the writing class for it did not allow room for corrective measures to be taken. The nature of data collection provided the researcher with the opportunity to dig deeper and gauge the real picture which was then utilized in the subsequent stages of the larger study which attempted to develop writing skills in ESL learners.

Keywords: *English as a second language, teacher perceptions and student perceptions, writing skills*

Peace programmes: Lessons from other countries to build sustainable peace in Sri Lanka

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Sri Lanka ended the prolonged ethnic conflict in 2009, having suffered socioeconomically and politically since 1983. After the war, maintaining ethnic harmony and obtaining positive peace in a multi-ethnic, multi-lingual and multi-cultural society has been a great challenge. In order to address this challenge and to achieve sustainable peace, Sri Lankan governments have introduced various peace measures including educational programs with school children and there are ongoing peace education programmes engaging school children, as peace education programmes are very common and popular worldwide and some countries have been able to achieve peace successfully through them. Therefore, Sri Lanka too can adopt such programmes. The objectives of the study were to investigate existing peace education programmes regionally and to explore the best practices elsewhere in the world with a view to drawing some lessons for Sri Lanka. The paper used qualitative research which included a comprehensive literature survey and several case studies of ten countries. The findings from the case studies suggest that there are programmes that can be easily adapted to the Sri Lankan context like storytelling sessions, traveling theater, traditional folk stories, proverbs, and textbook analysis. Furthermore, peace programmes should aim to improve children's intrapersonal skills. Language and language teachers have a vital role in peace-building programmes. In schools, language teachers, together with school librarians, can do many programmes to improve children's peace skills in exciting ways. Moreover, language teachers can have a book corner in every class with folk stories and proverbs which have traditional wisdom to build sustainable peace and harmony in Sri Lanka, through school children.

Keywords: *peace education, peace programs, sustainable peace*

The influence of perceived transformational leadership of school principals on the followership styles of teachers: A study based on graduate teachers in Colombo district public schools

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The study identified the influence of perceived transformational leadership of principals on the followership styles of graduate teachers in Colombo district public schools. Followership style can be defined as the follower's preferred way of behaving when in the following mode. The objectives of the research were, (1) followership styles among the graduate teachers (2) the association between followership styles of graduate teachers and their demographic variables (3) level of transformational leadership of principals perceived by the graduate teachers and (4) influence of perceived transformational leadership of principals on the followership styles of graduate teachers in Colombo district public schools. A questionnaire survey (n=496) based on Kelley's Followership Questionnaire and Bass and Avolio's Multifactor Leadership Questionnaire was administered to collect data regarding followership styles of respondents and level of perceived transformational leadership of their principals. Semi-structured interviews were conducted with ten purposively selected teachers who reflected all followership styles. The majority of graduate teachers in the sample were found to be effective followers. Respondents' age, teaching service, and the service under the incumbent principal revealed no significant association with their followership styles whereas respondents' gender and school type revealed a significant association with their followership styles. Finally, the results suggested that higher levels of perceived transformational leadership of principals increases the graduate teachers' probability of performing as effective followers and decreases their probability of performing as moderately effective and ineffective followers. The study contributes to the limited body of followership research related to members of educational organizations by being the only study to examine the followership styles of Sri Lankan public school teachers.

Keywords: *effective followers, followership styles, transformational leadership*

An analysis of the Sinhala language and literature curriculum using Higher Order Thinking Skills (HOTS)

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In any country, the goals of education that are required to be achieved are transmitted to students and teachers through the curriculum. As long as the Text Books (TB) and the Teachers' Instruction Manuals (TIM) are well enriched, the profit gained by education would be enhanced. Even though countries have gone beyond curriculum development and have focused more on achieving higher levels in relation to Bloom's Taxonomy, in Sri Lanka there are areas which need further development. When evaluating recent assessment reports on the G.C.E. (O/L) Sinhala Language and Literature curriculum, it is clear that the Higher Order Thinking Skills (HOTS) of students need to be further developed. Therefore, this study aims to examine the opportunities provided to improve HOTS of grade 6 students who are at the preliminary stage of studying language in an organised manner. For this, 21 lessons in the grade 6 Sinhala text book have been analysed using the content analysis method under descriptive analysis. This was based on the revised Bloom's Taxonomy of the cognitive domain. 65.74% of the subject content and assessment criteria found in grade 6 Sinhala TB and TIM represent Lower Order Thinking Skills (LOTS) (remember, understand) whereas, 34.26% of them represent HOTS (apply, analyse, evaluate, create). Mismatches suggest TB and TIM aren't compatible and four basic language skills are not given equal weight. Both TB and TIM need to go hand in hand, complementing each other. Further, the four language skills should be equally considered. TB requires a well balanced assessment methodology integrated with HOTS and LOTS.

Keywords: *content analysis, four basic language skills, Higher Order Thinking Skills, Lower Order Thinking Skills, Bloom's Taxonomy*

Factors affecting the teaching-learning process of teachers of dance in State schools in Sri Lanka

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The purpose of this study is to investigate the factors that affect the teaching of dancing in schools. Dancing is an optional subject offered under the aesthetic subjects in the school curriculum. To practically present a dance with technical skills and proficiency, a person must master the basic structure of dancing like singing, playing drums and creative movements. The teacher engaged in the teaching learning process in the school system also should be fully equipped with subject knowledge and technical skills of dancing. Teachers of dance in the state schools in Sri Lanka have educational and professional qualifications. However, the majority of them adhere to traditional methods of teaching and avoid creative activities. Since creativity is a core element of dancing, these skills are essential for a teacher of dancing. Hence this study is an ongoing research to develop the creativity of teachers of dance. The aim of this paper is to investigate the factors that hinder creativity of dance teachers. Accordingly, the objectives of this research were to investigate the factors affecting the teaching-learning process of dancing in schools and to examine the factors that affect the creativity of dance teachers. The research sample included dance teachers, principals and administrators in schools in the Homagama education zone. This research was conducted as a library and field survey. Data were gathered using documentary survey, interviews, questionnaires, classroom observations and analysed using quantitative and qualitative methods. Key factors affecting the teaching-learning process of teachers of dancing were: lack of exposure of teachers to creative methods, lack of opportunity to practice creative methods due to the exam oriented educational system, excessive work load of the teachers and lack of resources. Therefore, it was revealed that the creativity of the dance teachers could be developed by providing them with appropriate techniques and strategies.

Keywords: *creativity, Dance teachers, teaching-learning process*

Increasing student awareness of school Guidance and Counseling Units: A study

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The Sri Lankan government has applied various reforms to the government school sector, with the intention of improving the quality of education. There was a growing interest to apply guidance and counselling to address emerging problems and to reduce the emerging psychological and behavioural problems in the school sector. Therefore, the ministry of education introduced guidance and counselling to the school sector in 1983 by starting the “Yowun Mithuro” project. As a result, the Ministry of Education emphasized on developing the guidance and counselling services in schools. The Ministry of Education, through circular no 2001/16, stated that each school which has more than 350 students should include a school guidance and counselling service within the schools and should appoint a teacher counsellor. Thereafter, circular no 6/2013, released in January 2013, addressed the importance of establishing a “School Guidance and Counselling Unit” in all schools. The Ministry of education issued these directives regarding guidance and counselling in order to enhance the academic and personal development of students and ensure creating a skilful and balanced person who could face the challenges of the 21st century. This research examined the awareness of students regarding the school Guidance and Counselling Unit and identified the steps necessary to increase student awareness about the services of the unit. Purposive sampling was used to select the school sample. Data gathered from interviews, questionnaires, observations and institutional data were analysed quantitatively as well as qualitatively. According to the study, it was noted that school Guidance and Counselling Units were not functioning as expected by the circulars and most of the students and teachers were unaware of the services of the school Guidance and Counselling Unit. The services of school the Guidance and Counselling Units were limited to addressing minor issues of students. Maintaining an annual plan for the school Guidance and Counselling Unit and conducting programmes via the unit will help to increase awareness among students.

Keywords: *school guidance and counselling, School Guidance and Counselling unit, students' awareness*

Knowledge vs. Skills: Insights from the Civic Education Study 2017

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Literature abounds with references to skill development in students. However, most such literature refers to soft skills or hard skills with the emphasis shifting more towards soft skills. Yet, in learning a subject, the ability to apply content knowledge to specific situations, which is referred to as an interpretive skill, is often neglected. The main objective of this paper is to examine how students' civic skills knowledge contributes to their civic knowledge or competency. This paper is based on a subset of data from the national study on Civic Education in Sri Lanka conducted in 2017 by the National Education Research and Evaluation Centre (NEREC). In this study it was assumed that students' civic knowledge or competency comprised of their knowledge of content and knowledge of skills in interpreting. The Civic Education Study 2017 was a replication of the NEREC 2003 study with the main aim of assessing the changes in civic and democratic competencies in school children in Sri Lanka since 2003. The 2003 study was basically a replication of the Civic Education study conducted by the International Association for the evaluation of educational achievement (IEA). In the present study, the sample was 5492 grade 9 students representing all provinces. This paper uses data only from part 1 of the student questionnaire. It comprised 16 multiple type test items which assessed both knowledge of content as well as skills in interpretation. The findings revealed that in 2017 the students' content knowledge has increased. However, their interpretive skills have declined. As a result, the overall civic knowledge has increased only slightly. The main reason for the low interpretive skills is the lack of suitable activities in the textbooks to develop the interpretive skills and the lack of awareness of the teachers regarding interpretive skills and how to facilitate such skills.

Keywords: *Civic Education, content knowledge, interpretive skill knowledge*

**A study of the issues faced by internship English medium Science Teachers in the
National Colleges of Education (NCoE)**

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English Medium Education (EME) was introduced in the National Colleges of Education (NCoE) when Bilingual Medium Education (BME) was introduced in 2001 in the state and state assisted schools in Sri Lanka. However, Internship Prospective Teachers (IPTs) in NCoEs faced many problems due to mismatches between the concepts of BME and EME. The aim of this study is to investigate the issues faced by IPTs when offering the subject of Science during the internship period in the state schools. This study was conducted as a survey and the objectives of the study were to examine the nature of the EME in NCoEs, the needs of the NCoE PTs and the Teaching learning-process of IPTs in EME. The sample constituted 40 IPTs and 7 EM lecturers. Data, collected through questionnaires, classroom observations, interviews and a documentary survey, were analysed using quantitative and qualitative methods. The findings revealed were, mismatches of the subject content between the NCoE syllabus and the school syllabus, lack of professional training for EME lecturers, lack of collaboration between the authorities responsible for implementing NCoE programmes and lack of Second Language competency in PTs. Therefore, opportunities should be provided for the professional development of EME lecturers in the NCoEs; development of the presentation skills of PTs should be given prominence; an Activity Period to develop classroom bilingualism should be introduced; the delivery method has to be updated towards a technological based method; opportunity should be provided for the development of English skills of PTs. Therefore, it is necessary to introduce a mechanism to develop the teaching learning process in NCoEs, by eliminating irrelevant subject matter and developing suitable subject content. Moreover, a mechanism should be introduced to develop the English Language competency of Science PTs.

Keywords: *bilingualism, English medium, internship, prospective teacher, National Colleges of Education*

Issues in teaching Information Communication Technology (ICT) in school

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Teaching practicum is one of the major components of teacher preparation programmes at the National Colleges of Education (NCOEs) in Sri Lanka. It makes way for student teachers (ST) to apply theory to practice and helps them to understand their professional roles related to the teaching-learning process. Further, Information Communication Technology (ICT) was included to the curriculum to prepare a teacher to be able to keep up with the demands of the 21st century. However, the majority of the STs faced difficulty in the application of theories of ICT in practical teaching. Although STs were thorough with the subject knowledge of ICT, they lacked ICT teaching skills. The aim of this study was to identify the issues faced by the STs of the Nation College of Education in teaching ICT in the classroom. Accordingly, the objectives of this study were to examine the methods used in the NCOEs in developing the ICT teaching skills of STs, examine the issues of the lecturers in developing the ICT teaching skills of STs, and examine the opportunities and resources available for the development of ICT teaching skills. The study was conducted as a survey of a purposive sample of the ICT internship STs and ICT lecturers at NCOE Maharagama. Data were collected using documentary survey, interviews and observation. Data were analysed using qualitative and quantitative methods. Some of the key findings were: inadequate training in terms of teaching, lack of opportunities, insufficient authentic teaching experience; inadequate teaching knowledge of the lecturers; lack of opportunities at NCOE in using theoretical ICT knowledge in practical teaching, inadequate authentic teaching experience in the real classroom, lack of opportunity for the professional development of the ICT lecturers and inadequate physical resources. There were no relevant policies for teaching ICT in schools. As a result, there is no uniformity in teaching ICT. Therefore, it is important to introduce a framework to facilitate teaching learning process of ICT student teachers in the NCOE.

Keywords: *Information Communication Technology, National College of Education, student teachers*

Self-efficacy in teachers: A key predictor of inquiry-based Science instruction in the classroom

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Despite attempts at state levels to improve inquiry-based science instruction in the classroom, instructional practice is dominated by teacher-centered confirmatory exercises, rather than enactment of authentic inquiry. It is empirically evident that use of scientific inquiry by science teachers is greatly dependent on their receptivity to inquiry-based instruction in the classroom. Self-efficacy has been identified as an important predictor in a teacher's professional career for receptivity to any instructional process. There is an enormous need for research on this problem locally to seek whether the lack of use of scientific inquiry is due to the lack of self-efficacy in teachers or due to any other factors. This study investigated science teachers' perception of the use of learning outcomes in inquiry-based instruction, associated with their self-efficacy in student engagement, classroom management and instructional practices in teaching scientific inquiry. The survey method was employed with a questionnaire for data collection from 148 practicing teachers in state schools in 2018. A General Linear Model (GLM) Univariate analysis using the SPSS 21.00 programme was used for data analysis. Results disclosed that although teachers frequently engage students with scientifically oriented questions, attempts made to allow the students to plan investigations to gather evidence in response to the questions were inadequate. The mean perceived self-efficacy in student engagement reported comparatively lower than that of instructional strategies and classroom management in teaching scientific inquiry. The results also indicated that there is significant impact on science teachers' self-efficacy due to beliefs regarding student engagement, classroom management and instructional strategies on teachers' receptivity to inquiry-based instruction in the classroom.

Keywords: *scientific inquiry, self-efficacy, student engagement*

Achieving competency in sustainable development through the science curriculum at senior secondary level: A critical review

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This study is a literature review related to an ongoing research titled “The effectiveness of the science curriculum (SC) in senior secondary level to achieve competency in sustainable development” (SD). Educational reports, text books, research papers, e-journals and related articles have been analyzed to identify the themes related to SD and competency, significance of the school curriculum to achieve SD and the factors that affect achievement of educational competencies. It was revealed that SD is development that meets the needs of the present, preserving natural resources and ecosystems for future generations. Literature emphasizes that it is important to reorient education and curriculum to give opportunities to everyone to acquire knowledge, skills, and attitudes that empower them to contribute to SD. Furthermore, literature indicates that Education reforms in Sri Lanka in 2015 were based on a thorough study of the changes that have taken place in the global context, in order to direct students on inquiry based learning by considering teachers as the pilots of the school system. Further, it highlights that teachers should possess a broad knowledge and attitudes of their subjects and pedagogical skills. There are a number of factors within school such as content of the curriculum, teacher, student and physical resources related factors as well as outside school factors such as home environmental conditions, provision of tuition and occurrence of conflicts and disputes in society which affect the academic performance of students. The literature has proved that disparities are greater among schools in Sri Lanka in terms of school category, type of administration, composition and location. Ongoing research has initiated broader attention to the education system to develop proper knowledge, attitudes and skills of senior secondary level students to empower them to contribute to SD effectively, by considering the available resources and literature.

Keywords: *competency, science, sustainable development*

Identifying the factors influencing grade 11 Mathematics teachers' development of Digital Technology Geometry tasks

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Research suggests that using digital technology (DT) has the potential to support students' mathematical understanding and that rich tasks enhance the effectiveness of using such technology in the classroom. Tasks, carefully designed by educators, inevitably need adapting during teacher implementation. Thus, this research considered the importance of supporting teachers in designing rich DT tasks themselves for their students. From that perspective, the benefits of collaborative work in small teacher communities in the same school or educational zone were investigated. This study sought to identify what factors influence grade 11 mathematics teachers in designing DT tasks, and how. A design-based research methodology was adopted within a socio-cultural constructivist paradigm to identify these teacher related factors. Furthermore, a professional development (PD) programme was designed and conducted to investigate its supportive benefits for teachers. Three groups of three teachers collaboratively designed a preliminary task after participating in the PD program. Then, the groups modified their tasks and participated in an interview. Data were collected using a questionnaire comprising open and closed questions and Likert scales, semi-structured interviews, and observations. Both tasks were analysed using the Task Richness Framework developed for the research. The findings suggest that task richness after the PD intervention had significantly increased for all groups. Further, the supportive nature of PD programmes improved teacher attitudes towards using technology in teaching and encouraged confidence in developing tasks. Teachers having higher teaching, instrumental genesis (IG), positive attitudes and confidence are more likely to design quality tasks. Among the three groups, members of groups homogeneous in age and experience showed more willingness to share ideas, with greater flexibility in approaching DT. The evidence suggested higher success of PD programmes with communities of inquiry where age and experience are homogenous. The study showed that conducting similar DT PD programmes may be effective in supporting teachers to produce better tasks.

Keywords: *instrumental genesis, Digital Technology Task, teacher factors*

FACULTY OF GRADUATE STUDIES



Health and Well-Being

23 November 2019

**MESSAGE FROM THE DEAN
FACULTY OF GRADUATE STUDIES**

Senior Professor Nayani Melegoda



The Faculty of Graduates Studies (FGS) will hold its Annual Research Sessions on November 23, 2019 on the theme “Health and Well-Being.” Reflecting on the interdisciplinary nature of study programmes offered at the FGS, the call for abstracts encouraged students and researchers to submit along three conference tracks: Health, Security, and Sustainable Development, Physical and Psychological Health and Health and Human Resource Management. The sessions, arranged according to the above tracks, will feature 29 presentations by students and resource persons from the various study programmes offered at the FGS.

In the year 2019, the FGS won a Development Oriented Research (DOR) Grant from the Accelerating Higher Education Expansion and Development (AHEAD) Project. Work is progressing well, with the team completing a book chapter (forthcoming), abstracts of papers presented in *ICEEMS 2019 CUSAT* in Cochin, India, *Academics World conference*, in London, UK in 2019, *ICSD 2019* to be held in the Maldives, *NSF /SCST 2019* (forthcoming) and a publication in the *Colombo Journal of multidisciplinary Research* volume 4, issue 1 of 2019 which will be available at the symposium.

I take this opportunity to place on record my sincere thanks to all resource persons across the faculties of the University of Colombo and other Universities, Industry personnel, course coordinators and staff of the Faculty of Graduate Studies for organizing the Annual Research Sessions 2019. On behalf of all of them, I wish all our researchers, postgraduate students and participants all the very best in their academic endeavours.

FACULTY OF GRADUATE STUDIES

PROGRAMME

23 November 2019

10.00 am	Registration & Refreshments
10.30 am – 1.30 pm (Presentations)	Track 01: Health, Security and Sustainable Development <u>Session 01:</u> (10.30 am – 1.30 pm) Session Chair – Professor Lasantha Manawadu <u>Session 02:</u> (10.30 am – 1.30 pm) Session Chair – Senior Professor Lakshman Dissanayaka <u>Session 03:</u> (10.30 am – 1.30 pm) Session Chair – Senior Professor Nayani Melegoda Questions & Answers (1.30 pm – 1.45 pm) Award of Certificates (1.45 pm – 2.00pm)
10.30 am – 1.30 pm (Presentations)	Track 02: Physical and Psychological Health <u>Session 01:</u> (10.30 am – 1.30 pm) Session Chair – Senior Professor Jeniffer Perera <u>Session 02:</u> (10.30 am – 1.30 pm) Session Chair – Professor K. R. R. Mahanama Questions & Answers (1.30 pm – 1.45 pm) Award of Certificates (1.45 pm – 2.00pm)
10.30 am – 1.30 pm (Presentations)	Track 03: Health and Human Resource Management Session Chair – Dr. Sreemali Hearth Question & Answers (1.30 pm – 1.45 pm) Award of Certificates (1.45pm – 2.00pm)
2.00 pm onwards	Lunch and Fellowship

FACULTY OF GRADUATE STUDIES

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21st century skills development: An analytical study of pedagogical practices in the classroom

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This study aims to analyse the pedagogical practices in the classroom to identify how they support skill acquisition for sustainable development. It examines the quality of the provision in the classroom to enhance 21st century skills - 4Cs - collaboration, communication, creativity and critical thinking. The rationale for the study comes from the fact that despite the significant progress in educational provision and participation the quality of education has not kept pace. There is a marked mismatch between the skills gained by the pupils through formal education in Sri Lanka and the skills preferred in the globalised world of work. For this study a questionnaire was issued to 729 grade 9 pupils from 23 different schools in the Colombo district. The number of schools was identified using a statistical method. A questionnaire was designed to identify the opportunities provided to the pupils to gain skills in the classrooms through formal education. The implementation of the 4Cs was investigated through group work, presentations, research projects and experiments carried out during science lessons. The data was processed using a frequency distribution of the percentage of preference given for each skill taught in class. The statistical analysis was supported by the verbatim responses given by the science teachers of the respective classes under investigation. 63% of the pupils said that they do group work, 93% claimed that the experiments are done by the teacher as demonstrations, 75% claimed that they have not done presentations and 90% claimed they were not exposed to research projects. The study also finds that the infrastructure facilities are not adequate to support activities. Hence the study concludes that apart from group work, less emphasis is paid to incorporating activities that support the implementation of the skills. Thus, this study recommends providing suitable resources to schools and improving teacher training to facilitate teachers with the expertise required to deliver syllabus content integrating the 4Cs.

Keywords: *21st century skills, collaboration, communication, creativity, critical thinking, Sri Lanka, sustainable development*

**Association between socio-economic factors and psychological well-being of older adults
in Elders' Homes: An ongoing study**

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Socio Economic Status (SES) is measured as a combination of education, income and occupation to define the social standing or class of an individual or group. Health and social sciences particularly employ SES as a reliable and consistent predictor of a considerable amount of outcomes, including physical and psychological health across the lifespan. As the older adults in elders' homes have fewer options for continued income, it is predicted that they are at a risk of being economically disadvantaged and in potentially lower levels of SES. Therein, the objective of this ongoing cross-sectional exploratory study is to examine the associations between the variables of number of years of education, monthly income and two psychological well-being dimensions of environmental mastery and autonomy. The convenient sampling method was used to recruit 195 older adults (60 years and above), residing in elders' homes that provide residential care for older adults in the Colombo district. Responses were recorded for Sinhalese versions of environmental mastery and autonomy scales along with the educational and income levels. Significant positive correlations revealed that older adults with higher levels of education and income tend to be more autonomous and possess an increased sense of environmental mastery. At the same time, older adults who experience an increased sense of environmental mastery seemed to be more autonomous as well. The findings establish the link between SES and environmental mastery and autonomy of older adults in elderly care homes in the Sri Lankan context. Further, the findings support the previous research that has highlighted SES as one of the important contextual moderators for psychological well-being. Implications for policy makers and future research are also discussed since an ever-increasing demand for institutional support for the older adult care would be common in Sri Lanka in the coming decades.

Keywords: *Elders' homes, older adults, psychological well-being, socio-economic status*

Impact of imprisonment on health and well-being of adult prisoners and recidivism: A qualitative study of four closed prison establishments in Sri Lanka.

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This qualitative study aims to explore the impact of imprisonment on health and well-being of prisoners and recidivism among adult prisoners in Sri Lanka. Health and well-being of prisoners is an important aspect in the rehabilitation process of prisoners in order to reintegrate them into society as law abiding citizens. Most of the prisoners have come from poor backgrounds. They tend to face stress due to their new prison life. In this qualitative study, focus group discussions and in-depth life history interviews with inmates and rehabilitation staff at four closed prisons in Welikada, Mahara, Bogambara and Angunakolapelessa and life history interviews with ex-prisoners were conducted. Purposive sampling was implemented in selecting the sample. The findings revealed that the majority of prisoners are either drug addicts or mentally ill and that they experienced shock of imprisonment, isolation, violence and enforced association with other criminals has negatively impacted their health and well-being. Prison officers also admit that rehabilitation programmes are conducted in an ad-hoc manner. The findings further revealed that overcrowding in prisons, violence, poor nutrition and sanitation, lack of access to proper medical treatments and counseling facilities are reported as some of the common unhealthy prison conditions that aggravate the condition. There is a high prevalence of some diseases such as tuberculosis, HIV/ AIDS, hepatitis and skin diseases due to poor the conditions of prisons. When compared with their male counterparts, a majority of female prisoners reported that imprisonment impacted negatively upon the quality of their lives. There is a desperate need for improving health care and facilitating the well-being of prisoners in order to minimize recidivism and maximize effectiveness of prison rehabilitation programmes. As good health care in prisons leads to good public health, it is strongly recommended that a national policy be established through advice from prison authorities and health authorities in Sri Lanka. Similarly, prisoners should be empowered by delivering health information through proper prison library services.

Keywords: *health and well-being of prisoners, imprisonment, recidivism, rehabilitation*

**Childhood shows the man as morning shows the day: A critical analysis of the link
between childhood abuse and juvenile delinquency behaviour**

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This research examines the factors that contribute to juvenile delinquency and further examines why delinquency prevails despite the separate judicial process to try juvenile delinquency cases. It is argued that delinquency during adolescence occurs as a consequence of early physical, psychological, sexual abuse, neglect and various other risk factors. Furthermore, it is argued that despite the juvenile justice system and institutions established to mitigate the issue of juvenile delinquency, a considerable number of children in Sri Lanka continue to be victims and delinquents due to a number of shortcomings of the justice system and institutions. For the purpose of substantiating the argument, literature on causes and conditions of delinquency will be reviewed to support the hypothesis, juvenile delinquency is caused due to certain factors that contribute towards child abuse and neglect; poor parenting skills, parental negligence, legal illiteracy, parents' low education background, parents' criminal conduct and history of violence, poverty, poor stability and security within the family, single parent families, parental substance abuse and children being unaware of their rights and dignities. This research will be based on a qualitative and quantitative research methodology. Statutory laws, books, reports, journal articles, publications and statistics gathered from governmental and non-governmental child protection authorities and country reports pertaining to juvenile delinquency behaviour will be utilized. This research shows that juvenile delinquency could be discouraged only through close family relationships which foster children's self-esteem and punish negative behaviour.

Keywords: *child abuse and neglect, family relationships, juvenile delinquency behavior, juvenile justice system, legal illiteracy*

A comparative study of the pharmacognostical, phytochemicals and physico-chemical studies of 3 plant species of Solanaceae family used in Ayurveda

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Plant species of the family Solanaceae contain trees, shrubs and herbs with therapeutic natural compounds. The *Solanum* genus of this family accommodates diverse groups of flowering plants, which include medicinal plants and food crops. Among medicinal plants, *Solanum melongena* L., *Solanum xanthocarpum* L. and *Solanum trilobatum* L. are commonly used in the Sri Lankan traditional and Ayurveda system of medicine. These three medicinal plants have demonstrated strong efficacy against diseases in the respiratory system due to their pharmacologically active secondary metabolites. No chemical and pharmacognostical comparison have been done for Sri Lankan grown species of these three plants. Hence the main objective of this study was to compare the physicochemical, phytochemical and pharmacognostical profiles of *S. melongena*, *S. xanthocarpum* and *S. trilobatum* L which are grown in Sri Lanka. Pharmacognostical characters and quality control parameters of ash values, extractive values, heavy metals and qualitative phytochemical analysis were performed according to WHO guidelines. Further analysis of TLC and HPTLC fingerprint patterns of methanolic extract of these plants were also conducted. The results of ash values and extractable values were comparable with the results in Ayurveda pharmacopeia of India and water soluble ash content of *S. xanthocarpum* (6.4 %) is higher than the *S. melongena* (2.8 %) and *S. trilobatum* (4.3 %). The hot water and hot methanol extractable matter of *S. xanthocarpum* plant is higher (23.8%, 20.4%) than the *S. melongena* (8.8%, 9.7%) and *S. trilobatum* (13.8%, 7.4%) respectively. Phytochemical analysis reveals the presence of saponins, alkaloids, tannins, phenols, flavanoids, terpinoids, cardiac glycosides and steroids. Results of these physico-chemical, phytochemical, pharmacognostical and TLC analysis can be used to compare the specific features among these three species, assess the quality and detection of any adulteration for *S. melongena*, *S. xanthocarpum* and *S. trilobatum*.

Keywords: *Solanaceae, Pharmacognosy, Physicochemical analysis, Phytochemicals*

Ayurveda treatment regimens for Osteoarthritis: A comprehensive review

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Osteoarthritis (OA) has become a burden globally for the healthcare sector due to its high prevalence and incidence. There are numerous drug treatments for OA in allopathic medicine. However, their efficacy and adverse effect profiles often limit their use. According to the main sources of Ayurveda, Sandhigataavata is the frequently used term in conditions related to OA. The aim of this study was to review comprehensively randomized controlled trails on the effectiveness of the treatment regimens in the management of OA and/or Sandhigataavata in the Ayurveda system of medicine. A comprehensive systematic review was conducted in the PubMed database for studies published in peer reviewed journals between the years 2004 and 2019. The following key words were used: “Ayurveda”, “Treatment regimen”, “Osteoarthritis”, “Sandhigataavata”, “Randomized Clinical Trails”. To obtain additional data, a manual search was performed using the reference list of included articles. The literature search identified 46 articles in the PubMed database. After following the inclusion criteria 20 review articles were included. Among the reviewed articles, most dealt with a few modalities of treatment, rather than the complete classical line of Ayurveda treatment. Proper protocol, with clinical trial registration including eligibility criteria for selecting patients and outcome measurement with proper statistical interpretation, were not explained in many studies. It is concluded that only two studies have been conducted with properly designed randomized clinical trial (RCT) for Ayurveda treatment regimens for OA. Therefore cost-effective, safe and efficacious Ayurveda treatment regimens for the long-term management of OA should be developed, including proper protocol and through conducting proper RCT.

Keywords: *Ayurveda, Osteoarthritis, randomized clinical trails, Sandhigataavata, treatment regimen*

Teaching pedagogies: Supporting graduates to perform better at international English language examinations

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The number of medical graduates applying for the International English Language Testing System (IELTS), seeking job placements abroad is increasing annually. According to the information of the local exam body, the British Council, doctors find it challenging to achieve the required band score, especially in the reading component. This study explored whether different delivery modes, online, face to face and blended, influenced their achievement when all other factors were held constant. The study duration was 3 months. A Learning Management System (LMS) was created which was accessible via the URL <http://lms.med.cmb.ac.lk/course/index.php?categoryid=8>. With the face to face mode continuing as a control group (n=4), the blended (n=4) and online (n=4) groups received ten online modules on a reading component similar to the past papers of the IELTS. Three visiting Lecturers of English were assigned to carry out teaching to three different groups. Online interaction was encouraged for both experimental groups. While the online group received all lessons online with no face to face instructions, the blended group received 70% of the course materials online with five face to face sessions to cover up the balance 30% of the course modules. The control group received the same lesson materials and practiced those only in their face to face classes with the teacher. While the three groups showed the average performance as Blended =47.75, Online = 40.25, Face to face =48.00 at the pre-test of their reading skills, a similar course-end test showed the blended group participants to have scored significantly increased marks (mean =54.50, $t=-27.00$, $p=.000$), compared to their counterparts (Online = 44.75, $t= -5.196$, $p=.014$, Face to face =51.25, $t= -1.967$, $p=0.144$) at the significance level of $p < .005$. This study can have implications on preparing medical graduates for English reading papers in the context of English teaching.

Keywords: *higher education medical graduates, International English Language Testing System, virtual blended ode*

Green adoption in manufacturing small and medium scale enterprises in Sri Lanka: A case study

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Adopting green practices by manufacturing companies has been vital for achieving sustainable development goals (SDGs) in economies. As evidenced through the existing research findings, some of the manufacturing small and medium scale enterprises (SMEs) in developing economies have reportedly faced substantial challenges when attempting to adopt green practices, while a few have succeeded. The majority of such research findings are based on studies in India, Malaysia, China and Thailand and provide important implications, particularly for those local contexts. Thus, we identify a lacuna in the knowledge on attempts at green adoption in Sri Lankan manufacturing SMEs. The present study, focusing on this gap, aims to explore the motives, practices and constraints in adopting green practices in an apparel sector manufacturing SME located in an urbanized environment in Sri Lanka. The study examines three aspects: ‘why’, ‘what’, and ‘how’ green practices have been adopted in the enterprise and the obstacles encountered in this endeavour. Applying the case study strategy for in-depth explorations, we collect data through semi-structured interviews, discussions and on-site observations. Our findings are as follows: the ‘Why’ aspect of the exploration reveals an underlying drive for pro-environmental behaviour of the owner-manager, which has been derived through childhood experiences. The ‘what’ aspect divulges a number of interesting green practices introduced and adopted by the owner-manager amid individual level resistance from the workforce. The ‘how’ aspect shows the strategies used for overcoming the resistance. The findings, even though non-generalizable to all manufacturing SMEs, shed light on possible antecedents of pro-environmental behaviour of entrepreneurs, the type of green practices adopted in manufacturing SMEs and the obstacles and strategies used for overcoming them by a typical entrepreneur in the Sri Lankan context. We conclude that attitudes towards sustainability and ethical concerns on environment play a vital role in initiating and continuing green adoption in SMEs in the apparel sector.

Keywords: *green practices, manufacturing SMEs, Sri Lanka*

Assessment of social vulnerability to natural coastal hazards in selected GN divisions of the Negombo DS

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Determination of vulnerability to natural coastal hazards is vital for the sustainable wellbeing of the coastal community of Negombo GS as it is a coastal belt surrounded by consecutive bodies of salt and brackish water. Sea level rise, flood and drought were the vulnerability assessing factors analysed within 10 GN divisions based on the predesigned conventional standard of UNHABITAT and World Bank. The objective of this study was to assess the social vulnerability of selected GNs of the coastal belt of Negombo for natural coastal hazards. The study was conducted via descriptive analysis research methods and ten vulnerability indicators (VI) and six life line facilities (LLF) were analysed. With a vulnerable community including 54% women, 13% children below school age, 7% elderly people of over 65 years of age, 2% special needs children and an unemployment rate of 18% and 8% student population; approximately 5% of the population depend on government incentives for their living. Under the LLF analysed, 12% of the population has no access to safe water, 4% had no electricity facilities, 88% absence of a waste disposal service and 14% without a permanent roof were found to be critical factors needed to be considered for prompt action by relevant authorities. Computed Pearson's Correlation Coefficient between income level and education level was +0.51 while between access to modern communication system and age range was +0.41, exhibiting a moderately positive relationship. Among the three coastal hazard factors studied, sea level rise had the highest impact, showing it to be the most threatening vulnerability factor for the Negombo community, affecting both human dwelling and livelihood as it affects the availability of land and the demography.

Keywords: *Coastal hazards, sea level rise, vulnerability*

Functional abilities of and adaptations used in the classroom by children with Down syndrome in the Matara district

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Children with Down syndrome (DS) have performance limitations in classroom activities. This study aimed to identify the levels of independent classroom abilities in students with DS in the Matara district and to describe the adaptations used in classrooms to improve the performance. A cross-sectional study was conducted among 65 children (Male: 37, Female: 28) with DS aged 6-9 years studying in public schools in the Matara district. The Classroom Activity Performance Assessment (CAPA), developed, based on literature, local assessments and expert opinion was administered by the class teacher and was used to assess independent classroom functional abilities and the adaptations used by the children. Data were analysed using SPSS statistical software package. The mean age (\pm SD) of children with DS was 7.7 (\pm 1.2) years. The majority were able to manage meal time activities (89.2%) and handling the school bag (75.4%) independently. There was a low proportion of independent performers in using drawing materials (27.7%), applying glue in the correct place of a paper (26.2%), folding a paper along a line (12.3%), cutting along a line with scissors (16.9%) and building 3D figures using clay (13.8%). The adaptations used by the majority were: extended time (72.3%), increased feedback (70.8%) and use of reinforcers (70.8%). Very few children had adapted work surfaces (3.1%) and adapted scissors (7.7%). The children with DS had performance limitations in several areas of classroom activities, indicating their impaired intellectual and fine motor development. Findings emphasize the importance of practicing school readiness activities and activities to facilitate intellectual and fine motor development. Further research is required to design and evaluate adaptation guides for Sri Lankan children with DS in classroom context.

Keywords: *adaptation, classroom abilities, Down syndrome, fine motor activities, school*

Comparative physical, morphological and structural changes in sulphur purification with special reference to Ayurveda

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Sulphur is subjected to *shodhana* process to eliminate harmful substances prior to Ayurveda pharmaceutical preparations. For this purpose, many naturally occurring plant juices are used. This research was carried out to identify and evaluate the physical, morphological and structural changes of sulphur when subjected to the *shodhana* process with *Eclipta alba* water extract and to compare the differences with the laboratory purification method using xylene. In this work, sulphur *shodhana* was carried out using fresh *Eclipta alba* water extract. In addition, purification of sulphur with xylene was also done as the laboratory method. Raw sulphur, sulphur samples at different steps of *shodhana* and sulphur sample of laboratory method were all subjected to detailed surface morphology by Scanning Electron Microscopy (SEM), detailed internal structure by powder X-ray diffraction (XRD) and Energy-dispersive X-ray spectroscopy (EDS) for estimating relative chemical abundance. Observed physical changes on samples revealed considerable differences in colour, allotropic form, odour, hardness, transparency and lustre. The porous structure of the sulphur increased with increasing temperature during the steps involved in the Ayurveda procedure. In contrast to the porosity observed with the Ayurveda samples, there is a significant enhancement of the porosity in the laboratory purified sulphur. Increased porosity clearly reveals that the sulphur samples obtained via the laboratory purification method is brittle in nature. Further, EDS results obtained for all samples show the presence of sulphur as the only element. The XRD patterns of the samples which were taken during the Ayurveda purification were complex, indicating the different crystal forms when they compare with the raw and sulphur purified by xylene. The presence of rhombic form was identified in all the samples. There were peaks related to the monoclinic form due to the instantaneous heat changes in Ayurveda procedure, but peak intensities diminished with time. However, the changes in the peak intensities could be associated with the rearrangement of atoms during the purification processes. Although the laboratory purification method separates the sulphur from chemical impurities, the Ayurveda *shodhana* process with heating, melting and dipping in herbal liquids converts the sulphur into a better state, to be used in a pharmaceutically suitable form.

Keywords: *Eclipta alba*, purification, *shodhana*, Sulphur

Determination of Spatial Sea Level Variation between the Arabian Sea and the Bay of Bengal

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Determination of mean sea level change is a unique indicator of global warming influenced by anthropogenic activities during the last few decades. In situ sea level data collected from Global Sea Level Observing System (GLOSS) conducted under the auspices of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) and satellite observations were used from Achieving, Validation and Interpretation of Satellite Oceanography (AVISO). Astronomical effect removed residual sea level variation was isolated, subtracting observed tide gauge time series. The tidal constituents were quantified using T_TIDE harmonic analysis function of time series analysis by one-minute frequency tide gauge data obtained during the period 1990 to 1998. The spring and neap tidal range were calculated using tidal constituents according to the methodology of Hicks in 2006. The tide pattern was analysed quantitatively using the ratio of (K_1+O_1) to (M_2+S_2) . Then spring and neap tide variation were calculated in the Bay of Bengal and Arabian Sea representing reference seas within the northern Indian Ocean. The seasonal and long term variations were analysed individually using monthly mean values of high frequency tide gauge data and satellite data. The end results obtained both tide gauge and satellites were super positioned for the accuracy of different data sources in Arabian Sea and Bay of Bengal. Mean sea level values of both data sources shows positive linear trend of 0.0714 m in Bay of Bengal and 0.0705m in Arabian Sea. The spring tidal and neap tidal ranges were computed as 1.816 m, 0.876m while 2.350 m 0.964m Chittagong and Karachi respectively based on Hicks in 2006. The average seasonal sea level variation was 60-70 cm in Chittagong station and 15 cm was in Karachi station. The maximum seasonal sea level change was recorded in the Arabian Sea before the Bay of Bengal.

Keywords: *Arabian sea, Bay of Bengal, climate change, sea level, steric height*

Design of an automatic tea withering control system

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In Sri Lanka, Orthodox and Orthodox rotor vane manufacturing is still widely practiced although there is much more scope for improvement and enhancement of productivity. Incorporating automated systems in various stages of the tea manufacturing process will lead to improve the quality of manufactured tea while improving productivity and conserving energy. Withered energy costs exceed 40% of the total energy cost per kilogram of green tea leaves. The automatic wiping system can reduce the production cost by controlling the hot air fan system, thereby reducing the heat energy and electric energy during the wiping process. During traditional tea production, while withering, moisture content of green leaves is reduced to 55% (wb) (hard withering). Depending on the weather and leaf conditions, it takes about 6 hours to wither and about 12-18 hours to wither respectively. This study attempts to design an automatic tea-break control system based on real-time data. The proposed system is based on a motor control unit, automatic valves, sensors and actuators that control several variable parameters such as temperature, moisture content and air flow. Withering is done at 68–77°F depending on the climatic conditions. For best withering, a Hygrometric difference of 39.2°F is maintained. A microcontroller has been used to process data received from sensors and to provide control signals. An array of temperature sensors are connected to the chamber at three different locations near the hot air blower. This design implements a louver mechanism system in front of the fan. The shutter mechanism system operates via a feedback system. Temperature readings were recorded by a microcontroller-based data logging system for 48 hours. Logged data were plotted against the actual temperature by considering the environment temperature. It can be concluded that applying a nearly constant temperature (hot-air) throughout the trough by automation can lead to good quality withered tea whilst conserving energy.

Keywords: *louver mechanism system, moisture content and air flow, sensors and actuators, temperature, withering*

Factors affecting an effective reconciliation process in post war Sri Lanka: A public perceptions perspective

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In the concluding months of the near three decade long civil conflict in Sri Lanka, an often stated allegation is that multiple violations of human rights occurred under the auspices of both belligerents, with predominant responsibility for such alleged violations being attributed to the Sri Lanka armed forces. As reports by domestic and international mechanisms, such as the Report of the Lessons Learnt and Reconciliation Commission of Sri Lanka, and the Report of the UN Secretary-General's Panel of Experts on Accountability in Sri Lanka, offer very divergent accounts of the last stages of the conflict, the division between truth and fiction is vast. In the years that followed, and in particular as part of the national discourse following the change in regime in January 2015, a process of reconciliation, transitional justice and accountability emerged. Whilst many of such reconciliation initiatives became institutionalized at the level of policy and governance, the public perceptions of such initiatives were not accurately mapped. The public perception of such initiatives is essential, as a concept as complex as reconciliation requires a more than partial understanding of the environment in which it is taking place. This is important, as accountability requires the belief that some manner of wrong was committed during the conflict, and if this is lacking in public perceptions, the process of reconciliation may be at threat. The study seeks to adopt a mixed methodology in analyzing and mapping public perceptions towards reconciliation, and discerning if the identified perceptions are conducive to the spirit and expected outcomes of the nationally driven process of reconciliation. This will take place through a quantitative analysis of a sample from the public, as well as a qualitative analysis of interviews with key personnel in institutions promoting reconciliation.

Keywords: *reconciliation, post-conflict, public perceptions*

Impact of masculinity ideologies and gender role conflicts on men's health

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Men are socialized to behave differently from women and to fulfil different social roles. They constantly work hard to achieve dominant masculinity values and to perform stereotypical gender roles. This research aims to study how masculinities and men's gender roles impact the physical and mental health of Sri Lankan men. A desk review of existing literature on masculinity and men's gender roles was conducted. Gendered patterns of health data and findings from fifteen individual in-depth interviews conducted with men were analyzed against the desk review. The findings suggest that men's constant efforts to attain hegemonic masculinity ideals correlates with men's exercise of violence, experience of depression and anxiety, and use of alcohol and smoking. Men's dominant gender roles of being the breadwinner, provider and protector make them undergo occupational risks, get exposed to accidents, keep them away from their families limiting their needed care and affection, force them to use violence to protect family honor, and undergo mental health disorders at the failure to meet the social demands. Men's use of alcohol, smoking, violence and aggression were related to these mental disorders or to the influence of dominant masculinity values. Men from poor economic conditions were more exposed to these physical and mental health issues than other men. Unhealthy mental health conditions had negative impact on family; reflected in the form of intimate partner violence, lack of expression of affection and marital dissatisfaction. Health systems were not sensitive to the needs of men and men did not recognize their psychological disorders as problems requiring attention. It is important for policy makers and clinicians to recognize and address these health issues associated with the social construction of masculinity and men's gender roles, and to make health systems more sensitive to the psychological needs of men.

Keywords: *gender, masculinity, roles, psychology, health*

Test-retest reliability and validity of the Prakriti assessment questionnaire in patients with gynecological diseases

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This study was designed to validate a Prakriti assessment questionnaire through the scientific method. Prakriti is one of a basic concepts discussed in Ayurveda which can categorise population into several subgroups, based on phenotypic characters like appearance, temperament and habits. Traditionally, Prakriti assessment is done by an Ayurveda physician with clinical investigations but in recent times several tools have been developed to assess the Prakriti, including questionnaires. In this study cases were selected randomly from the outpatient department of the Gynecology unit, National Ayurveda Hospital, Borella. Cross cultural adaptation was achieved by translating the questionnaire from the original version, performed by independent mother tongue translator with an Ayurveda background, followed by committee review. Test-retest reliability was examined for 40 subjects who completed the tool twice within a 14 day interval. Cronbach's Alpha was run to test the test-retest reliability of the questioner. Reliability for the Prakriti assessment questionnaire from the 1st administration to the 2nd attempt was 0.585 to 0.453 respectively. This study noted less than optimal reliability for the Sinhala version of the Prakriti assessment questionnaire. Despite this finding, modifications of the tool are still necessitated by the absence of gold standard Prakriti assessment measurement for the Sinhala speaking population. Therefore, it is necessary to develop a more sophisticated tool which can be used for research and clinically in Ayurveda medicine in Sri Lanka.

Keywords: *Prakriti, Prakriti assessment questioner, test re test reliability*

Duality of interstate agreements on security matters: A source of conflict or solution?

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Interstate agreements among States on security matters are generally expected to be mutually beneficial and create strong international ties. However, popular agreements such as Acquisition and Cross Services Agreement (ACSA) and Status of Forces Agreement (SOFA) are viewed by many as wolves in sheep clothing than an agreement to mitigate the conflicts, which compromise the sovereignty of the weaker State. The dual nature of these agreements are famed at being one sided and the benefits weighing heavily towards the superpowers. This study endeavours to focus on the problem “Does interstate agreement on security matters attempt to resolve prolonged intrastate conflicts or create new conflicts due to its duality, in light of recent agreements between states?” The mode of research is qualitative and the ACSA agreement between the United States of America and Sri Lanka signed in 2007 and 2017, and the proposed SOFA between USA and Sri Lanka in 2018 are meticulously analysed. Recent ACSA and SOFA agreements from Japan, South Korea and Iraq are discussed in order to support our main findings. In conclusion, *firstly*, the implementation of the clauses in the above agreements will affect Sri Lanka adversely and violate its sovereignty and territorial integrity. *Secondly*, inherent dynamics of the Indian Ocean will be challenged or changed and will create new conflicts of power, to control Indian Ocean. *Thirdly*, intra and extra regional friendly States will resort to a polarized system of international relations in their formal engagements with other States. *Finally*, the case studies will support the argument that if Sri Lanka ratifies the SOFA agreement and implements the ACSA, the new situation will create greater conflict in the country and thereby it will be at a disadvantage at social and military level while exploring sustainable development policies for Sri Lanka, rather than a solution to the problems.

Keywords: *conflict, duality, interstate agreement, security, solution*

Developing a screening tool for early identification of early signs of dyslexia in children aged 4 to 6 years using Sinhala as first language: The pilot phase

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A number of children globally who enter formal education become school dropouts. Difficulty in learning to read and write is one of the primary causes for the majority of children to fail to make academic progress. As in the rest of the world, this is the case in Sri Lanka. There are no culturally and linguistically appropriate diagnostic tools to identify these difficulties in Sri Lanka. Therefore, this study aimed to design a screening tool to screen children at risk of having dyslexia and to check the practicality of using the screening tool. A descriptive cross sectional study was conducted. The main phases of the study were development of the tool, Delphi review with 10 professionals and pilot testing with 30 typical readers aged between 4 to 6 years. Purposive sampling was used to select students, who have grade level adequate literacy skills with no physical, psychological or sensory concerns to check the practicability of the tool and its administration. Content analysis was conducted to check the safety, feasibility, acceptability and sustainability of the screening. According to the Delphi review feedback, the tool was modified changing some pictures and sentences used. Some tasks included for the tool were removed from the tool as the majority of students did not responded to those areas (phoneme identification, phoneme categorization, phoneme deletion and substitution, grammar). All other tasks were completed by the participants with more than 75% accuracy. The pilot study ensured that the assessment was appropriate to the intended outcomes of the participants through modification of the tasks. According to the findings of pilot study, it was confirmed that it is appropriate to be used with the subjects of the respective age with modifications, to identify the presence of risk for reading difficulties. Transparency and equity were observed to be practiced in the screener.

Keywords: *dyslexia, risk identification, screening, Sri Lanka*

Geographic distribution and timely changes of mental disorders cases in Sri Lanka

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“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” (WHO, 2003) At present, study of mental health is important to identify social behavior as incidence of mental disorders is increasing compared to other health problems. The distribution of these cases differs according to geographic variation as well. In Sri Lanka too, patients with mental disorders are on the rise. Mental health problems affect people’s lives by decreasing their skills and abilities. Mental disorders pose a major challenge to global development. Many issues occur with increasing cases of mental disorders in rapidly growing populations. So the aim of this study was to analyse geographic distribution and timely changes of patients with mental disorders in Sri Lanka. Data of patients with mental disorders and population trends in Sri Lanka during 2005-2016 were obtained from the annual health bulletin published by the Health Ministry and census and statistics published by the Department of Census and statistics. Reported incidence rate (/100,000 population) was used to analyse the geographic distribution and timely changes of mental disorder cases in Sri Lanka. In Sri Lanka, during the period of 2005-2016, the reported incidence rate for mental disorders cases was 1757.56 per 100, 000 population. During the same period, reported incidence rate (/100,000 population) increased in Sri Lanka. Geographic distribution analysis shows that the reported incidence rates of mental disorders in Sri Lanka were higher in Colombo (2014) and Kilinochchi (2015-2016) where the rates were more than 350 per 100 000 population. Cases of mental disorders are clearly increasing in Sri Lanka. The incidence of mental disorders in Sri Lanka shows significant differences according to the district.

Keywords: *geographic distribution, mental disorders, mental health, reported incidence rates, timely changes*

Remodeling human security through radicalised women: A case study of Islamic State female affiliates

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“Women in radicalization and violent extremism” was under the ashes till the Easter Sunday attack series in 2019. Despite the fact that Jihadi teachings consider females as secondary citizens, Islamic State producing female centric propaganda is a new trend; it recruits women through remodelling the human security concept providing stereotypical gender roles pampering radical female psychology. As per the Global Extremism Monitor, of a 100 distinct suicide attacks conducted around the world in 2017, 181 were by female militants; which register 11% of all attacks in that year. Not only in numbers but also in severity, attacks launched by women increased. Female suicide attacks are more lethal on average than those conducted by men. In Indonesia, most fatal attacks in decades were carried out by women and children. This study based on Barry Buzan’s three entities of Human Security, observing Islamic State remodel human securities to impress females for the membership. The international center for the study of violent extremism (ICSVE) introduced ten reasons for women to look for Jihadi membership of which a few reasons are used the Islamic State intentions in remodeling the human security concept using their radical religious ideology. Understanding hunger, indignity and fear as three human insecurities, women affiliates owe themselves to the extremist terrorist group and willingly take “martyr”. After the defeat of IS stronghold in Syria IS use women as a sensitive approach to indoctrinate families and reestablish the Islamic state which could make a greater impact on human security of everyone. The study is mainly based on secondary and qualitative data in data collection and web sources. In analyzing the collected data, the author found that counterterrorism strategies should not minimize its attention on women in terrorism and improve women imitateness within Islamism to eradicate religious misguidance on which Islamic State use remodeled human security.

Keywords: *human security, Islamic State, radicalization, women in terrorism*

Sustaining Sri Lanka's free health care: Identifying a normative framework of policy analysis

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Sri Lanka's health sector has seen wide-ranging successes and comprises a decentralized health care structure and system that reaches the remotest villages in the country. A hallmark of the sector has been that health care continues to be 'free' and 'accessible'. A consistent limitation in the health policy environment however, is that health policy implementation has been random and sporadic. This has implications for the sustainability of Sri Lanka's free health care, in a context of changing health demographic and disease burden. The current policy of 2016 was adopted 20 years following the policy of 1996, and endorses much of the challenges highlighted previously, without the articulation of a clear policy ethos for the continued and sustained implementation of Sri Lanka's successful free health care system(s). It is contended in this paper that a key lacuna in health policy implementation in Sri Lanka, is the absence of a clear normative foundation on which to formulate health policy. A normative basis for policy formulation will direct more specific and nuanced implementation of health policy, with clear rationale for identifying health priorities. The study takes a theoretical approach to policy analysis, and is primarily book-based. It adopts a multi-disciplinary approach touching on theories of law, public policy, political science and social theory. Credible secondary data is used to highlight salient contextual features that support the theoretical and normative assumptions and assertions of the paper. In conclusion, the paper outlines as a way forward and point of reference, a distinct normative framework for the formulation and implementation of health policy in Sri Lanka. It provides a key rationale for the adoption of the framework, and points to its potential benefits for a more specific implementation of relevant and time-bound health policy formulation.

Keywords: *health policy, normative foundation, sustainable health services*

Predicting heart diseases using machine learning algorithms

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Expenses on healthcare are growing at an overwhelming rate, burdening national and corporate budgets due to asymptomatic diseases including heart diseases. Therefore, trending technologies such as machine learning have been widely used in early detection and treatment processes. The aim of the study was to identify the most significant predictors of heart diseases and predicting the overall risks by using one of the classification models, the binary logistic regression model. Initially, data were gathered through clinical data and medical records of 269 patients in Colombo district from medical centers using questionnaires. However, there were 29 records removed in the data pre-processing. Therefore, 194 males and 46 females were included in the final sample. Data analysis was carried out in Python using Jupyter Lab(Anaconda), an emerging machine learning analytical tool to validate logistic regression. Further, it was evaluated the risk of 10-year heart disease using 15 IVs in this study. The attributes of the data set were selected after a backward elimination process considering the P values which are lower than 5%. Therefore, the logistic regression model is derived through P values of the variables <0.05 (age, totChol, diaBP). Age, total cholesterol and diaBP are the odds of Coronary Heart Diseases(CHD). The model derived can be deemed as more specific than sensitive. Further, the accuracy of the model was tested as 0.73. Moreover, according to the outcome, the model could be improved by using more data.

Keywords: *classification algorithms, data analysis, heart diseases, logistic regression, machine learning*

Students' performance in the G.C.E (O/L) examination in the post-war context in the Northern Province of Sri Lanka

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The Northern Province (NP) of Sri Lanka was affected by the protracted civil war for more than three decades. Before the civil war, NP was leading in the general examinations performance. But in the post war period, performance of students in general examinations has not shown an improvement, especially in the G.C.E (O/L) examination. This study analyses the G.C.E (O/L) examination results of NP with other provinces in Sri Lanka in the pre and post-war context. Secondary data is obtained from statistics reports published by the Department of Examination, Sri Lanka. Descriptive statistics and graphs were used to analyze the data. The study revealed that, in the pre-war era, the percentage of students who passed the G.C.E (O/L) examination in the Northern Province was higher than the national level, while in the post war era it has been reversed. Further, it was found that the percentages of those who passed the G.C.E (O/L) examination within the Northern Province during 2010-2018 shows an inconsistency between the periods and places. There is a significant difference between National figures and the figures from districts of Jaffna and Kilinochchi during the period. However there is a fluctuation in the difference between National figures and the figures from Mannar and Vavuniya districts during the period. The trend of the G.C.E (O/L) performance during 2010-2018 among the national level and Mullaithivu district implies that Mullaithivu is far below than National performance during the period. When compared with zonal and educational division level, NP is far behind in this context. This study would hopefully benefit academics, researchers, policy-makers and practitioners through exploring the students' performance in the G.C.E (O/L) examination, and pursuing strategies to improve the current status of it.

Keywords: *G.C.E (O/L), Northern Province, performance, post-war context, school students*

Teacher preparedness in identifying Dyslexia among young children in the Western Province of Sri Lanka

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Early and proper identification of children with reading disability (Dyslexia) is critical to their success in education, health and overall life. If dyslexia could be identified in the initial school years, they can be evaluated thoroughly for strengths, weaknesses and for a diagnosis if applicable, to go forward with timely remediation and accommodation. The identification process needs resources, knowledge and planned multidisciplinary approach. Among them, primary school teachers are the professionals who are involved with children's education and could screen children at risk. Hence, their knowledge, attitudes and awareness were investigated to evaluate their preparedness to identify children with a reading disability at an early age. Considering Western Province, where most of the resources are available compared to other provinces, a descriptive cross-sectional survey was carried out in all three districts in the Western province. Five schools were randomly selected from each district among all schools which had a primary section. From the primary class teachers, ten were randomly selected from each school to a total of 150, after excluding teachers who taught in special needs classes and teachers who do not teach a language-based subject. Data were gathered with a validated questionnaire with regard to awareness, knowledge and attitude. Individual scores to each domain were calculated and the preparedness was evaluated. Chi square test and binary logistic regression were performed. 81.3% teachers had a knowledge score <50%, 74% of teachers had an awareness score <50%, which were not satisfactory but attitude was comparatively satisfactory (82.7% had a score >50%). Training on special needs education is significantly associated ($p < 0.05$) with preparedness, knowledge and awareness. Knowledge, awareness and attitude strongly predicted ($p < 0.05$) teachers' preparedness to identify children with reading issues. Awareness and knowledge should be optimized in primary school teachers in view of preparing for identification of possible children with dyslexia.

Keywords: *dyslexia, identification, primary school teachers, Sri Lanka*

Empowerment as an approach for women with domestic violence experiences in Sri Lanka

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Domestic violence against women has gained considerable prominence as a major social problem in Sri Lanka. Domestic violence is a deep rooted phenomenon which has a destructive impact on physical and mental health as well as on the quality of life of women in Sri Lanka today. Although several approaches drawn from different theories are applicable in exploring the origin of this social phenomenon, only few studies have examined the effectiveness of psycho-social interventions for both prevention and response to victims of women exposed to violence in a marital relationship. This study examines what interventional approach might be most appropriate in helping women to become safer and in addressing the immediate and longer term consequences of women experiencing domestic violence. The study is based on the theoretical concept of empowerment that originated in social psychology and its application that aims to protect women from domestic violence. A qualitative approach with purposive sampling was adopted in order to understand the dynamics of difficult life situations and the need for both personal support and structural changes in the context of empowerment. In-depth interviews were carried out with women who have suffered domestic violence in the marital partnership context and focus group discussions with experts who are working in the anti-domestic violence movements, who have also played central roles in the creation of community specific programs addressing domestic Violence in Sri Lanka. A tentative model based on appropriateness for addressing Sri Lankan women's coping strategies, coping resources, help seeking, and social support is created from the findings and further research is discussed. Empowerment is understood as an intentional process that includes action of women in gaining power and gaining greater access to social resources with the aim of achieving personal and collective goals for their well-being.

Keywords: *domestic violence, empowerment, psycho –social intervention, well-being of women in Sri Lanka*

The sustainable utilization and exploitation of marine resources in the Indian Ocean

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The Indian Ocean region is considered as a more controversial hub of global geopolitics than other ocean regions due to their marine resources and geopolitical importance. This research will analyse how the marine resources in Indian Ocean region are utilized and exploited in a sustainable manner by using a constructive methodology. The main objective is to investigate the challenges and prospects of the prevalence mechanisms for the protection of marine resources of the region. A qualitative research was carried out by gathering primary and secondary data; the paper examined what the reality is and what can be predicted to happen again under same circumstance. The hypothesis of this research is that by revisiting and moderating the existing architecture of sustainable development mechanisms, the marine resources of Indian Ocean can be utilized in a sustainable manner. Moreover, the Indian Ocean becomes a critical area for power struggles among major powers and global trade and commerce due to its marine resources. As a result, large portions of marine resources are polluted due to the demand on marine resources and long-term supply. Further, as a suggestion, the developing countries in the region, including small islands, should be considered in the Blue Economy framework for sustainable utilization and exploitation. Various state and non-state sectors have already taken actions to ensure economic development and bring all the parties into the transition process, leading to a blue economy. The existing partnerships that were set up by sustainable development mechanisms have not covered all the relevant sectors in the Indian Ocean. Hence, to establish the blue economy of the region, new partnerships should come together and should address the gaps in the legal, administrative, institutional frameworks and strengthen the enforcement of regulations and international regional agreements should be established.

Keywords: *Blue economy, liberal institution, marine resources, sustainable development, sustainable utilization*

Effectiveness of human resource management practices on employee well-being: a case study in a construction organization in partnership with a foreign government

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The main purpose of this research is to investigate the effectiveness of Human Resource Management practices on employee well-being in an organization. The research hypothesizes that human resource practices are in place in most of the organizations and the well-being of the employees is considered a requirement for achievement of set goals and the concern of the organization. This research is focused on the most influential factors on employee well-being of the organization. The survey is based on employees on all levels of an organization which is subject to influences of a variety of stakeholders such as the government, environmentalists, university students, potential investors (local investors as well as foreign investors), professional bodies representing various professions etc. The project had to be interrupted and stopped several times due to the interferences of stakeholders. The investment of the company subjected to the case study is massive and success of the performance of the project company has a direct impact on continuous support that the organization receives from the employees to maintain the continuous growth of the organization. The research team used the “convenient sampling method” and the research team conducted a cross-sectional study. The population consisted of 30 employees and the sample size for collecting information for the survey is also 30 employees. A scaled questionnaire was distributed to selected employees to collect data and the response rate for the questionnaire is 100%. The research team interviewed two main officers of the Human Resources Team to understand the operational side of Human Resource practices in the organization concerned. Data analysis is done using appropriate quantitative and qualitative techniques. The knowledge gained through the research has contributed to the organization which this research was based on. Finally, recommendations are suggested to the management of the project company.

Keywords: *employee well-Being, employee performance, human resource practices, organization*

A Neoclassical Realist approach to China's future relations in the South Asian Region

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China has asserted itself as a South Asian state by showing a keen interest in its affairs. China's stance indicates that it respects the sovereignty and territorial integrity of countries and is not favorable towards involving themselves in the domestic affairs of other countries. However, China's current relations in the South Asian region are facing a predicament as there is a possibility of some national governments and their domestic constituencies not favoring China's policies in their countries. Stemming from a Neoclassical Realist lens which underscores the importance of state-society relations in the foreign policy-making of a country, this article analyses the reasons as to why national governments and their domestic constituencies, especially in the South Asian region may have these perceptions and also what type of policies and practices have led to this opposition. The primary objective of the study examines how China's relations in the South Asian region can be improved in order to create a better image. Following the case study method, the research was conducted with publicly available data. The methodology utilized, examines how the public from Myanmar, Pakistan and Sri Lanka have influenced each of these countries' foreign policy-making towards China. It was found that China's foreign policy executive needs to be conscious that the people of South Asia are currently assertive about their governments' policy initiatives, thus requiring a more conscientious approach. China must be mindful that these concerns could also affect the future of the Belt & Road Initiative. In conclusion, when analyzing the South Asian states' external relations pertaining to China, it can be established that these states will attempt to be more vociferous in their interaction and relations. Hence, China should calibrate its diplomacy to suit modern day requirements so that it does not alienate other countries.

Keywords: *Belt & Road Initiative, China, foreign policy, Neoclassical Realism, South Asia*

Challenges of Small and Medium Enterprises in the Information Technology and Business Process Management (IT-BPM) Industry

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The information technology and business process management (IT-BPM) industry is one of the fastest growing industries in Sri Lanka. The industry vision is to reach USD 5 billion exports revenue by 2022. IT-BPM is a knowledge based industry which has infinite potential to grow in the global market which makes it different from many other industries. Small and medium enterprises (SME) development initiatives have been introduced by various stakeholders and SMEs are given high priority in their support programs. However, exports revenue numbers reflect that, IT –BPM SMEs have failed to grab the global market opportunities due to various reasons and challenges. This research aim is to identify the challenges encountered by the SMEs in the IT-BPM industry in achieving firm growth. Force field theory has been used to develop the conceptual framework of the research. Qualitative techniques such as secondary data obtained from literature review, key informants interviews (KIIs) with industry experts and focus group discussion (FGD) with IT-BPM industry SMEs has been used to collect data. 20 IT-BPM industry experts were selected from policy making authorities, SMEs and representatives of industry associations such as FITIS, SLASSCOM, SME Eco-system builders by snowballing sampling technique. Grounded theory has been used for data analysis. Study concludes that, lack of access to finance; lack of entrepreneurship training and development; lack of innovation capability and resources; lack of support from the government; lack of infrastructure; getting access to new markets; as challenges to the IT-BPM industry SMEs which are common to other sectors as well. Due to specific characteristics of IT-BPM SMEs, they face industry specific challenges such as country branding gap, lack of long term country vision for IT, getting access to quality HR, and limited market intelligence.

Keywords: *challenges of IT-BPM Industry, challenges of SMEs, Small and Medium Enterprises, IT-BPM Industry*

FACULTY OF LAW



Health and Well-Being: The Law's Response

29 November 2019

**MESSAGE FROM THE DEAN
FACULTY OF LAW**

Prof. W. Indira Nanayakkara



On behalf of the Faculty of Law, I take immense pleasure in forwarding this message on the occasion of the Annual Research Symposium of the University of Colombo.

The theme of the Faculty of Law conference, 'Health and Well-Being: The Law's Response' is significant in today's context as health, its regulation, and non-regulation have impacted many facets of modern human life. The involvement of the field of law is ever changing and impactful in this respect. The research submitted for presentation at the symposium covers a wide range of topics from law's necessity in ensuring cyber well-being of human beings to right to live and die in a dignified manner.

The Annual Symposium is an occasion where the Faculty celebrates its long-standing tradition of legal research and showcases its research potential. Similar to every year, the Faculty is intending an academic exchange on increasingly relevant and current legal issues related to Sri Lanka and those which transcend its borders. The Faculty of Law further looks forward to sharing its research output with the legal community and other stakeholders. The insights they receive will help them to raise the standard of review, critical deliberations, and aid in producing cutting-edge research that provides the basis for law reform. The Faculty of Law, this year, submits abstracts of its staff members for this publication under the theme *Health and Well-being: The Law's Response* in keeping with the overall objectives of the university Symposium. The theme underlies the fruition of the vision of the academics at the Faculty of Law, University of Colombo, to explore aspects of law and their impact on areas which have a direct bearing on the socio-economic realities of Sri Lanka. I am certain that the presenters, discussants, and participants will have an academically rewarding, enriching experience, and a fruitful exchange on intellectually stimulating content.

FACULTY OF LAW

PROGRAMME

29 November 2019

Venue: FGS Auditorium (Old Building)

1.45pm – 2.00pm	-	Arrival of the Guests and Invitees
2.00pm – 2.10pm	-	Lighting of the Oil Lamp
2.10pm – 2.15pm	-	National Anthem
2.15pm – 2.20pm	-	Introductory Video
2.20pm – 2.30pm	-	Pooja Dance
2.30pm - 2.40pm	-	Welcome Address by the Dean
2.40pm - 2.50pm	-	Address by the Vice Chancellor
2.50pm – 3.10pm	-	Speech by the Chief Guest
3.10pm - 3.15pm	-	Introduction of the Keynote Speaker
3.15pm – 4.00pm	-	Keynote Speech
4.00pm – 4.20pm	-	Valedictory Address
4.20pm – 4.25pm	-	Vote of thanks by the Conference Chair
4.30 pm – 5.00pm	-	Refreshments

INTRODUCTION TO THE KEYNOTE SPEAKER

Prof. Naganathan Selvakkumaran

Head, School of Law, SLIIT



Professor Naganathan Selvakkumaran, LLB (Hons), MPhil in Law and Attorney-at-Law, is the Founding Professor and Head of the School of Law at the Sri Lanka Institute of Information Technology, Malabe. Before joining the School of Law, he retired from the University of Colombo after a distinguished career of over four decades as an academic, having joined the Faculty of Law in 1975. He held various administrative-cum-academic positions at the University of Colombo, including the Dean of the Faculty of Law for twelve consecutive years.

He is a Member of the Constitutional Council of Parliament, as one of the three non-Parliamentarians who represent civil society. He was accepted unanimously by Parliament to be a Member of the Constitutional Council and appointed by His Excellency the President. He is also a Member of the Law Commission of Sri Lanka. Professor Selvakkumaran serves as a Senior Legal Advisor to the University of Colombo and the University of Jaffna.

He was a former Member and Chairman of the Official Languages Commission, a Member of the Human Rights Commission of Sri Lanka, a Member of the Council of the Open University of Sri Lanka and a Member of the Sri Lanka Foundation Institute. He also served as a Member in various statutory Boards, such as the Board of Management of the Postgraduate Institute of Medicine, the Postgraduate Institute of Indigenous Medicine, the Postgraduate Institute of Agriculture, the Postgraduate Institute of Humanities and Social Sciences, the Institute of Human Resource Advancement, the National Council of Elders. He was also a Member of the Presidential Committee of Inquiry into the Local Government System in Sri Lanka. He served as a Consultant to the National Integration Programme Unit under the then Ministry of National Integration and Ethnic Harmony. Although he was invited to be a Member of the first Right to Information Commission of Sri Lanka, he declined to accept the position offered by His Excellency the President on the grounds that he was

a public officer at that time which impeded him from accepting such a post both legally and ethically.

Professor Selvakkumaran specialized in the field of Public Law – both Constitutional Law and Administrative Law – in which area he was awarded the Degree of Master of Philosophy. He has been a committed and dedicated lecturer and researcher. He has written widely on these areas and he has been an excellent communicator. He is well respected by the members of the legal profession and others due to his legal scholarship, professional integrity and moral rectitude.

Health and Wellbeing: The Law's Response

Prof. Naganathan Selvakkumaran

Head, School of Law, SLIIT

‘Health and wellbeing’ of the individual, the community, the people or the State will be relative and subjective, as one tries to understand their meaning. They are not susceptible to any precise definition, though there could be different shades of meanings and a generalized understanding of them. As such, the law’s response to ‘health and wellbeing’ will naturally be varied and diverse; it will depend on the specific category of whose health and wellbeing one is trying to reflect on.

The focus of this address will be on the question of health and wellbeing of the State of Sri Lanka from the standpoint of Public Law of the country. One cannot claim that the state of health and wellbeing of the country, in a metaphorical sense, is robust or vibrant! There is much to be desired of their state.

It is not that the country does not have laws to ensure a desired state of health and wellbeing of Sri Lanka. Save the Constitution we inherited at the time of independence, our home-made Constitutions – both the 1972 & 1978 – displayed a penchant for heaping on enormous and unlimited powers either on the Legislature or on the Executive and thereby paying lip-service to the concept of constitutionalism. However the 19th Amendment to the present Constitution brought about certain desirable changes to reign in the unbridled Executive Presidential system that was introduced by the 1978 Constitution.

But the main cause for concern is not the lack of adequate laws, but the laid back, lackadaisical, inefficient and improper approach to effectively enforcing the existing laws in the country. While there are a few systemic structural issues which contribute to the lack of wellbeing of the State, there are many enforcement and/or implementation issues which undermine it. The address will attempt to highlight how the provisions of the Constitution and laws are observed in the breach and scant respect is paid to upholding their spirit and substance, thereby undermining the rule of law. Although there has been a glimmer of hope, now and then, emanating from the

highest court of the land, it has not been consistent and as a result, fails to inspire confidence in the minds of the people.

Although constitutional attempts have been made to de-politicize the public service and the police service as well as to insulate some important institutions and offices from the political influence of the executive, their achievements are a far cry in actual practice.

FACULTY OF LAW

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Bargaining beauty: The law's response to regulate the beauty industry in Sri Lanka

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Medical technology has affected the beauty culture industry in the means of cosmetic procedures. There are mainly two types of cosmetic procedures: surgical and non-surgical. Although it is difficult to obtain statistics, a growing number of web advertisements suggest that the demand for non-surgical cosmetic procedures in Sri Lanka is increasing annually. This is mainly due to the influences made by social media, social trends and a culture of celebrity idolizing. This could mislead the general public since there are no filtering mechanisms on web advertisements and social media platforms. Though well-being is not recognized as a right, the unregulated practices of the beauty culture industry in Sri Lanka has created a wide freedom with regard to interpreting a right to health and well-being which potentially captures an entitlement to be beautiful. Although there are laws such as National Medicines Regulatory Authority Act No. 5 of 2015 to register drugs and cosmetics, there is no system to register 'beauty culture' practitioners. Moreover, the Consumer Affairs Authority Act No. 09 of 2003, Product Liability Law and common law development are insufficient to address the complex issues pertaining to the subject. Wrongly administered non-surgical cosmetic procedures could cause serious damage such as blindness, paralysis and skin necrosis. The purpose of this research is to suggest a regulatory mechanism that can apply to non-surgical cosmetic procedures in Sri Lanka. For this purpose, the research will address the following: (i) reasons and trends behind non-surgical cosmetic procedures (ii) existing remedies for flawed non-surgical cosmetic procedures and (iii) the need to have a regulatory mechanism. The research will be based on an analysis of existing domestic and foreign legislation, academic articles, case law and reports by recognized organizations/institutions, mainly in Sri Lanka, USA and the UK. In conclusion, the research will recommend a suitable regulatory mechanism on non-surgical cosmetic procedures in Sri Lanka.

Keywords: *medical technology, non-surgical cosmetic procedures, right to health and well-being*

Protecting the right to privacy for digital well-being: a critical analysis of the proposed personal data protection bill in Sri Lanka

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Digital communications technologies have invaded our day to day lives through internet, mobile smartphones and Wi-Fi enabled devices. This has resulted in real time communication through innovations in communications technologies which have enhanced the exercise of freedom of expression and access to information in the digital world. In addition, digital technologies have contributed towards the advancement of democratic participation by facilitating global debates and expanding the capacity of stakeholders, including governments and other non-state actors, and enabled them to conduct surveillance, interception and data collection. Thus, this has created an environment which makes social life not only vulnerable to mass surveillance but also induces people to become a part of it, without their independent consent. Article 12 of the UDHR and article 17 of the ICCPR provides the right to privacy, which includes freedom from arbitrary or unlawful interference with his or her privacy, family, home or correspondence, and unlawful attacks on his or her honour and reputation. Sri Lanka is yet to recognize the right to privacy as a fundamental right. However, Sri Lanka, as a member of the UN and a state party to ICCPR, arguably has an obligation towards upholding this right for its citizenry. Attempts to enact a piece of legislation to regulate personal data protection in Sri Lanka is currently in progress. This qualitative research paper primarily attempts to examine the framework for the proposed personal data protection bill in order to identify its potential to cater to the requirements of Sri Lankan society, in the digital era. This examination is based on the basis of principles of human rights law, legal and moral reasoning, and theoretical developments related to the right to privacy.

Keywords: *digital well-being, personal data protection, proposed framework, right to privacy*

Intricacies of fault based liability in medical negligence litigation in the 21st century: The case of Sri Lanka

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Among numerous civil wrongs captured within the complex legal framework governing law of Delict in Sri Lanka, medical negligence litigation stands prominent from patients' point of view as well as from the point of view of medical professionals. From patients' point of view, medical negligence litigation plays a decisive role in shielding life. Conversely, from the point of view of the medical professionals, it is rather a responsibility which leaves no room for potential human errors. Despite its significance compared to other delicts, medical negligence disputes in Sri Lanka are principally adjudicated through civil litigation where, the orthodox adversarial system of justice is preserved. This system has subjected the litigants to confront its inherent complications such as law's delays, exorbitant costs-and uncertainty of justice which have resulted in further victimization of the victims of medical negligence. Thus, for years, the necessity of wiping out the conventional adversarial system of justice which corresponds with the fault based liability system in medical negligence litigation has been a concern of many countries. As a result of vexed legal practices, implementation of a non-fault compensation system that would permit compensation to be granted without having to prove the fault on the part of the medical personnel developed as an alternative method to medical negligence litigation. Contemplating the intricacies of fault based liability and potential obstacles in proposing a no fault liability concerning Sri Lanka, the research seeks to determine to what extent the current practice pertaining to medical negligence litigation can be understood as a pathway to justice. The chosen topic is assessed through a philosophical approach underscoring the importance of distributive justice which predominantly highlights the role of society and community's responsibility while advancing corrective justice only as a supplementary measure which is concerned with personal responsibility.

Keywords: *adversarial system, fault based liability, medical negligence, non-fault compensation*

Unsafe, unhealthy and unequal: examining bullying and harassment experienced by schoolteachers within the context of ‘right to equality’ in Sri Lanka

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Although several measures have been taken to prevent bullying and harassment of students in schools, little or no consideration was given to protect teachers from such unhealthy and unsafe workplace behaviours. Explicit and implied workplace hierarchies built on informal human resources management structures continue to control the employee relations in schools, while meagerly adequate policies are rarely applied or disregarded altogether, creating an environment where unhealthy or unsafe behaviours perpetuate. Referring to the instruments which regulate the employee relations in the school system, this article attempts to define bullying and harassment within the existing right to equality provisions of Sri Lanka. In particular, this paper explores the parameters of Article 12 of the Constitution to lay a foundation to construct a remedial logic for individuals aggrieved by workplace bullying or harassment, while referring to the conceptual underpinnings of anti-bullying and anti-harassment laws in other Commonwealth legal systems.

Keywords: *bullying, harassment, schools, Sri Lanka, workplace*

Right to recall for the well-being of a country: a critical review

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Decision-making power in a democratic society always lies with ‘the people’ and is bounded with the idea of sovereignty. It is entrusted to representatives of their own choosing, for defined purposes and for a specific time period as determined by the constitution or legislative enactments. Arguably, whenever that power is exercised contrary to people’s wishes, such acts in and of themselves form a sufficient ground for those representatives to be recalled before the end of their term in office. At present, countries witness a constant rise in unethical and irresponsible behavior on the part of the elected public representatives. Right to Recall (RTR) can be introduced as one of the main mechanisms to address such issues. RTR in simple terms is a process by which the electorate is granted the power to ‘recall’ elected officials before the expiry of their term of office by filing a petition. It is considered as one main facet of direct democracy and its origin can be traced to Athenian democracy. RTR is present in various jurisdictions across the world. For instance, RTR is practised in countries such as the United States, Canada, Venezuela, Philippines, and Switzerland. Presently, many other countries are also attempting to introduce a recall system at the national level while some utilize this mechanism at least at their local government levels. This qualitative research aims to explore the viability of introducing RTR for the well-being of a country highlighting the strengths, weaknesses and challenges of the same. It is argued that introducing RTR to a country could be a feasible, but radical reform.

Keywords: *accountability, corruption, direct democracy, right to recall, well-being*

University as an entrepreneur: the role of universities in today's global economy

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Today, universities are expected to join forces with the private sector as they are expected to make a tangible contribution to the society. Universities are expected to contribute to economic development through investments in R&D, enhancing technological developments in the domestic industry. Attempts to commercialize university research outputs and laboratory products and processes may be technologically accurate and sound in theory; however, this output may lack marketability and this reality is now in the minds of many policy makers in developing countries. Hence, the existence of useful research results which remained unused due to the absence of a pro-active policy to transfer such results to industry can be minimized, if commercialization of research within an effective intellectual property protection mechanism can be suitably adapted to the legal regime of a country. This research paper critically evaluates the extent to which some intellectual property concepts can be utilized to enhance university - industry relationships and commercialization of research works in the market. However, up to recent years, many developing countries were faced with the reality that university academics have attached far greater importance to writing academic papers and having them published in leading scientific journals/ publications than seeking patent protection for their innovative ideas or inventions or transferring this new technology to private industries for the purpose of commercialization or marketing the invention. Hence, the importance of having this university - industry relationship can be justified in many respects. This research aims to understand the possibilities of enhancing the effectiveness of research and inventions in universities through an effective university - industry relationship (U-I Relationship) which can be created by applying an effective intellectual property policy.

Keywords: *commercialization, entrepreneurship, innovation, intellectual property*

**Steps for a journey ahead: Towards a healthy employer-employee relationship
in an information society**

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Technological advancement and its developments over the past centuries have effected many changes to the lifestyles of humankind. In the field of law, the law of employment, within which the relationship of employer-employee is regulated, has undergone tremendous changes due to the structural advancement of information technology. However, despite these changes, it is important for a State to protect and enhance a healthy relationship between the employer and employee through rules and regulations, as it is considered to be a stressing economic factor. Therefore, this research paper analyses whether and to what extent the prevailing rules, regulations and practices enhance healthy workplace practices in the modern era of information. The paper mainly focuses on where the law is silent with respect to the emerging modern workplace issues in terms of the existing regime of employment law in Sri Lanka. This analysis is undertaken from comparative legal experience in the United States, Singapore and United Kingdom. The choice of jurisdiction is based on the development of existing laws in relation to an information society. The research adopts a qualitative study of the relevant materials. As it is time to think out of the box, the research concludes that a policy change through interpretation and legislation is needed for the enhancement of healthy employer-employee relationships in today's information society.

Keywords: *Employer-employee relationship, information society*

**Bridging the gaps between economic development and sustainable development:
prospects and challenges in the legal system of Sri Lanka**

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Economic development brings higher welfare to the present generation where sustainable development aims to achieve development to meet the needs of the present generation, without compromising the needs of future generations. Developing countries are most concerned about economic development and Sri Lanka is not an exception to this. Foreign Direct Investment (FDI) and industrial activities play important roles in economic development in Sri Lanka. When development activities take place through FDI and industrial activities, concerns of environmental protection should be emphasised to ensure the well-being of the present and future generations. Destroying natural resources by over-utilization and improper usage and polluting the environment for economic development affect sustainable development. The National Environmental Act (NEA) plays an important role in protecting the environment through the Environmental Protection License (EPL) and the Environmental Impact Assessment Report (EIA) in industria and other activities as well as projects prescribed in the gazette. These requirements vary greatly in procedure and practice, and, as a consequence cause a gap between economic and sustainable development. This is a particular problem and this article explores and aims to analyze the procedural and practical gaps of EIA and EPL requirements in Sri Lanka. The Public Contracts Act of Sri Lanka applies to all State contracts where the cost of the contract exceeds five million. There is a threat to the environment where the contracts formulated under this Act do not fall under the prescribed list of EIA or EPL. A well developed approach can be identified in the Public Contracts Regulation 2015 of the UK, which provides provision to ensure environmental management standards in public contracts. This paper concludes with recommendations drawn from the UK and Nepal applied to the existing legal framework of Sri Lanka to achieve sustainable economic development by considering the well-being of the present as well as that of future generations.

Keywords: *economic development, environmental impact assessment, environmental protection license, foreign direct investment, sustainable development*

Assuring health and wellbeing beyond humankind: A legal proposition to move from an anthropocentric approach to right to health to a right to health inclusive of nature

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Right to health and wellbeing have often been perceived through an anthropocentric viewpoint, which emphasizes the necessity of preserving the health of the environment for the benefit of humankind. This perception seems rational since the Constitutional safeguards of fundamental rights are often intended for human beings and therefore, by its very nature, anthropocentric. However, when the intrinsic and undeniable link between human health and wellbeing and the health of the natural environment are taken into account, particularly in the context of the growing emphasis on the necessity to address climate change issues in order to ensure the continuous survival of human beings, an anthropocentric approach to right to health can no longer be justified. Therefore, this research analyses how legal proposition can be moved from the anthropocentric approach to right to health, to a right to health inclusive of nature. This is known as ecocentrism. The research was carried out using the black letter approach of research based on Constitutions, legislations, judicial decisions and international conventions as primary sources and books with critical analysis, journals, theses and electronic resources as secondary sources. The research proposes that right to health shall find a fair balance between anthropocentrism and ecocentrism and applauds the expansion of the rules pertaining to *locus standi* towards environmental objects adopted in the jurisdictions of India and New Zealand as an effective legal development in deeming human beings not as the central concern, but as a part of a wider concern to ensure the health of the planet and its components.

Keywords: *anthropocentrism and ecocentrism, environmental rights, right to health and wellbeing*

The impact of the gender digital divide on women in Engineering and Technology: The law's response

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The gender digital divide is currently acknowledged as a factor that militates against the advancement of human rights. Affecting women's ability to realize their full potential, this technology related divide disincentivizes the effective participation of women in the fields of Technology, Engineering and Mathematics. In 2017, the United Nations Human Rights Council identified the gender digital divide as causing the gender gap which disadvantages women by perpetuating inequality and discrimination. Recent statistics on the digital landscape of Sri Lanka signals that the gendered divide in access to and use of information and communication technology could eventually lead to a lesser number of women studying, researching, working and leading in the stated fields. As such, the gender digital divide impacts the socio-economic wellbeing of women as well the economies which they are part of. This research focuses on Sri Lanka's case of low female representation in the fields of technology, engineering and mathematics. The issue has not drawn adequate attention locally, despite significant female achievements in literacy and employment but disproportionate and continuing low female participation rates in the stated fields. Significantly low numbers of female enrollment in Engineering and Computer Science was observed during the past three years; nevertheless, the state claimed to be disinterested to intervene. Based on the gender digital divide in Sri Lanka, this research analyses how the gender digital divide hinders women's rights and access to STEM fields, leading to perpetuate other social factors such as stereotyping and mistrust in female expertise in these fields. A human rights-based approach is adopted to highlight that the current policy-based interventions are insufficient and slow moving. Drawing from the international discourse around law and development and comparative perspectives, this research urges for and proposes legislative remedies to address the gender digital gap.

Keywords: *gender digital gap, law reforms, policy, women's rights*

Quantifying damages for mental pain and suffering in dependent's action: Some thoughts for a comprehensive framework

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The legal anomaly fostered by the Supreme Court in *Priyani Soysa v. Rienzie Arsecularatne*² as to whether damages for mental pain and suffering in dependent's action could be awarded, has now been resolved. The decision of *Palamandadige Lalitha Padmini Fernando v. Ceylon Tobacco Company Limited*³ and the Recovery of Damages for the Death of a Person Act⁴ have shed light on the recognition of mental pain and suffering - a form of non-patrimonial loss. Neither the judiciary nor the legislature however, provide a yardstick for the assessment of damages of this nature, and yet again, leave the component of assessment of damages unattended. This paper attempts to discover a suitable framework for the provision of damages for mental pain and suffering in dependent's action. For this purpose, questions concerning the objectives for awarding damages for pain and suffering, factors influencing the quantum of damages, and the potential methods to derive the quantum of damages are explored. Examination of decided cases reveals that the actual impact - diminution of health condition - brought in to the victims' life is often forgotten or neglected during the phase of quantifying the damages for this type of loss. For the assessment of damages concerning such losses, the Sri Lankan judiciary uses its discretion to arrive at an amount that is referred to as an 'equitable assessment'. What is meant by an equitable assessment has not been clearly laid down anywhere. This could therefore be deemed as vague terminology, influenced by subjective judgments that address the issue related to quantifying damages. This study thus argues that the interface with health economics must be drawn on in the above respect. Health indicators such Quality Adjusted Life Years (QALYs), Value of a Statistical Life, and Value of Statistical Life Year are analyzed for the purpose of determining the quantum of damages with precision.

Keywords: *dependent's action, mental pain and suffering, quantum of damages*

² 2001 (2) SLR 179

³ S.C. Appeal 102/2009 decided on 14 June 2018

⁴ No. 2 of 2019

Medical intent and the response of the Law of Delict and Tort Law

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Liability for negligence and intentional wrongdoings in medical cases are two separate issues. Both are considered as a part of professional misconduct. However, intentional acts involve desirous, willful and frolic actions. The latter is considered more seriously in the modern legal systems, in comparison to negligence. Mental states are generally difficult to prove. Sometimes, the effort of the plaintiff in establishing the intention may not tally with the legal remedy which is gained at the end. Therefore, patients are not interested in suing doctors for their intentional acts. However, intentional acts of a medical practitioner may affect the patient in two ways. On the one hand, the doctor may have intentionally violated the physical integrity of the patient which also involves the patient's privacy. On the other hand, intentional invasion of the physical and mental integrity of a patient is a 'trespass to the person'. Both acts are unlawful and should be tested separately, depending on the approach of the legal action. Violation of physical integrity and privacy must be analysed in all contexts. Both may occur where the patient has not consented to proceed with a treatment or surgery. 'Consent' is a valid defence to intentional acts. 'Valid consent' in a given case, is an issue of concern. Generally, intentional acts are not covered by insurance policies. Within this background, this article examines the scope of the delictual action for intentional acts in medical cases and its applicability in case law and statutes. The study contains a comparative study of Roman Dutch law as prevailing in South Africa, English law and Australian law with Sri Lankan law.

Keywords: *assault, consent, intentional acts, medical cases, trespass to the person*

The right to a clean and healthy environment: The way forward for Sri Lanka

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The right to a clean and healthy environment is an essential prerequisite which enables the full enjoyment of other human rights. Although it is recognised under international instruments, Sri Lanka, including many other countries, has not recognised it constitutionally or through other legislative enactments. As a result, it is difficult to claim this right when State parties' response is poor in relation to the domestic curbing of environmental pollution. There are three approaches applied by different jurisdictions in the world in recognizing this right: as a constitutional right, by recognizing this right within a specific legislation and through judicial interpretations. Even though Sri Lanka belongs to the third category, the judiciary rarely recognises the right to a clean and healthy environment. Therefore, this research seeks to analyse how the right to a clean and healthy environment has been interpreted under international instruments and to evaluate Sri Lanka's response thereto. This research uses qualitative methods: the analysis will be based on sources such as the Constitution, statutes, and international instruments. Moreover, three judicial decisions, namely *Bulankulama and Six Others v. Minister of Industrial Development seven others* (2000), *Watte Gedera Wijebanda v. Conservator General of Forests and others* (2006), and *Ravindra Gunawardena Kariyawasam v. Central Environmental Authority & others* (2019) will be analysed to assess how the Sri Lankan judiciary has interpreted the right to a clean and healthy environment. The other key argument is that, even though the right to a clean and healthy environment has become a globally recognised right, it has not at present been recognised in Sri Lanka as such.

Keywords: *human right, rights to a clean and healthy environment, Sri Lankan context*

**Moving beyond policy to justiciability:
In support of the right to health as a fundamental right in Sri Lanka**

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Sri Lanka has a universal public healthcare system free at the point of delivery, supplemented by private health care. There is a common assumption by the public that health is a constitutional right in Sri Lanka; but in fact, it is not constitutionally enshrined nor protected under any statutory law, being merely a longstanding State *policy* on free universal health-care. The right to health is not justiciable since there are no direct legal remedies from courts or tribunals if there is a violation of the right. This paper is an analysis of existing legal standards, expert opinion, public opinion, and policy analysis, to argue that any reform of the fundamental rights chapter of the Sri Lankan Constitution should include a provision on the right to health. The ideological divide between civil and political rights as being justiciable, and economic, social, and cultural rights such as right to health being merely aspirational, is a legacy of the Cold War period which lives on in the neo-liberal position that denies statutory and constitutional recognition to the right to health. Some of those involved in the proposals for a new Constitution from 2015 onwards continue with this debate. However, the experiences of States which included the right to health in their constitutions and whose constitutional courts dealt with cases on the topic have convinced even those who originally did not support justiciability of social and economic rights, of the importance of its inclusion as constitutional rights. The UN Rapporteur on the Right to Health has highlighted the importance of such “transformative constitutionalism”. The national policy on health that Sri Lanka has followed since even before independence, has taken a specifically non-market approach to health, and an extension of this policy position would be in support of the right to health as a constitutional fundamental right.

Keywords: *constitution, fundamental rights, justiciability, reform proposal, right to health*

Third world countries and sustainable tax governance with special reference to Sri Lankan Income Tax Law

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Fiscal transparency and sustainable tax governance in developing countries is of utmost importance to protect the tax base, increase tax revenue and to promote economic development and tax justice. States are dependent on tax revenues, because it is a part of society's distributive mechanism, balancing income inequality, financing government expenditure and helping with the regulatory objectives of economic development. With respect to Sri Lanka, it is revealed through almost all data sources that almost 90% of revenue comes from taxes, of which 80% comes from indirect taxes and only 20% come from direct taxation. The major reason for the above percentage is the narrowness of the tax base. In addition, there are a number of reasons for the decline in tax revenue in Sri Lanka. The most important and relevant are the complexity in income tax laws and the unplanned ad hoc tax incentive exemptions, tax holidays, reliefs, duty waivers, tax evasion, many discretionary tax measures in operation, a weak tax administration, etc. They have eroded the tax and fiscal base, with the resultant loss of revenue estimated at over 1% of annual GDP. Against this background, this paper highlights the urgency of having a strong tax system in Sri Lanka and the need for establishing a fair and efficient system of income taxation, including efforts to fight against tax evasion and tax avoidance. A State would be able to meet sustainable tax governance by having a thorough, well-developed tax law regime and proper tax administration. Therefore, the current study aims to review certain aspects of income taxation and propose ways to achieve sustainable tax governance in Sri Lanka.

Keywords: *economic development, fiscal stability, sustainable development, tax governance, tax justice*

A new breed of night workers: the Sri Lankan law's response to the impacts on health and wellbeing of night workers.

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Structural changes in the working hours and working culture in the technological era have increased the number of workers engaged in night work. Although night work has responded to a variety of technical and socio-economic issues, it has also made an adverse impact on workers' health, safety, and work-life balance. Thus, this research aims to explore the gaps in Sri Lankan Law relating to night workers in the light of health and wellbeing of such workers and attempts to recommend appropriate measures to advance the same. This research is conducted as a literature review based on primary and secondary sources using the mixed methods approach. The international standards adopted by the International Labour Organisation (ILO) prior to the 1990s do not, in particular, deal with this issue. The Night Work Convention (C171) recognised the importance of regularising working culture in response to the health needs of such working community. Nonetheless, Sri Lanka, not being a signatory to this Convention, does not have the international obligation of implementing the same. However, it does not exclude the duty to respond to the needs of the local working community. Although fewer laws identify the term 'night work' in Sri Lanka, none of them, in particular, deal with the said issue. Moreover, the insufficiency of statistics and medical researches pertaining to the health status of night workers in Sri Lanka also impact law's response. Therefore, the author recommends to make necessary changes in existing law and also recommends to enact a new legislation including strategic measures to regulate and balance the working culture by analysing the strategies used in the laws of few other selected countries to accommodate the constructive needs of both national economy and health and wellbeing of the night working community.

Keywords: *health and wellbeing, health effects, international labour standards, night work, working culture*

A reflection on the Chunnakam Power Plant Case in the light of healthy environment

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In *Kariyawasam v. Central Environmental Authority* case known as *Chunnakam Power Plant Case*, a thermal power plant owned by a company discharged petroleum wastage and caused water pollution. State authorities failed to implement the provisions of the National Environmental Act to control the pollution. A public spirited citizen filed a public interest case for violation of fundamental right by the inaction of State authorities. The Supreme Court recognized the *locus standi* of the Petitioner even though the residents of the area have not been included as Petitioners. The Supreme Court expanded the scope of fundamental right to equal protection of the law in Article 12(1) by combining the directive principle in Article 27(14) which obliges the State to protect the environment with a view to preventing violation of fundamental rights. The Supreme Court analyzed many reports and considered the complaints of the residents and introduced the ‘common sense approach’ to hold the liability of the Company for the pollution. The Company is not an agency or instrumentality of the State. However, the Supreme Court held that it would not affect the jurisdiction of the Court to make an Order against the Company to remedy the loss or damage caused by the pollution. The Supreme Court ordered the Company to pay compensation based on the ‘Polluter Pays Principle’. The decision creates a precedent to hold non-State actors responsible for pollution in fundamental rights cases. The case has made a significant contribution to the development of environmental jurisprudence in Sri Lanka in the absence of a specific provision for environmental right in the Constitution.

Keywords: *compensation, inaction, pollution*

Financial well-being of companies: a critical analysis of Corporate Finance Law

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Corporate finance is said to be the centre point of corporate law. A company needs finances for it to commence and run the business. The rights, duties and obligations of the parties relating to finance arise thereafter when the business activities of the company kick off and the business is on track. Statutory provisions as well as the concepts of common law govern the law relating to corporate finance. Such statutory provisions include many mandatory requirements that impose duties on those who manage companies in order to safeguard various stakeholders. However, corporate finance is a mystery for many. This is because it is not easy to understand the law relating to allotment of shares, consideration for shares, stated capital, reduction of capital, solvency test, distribution, debt finance, financial accounts, group accounts and the role of directors and auditors in these aspects. Over and above these provisions, there exists the concept of capital maintenance. The general public invests in companies without understanding the technicalities of corporate finance law, although corporate finance is primarily concerned with maximizing shareholder value. The volume of public investment in companies is not on the increase, and it may be due to this reason that corporate finance is a mystery to laymen. It means that the stability of the company in which they invest is never understood by the investors who burn their hands when the company collapses. This research therefore focuses on the fact that the existing laws relating to corporate finance are too complex and technical. It is found that such complexities are beyond the understanding of an ordinary investor. Such complexity discourages people to invest in companies. Therefore, it is important to develop a user-friendly mechanism regarding matters connected with corporate finance law. It will not only contribute to the well-being of companies but also help countries to boost their economy. This research is primarily based on secondary resources while primary data is also obtained.

Keywords: *corporate finance law, corporate solvency, financial well-being*

Complying with human rights while countering terrorism: An analysis of legal responses to the Easter Sunday attacks in Sri Lanka

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With terrorism reappearing in Sri Lanka consequent to the 2019 Easter Sunday bomb explosions, the need to counter terrorism has also resurfaced as a key priority. The old debates on the conflict of interests between the need to maintain security and to protect people's freedom and rights emerged. This research examines the relevant international and domestic counter-terrorism laws and selected human rights subject to counter-terrorism measures with a special focus on the contemporary Sri Lankan debates on Prevention of Terrorism Act and the Counter-Terrorism Bill. This is a qualitative research that emphasizes the need to comply with human rights while countering terrorism. This paper argues that both objectives can be achieved by respecting the rule of law, paying due care, and refraining from using arbitrary power. Counter-terrorism measures should not be a justification to derogate from human rights protection. Protecting the non-derogable rights without limitations and upholding the other fundamental rights with minimum limitations is paramount. The need for a strong State, which has the capacity to encapsulate both interests together, is emphasized. States must ensure that any measures taken to combat terrorism have complied with their international treaty law and customary law obligations. Sri Lanka, in the aftermath of the blasts, should issue stringent guidelines to the law enforcement officials to follow; when arresting, interrogating and detaining the suspects of terrorist activities, minimize the chances of personal liberties from being infringed. Reforms are a must, but it should not weaken the security in the country.

Keywords: *countering terrorism, human rights, legal responses*

Competition law as a tool for promoting consumer well-being

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The ultimate goal of both consumer and competition laws is to enhance consumer well-being. Competition law focuses more on the supply side of the market and ensures that consumers have adequate choices of goods and services at affordable prices, while consumer law deals with demand issues and ensures that consumers can enjoy their rights efficiently. The objective of this paper is to examine whether the existing laws regulating market competition in Sri Lanka can be considered as an adequate tool for extending the scope of consumer protection and to re-shape the existing laws for consumer well-being. The question arises as to how these two sets of laws can interact with each other to promote fair market competition, in order to enhance consumer welfare. To answer this question, the paper analyses how these two function as two sides of one coin and may deter anti-competitive practices. It highlights the complementary nature of the two laws in promoting market competition and enhancing consumer welfare. The paper analyses competition law as one that regulates anti-competitive practices arising from undue market power by the firms which adversely affects the consumers in the forms of higher prices, lower quality and limited choices. Thus the law benefits the consumer through enforcing strict sanctions on anti-competitive practices, including abuse of dominant market power, cartels, and mergers. The study wishes to engage with policy makers to suggest separate competition legislation for Sri Lanka, to provide consumers with the greatest range of choice among products and services at the lowest cost. The paper debates the theoretical perspectives of policies and assesses relevant aspects of legislative history and available laws on competition and consumer policies in Sri Lanka. Hence, the research is qualitative in nature while the quantitative method is used in relation to collecting data from consumers.

Keywords: *anti-competitive practices, competition policy, consumer welfare, protection*

**Medico-legal approach to passive euthanasia: An analysis of the existing legal
framework and medical practices in Sri Lanka**

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The right to life includes the right to live with human dignity. However, whether the right to a dignified life could be interpreted up to the level of the ‘right to die with dignity’ is a highly controversial topic in the medical-legal arena, in terms of the legalisation of euthanasia. This study is limited to discussing the medico-legal approach to passive euthanasia in Sri Lanka, with a comparative analysis of other jurisdictions: India and the United Kingdom. The legalisation of passive euthanasia is linked with the concept of ‘autonomy of the patient’ which recognises that a terminally ill patient who is undergoing unbearable suffering has a right to make a decision either to continue or discontinue his or her life-sustaining treatment. First, this research aims to discuss the existing legal framework and the practice of performing passive euthanasia in Sri Lanka. Then, this study evaluates the validity of various bioethical, legal and philosophical arguments for and against the legalisation of this medical practice. In addition to that, attention is paid to making appropriate recommendations to ensure the right to a dignified death while providing a statutory safeguard against undue influences, abuses and/or malpractices of such authorisation. This study adopts the qualitative research method which is carried out through reference to secondary data such as legislation, case law, experts’ opinions and treaty law.

Keywords: *autonomy of the patient, legislative intervention, passive euthanasia, right to a dignified death right to live with dignity*

Towards gender diversified boards: The Sri Lankan experience of women on corporate boards

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Women's empowerment in various sectors remains an interesting topic subjected to stimulating debate in Sri Lanka. Even though women's participation in decision making processes and policy making bodies has been ever demanding, application of the same subject matter to the corporate sector has been a topic that has been silenced over the years. Having gender diversified boards is a timely subject for discussion and research among top management, corporate sector personnel, academics and stakeholders. In light of the current trends in corporate governance, women's representation in corporate boards is considered as a positive factor which enhances performance. Yet, this has been subjected to criticism and debate. Being an Asian country, Sri Lanka's experience of women's representation on corporate boards seems a grey area. This paper consists of an exploratory research which utilizes a critical approach to examine the current practices and experience of women's participation in corporate boards in Sri Lankan companies based on primary and secondary sources. The paper also contains a comparative study of jurisdictions of India, Italy, and the United Kingdom which have adopted quotas while some have passed legislations in order to achieve the high participation of women. However, low participation of qualified women serving on corporate boards has remained an untouched topic in Sri Lanka due to various factors. Therefore, the objective of this research is to critically analyse those factors and suggest a suitable framework to achieve gender diversity in corporate boards in Sri Lanka. Considering the observations, it can be stated that the existing corporate legal framework is not effectively designed to enhance gender diversity on corporate boards.

Keywords: *corporate board, corporate governance, gender representation, women directors*

Live life, love work: An assessment of the legal responses to labour flexibility

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Substantial variations in labour force demographics and the necessity of embracing a work life-balance have highlighted the importance of welcoming labour flexibility to modern workplaces. Conscious of this growing need for viable labour flexibility and insufficient study of this, the research reviews the efficacy of international and national labour frameworks in facilitating healthy and sustainable labour flexibility. This qualitative research is primarily rooted in International Labour Organization (ILO) instruments and labour legislation in Sri Lanka. Secondary sources such as commission reports, texts of authority, and research studies have been used in finding answers to the research problem. The paper offers a critical examination of key ILO Conventions on working time and work-life balance and argues that most of them have failed to promote a general consensus on a valid definition of viable flexible working. The narrow definitions of the exceptions to the normal scheme of working hours authorized by these Conventions and the prevalent 'specifying particular substantive outcomes model' restrict the possibilities for flexibility and variability. On the other hand, the open-endedness of ILO instruments on work-life balance hints at the danger of wild flexibility. The research proceeds to prove that Sri Lankan labour legislations do not expressly deal with labour flexibility and are reluctant to diverge from the traditional concept of working also due to culture and gender ideological factors. Non-regulation of employer oriented flexible working arrangements in the informal economic structures jeopardise decent working norms of the workers. Grounded in this line of argumentation, the paper aims to highlight the necessity of reframing the international and national labour law framework and moving to a sustainable and family-friendly flexible working framework.

Keywords: *ILO, labour flexibility, work-life balance*

FACULTY OF MANAGEMENT AND FINANCE



Management for Health and Well-Being

25 October 2019

**MESSAGE FROM THE DEAN
FACULTY OF MANAGEMENT AND FINANCE**

Dr. M.P.P. Dharmadasa



I am delighted to send this message for the 2019 Annual Research Symposium of the University of Colombo.

The Faculty of Management and Finance integrates the faculty session of the University of Colombo Annual Research Symposium with the Annual International Research Conference on Management and Finance (IRCMF) organised by the Faculty of Management and Finance which will be held on 25th October 2019. A growing body of research is vital for management practices and for improving organisational outcomes. Certainly, this type of conference not only brings all the researchers to one platform, but it also inculcates a research culture among the fraternity, thereby contributing to the development of the nation. In this light, IRCMF strives to create a research culture among academia and it is a platform for academics to discuss and debate scholarly concerns through 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 are tailored to address the overarching objective of our research symposium and have undergone a peer reviewed process to maintain the quality of the abstracts.

I am sure that a symposium and conference of this type will inculcate a much needed research culture among academics and trigger interactions among researchers to exchange perspectives on recent advances in the area of management. I take this opportunity to thank the staff, reviewers and the organising committee for their contribution in successfully organising and managing this event.

I wish the Annual Research Symposium of the University and Annual International Research Conference on Management and Finance (IRCMF) 2019 a grand success.

FACULTY OF MANAGEMENT AND FINANCE

PROGRAMME

25 October 2019

07.45 a.m.	Registration
08.30 a.m.	Arrival of Guests
08.30 a.m.	National Anthem and Lighting of the Oil Lamp
08.40 a.m.	Welcome Address Dr. Seuwandhi B. Ranasinghe Conference Co-chair
08.45 a.m.	Address by the Dean Faculty of Management and Finance, University of Colombo Dr. M. P. P. Dharmadasa
08.50 a.m.	Address by the Chief Guest Vice Chancellor, University of Colombo Senior Professor Chandrika N. Wijerathne
09.00 a.m.	The Keynote Speech Dr. Asanga Thilakarathne (Former Senior Professor, University of Colombo)
10.00 a.m.	End of the Inauguration Ceremony and Morning Tea
10.30 a.m.	Commencement of Parallel Sessions
01.00 p.m.	Lunch Break
02.00 p.m.	Industry Dialogue 2019
04.00 p.m.	Plenary Sessions
04.15 p.m.	Award Ceremony
04.30 p.m.	Vote of Thanks Dr. Tharindu C. Ediriwickrama Conference Co-chair
04.35 p.m.	Concluding Remarks

INTRODUCTION TO THE KEYNOTE SPEAKER

Asanga Tilakaratne, PhD

*Senior Chair Professor of Pali and Buddhist Studies (Former)
University of Colombo*



Asanga Tilakaratne (PhD University of Hawai'i) is (former) Senior Chair Professor of Pali and Buddhist Studies and Founder Head of the Department of Buddhist Studies at the University of Colombo, Sri Lanka. During 2003-2006 he served as the director of the Postgraduate Institute of Pali and Buddhist Studies, University of Kelaniya.

From 1999-2000, Professor Tilakaratne was a Senior Commonwealth Fellow and was attached to the Oriental Institute, Oxford University. He has served as Visiting Professor at Yonsei University, Korea, Otago University, New Zealand, Savitribai Phule Pune University, India, Somya Vidyavihar, Mumbai, India and Sitagu International Buddhist Academy, Myanmar. He has published, both in Sinhala and English, more than one hundred papers on Buddhist studies. Of his more recent academic works, *Theravada Buddhism: the View of the Elders* (2012) was published by University of Hawaii Press in the series of 'Dimensions of Asian Spirituality'. He co-edited with Prof. Oliver Abenayaka *2600 Years of Sambuddhatva: Global Journey of Awakening* (2012), a work covering the history and the current status of global Buddhism of all three traditions.

In 2002, Prof. Tilakaratne founded the Sri Lanka Association of Buddhist Studies (SLABS), an academic and professional organization of Buddhist scholars in Sri Lanka, and continues to serve as its joint secretary. In 2003 he founded, with a group of academics and professionals, Damrivi Foundation, a government registered, not for profit voluntary organization for economic, social, educational and spiritual development, and continues to function as its founder chairman.

Need for Paradigm Shift: A *Metta*-based Approach to Business

Asanga Tilakaratne, PhD

Senior Chair Professor of Pali and Buddhist Studies (Former)

University of Colombo

Business goes on as usual, with the exception of innovations, modifications or further refinements, all within the existing system; few seem to feel any need for fundamental change. But the question is, can we go on in this manner without examining the implications of the basic assumptions underlying the practice of business? In this paper some of the assumptions behind the practice of business will be examined from a Buddhist point of view. The purpose is to raise awareness of the relevant issues, but not to undertake the task of producing a new philosophy for business.

Business is usually motivated by profit, gained by selling things or providing services. In the face of acute competition, one needs to have strategies for marketing. All these activities are aimed at people. Who are these people - are they ready-made objects to be manipulated in a manner that maximizes someone's profit? This suggests that the concept of the consumer is fundamental to business and marketing. But can we exploit human beings (and animals and nature) as a means to our own ends?

The Buddhist principle of Dependent Origination has the fundamental insight that all beings and all things in the world are inter-connected and inter-dependent in some important ways. While this has many applications, when applied to business and marketing, it shows that 'exploiter' is also exploited, and cannot remain unexploited while exploiting others. It appears that the philosophy of Buddhism has important insights to offer to widen the worldview of business thought and practice. This paper attempts to contribute to the discussion on meta-business which is on-going in many parts of the world.

FACULTY OF MANAGEMENT AND FINANCE

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The impact of transformational leaders on the regulatory focus of followers: the moderating effect of individualism vs. collectivism

D. C. L. Digoarachchi¹ and J. A. S. K. Jayakody²

¹*Department of Management and Organization Studies, University of Colombo, Sri Lanka*

²*Department Management and Organization Studies, University of Colombo, Sri Lanka*

To achieve desired organizational outcomes within organizations, transformational leaders may use different strategies. Some will focus more on the responsibilities, deadlines, obligations (Prevention Focus) or things that followers ought to do and the others may pursue development and change in the behaviors of followers through transformation of self by exploring how to be creative in their behaviors (Promotion Focus). Similarly, the leader activates prevention and promotion foci at different points of time, or even simultaneously. However, there is no reported attempt to validate the above argument in the Sri Lankan context and, in general, very few studies have examined these arguments even in other contexts. Therefore, there is an empirical gap to test the above dynamics in the Sri Lankan context. The objective of this study is to investigate the impact of transformational leaders on the regulatory focus of followers and the moderating effect of individualism vs. collectivism. The primary data has been collected from 100 branch managers including, private, state and foreign banks and 200 immediate and non-immediate employees reporting to each manager through structured questionnaires. The results have shown that transformational leaders elicit both prevention and promotion foci in the followers' behavior while organizational culture moderates the followers' behavior. Further, it has shown that when there is a horizontal collectivistic organizational culture, the leaders prime followers' promotion focus.

Keywords: *collectivism, individualism, prevention focus, promotion focus, transformational leadership*

Factors determining outsourcing trajectory: A review of literature

D. Rajini¹ and K.A.S.P. Kaluarachchi²

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²*Faculty of Management and Finance, University of Colombo, Sri Lanka*

Outsourcing is a contractual-based, results-oriented inter-organizational relationship where an external provider organization is hired by a client organization to perform in-house activities on its behalf. While it is considered as a management tool usable in response to competitive business environments, the existing literature reports a considerable amount of outsourcing failures as well. How success and failure factors of outsourcing exist or have been addressed within an outsourcing arrangement determines whether outsourcing is considered as succeeding or failing. Though the existing literature discusses the success and failure factors of outsourcing separately, studies which discuss these factors together are seldom found. This fact motivated a review of literature in order to investigate the success and failure factors together to derive determinants of outsourcing trajectory. As the methodology, the paper reviews related literature on outsourcing in the international and the Sri Lankan contexts. The paper identifies twenty-two (22) factors as determinants of outsourcing trajectory among which, the most frequently discussed factors in the existing literature are adequate planning, scope definition, definition, selection of service provider, contract development, contract management, top management commitment, clarification of roles and responsibilities/ work understanding, communication, and knowledge management. As implications, consideration of the identified factors prior to the implementation of outsourcing could help practitioners to proactively manage their outsourcing strategies in a way that those factors are addressed effectively. In addition, consideration of the identified factors as determinants of outsourcing trajectory could also guide the practitioners to assess their current outsourcing strategies and to take corrective measures appropriately. The present study also calls for further research to investigate how those factors could behave in different outsourcing settings as well as to know the relative significance of each such factor in successful or failed outsourcing projects.

Keywords: *determinants of outsourcing trajectory, failure factors, literature review, outsourcing, success factors*

Towards understanding how women in banking respond to the perceived Glass Ceiling phenomenon: A conceptual analysis

R.Razik

Department of Human Resources Management, University of Colombo, Sri Lanka

The Glass Ceiling (GC) phenomenon has been an all-time favorite and an ever-evolving research area for research enthusiasts in gender studies. Although the status of modern day working women has significantly improved, women in senior management positions remain largely under represented across various industries in all parts on the world. In the context of Sri Lanka, the banking industry, which is a major contributor of its economic growth, bears an obvious under representation of women in senior management positions. However, the industry itself is highly regulated and governed by the directions issued by the Central Bank of Sri Lanka (CBSL), where the directions have stipulated the job specifications of Key Management Personnel (KMPs). Thus, a question arises whether the under representation of women in management positions validates the existence of the GC effect in the banking industry in Sri Lanka. While the available research literature on GC attempts to identify what causes GC, there is a void in research which examine how women manage and respond to a perceived GC effect. This paper attempts to develop a conceptual design to examine a perceived GC effect in the banking industry in Sri Lanka. This paper postulates that women's perceptions of the GC effect are influenced by precedents of role and incongruence, moderated by self-efficacy, rather than demographic or organization based factors. Additional research would be required to empirically validate the proposed conceptual design through systematic investigations. The proposed conceptual model paves the way to fill a research lacuna in understanding how women respond to a perceived glass ceiling effect, and findings based on the empirically tested model would provide insights for a novel research paradigm for academics and for the practitioners of the banking industry to introduce/ alter organizational practices in managing their female workforce, as the model provides critical information on how women respond to a perceived GC effect.

Keywords: *banking, glass ceiling, responses to glass ceiling, role in congruency, self-efficacy*

Behavioral factors and stock investment decision making: the moderating role of gender

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²*Department of Finance, University of Colombo, Sri Lanka*

The purpose of this study is to investigate the impact of the most commonly seen behavioral factors, namely anchoring, disposition effect, home bias, herding, overconfidence and the risk perception, on investment decision making and to examine how gender affects the above factors through theoretical proposal and subsequent verification through empirical evidence of individual investor's stock investment decision making at Colombo Stock Exchange (CSE). For this purpose, primary data was collected from 405 individual investors through listed stockbrokers at the Colombo Stock Exchange. Data was analyzed using Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). The survey evidence shows that, six behavioral factors, viz, anchoring, disposition effect, overconfidence and risk perception influenced the investment decision making of individual investors. It further demonstrates that gender is a significant moderating factor with regards to anchoring, disposition effect, herding, overconfidence, risk perception, and stock investment decision making. This study is the first of its kind to quantify the moderating effect of gender and behavioral factors on stock investment decision making. The results of this study can be useful for individual investors, investment managers, and also for policy makers.

Keywords: *behavioral factors, gender, investment decision making, Structural Equation Model*

**Intention to use e-Learning by a generationally diverse workforce in the banking sector
in Sri Lanka: A technology acceptance model based study**

W.M.V.D. Wasala¹ and K.A.S.P. Kaluarachchi²

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²*Faculty of Management and Finance, University of Colombo, Sri Lanka*

eLearning is a global phenomenon central to many industries. In recent times, workplace learning has risen beyond its traditional form and utilization of eLearning in business contexts has increased rapidly. Within this background, though the Technology Acceptance Model (TAM) is receiving extensive empirical support in information systems (IS) and learning literature, the theoretical contribution of TAM needs to be critically examined. TAM seems to neglect some essential constructors like Perceived Enjoyment (PE) and moderators such as age difference (generational diversity) and gender. Further, there is limited research on the factors causing employee intention to use the eLearning systems in the banking sector in Sri Lanka. Students' intention to use the eLearning system is different to that of the adults whose learning intention merely depends upon their background and attitudes. Hence the need to examine the intention to use eLearning by the generationally diverse workforce in the banking sector in Sri Lanka, based on the extended version of TAM. This study considers only Gen X and Gen Y and not Gen Z; the findings confirm that the Perceived Usefulness (PU), PE, and Attitude towards Using (AU) are key determinants in defining Behavioral Intention (BI) but not the Perceived Ease of Use (PEU). Further, it is confirmed that Gen X and Gen Y moderates the BI of employees. The study enriches learning and IS literature on BI towards eLearning usage and the findings may be beneficial for developers and decision-makers before developing/ implementing eLearning systems at the workplace. Although the present study was limited to the banking sector in Sri Lanka, similar future studies can be expanded to include the global banking sector and may explore the intention of using eLearning in various industries. Moreover, a longitudinal study can be carried out using qualitative methods or mixed methods for a larger sample, to generalize the findings further.

Keywords: *banking sector in Sri Lanka, E-learning, generationally diverse workforce, technology acceptance model*

FACULTY OF MEDICINE



Health and Well-Being

**MESSAGE FROM THE DEAN
FACULTY OF MEDICINE**

Professor Jennifer Perera



The Annual Research Symposium is an important calendared event of the University of Colombo. All Faculties and Institutes participate in this activity with much enthusiasm and commitment. The theme for this year, “Health and Well Being” describes the need for promoting innovative research to address the global health needs in general, and the country’s health needs specifically. The World faces a wide range of health and wellbeing challenges. Multi-disciplinary research is needed to bring about real world solutions to promote health and wellbeing across the life course.

In view of the epidemic of non communicable diseases that has consumed the world it is important that health promotion through exercise, physical activity, meditation and other relaxation methods be ingrained into community and patient care. This could be accelerated by translating high quality research into interventions that are an integral part of day to day life in the community, in-order to achieve better patient outcomes in the prevention of disease and in the promotion of physical and mental health well- being.

There are many more challenges. The majority of the world’s pathogenic bacteria have now developed some level of resistance to antibiotics (AMR) and medical professionals are at the stage of using last resort drugs. Integrated intervention approaches including developing new treatments, targeted drug delivery, rapid diagnostics, environmental decontamination strategies combined with better understanding of the human and social dimensions of the AMR problem are desperately needed. Thus research needs to focus on mitigation strategies that enable the control of spread of resistance.

Further, research into ageing, frailty and dementia that looks across a range of topics from early diagnostics, modifiable risk and protective factors to systems

analysis and evaluation in the provision of treatment and care to deliver safer, more productive and inclusive services for physical and mental wellbeing of the elderly is a dire necessity.

It is also important to note that we humans are linked to natural systems. Degradation of the natural systems will affect planetary health including human health and wellbeing. Our research should be developing vital solutions for enhancing the quality of life and delivering improved health for all, together with respect for the integrity of natural systems.

Better models of community empowerment need to be designed through stakeholder participatory research as the community is the main stakeholder to whom products and results of research will be of benefit, in order to improve their life in both health and disease. Thus, the involvement of the lay public in healthcare research needs to be taken into consideration in designing research.

In conclusion, I am very grateful to the Faculty organizing committee, led by Dr Prasad Katulanda, for organizing this event with much commitment and dedication. On behalf of the Faculty of Medicine, University of Colombo, I send the organizing committee and all participants of this Annual Research Symposium 2019 my sincere good wishes for a very productive and enjoyable event that would yield very fruitful outcomes.

INTRODUCTION TO THE KEYNOTE SPEAKER

Vidya Nidhi Prof. Kamini Mendis. MD. DSc.

*Professor, Chair Professor and Head,
Department of Anatomy, University of Colombo*



Professor Mendis, a medical graduate of the University of Colombo, Sri Lanka, is a Malariologist and Medical Parasitologist, an academic, researcher and a public health expert. She helped launch the Global Roll Back Malaria initiative of the WHO in 1998, and then served as a senior staff member of the Global Malaria Programme of the WHO, Geneva until 2010.

Her contributions to Tropical Medicine have been honored by several awards. Among them, nationally, is the Presidential Award Vidya Nidhi in 1983. Internationally, she has been the recipient of the Chalmers Medal of the Royal Society of Tropical Medicine, UK in 1991, and the Ashford Bailey Medal of the American Society of Tropical Medicine and Hygiene (1993). She has served on several international scientific and review boards and committees on malaria and on international health, and has chaired several of them. She has been the keynote speaker at many prestigious international events in Tropical Medicine, including delivering the celebrated Gorgas Memorial Lecture in the United States of America in 2000.

She now serves as a member of several international committees and advisory boards on research, control and elimination related to malaria, and provides advice to governments on malaria elimination. She also serves on several national committees of the Ministry of Health, Sri Lanka, and on advisory bodies of national research agencies.

Her current interests and pursuits involve supporting regional and international efforts to strengthen the evidence-to-policy pathway for malaria and supporting the implementation of malaria control and elimination in the field. She is focussed on strengthening policies and strategies to promote research and epidemiology-based malaria control in-order to enable countries to eliminate malaria.

The key note address would be delivered at the Colombo Medical Congress to be held on the 12th to 15th of February 2020 to celebrate the 150 year anniversary of the Faculty of Medicine Colombo.
colombomedicalcongress.org

Malaria in Sri Lanka: Past, Present and Future – The Vision

Kamini Mendis. MD. DSc.

*Professor, Chair Professor and Head,
Department of Anatomy,
University of Colombo*

Malaria, a disease which had a major public health impact on the population of Sri Lanka and which impeded human development for many centuries, was eliminated in 2012. Yet, being a tropical country with a high prevalence of malaria vector mosquitoes, and receiving a regular influx of the malaria parasite through imported malaria cases entering the country, the risk of re-establishment of malaria transmission remains high. Six years after elimination, the country maintains a strict surveillance and response system for imported malaria cases and mosquito vectors of malaria to ensure that the country remains free of malaria. Such a surveillance and response system will need to be sustained until the world is free of malaria or at least until the Southeast Asian region has eliminated the disease, when the guard may possibly be lowered. To financially sustain a programme for a disease, which is no longer present, a sound evidence-based investment case is required. It also calls for optimal surveillance strategies, which can only be sustained on the basis of evidence generated through operational research.

Since the year 2000, twenty formerly malarious countries have eliminated the disease but malaria still remains highly endemic in tropical Africa, and in some countries in Asia and South America. Eradicating malaria is a long-term goal to which global health leaders aspire. It calls for greater innovation for new and more effective tools, better management systems for malaria control programmes and a sustained high level of financial investments.

FACULTY OF MEDICINE

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Association of leptin (*LEP*) and leptin receptor (*LEPR*) gene polymorphisms and serum follicle stimulating hormone (FSH) concentration in Sri Lankan women with polycystic ovary syndrome (PCOS)

S. Ainkaran^{1,2}, K. Jeganathan^{1,2}, S.R. Karunaratne S.R.¹, W.S.S. Wijesundera^{1*}, C.N. Wijeyaratne³

¹ *Department of Biochemistry and Molecular Biology, Faculty of Medicine, University of Colombo*

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Follicle stimulating hormone (FSH) which plays a major role in modulating the hypothalamus- pituitary- gonadal (HPG) axis is important for normal ovarian function and folliculogenesis. Insufficient FSH secretion due to dysregulation in HPG signaling leads to hyperandrogenism, a salient feature of PCOS. Leptin, an adipocyte-secreted hormone that conveys information to the hypothalamus regarding the body energy stores also modulates the HPG axis. Soluble leptin receptor, the major leptin-binding protein is primal for transportation, sequestration and regulation of hypothalamus signaling. We wish to determine the frequency of single nucleotide polymorphisms (SNPs) of *LEP* (rs 7799039) and *LEPR* (rs 1137100) genes and their association with serum FSH in Sri Lankan women with PCOS. Genotyping of SNPs in *LEP* and *LEPR* was done using PCR-restriction length fragment polymorphism (RFLP) and tetra-primer amplification refractory mutation system (ARMS) PCR in a selected study population consisting of 36 subjects with PCOS from adolescence (mean age 25.97±6.223) confirmed by Rotterdam criteria. Follicular phase serum FSH concentration was determined using ELISA. Data was analyzed using SPSS V.17. This study consists of preliminary data analyzed using the selected patient population. The mutant alleles were more prevalent in this cohort concerning both polymorphisms. Mean FSH concentration in those with wild type (3.68mIU/mL ± 1.76) and mutant (5.67mIU/mL ± 1.56) genotypes, which includes homozygous and heterozygous mutant alleles of rs 7799039 of *LEP* gene, were compared (independent student t-test). A significant association was observed (p=0.04) between the mean FSH concentration and rs 7799039. We recommend further analysis to explore correlation between FSH and leptin in a Sri Lankan PCOS cohort compared with a control population.

Keywords: FSH, *LEP* (rs 7799039), *LEPR* (rs 1137100), leptin, PCOS

This abstract would be presented during the Colombo Medical Congress to be held on the 12th to 15th of February 2020, www.colombomedicalcongress.org

Evaluation of a novel PCR assay to enhance case detection of human leishmaniasis in Sri Lanka

M. A. B. Deepachandi¹, Y. R. Gange¹, M. A. S. Dayananda¹, C. S. Weerasinghe¹, S. A. S. C. Senanayake¹, S. S. S. B. D. P. Soysa², N. D. Karunaweera¹, H. V. Y. D. Siriwardana¹

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Sri Lanka reports a large outbreak of human leishmaniasis caused by *Leishmania donovani*. Early case detection and management is a main approach identified for *L. donovani* control in the regional leishmaniasis elimination drive. Timely treatment is important to minimize risk of death in visceral disease and undesired sequelae of long standing infection on both patients and community. Usefulness of light microscopy and *in-vitro* culture in case detection is limited in chronic, atypical or treated lesions. However, timely and accurate investigation of all light microscopy (LM) /*in-vitro* culture negative cases for all forms of leishmaniasis is preferred prior to treatment. Therefore, we evaluated a modified nested PCR (Mo-STNPCR) for the detection of leishmaniasis in those who turn negative with first line assays. *Leishmania* DNA was amplified using *Leishmania* genus specific PCR primers, which excluded the amplification of other kinetoplastid parasites. Infected materials from patients with cutaneous (n=30) and visceral (n=10) leishmaniasis and from controls [non-leishmanial skin diseases (n=10), other systemic diseases (n=10) and healthy individuals (n=10)] were examined. Results were compared with LM and *in-vitro* culture. Cost analysis was carried out. Mo-STNPCR was 100% sensitive and specific for diagnosis of leishmaniasis. LM and *in-vitro* culture were positive in 75.0% (n=30/40) and 72.5% (n=29/40) samples respectively where a combination provided 87.5% (n=35/40) sensitivity. Mo-STNPCR did not cross react with control samples, reduced the risk of cross-contaminations and carry over contaminations since the complete reaction was carried out without opening the tubes. Per patient cost was calculated as 3500/=, 300/= and 600/= for Mo-STNPCR, LM and *in-vitro* culture respectively. Although several PCR techniques are used for diagnosis of leishmaniasis in different local settings, Mo-STNPCR is useful in detecting leishmaniasis with high accuracy in the minority of cases that go undetected by first line investigations.

Keywords: diagnosis, Leishmaniasis, *Leishmania donovani*, PCR

Acknowledgement: The University of Colombo & the National Institute of Health, USA for funding.

This abstract would be presented during the Colombo Medical Congress to be held on the 12th to 15th of February 2020, www.colombomedicalcongress.org

Genomic surveillance reveals population diversity of *Plasmodium vivax* parasite isolates from Sri Lanka

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Sri Lanka was certified as a malaria free nation in 2016 but imported malaria cases continue to be reported. This study used a previously developed *P. vivax* Single Nucleotide Polymorphisms (SNP) barcode to evaluate the population dynamics of *P. vivax* parasite isolates from Sri Lanka. Genotypes of 40 previously identified *P. vivax* SNPs were determined by High Resolution Melting (HRM) barcode method from parasite isolates collected during 2005-2011. Minor allele frequencies, linkage disequilibrium, Pair-wise F_{ST} values, Complexity of infection (COI) and molecular diversity indices were examined; neutrality tests were carried out to determine the genetic diversity. Identity by descent (IBD) analysis was carried out and SNP barcode was used to identify the clustering of the parasite sub-populations. The 40 SNP barcode data created 6 clonal clusters. The proportion of mixed-clone infections was significantly higher in isolates collected from the year 2007. The minor allele frequencies of the SNPs changed dramatically from year to year. A cladogram constructed to examine the distribution of the parasite populations based on genetic structure demonstrated clustering of parasite isolates from 2007 compared to the isolates from other years. The majority of the isolates from 2007 consisted of at least 2 genetically distinct parasite strains. The overall percentage of mixed clone infections for the entire parasite population was 39.21%. IBD analysis revealed the genetic clustering of the parasite populations. The genetic information of the local *P. vivax* malaria parasite has the potential to be useful in differentiating the parasite sub populations.

Key words: HRM method, Genetic barcoding, Malaria

Acknowledgement: The Barcode Programme, The Broad Institute, Harvard MIT, USA for funding the study

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Validation of Asian resting metabolic rate equations in Sri Lankan adults

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Resting metabolic rate (RMR) is the largest component of total energy expenditure and is used to calculate energy requirement of individuals. The desktop indirect calorimeter has been demonstrated to be a robust alternative to the traditional indirect calorimeter in the measurement of resting metabolic rate (RMR) and can be used effectively for the validation of RMR prediction equations. RMR is related to lean body mass and therefore Asian equations, (Ganpule, 2007 and Japan DRI, 2010 (Japan), Liu and Yang (China, 1995), Camps (Singapore, 2016) and Ismail (Malaysia, 1998) are more likely to be valid for Sri Lankans than Western equations, with validation being mandatory before use. This study assessed the validity of these RMR equations against the reference method in healthy Sri Lankans. Fifty seven apparently healthy Sri Lankans (27 males and 30 females) aged between 19 and 60 years were included in the cross sectional study. Anthropometric measures (height and weight) were taken. RMR was measured using Fitmate GS desktop indirect calorimeter (COSMED, Italy) adopting a standardized protocol. RMR was also calculated using six equations developed in Asian countries. Agreement between predicted and reference values was assessed using Bland-Altman plots. The mean age was 34.9 ± 13.0 years and the mean BMI was 23.7 ± 2.9 kg/m². The mean RMR measured was 1169.6 ± 184.6 Kcal/day and estimated mean RMR using each prediction equation was Ganpule: 1340.0 ± 207.6 kcal/day, Ismail: 1343.7 ± 155.4 kcal/day, Camps (Singapore equation): 1346.0 ± 194.4 kcal/day, Japan DRI: 1394.3 ± 252.6 kcal/day, Liu: 1421.5 ± 211.7 kcal/day, and Yang: 1464.3 ± 260.0 kcal/day. The limit of agreement was wide, with negative bias observed for all six equations. The lowest mean bias (-170 ± 102 kcal/day) was observed in Ganpule equation. Existing Asian RMR prediction equations overestimated RMR in Sri Lankans.

Keywords: *indirect calorimeter, prediction equations, reference method, resting metabolic rate, validation*

Acknowledgement: *The COSMED Fitmate desktop indirect calorimeter was obtained through a Technical cooperation (TC) grant of the International Atomic Energy Agency (SLR/0635).*

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Respiratory functions in a cohort of elders residing in residential care facilities in the Colombo district

B.M. Gunawardana, W.A.D.L. Amarasiri, P.M. Atapattu, A.D.A. Fernando, M. Gunatilake, S. Wasalathanthri, W.D.N. Dissanayake, R. Jayawardena, K.P.C. Dalpatadu, K. Vithanage, N. Wickramasinghe, S.K. Jayaweera, B.L. Sathkumara, W.M.L.V. Wanninayake, H.A.R. Ranawaka, N. Vamasivam, U.A.H. Udagedara, H.P.C. Thissera
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Respiratory function in elderly is influenced by age, physical wellbeing and respiratory disease. The aim of this study was to assess respiratory function and association with these factors in elders residing in residential care facilities in the Colombo district. This descriptive cross-sectional study, included elders > 65 years, from 22 residential care facilities in the Colombo district. Height, weight, waist hip circumference, spirometry (BioPonys-3 spirometer), frailty (five-Fried-model indicators) and physical activity score for elderly (PASE questionnaire) were measured. Ventilatory defects were classified as obstruction (FEV_1/FVC ratio < 0.70), restriction (FVC < 0.80) and mixed if both criteria were present. The association between median spirometry values with anthropometry, frailty and PASE scores was determined using Spearman correlation. The association between ventilatory defects, respiratory disease, BMI, frailty and physical activity status was assessed using Chi-square test. Of 465 participants, records of 110 with accurate spirometry were analysed. Subjects were 30% male; mean(SD) age 76(6.97) years, mean(SD) BMI 22.79(4.44) kg/m^2 ; mean waist-hip-ratio(WHR) 0.91 in males, 0.87 in females; and mean SpO_2 96.27%. In spirometry 15(13.6%) demonstrated obstruction, 11(10%) restriction and 6(5.5%) mixed pattern. Five(41.6%) elders with respiratory disease and 10(16.1%) apparently healthy elders demonstrated ventilatory defects. Of those with high WHR only 17.4% demonstrated spirometry restriction, which was statistically insignificant. In those with normal lung function, the median (SE) values of FVC , FEV_1 , FEV_1/FVC , $PEFR$ and $MEF_{75,50,25}$ were 1.3(0.05), 0.90(0.084), 1.16(0.084), 145.85(8.33), 2.24(0.125), 1.68(0.077), 0.88(0.976) respectively. A significant ($P < 0.05$) difference was observed between the mean FVC , FEV_1 , $MEF_{75,50}$ values in the frail and non-frail groups.

There was no association between known respiratory disease and ventilatory defects. The majority demonstrated normal lung functions, despite the presence of low physical activity, high frailty and abnormal BMI.

Keywords: *anthropometry, elders, frailty, respiratory functions, spirometry*

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**Genetic variants of arylsulfatase A (ARSA) gene in a cohort of patients with
metachromatic leukodystrophy in Sri Lanka.**

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Metachromatic Leukodystrophy (MLD; OMIM #250100) is a rare neurodegenerative disorder affecting 1 in 40,000 people worldwide due to a mutation in the arylsulfatase A gene (*ARSA*). MLD is divided into three main subcategories depending on the age of onset. The variants of MLD in the Sri Lankan population is currently unknown. This study was conducted to observe the relationship of the variant profile of the *ARSA* gene with the age of onset of the disease. Twenty patients from eighteen families were screened for *ARSA* gene mutations from 2011-2017. Prior to testing, patients were clinically diagnosed to have MLD based on expert neurological opinion, ARSA enzyme activity and neuroimaging findings. The patient's genomic DNA extraction was carried out using QIAamp DNA Blood Mini Kit; Qiagen, according to the manufacturer's protocol. Full length ARSA gene including coding exons and corresponding intron/exon boundaries were amplified by seven forward and reverse primer sets. The PCR fragments were subjected to sanger sequencing using BigDye® Terminator v3.1 Cycle Sequencing Kit by Applied Biosystems® 3130 Genetic Analyzer followed by ethanol purification. The resultant ABI files were analyzed using codon code aligner software aligning with a human ARSA reference sequence obtained from ENSEMBLE database.

The median age at diagnosis was 19.9 years (range = 0.8-40). The clinical categories were as follows: infantile 7; early juvenile 1; late juvenile 2; and adult 10. Of the 13 different genetic variants three were novel. The three novel variants were p.Asp281Asn, p.Asp283Asn, p.Ala344Asp. Seven patients out of 20 were positive for the pseudodeficiency (PD) allele c.1049A>G (p.Asn350Ser). No correlation was observed between the age of onset and the variant profile. However, different molecular genetic variants in the ARSA gene found in MLD patients of Sri Lankan origin were observed.

Keywords: *ARSA, MLD, neurodegenerative disorders*

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Nutritional intake and related factors among elders in residential care facilities in the Colombo district

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Malnutrition in the elderly leads to a number of adverse health outcomes. A well-balanced diet with balanced nutrients helps to overcome them. This study describes the nutrient intake and related factors among elders in residential care facilities in the Colombo district. A descriptive cross-sectional study was conducted among elders >65 years of age in residential care facilities in the Colombo district. Nutrient intake was assessed using a 24-hour dietary recall. Energy and nutrients were calculated using Nutrisurvey-2000 software. Physical Activity Score for Elderly (PASE Score) was calculated in all but bed-bound elderly (score \leq 73 considered low physical activity). Data from 342 elders (male =28.1%) were analysed. Mean \pm SD age of the group was 74.8 \pm 8.4 years. Mean \pm SD of energy intake was 1155.6 \pm 316.3kcal. Of all subjects, 82.5% had low protein intake (< 1 g/kg body weight). Fat intake was 29.1 \pm 11.0g. Carbohydrate intake was 193.0 \pm 61.9g. Dietary fibres intake was 8.2 \pm 5.1g. Mean \pm SD percentage of energy consumed from carbohydrate was 65.5 \pm 7.5% and 97.4% of elders had adequate carbohydrate intake ($>50\%$). Corresponding percentages of energy consumed from protein and fat were 12.6 \pm 3.1% and 22.0 \pm 6.6% respectively. Of the elderly 39.2% had low dietary fat intake ($<20\%$), while 73.7% (n=252) had low level of physical activity. There was significant association between sex and mean caloric intake, (independent-t test; $p= 0.001$). There was a significant positive correlation between PASE score and Caloric intake (correlation; $p<0.01$). Although majority of the elders consumed adequate carbohydrate and fat their protein consumption was found to be low. Physically activity of the elders significantly correlated with their calorie intake.

Key Words: *energy, nutrients, physical activity*

Acknowledgement: *This study was funded by Ceylon College of Physicians.*

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The cross-cultural adaptation of the Type D Personality Scale (DS-14) for use with patients diagnosed with Ischemic Heart Disease (IHD) in Sri Lanka

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Ischemic Heart Disease (IHD) has been classified as a major cardiovascular disease in the world and is the main cause of death in Sri Lanka. Negative affectivity (NA) and social inhibition (SI) are two traits which increase the risk of IHD. The DS-14 evaluates an individual's general level of distress, based on NA and SI. This study was aimed to cross-culturally adapt the DS-14 for use in Sinhala speaking patients diagnosed with IHD in Sri Lanka. Permission to validate the scale was obtained from the developers. The translation and back-translation were done by two professional translators and a pretest was conducted among five IHD patients to reconstruct the wording prior to the Delphi process. The Delphi process which assessed the content and consensual validity of the scale included an expert panel of two psychiatrists and four clinical psychologists. Delphi ratings received from stage one were summarized and presented for a second round and the re-ratings were evaluated for the degree of consensus. Following the Delphi Process, items for DS-14's Sinhala version were chosen based on the following criteria: (i) if 70% or more of the re-ratings were in category 0–3, that item/sub-scale was omitted or reworded to make it acceptable. If reworded, the Delphi Process was repeated for that item/sub-scale, and (ii) if 70% or more of the re-ratings were in categories 4–6 and 7–9, that item/subscale was retained. No items were removed from the original scale. Rewording of some items was done according to suggestions made by some experts to retain the conceptual meaning when translated to Sinhala. The DS-14's Sinhala version has shown encouraging psychometric properties and can be used in research and clinical practice for the purpose of screening patients with IHD for type D personality.

Keywords: *DS-14, ischemic heart disease, type D personality*

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Free sugar intake and associated factors among preschool children in the Colombo district

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High sugar intake causes dental caries and obesity in children. Assessing sugar intake and associated factors are vital in developing public health measures to address these adverse health outcomes. This study was carried out to assess the free sugar intake and associated factors among preschool children in the Colombo district. A food frequency questionnaire (FFQ) was developed using free sugar containing food intake data of 500 preschool children and validated against three 24hour dietary recalls (24hDR). The FFQ was then used to assess the free sugar intake of 813 preschool children aged 04-05 years, selected using probability proportionate to size technique and cluster sampling. The factors associated with sugar intake were assessed by a pretested questionnaire from the caregivers. The sugar intake measured from FFQ and 24hDR were highly correlated ($r=0.96$) and showed a very good agreement in Bland and Altman analysis (only 5% lying outside the limits of agreement). The median (IQR) free sugar consumption of preschool children was 57.9 (33.2 -95.8) g/ day (approximately 14.5 teaspoons/ day), which was 21.1% (12.5% -35.9%) of the total energy requirement of a 04 to 05-year-old child. Total energy obtained from free sugar in this age group was four times higher than the recommended level by the World Health Organisation (Free sugar less than 5% of total energy intake), and 96.3% of children exceeded the recommended sugar intake level. The median (IQR) sugar intake frequency was four (2.7 – 6.1) times per day. Sugar intake significantly reduced ($p=0.04$) with higher maternal educational level. The highest percentage contribution of total free sugar intake was from the bakery products (27%) followed by biscuits (15%) and table sugar (15%).

Conclusion

Majority of children exceeded the recommended sugar intake levels. Effective interventions should be carried out urgently taking the factors associated into consideration.

Key words: *associated factors, food frequency questionnaire, free sugar intake, preschool children*

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**Association of Leptin Gene Polymorphism and Selected Factors Affecting Food Intake
of Urban Women in Colombo Municipal Council Area**

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Obesity is multifactorial, with appetite being one factor. Polymorphisms in the leptin gene may have different effects on an individual's appetite. This study assessed the association of *LEP* G-2548A (rs7799039) gene polymorphism with overweight, proxy measures of fat and selected factors affecting food intake of urban women. Using cluster randomization, 151 women aged 30-45 years were recruited from three MOH areas of the Colombo Municipal Council. Anthropometry and skin fold thickness was measured using standard protocol. Interviewer administered questionnaire including hunger and satiety with reference to the previous days' lunch were assessed using a standard visual analogue scale (VAS: 100mm scale). Genomic region of 419bp carrying HhaI restriction site, rs7799039 was amplified using polymerase chain reaction to examine three possible genotypes. Chi-square test for categorical variables, independent student T-test and ANOVA were used. Genotyping data were available in 102 women with mean age (\pm S.D) of 37.80(\pm 7.20). Genotype frequencies for GG, GA and AA genotypes were 31.4%, 46.1% and 22.5% respectively. No significant differences in frequencies of GG, GA and AA genotypes between body mass index groups, waist circumference groups, waist hip ratio groups and fat mass percentage groups. From the total sample, 54.9% were satisfied (VAS= 90-100mm), 34.3% had no desire to eat further (VAS= 0mm), 37.3% felt full (VAS= 90-95mm) and 35.3% not hungry at all (VAS= 0mm). There was a significant ($P<0.05$) difference in the level of hunger between GG and GA genotypes, with a trend ($P=0.063$) being observed for desire to eat. There was no association between the polymorphism and proxy measures of body fat. However, the association between GG and GA polymorphism with hunger and desire to eat requires further study as it may suggest a predisposition to weight gain which could not be established. Limitations include self-selected unstandardized diets.

Keywords: *anthropometry, appetite, leptin, overweight, visual analogue scale*

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Polypharmacy and its associations with cognitive and physical functions among elders in selected residential care facilities in the in the Colombo District

B.L. Sathkumara, M. Gunatilake, P.M. Atapattu, K.P.C. Dalpatadu, A.D.A. Fernando, W.D.N. Dissanayake, S. Wasalathanthri, R. Jayawardena, W.A.D.L. Amarasiri, K. Vithanage, N. Wickramasinghe, S.K. Jayaweera, B.M. Gunawardana, W.M.L.V. Wanninayake, H.A.R. Ranawaka, N. Vamasivam, A.V.N.N. Upekshani, A.O.K. Waidyarathna
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Polypharmacy (concomitant use of ≥ 5 medications) which is an increasingly common phenomenon among elders, can lead to impaired cognition and physical functions, reducing quality of life. This study was conducted to describe the relationship between cognition, physical functions (gait speed and muscle strength) and poly pharmacy among elders in selected residential care facilities in the Colombo District. This descriptive cross-sectional study was carried out among elders aged >65 years in 21 residential care facilities in the Colombo district. Information on number of pills taken and selected demographic factors were collected using an interviewer administered questionnaire. Cognitive function was assessed using Montreal Cognitive Assessment (MoCA) validated for the Sri Lankan population (Impaired Cognition = MoCA <22). Three measurements from each upper limb were obtained to assess muscle strength using Jamar hand dynamometer and the highest measurement of non-dominant hand was considered as the measurement for muscle strength (weak <25 kg). When gait speed was measured using 6m fast gait speed test, < 0.65 m/s was considered as “slow” based on the average of two readings obtained. Parameters were analyzed using chi square and Pearson correlation coefficient tests. Out of 313 participants, 72.2% were females ($n=226$). The mean age was 74.5 ± 7.4 years. Polypharmacy was found in 38% ($n=119$); 76% ($n=238$) had impaired cognition [mean MoCA (15.58)] and 91.4% ($n=286$) had “weak” muscle strength [mean muscle strength (16.06 ± 5.89 Kg)]. Mean gait speed was 0.77 ± 0.29 m/s with “slow” gait speed in 31.6% ($n=99$). A statistically significant association ($p=0.004$) with a positive correlation ($p=0.00$, $r=0.208$) was observed between polypharmacy and cognitive functions. A negative correlation was observed between polypharmacy and physical functions [gait speed ($p=0.005$, $r=-0.158$) and grip strength ($p=0.047$, $r=-0.112$)]. This study revealed a statistically significant association with a positive correlation between polypharmacy and cognitive functions, even though polypharmacy was negatively correlated with physical functions.

Keywords: *cognitive, elderly, physical, polypharmacy, residential care*

Acknowledgement: *The Ceylon college of Physicians for funding the study.*

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***In vitro* evaluation of antiproliferative and cytotoxic activity and induction of apoptosis by *Munronia pinnata* (Wall.) Theob. (Binkohomba) in Rhabdomyosarcoma cells**

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Munronia pinnata (Wall.) Theob. (Binkohomba) is a herb widely used in ayurvedic medicine in Sri Lanka. The whole plant extract exhibits marked cytotoxicity. This study was carried out to analyse the antiproliferative, cytotoxic and apoptosis properties of *M. pinnata in vitro*. The herbal decoction was prepared by boiling the whole plant (60g) with water (1920 mL). The 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT), lactate dehydrogenase (LDH) assays, protein content and reduced glutathione content (GSH) were used to study antiproliferative and cytotoxic activities of the herbal decoction against human Rhabdomyosarcoma (RD) cells after 24hour exposure. The LDH leakage to the medium was expressed as the percentage of total LDH activity. Microscopic examination of cells stained with a mixture of ethidium bromide/acridine orange (EB/AO) and giemsa staining were carried out in RD cancer cells treated with the plant extract. MTT assay and microscopic observations for Vero cells (normal) were also performed and the results were compared with RD (cancer) cells. Cell viability for MTT assay showed effective dose concentration (EC_{50}) at 249.4 ± 23.5 and 2691.3 ± 5.3 $\mu\text{g/mL}$ on RD cells and Vero cells after 24hour treatment respectively ($p < 0.05$). The EC_{50} for percentage LDH leakage was $38.7 \pm 7.4\%$. Dose dependent decrease in the levels of protein and GSH was observed in RD cells treated with plant extract compared to untreated cells. Giemsa and AO/EB staining showed characteristic changes of apoptosis in RD cells but not in Vero cells.

M. pinnata shows antiproliferative properties and induced apoptosis in RD cells and also demonstrated less toxicity towards Vero cells compared to RD cells.

Keywords: *antiproliferative, Binkohomba, cytotoxicity, Munronia pinnata, Rhabdomyosarcoma*

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Sand fly prevalence and behaviour in selected army camps in Killinochchi and Mullaitivu districts

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Cutaneous leishmaniasis (CL) remains a fast-spreading health problem in Sri Lanka. The probable vector is *Phlebotomus argentipes* var *glaucus* (*P.glaucus*). Army personnel stand out as a high risk group with higher numbers of CL reported from Kilinochchi and Mullaitivu districts. This study was designed to identify the prevalence and behavior of sand flies in selected army camps in these districts. Two cattle-baited net traps (CBNT) and 20 light traps (LT) were set overnight in eleven (11) selected camps. Trapped sandflies were collected at 10pm and 4am from CBNT and following morning from LT. The total number of sandflies collected from the 11 camps were 1374 (Kilinochchi n=294/21.4%; Mullaitivu n=1080/78.6%). Majority of the sandflies were attracted to CBNT (n=1148/83.5%) while 226(16.55%) were collected via LT. Almost all the sandflies (99.6%) were identified as *P.glaucus* with the rest being *Sergentomyia* spp. The female:male ratio of sandflies in LT was approximately 1:2. An overall higher male ratio (who are non-disease transmitters) was seen in CBNTs than LT (female:male 1:4). That was more prominent in Kilinochchi (female:male 1:11.7) than in Mullaitivu (female:male 1:3.47). Only two sandflies were found at 4am in the CBNT set in Kilinochchi. Mullaitivu camps showed a collection of 649 sandflies at 10pm and 308 at 4am. The abundant presence of *P.glaucus* in the sandfly collections indicate the high risk of transmission of CL in the camps. The biting risk appears to peak during late night in Kilinochchi and Mullaitivu. This risk appeared more in Kilinochchi than in Mullaitivu. Control of sand flies and preventive measures against sandfly bites should be implemented in these camps to minimize further spread of CL with particular attention given to the Mullaitivu district.

Keywords: *army, cattle-baited net traps, Kilinochchi, Mullaitivu, sandflies*

Acknowledgment: *The TMRC Grant, National Institutes of Health, USA for funding.*

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An optimized protocol for extraction of high-quality RNA for the analysis of expression of hormone-sensitive lipase gene in adipose tissues of pregnant women

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Over expression of the key regulatory enzyme, hormone-sensitive lipase (HSL) involved in lipolysis leads to maternal obesity. Extracting high-quality RNA for analysis of gene expression, particularly from high fat tissues, poses methodological constraints due to high cellular fat content and instability of RNA. Usually, the quality and yield is low when RNA is extracted from adipose tissue (AT) in tropical countries. We aimed to optimize a method to extract high-quality RNA, and to thereby assess and compare the HSL gene expression in AT depots of normal weight and overweight pregnant women. Approximately 4g of AT samples (n=33) from superficial subcutaneous AT (sSAT), deep subcutaneous AT (dSAT) and visceral AT (VAT) from the greater omentum were collected. Samples were collected during elective caesarean sections from six normal weight (pre-pregnancy body mass index (BMI): 18.5-24.9kgm⁻²) and five overweight (BMI >25kgm⁻²) pregnant women. AT were immediately stored in RNA^{later} solution to avoid RNA degradation. TRIzol reagent protocol was performed for RNA extraction following effective disruption of the tissues by a mechanical homogenizer. Extracted RNA was reverse transcribed to cDNA to increase its stability allowing long term storage. Real-time PCR (RT-PCR) was carried out and cycle threshold (Ct) values were obtained to detect the expression of HSL gene relative to glyceraldehyde 3-phosphate dehydrogenase (GAPDH) reference gene. Melt curve analysis and 1.2% agarose gel imaging confirmed that the relevant genes were amplified, thus confirming that high-quality RNA was extracted. Expression of HSL gene was significantly higher (P=0.033) in dSAT compared to VAT. The fold change in expression of HSL gene in overweight women compared to normal weight pregnant women was high for dSAT (36.03) followed by sSAT (22.28) and VAT (1.94). High-quality RNA could be successfully extracted. Over expression of HSL gene was observed in overweight pregnant women with the optimized method.

Keywords: *deep subcutaneous adipose tissue, degradation, high-quality RNA, hormone-sensitive lipase, RNA extraction*

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Effect of colours of Light-Emitting Diodes (LED) in trapping of phlebotomine sandflies in Sri Lanka: A preliminary study

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Insects become attracted to different colours of light. Light traps are popular and used as an easy method for collection of phlebotomine sandflies, vectors of leishmaniasis. This study investigated the effect of different colours of light in attracting the sandflies using the Center for Disease Control and Prevention (CDC) light traps equipped with LEDs of different colours. The study was carried out in selected locations in Anuradhapura, Kurunegala, Matara, Hambanthota, Polonnaruwa and Gampaha districts of Sri Lanka, from December 2018 - July 2019. Phlebotomine sandflies were collected using CDC light traps (Bioquip, USA) fitted with ultraviolet (UV) (390nm), red (660nm), blue (430nm), green (570nm) and yellow (590nm) LED panels. Traps were placed in close proximity to possible sandfly breeding and resting sites. Collections were done in a single night from 6 p.m. to 6 a.m. per location. A total of 412 sandflies [male = 178 (43%) and female = 234 (57%)] were collected from 36 locations. The highest number of flies were collected using UV LED light traps [n=120 (29%)] followed by yellow [n=96 (23%)], blue [n=91 (22%)], red [n=74 (18%)] and green [n=31 (8%)] respectively. Through morphological identification, n=300 (73%) were identified as *Phlebotomus argentipes* (male = 149 (36%) and female = 151 (37%)) and n=112 (27%) as *Sergentomyia* spp. [male = 30 (7%) and female = 82 (20%)]. The findings suggest that the CDC light traps equipped with UV LED are more efficient in attracting sandfly species in Sri Lanka while traps with green LED were least effective.

Keywords: CDC light trap, Sandfly, Sri Lanka

Acknowledgement: The TMRC Grant, National Institutes of Health, USA for funding

This abstract would be presented during the Colombo Medical Congress to be held on the 12th to 15th of February 2020, www.colombomedicalcongress.org

Anti -proliferative and apoptotic activity of *Naja naja* (Indian cobra) venom on rhabdomyosarcoma (RD) and kidney epithelial (Vero) cells

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Cancer is the leading cause of death in most countries. Hence, there is an urgent need to find safe and effective therapeutic agents to treat cancer. The aim of this study was to investigate the cytotoxic effects and apoptotic activity of *Naja naja* venom on RD cancer cells and Vero normal cells. 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay, release of lactate dehydrogenase (LDH) and the protein content of the cell lysate were carried out to evaluate cytotoxic effects after 24 h exposure to RD and Vero cells. Apoptotic activity was determined via fluorescence microscopy by staining with ethidium bromide/acridine orange dye mix. Oxidative stress was investigated by reduced glutathione (GSH) and nitric oxide levels in cells. A positive control (25 mM cyclohexamide) and a negative control (culture medium) was carried out for all assays. Experiments were carried out in triplicate. Statistical analysis of variance (ANOVA) was performed using Microsoft Excel 2013. Anti-proliferative activity was observed on both types of cells and the mean (\pm SD) EC₅₀ values for MTT assay was 4.18 (\pm 0.47) μ g/ml and 7.16 (\pm 0.73) μ g/ml for RD and VERO cells respectively. The inhibition of the venom on RD cells was significantly higher ($p < 0.05$) than on VERO cells. The mean (\pm SD) EC₅₀ value for LDH assay on RD cells was 6.27 (\pm 1.25) μ g/ml. In morphological analysis, apoptotic changes in morphology such as cell shrinkage, chromatin condensation and irregularity in shape were observed. At concentrations between 1-5 μ g/ml, the results showed a dose dependent decrease in GSH levels and protein content of the cell lysate compared to the negative control. Nitric oxide production relative to the negative control was decreased at concentrations between 0.1 – 2 μ g/ml. The present study demonstrated that *N. naja* venom induces apoptosis in cancer cells by increasing oxidative stress.

Key words: anticancer, apoptosis, Indian cobra, *Naja naja*, venom

This abstract would be presented during the Colombo Medical Congress to be held on the 12th to 15th of February 2020, www.colombomedicalcongress.org

Knowledge of healthcare professionals at a selected hospital in the Western Province regarding service provision to visually/hearing disabled patients: pre and post-training analysis of a capacity building workshop

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Patients with visual / hearing impairment need to access the healthcare system and use medicines just like others. However, the difficulties and barriers they face in this process are poorly recognized. No studies have been done in Sri Lanka as yet to assess the knowledge of healthcare workers regarding service provision to these patients. A capacity building in-service training workshop was carried out at Colombo South Teaching Hospital for 84 participants including doctors, nurses, pharmacists, physiotherapists and social workers. A self-administered questionnaire was given to all participants, pre and post-intervention, and was analysed to assess the baseline knowledge of the participants and the improvement following the workshop. SPSS (version 20) was used to analyse data. Of the participants, 26.2% stated that they did not know the special needs of visually or hearing disabled patients. Only 15.5% of the study group had previous inputs during their professional training on managing such patients. A significant improvement was seen in the participants' knowledge on vision and/or hearing impaired patients in general ($p < 0.05$), and the effective means of communicating health information to vision impaired patients including talking books ($p = 0.000$) and tactile images ($p = 0.000$), and to hearing impaired patients including pictograms ($p = 0.000$) and sign language ($p = 0.000$) in the post-training analysis. There were many knowledge gaps in the participants on service provision and communicating health information to vision/ hearing impaired patients that reduced significantly post training. This emphasizes the need for national level capacity building programs targeting healthcare professionals to improve the service provision to patients with disabilities.

Keywords: *access to healthcare services, disabled patients, healthcare professionals, visual/hearing impairment*

This abstract would be presented during the Colombo Medical Congress to be held on the 12th to 15th of February 2020, www.colombomedicalcongress.org

Risk of falls and gait characteristics among older persons with type 2 diabetes mellitus

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Diabetic peripheral neuropathy (D-PN) often leads to gait alterations which increases the risk of falls and early detection will help reduce the morbidity and mortality. This study aimed to compare gait characteristics and risk of falls among type 2 diabetes mellitus (DM) patients with D-PN and those without D-PN (D-noPN) and healthy controls (HC). We conducted a case-control study of patients with DM 50-70 years of age attending diabetic clinics at National Hospital Colombo via purposive sampling. Neuropathy was assessed using validated symptom and examination scores for D-PN, and vibration perception threshold assessments (Biothesiometer;VPT). Gait was assessed using Physiolog sensors (tempo-spatial gait parameters). Risk of falls was tested with the Physiological Profile Assessment (PPA). Data were analyzed using SPSS statistical software package with ANOVA and Kruskal Wallis H test appropriately. The sample comprised 153 participants; D-PN group (n=51; age=61.6years±6.2mean±SD; DM for 17.5years±7.6), D-noPN group (n=52; age 61.5years±5.9;DM for 11.8years±7.0) and HC (n=50; age 59.9years±7.3).D-PN group demonstrated higher symptom scores (D-PN=2.33±1.12SD; D-noPN=0.44±0.85SD, p<0.001), examination scores (D-PN=5.33±2.96SD; D-noPN=1.04±1.33SD, p<0.001) and VPT (D-PN=39.9±9.4SD; D-noPN=16.3 ±7.1SD, p<0.001) compared to D-noPN. Stride velocity was higher in D-PN compared to HC (D-PN=1.33±0.23SD; HC=1.43±0.21SD, p=0.027) and D-noPN (D-noPN =1.43±0.24SD, p=0.034). Stride length was significantly shorter in D-PN compared to HC (D-PN=1.37±0.17SD; HC=1.40±0.14SD, p=0.004) but not significantly different compared to D-noPN (D-noPN =1.37±0.17SD,p=0.057). Risk of falls as assessed with the PPA was significantly higher in D-PN (1.68±1.13) compared to HC (0.49±0.96; p<0.001) and D-noPN (0.74±0.80; p<0.001). D-PN older adults walk slower and have an increased risk of falls compared with HC and D-noPN adults. These findings suggest the importance of assessing gait and risk of falls in DM patients, especially in those with DPN to assist in planning interventions to reduce falls and associated morbidity, mortality.

Keywords: *diabetic peripheral neuropathy, gait alterations, risk of falls*

Acknowledgement: *Postgraduate research Scholarship (AP/3/2/2016/PG/05), University of Colombo, Sri Lanka.*

This abstract would be presented during the Colombo Medical Congress to be held on the 12th to 15th of February 2020, www.colombomedicalcongress.org

FACULTY OF NURSING



Empowering Nursing Education and Research for Better Health Care

29 and 30 November 2019

**MESSAGE FROM THE DEAN
FACULTY OF NURSING**

Professor Devaka Weerakoon



It is with great pleasure that I write this message on the occasion of the Annual Research Symposium- 2019 of University of Colombo. The primary aim of the Faculty of Nursing is to produce highly skilled nursing professionals to enhance the quality of nursing care, foster nursing education, promote health research and to contribute towards reduction of global disease burdens, maternal and neonatal morbidity and mortality. Thus, this year's research symposium of the Faculty of Nursing, which will be held on 29 and 30 November 2019 at the Auditorium of the Faculty of Nursing under the theme "Empowering Nursing Education and Research for Better Health Care", aims to focus on the importance of education and research in the health care sector.

The Faculty of Nursing recognises the importance of research in the relevant disciplines of nursing and related sciences. It thus expects to provide all the necessary facilities for its faculty members and students to become involved in high quality research in the years to come. In addition to the technical session, the organisers have also decided to hold a Mini-symposium where four eminent speakers will give presentations on different aspects of nursing education and research. Further, this year, the symposium organising committee plans to hold a one-day research educational workshop for the nursing community with the aim of promoting a research culture within the nursing sector.

I take this opportunity to congratulate all the presenters and thank them as well as the keynote speaker and the invited speakers for their kind contribution to this research symposium. I also thank the Vice-chancellor, Symposium Chair and her team, the Faculty Symposium Committee and my Faculty Members for the efforts rendered towards a very successful Research Symposium 2019.

INTRODUCTION TO THE KEYNOTE SPEAKER

Dr. Rasika Jayasekara

RN, BA, BScN (Hons), PGDipEdu, MNSc, MClinSc (Evid Based Healthcare) PhD

Senior Lecturer in Nursing and Midwifery, School of Nursing and Midwifery, University of South Australia



Dr Rasika Jayasekara completed his nursing training from the School of Nursing, Kurunegala and became a registered nurse in 1992. Dr Jayasekara completed his bachelor's degree from University of Peradeniya in 1996 and a Bachelor of Science in Nursing from the Open University of Sri Lanka in 1999. He received the Athabasca University of Canada Gold Medal for Excellence in the BSs Nursing programme. In 2000, he was selected for the first Master of Nursing Science programme in Sri Lanka which was funded by WHO under the academic auspices of the University of Adelaide, South Australia and the University of Sri Jayewardenepura. Dr Jayasekara joined the academic staff of the School of Nursing in Rathnapura in 2002 and received his Postgraduate Diploma in Education from the Open University of Sri Lanka.

In 2004, he was fortunate to win a highly competitive prestigious University of Adelaide PhD international scholarship to complete his PhD. Dr Jayasekara received his PhD in Nursing Education from the University of Adelaide in 2008, and his PhD research focused on the development of an evidence-based conceptual framework for undergraduate nursing curricula in Sri Lanka. After completion of his PhD, Dr Jayasekara joined the Joanna Briggs Institute of the University of Adelaide as a research fellow where he gained extensive experience in research project management. During his work at JBI, he developed an evidence-based mental health web-based programme jointly with Scotland's Department of Health. At the same time, he worked as a Clinical Lecturer at the Medical School of the University of Adelaide, where he taught on research courses for medical students. Dr Jayasekara has completed his research management postgraduate research degree in 2012 from the University of Adelaide.

In 2010, Dr Jayasekara joined the School of Nursing & Midwifery, University of South Australia as a Lecturer in Nursing and Midwifery and was promoted to the

position of Senior Lecturer in 2013. UniSA School of Nursing is considered as the largest nursing school in Australia where the annual intake is more than 1000 students for undergraduate nursing and midwifery programmes. Dr Jayasekara teaches both undergraduate and postgraduate courses and led the teaching teams for Research Courses as the Course Coordinator. Dr Jayasekara supervises several honours, masters and PhD students.

As a senior researcher, Dr Jayasekara has been recognised as a methodological expert for systematic reviews within the National Health and Medical Research Council (NHMRC) and Department of Health and Ageing in Australia due to his extensive experience of the area, publication records and attracting research grants. He has led and successfully completed three NHMRC research projects to develop Australian Clinical practice guidelines, in particular, the Australian Guidelines for the Prevention and Control of Infection in Healthcare and National Evidence-Based Antenatal Care Guidelines. Dr Jayasekara has secured more than one million AU\$ competitive grant funding during the last ten years and has demonstrated highly successful project management. Dr Jayasekara has published more than 60 refereed journal publications, several book chapters and research reports related to the effectiveness of healthcare interventions, nursing education and research methodologies. Dr Jayasekara serves as an international advisory board member for several journals including Nurse Education in Practice and he is a member of Global Science & Technology Forum, Sigma Theta Tau International Honour Society of Nursing, Cochrane Nursing Care Field, The Joanna Briggs Institute, South Australia, JBI GRADE Centre. Dr Jayasekara is also a certified assessor for undergraduate nursing programmes and the nurse practitioner master programme under the Australian Nursing and Midwifery Accreditation Council which is the independent accrediting authority for nursing and midwifery education under Australia's National Registration and Accreditation Scheme.

Dr Jayasekara was the President of the Adelaide Sri Lanka Buddhist Temple where he led a team to obtain a more than half a million infrastructure grant from the Australian Government to build a community hall for the Sri Lankan community living in South Australia.

MESSAGE FROM THE KEYNOTE SPEAKER

It is a great honour and pleasure for me to be involved as a keynote speaker of the second research symposium of the Faculty of Nursing, University of Colombo, Sri Lanka. I am delighted to see that the organising committee has selected a very important topic– Empowering Nursing Education and Research for Better Healthcare!

Healthcare is changing dramatically due to the advancement of medical sciences and technology, the abundance of clinical research and the higher demands of consumers. As a key profession of healthcare, these changes represent a significant challenge to the nursing profession and nursing education in terms of maintaining the quality of services and preparing nurses for the future. Effective systems for education, research and regulation are vital to strengthening the contribution of nursing services to achieve better health care outcomes.

I would like to extend my sincere thanks to the organising committee for giving me this opportunity to share my experience as an educator and researcher.

FACULTY OF NURSING

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Skin whitening and anti-aging potential of Ceylon cinnamon (*Cinnamomum zeylanicum* Blume)

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The use of natural products as skin whitening and anti-aging agents has increased globally in recent years due to the adverse side effects associated with both noninvasive and invasive aesthetic treatments. However, *Cinnamomum* species are rarely investigated as skin whitening and anti-aging agents; there are no previous reports on the skin whitening and anti-aging activity of Ceylon cinnamon (CC). The present study addresses this gap by examining the bark of CC. Ethanolic (95%) and dichloromethane:methanol (DCM:M, 1:1 v/v) bark extracts of authenticated CC were used in this study. Skin whitening and anti-aging properties were evaluated using anti-tyrosinase (AT) and matrix metalloproteinase inhibitory activities [anti-elastase (AE), anti-collagenase (AC), anti-hyaluronidase (AH)] (n=4 for AT and AC; n=6 for AE and AH) respectively. Quercetin (for AT) and epigallocatechin gallate (EGCG; for AC and AH) were used as the reference drugs. Results clearly indicated that both ethanolic and DCM:M bark extracts of CC possess skin whitening and anti-aging activities. However, ethanolic bark extract showed significantly high ($p < 0.05$) skin whitening (AT: IC_{50} 437.85 ± 3.55 $\mu\text{g/ml}$) and anti-aging activities (AE, AC and AH: IC_{50} 19.78 ± 1.23 , 32.95 ± 0.58 and 1260 ± 10 $\mu\text{g/ml}$ respectively) than DCM:M of bark extract (AT: $19.14 \pm 1.99\%$ inhibition at 400 $\mu\text{g/ml}$ concentration; AE, AC and AH: IC_{50} 18.13 ± 0.50 , 51.58 ± 1.70 and 1770 ± 40 $\mu\text{g/ml}$ respectively). Further, both extracts demonstrated dose dependent activities for all the assays investigated (ethanolic and DCM:M bark extracts r^2 for AT, AE, AC, AH: 0.99, 0.98 & 0.96, 0.98 & 0.97 and 0.99 & 0.97 respectively). Moreover, both ethanolic and DCM:M bark extracts showed potent anti-collagenase activity compared to the reference drug EGCG and all the other activities were moderate in both extracts compared to the reference drugs (AT, AC and AH: 29.38 ± 0.49 , 112.16 ± 0.93 and 92.64 ± 0.37 $\mu\text{g/ml}$ respectively) used in each assay. In conclusion, the bark of CC possesses both skin whitening and anti-aging activities and highlights its potential use as natural skin whitening and anti-aging agent.

Keywords: anti-aging, anti-elastase, anti-collagenase, anti-hyaluronidase, anti-tyrosinase, bark extracts, Ceylon cinnamon, skin whitening

Factors associated with occupational injuries treated at the Accident Service of National Hospital of Sri Lanka

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Injury that occurs while people engage in their occupation is a major public health concern. This study sets out to determine the demographic and occupational characteristics, causes, types and injury severity of Occupational Injuries (OI) among patients treated at the Accident Service of National Hospital of Sri Lanka (NHSL) and carried out a descriptive cross sectional study. Data related to OIs were collected from the Accident Service Out Patients' Department (ASOPD) and from the casualty wards and Intensive Care Units. An interviewer administered questionnaire was used for data collection. Data was collected during January 2019. Descriptive statistics and ANOVA were used for data analysis. A total of 160 occupational injury victims were reported to the Accident Service of NHSL. Of them, 95% were males. Out of 160 victims, 63.1% (n = 101) were admitted to the ward and 36.9% (n = 59) had left after ASOPD treatment. The mean age of the victims was 39 years (SD 14.7). Among them, 33.7% were breadwinners of the family. Among the victims, 49.5% had studied up to GCE O/L and 32.7% had primary education. The majority (93.1%) of the injuries were reported in private sector. 59.4% of them were temporary workers. The construction sector recorded the highest injuries (39.6%). Most of them had no training in the relevant field. Although most of the victims know the risk (69.3%), safety measures (60.4%) and protective equipment (73.3%) were not used. Common reasons for OIs were negligence (48.5%) and unavailability of protective equipment (30.7%). One third of victims had machinery related injuries (33.7%, n = 34) and nearly one third were injured due to a fall (28.7%, n = 29). Wrist and hand (32.7%) was the commonly injured part of the body and 37.7% injuries occurred to the dominant hand. The highest number of injury category was fractures and dislocations (40.6%). Among the victims 7.9% had severe injuries and 92.1% had less severe injuries. Internal organ, vascular and nerve damage and multiple injuries were recorded as taking the longest length of hospital stay (LOS) (mean 8.7, SD 14.1). The LOS was statistically different between disease categories ($p < 0.05$). OIs are common among young males. Lack of training and not taking safety measures are common factors for OIs. Negligence and unavailability of protective devices are common reasons for not using the protective devices.

Keywords: *emergency department injury, fatal occupational injuries, non-fatal occupational injuries, occupational injuries, work related injuries, trauma*

Non Communicable Diseases among health care workers in the National Institute of Mental Health, Sri Lanka: Prevalence and associated factors

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Non-Communicable Diseases (NCDs) are the leading cause of the global health care burden, causing many devastating consequences. A descriptive cross sectional study was conducted to determine the prevalence of NCDs and associated risk factors among health care workers at the National Institute of Mental Health (NIMH) Sri Lanka, by using convenient sampling with the participation of 360 health care workers at NIMH. Participants included 17 doctors, 187 nursing officers, 118 supportive staff and 38 allied health professionals. The WHO Stepwise approach (Step 1 and 2) was used to obtain demographic, behavioral characteristic and physical measurement data. The Chi-square test was performed to determine the association between NCD prevalence and risk factors. The overall prevalence of NCDs was 26.1%. Among them, prevalence of three NCDs were found: 8.3% diabetes mellitus, 6.7% hypertension and 6.7% heart diseases respectively. With regard to the prevalence of NCD risk factors, in this sample 13.9% were underweight, 16.1% were overweight and 5.3% were obese. Practices of alcohol intake and smoking were 15% and 3.9% respectively. Age ($p=0.000$), BMI ($p=0.000$), gender ($p=0.004$) and use of alcohol ($p=0.000$) were significantly associated with prevalence of NCDs. A significant prevalence of NCDs was reported among health care workers in NIMH. These results emphasize the need for interventions and approaches to reduce and prevent NCDs and risk factors among health care workers.

Keywords: *health care workers, Non Communicable Diseases, prevalence, risk factors*

Association between perceived work disability and work related demographic factors of Early Rheumatoid Arthritis patients

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Rheumatoid Arthritis (RA) is a chronic, systemic inflammatory disease which causes severe disability at work and also in daily routines. The World Health Organization Disability Assessment Scale 2.0 (WHODAS 2.0) provides a global measure for disability. The disability levels of early RA patients (n= 154) attending the rheumatology clinic of Colombo South Teaching Hospital and associated demographic factors were assessed by using WHODAS 2.0 questionnaire. The mean age of patients was 52 (± 9) and the majority (68.8%) were female. The mean disease duration was 3 (± 1.2) years and the mean score of overall WHODAS was 37.7 (± 21.4). Each domain of cognition, mobility, self-care, getting along, life activities and participation were scored 0.98 (± 2.2), 7.6 (± 5.2), 3.2 (± 3.3), 1.1 (± 1.87), 14.8 (± 8.0), 10.2 (± 6.7) respectively. More than half (57.1%) of the patients were involved in light physical activities and 27.3% were sedentary workers. There were no significant differences between the overall WHODAS score with gender ($P = 0.068$), work category ($P = 0.259$), presence of family history of RA ($P = 0.259$). There was no significant correlation between the overall WHODAS score and age ($p = 0.186$, $r = 0.107$), disease duration ($p = 0.144$), years of work ($p = 0.427$), working days per a week ($p = 0.722$) and working hours per a day ($p = 0.643$). The overall WHODAS score had negative significant correlation with monthly income ($r = -0.257$, $p = 0.001$) and positive correlation with amount of leave taken within the last 30 days ($r = 0.453$, $p = 0.000$). The WHODAS score was significantly higher ($p = 0.001$) among the patients who changed job after the onset of RA. Disability related to early RA was not dependent on any demographic factor or time engaged in work. Patients with early RA may have a risk of job insecurity with higher work disability.

Keywords: *demographic factors, Early Rheumatoid Arthritis, work disability*

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FACULTY OF SCIENCE



Science for Health and Well-Being

26 November 2019

**MESSAGE FROM THE DEAN
FACULTY OF SCIENCE**

Senior Professor K. R. Ranjith Mahanama



Many young scientists from the seven departments of the Faculty of Science are presenting their research work at the Annual Research Symposium, University of Colombo, on 26th November 2019 at the Faculty premises. They are keen to share their research findings with colleagues in the Faculty of Science, in other faculties of the University of Colombo and with the special guests from the Asian University Alliance. Aligned with this year's university theme, the Faculty proposed the theme "Science for health and wellbeing" emphasizing the importance of scientific research in this sector.

The Faculty of Science offers numerous postgraduate programmes in accordance with the Sri Lanka Qualification Framework (SLQF) from Levels 7-12, in addition to the undergraduate programmes offered at SLQF Levels 5 and 6. At any given time about 500 postgraduate students pursue their studies in the Faculty under the guidance of a well-qualified academic staff member. Further, the Faculty contributes to national development through its industry link, the 'Colombo Science & Technology Cell'.

I take this opportunity to acknowledge all the presenters and their supervisors for their tireless effort in maintaining and nurturing the research culture in the Faculty. My heartfelt appreciation is extended to the reviewers for their voluntary service in giving valuable comments. On behalf of all the academic and non-academic staff of the Faculty of Science, I extend my sincere gratitude to the organizing committee and all the participants, and my wishes for a very rewarding and productive event.

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***In-silico* study of a potential inhibitor of Renin: Evolitrine**

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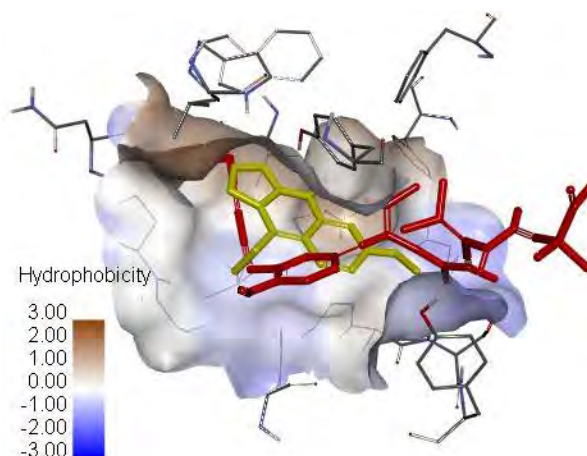
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Renin catalyses the first step in the conversion of angiotensinogen to angiotensin I. Inhibiting renin appears to be appropriate for the management of dyslipidemia because of the high specificity and unique role of this enzyme in the renin–angiotensin cascade. Computational approaches were used to provide a structural characterization of the binding site of renin with the binding of different inhibitors. Aliskiren remains the sole renin inhibitor in clinical use. Renin was virtually screened against a natural product database and the best hit molecules that established strong interactions with the residues of the aspartic protease binding sites were chosen for further studies. The molecular dynamic simulation studies proved that, Evolitrine was stable within the active site and stabilized the active site residues in comparison to Aliskiren (control). Considering the docking results and the RMSD values from the molecular dynamic simulations, we can conclude that Evolitrine could be a potent non-peptide inhibitor of Renin. Evolitrine is a natural product isolated from *Acronychia pedunculata* (family: Rutaceae). It is one of the commonly used medicinal plants in Sri Lankan traditional medicine. Different parts of this plant are used for the treatment of inflammatory conditions.



Aliskiren (red) and evolitrine (yellow) located in the active site gorge represented by hydrophobic surface

Keywords: *computational study, Evolitrine, molecular modelling, molecular dynamic simulations, Renin*

Identification of tiger beetles (Coleoptera, Cicindelinae) using an image based deep convolutional neural network

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Entomology is a multi-faceted deep area where expert knowledge and time consumption is high. In order to meet the growing biological demands and to compensate for the decreasing workforce, automated entomology is currently being used. Using this concept, we propose a deep learning methodology to identify tiger beetles in Sri Lanka, who belong to the order Coleoptera, of the family Carabidae and the sub-family Cicindelinae. The main objective of this study is to identify the six genera of tribe Cicindelini and three genera of tribe Collyridini of the sub-family Cicindelinae, using an image based deep convolutional neural network. Images were obtained by taking photographs during field investigations, from wildlife and nature photographers, tiger beetle publications and websites. A total of 242 raw images were obtained for the two tiger beetle tribes. However, due to endemism and rareness of the species, the number of images that could be collected was limited. Since deep neural networks require a large quantity of training data and also as the collected image set had an uneven number of images for each beetle genera, data augmentation was used to expand the quantity of images and to balance the dataset. Random rotation, shifts, shear and flips were conducted as augmentation methods. After image augmentation, a total of 900 images were placed in the training set and a total of 315 images were placed in the test set accordingly. After the image generation phase, training and testing data were evaluated using three models: AlexNet, a three convolutional layered deep learning model built using keras (open source neural network library written using python) and modified VGG16 model which is a multiclass classification method built with transfer learning approach. All three models were trained on six genera of tribe Cicindelini and three genera of tribe Collyridini. The highest validation accuracy of 62.06% was obtained from the modified VGG16 model. The final results revealed that the modified VGG16 network is suitable for tiger beetle identification and was placed at a comparative advantage over some existing techniques such as AlexNet. However, the analysis could be improved by increasing the number of images, by using more hostile data augmentation techniques and by weight decay methods. The development of an improved model can be used for identifying genera of other Coleopteran families and insects that are difficult to detect by conventional techniques.

Keywords: *Tiger beetles, Convolutional Neural Networks, AlexNet, VGG16, Image Augmentation*

Acknowledgement: *National Science Foundation (Grant No. RG/2017/EB/01)*

Factors considered when purchasing a car in Sri Lanka - A case study

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The car market in Sri Lanka is an ever-growing and a complicated market. Almost all types of cars in the world can be observed in Sri Lanka. Making a good decision when purchasing a car is challenging and the decision-making process of Sri Lankan car buyers is not studied by any research so far. This study is an effort to identify the factors considered when purchasing a car by Sri Lankans. A survey was conducted in the last quarter of 2018 to collect data from 194 respondents covering six provinces of the country, who recently purchased a car. Convenience sampling was used to select the respondents due to lack of a sampling frame to select a representative sample of car owners in Sri Lanka. The data was analyzed using both descriptive and advanced statistical analysis tools. A factor analysis was conducted in identifying the underlying, unobservable factors leading to the purchasing of a car. As per the findings in the descriptive analysis, price and availability of spare parts are the two most-considered aspects when purchasing a car. Promotion is the least considered factor. Nine key factors which influence the buying decision were identified through advanced analysis. Brand image, quality, comfort and reliability of the car, maintenance of the car, availability, promotions and modifiability of the car, condition, price and size of the car, after sales aspects of the car, customer perception of the car, appearance of the car and previous use/ownership of the car are those nine factors.

Keywords: *car market, factor analysis*

Dietary exposure assessment of trace elements in rice available in the Sri Lankan market through a validated test method: Health risk implications

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The trace element content in rice is an important aspect in terms of both toxicological and nutritional standpoints. Therefore, this study aimed to analyse both toxic and essential trace elements (As, Cd, Pb, Hg, Cr, Ni, Se, Zn, Cu, Mn, Fe, Co and Mo) in the main eight improved, traditional and imported rice varieties available in the Sri Lankan market through a validated test method. Method performance parameters comply with the standard requirements of AOAC and demonstrated that the method is suitable for determination of elements in rice, digested by microwave digestion followed by detection by ICP-MS. In most of the improved and all imported varieties, Zn has the highest mean concentration in the range of 5.81-18.41 mg/kg followed by Mn > Fe > Cu > Mo > Se > Co in the ranges of 5.74-10.19, 2.61-8.33, 1.54-2.28, 0.48-0.86, <0.05-0.16 and < 0.05-0.07 mg/kg respectively. In all traditional and two improved varieties, Mn has the highest mean concentration in the range of 13.37-24.01 mg/kg followed by Zn > Fe > Cu > Mo > Se > Co in the ranges of 8.26-18.91, 6.28-14.89, 2.28-3.00, 0.48 - 0.82, 0.07-0.15 and < 0.05-0.11 respectively. Toxic elements detected in rice were As, Cd, Cr and Pb. Arsenic was detected in all varieties except in white raw and white raw samba varieties which are free of the toxic elements analysed. Although *kaluheenati* is more nutritious due to the presence of the highest concentrations of Mn, Zn, Fe and Cu, all four toxic elements were detected in *kaluheenati* and also red raw samba varieties. However, only the mean concentrations (0.33 and 3.47 mg/kg) and estimated daily intake (1.6 and 17.4 mg/kg bw/d) of lead through consumption of *kaluheenati* and red raw samba exceeds the maximum permissible level (FAO/WHO CODEX Alimentarius) and tolerable daily intake (FAO/WHO Expert Committee on Food Additives) respectively.

Keywords: *dietary intake, ICP-MS, microwave digestion, trace elements, Validation parameters*

Acknowledgement: *Industrial Technology Institute (Treasury Grant No. TG 18/163)*

Comparison of dose to femoral heads in 3DCRT against Standard IMRT, SIB-IMRT and Sequential IMRT

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Carcinoma of the prostate is considered as the second major cause of cancer deaths in men in the world. Intensity Modulated Radio-Therapy (IMRT) technique is widely used to treat prostate cancer, as the ratio of normal tissue dose to tumor dose is reduced to a minimum. The primary aim of the study was to assess whether there is a significant difference between IMRT plans and Three Dimensional Conformal Radio-Therapy (3DCRT) plans. The secondary objective was to assess whether there is a significant difference between the dose to 50% volume of femoral heads (D_{50}) in 3DCRT against Standard-IMRT, Sequential-IMRT and Simultaneous Integrated Boost - IMRT (SIB-IMRT). Thirty-one patients treated for prostate cancer at Apeksha Hospital, Sri Lanka were enrolled in the study. Dose volume histograms (DVH) of patients with localized prostate cancer and high-risk prostate cancer were collected. The patients with localized prostate cancer and high-risk prostate cancer had been treated with Standard IMRT, Sequential IMRT and SIB-IMRT respectively. The DVHs were compared with the 3DCRT plans of each patient. There was a significant difference ($p < 0.05$) between D_{50} to femoral heads in the 3DCRT technique against standard IMRT, sequential IMRT and left femoral head in the SIB IMRT. Both femoral heads were overdosed in 9 out of 10 patients in 3DCRT against sequential IMRT. In 3DCRT against standard IMRT, overdoses were observed in right femoral head of 5 patients and in left femoral head of 7 patients. When other dosimetric parameters are taken into consideration the 3DCRT is comparable with IMRT treatment. However, dose to femoral heads are statistically significant in IMRT and 3DCRT treatment methods. Use of opposed beams and inability to modulate beam intensity are the main reasons for femoral heads being exposed to higher doses with 3DCRT at prescribed dose at or above 74Gy.

Keywords: 3DCRT, D_{50} , DVHs, IMRT, PTV

Preliminary study of fat composition in selected ready-to-eat foods in the Sri Lankan market

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Unhealthy fat consumption patterns, key global health risks at present, are of great concern to the World Health Organization (WHO). As such, it has recommended limiting the fat content, including saturated fat (SFA) and trans fat (TFA), in the human diet. Recently, Sri Lanka has also taken action to include the fat content in food labels. However, the country has not yet set the limits for total fat, SFA or TFA in foods due to limited baseline data on these unhealthy fat components. To address this knowledge gap, a study was planned to determine baseline data of fat components in locally consumed foods. In the initial phase, forty-eight food samples from six food varieties representing different types of food vendors from roadside sellers to high-end restaurants in the Colombo District, which are commonly consumed by both adults and children, were analysed according to AOAC and AOCS methods using a gas chromatography/flame ionization detector. The food analysed included chicken fried rice, normal chicken rice and curry, fish pastries, fish rolls, uludu wade and parrippu wade. Fat content of all samples was in the range of 3.32-82.98 percent by dry mass with the highest fat content in the samples of fish pastries. A significantly higher fat intake of 54.00 and 39.68 g per serving size (dry weight) was detected in fried rice from middle-end and high-end restaurants. Trans fats were detected in the range of 0.25 - 1.38 g/100 g fat in almost all the samples. Two samples of fish pastries (road seller category) contained more than 1 g/100 g of TFA. The highest average saturated fatty acid content was also detected in the samples of fish pastries from high-end (59.69 g/100 g) and road sellers (54.33 g/100 g). Both monounsaturated and polyunsaturated fatty acids were detected in all samples in the ranges of 20.01-50.23 and 5.80-16.33 g/100 g of fat respectively.

Keywords: *gas chromatography, total fat, trans fatty acids, saturated fatty acids*

Acknowledgement: *Industrial Technology Institute (Sri Lankan Treasury Grant No. TG/18/157)*

A modified Wiener index approach to reduce the compactness of an epidemiological network

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Infectious diseases have become the second leading cause of death in the world and is a major threat to public health in developing countries, where limitation of resources becomes a critical obstacle when implementing control strategies. Therefore, minimizing disease spread, subject to resource constraints, is of particular importance in health planning in developing countries. In regions with ample human mobility, compactness of the epidemiological network is a critical factor that contributes to the spread of the disease through regional interconnection. Hence, the problem of distributing resources in order to minimize the compactness of the relevant epidemiological network is inevitably encountered when a commendable control mechanism is designed. Several measures are available in the literature to estimate the compactness of a network, of which the *Wiener index* is the most prominent one. In this study we adopt a variant of the Wiener index as the compactness measure of the epidemiological network. Considering resource restrictions, we formulate an optimization problem on distributing the available resources to small health divisions of a selected region, aimed at minimizing the moderated Wiener index of the epidemiological network in that region. The mathematical optimization problem turns out to be non-linear as well as non-convex. Computational challenges faced in finding the global optimum to this problem are overcome by approximating non-linear functions by their linear counterparts, eventually reducing the problem to a mixed-integer linear program, solvable by an ordinary computer. We derive numerical results by applying our solution techniques to data on dengue transmission in Colombo. Our results indicate that the prevalent resource allocation criterion for Colombo does not minimize the compactness of Colombo's epidemiological network.

Keywords: *epidemiological network, separable programming, Wiener index*

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Effect of surface morphology on the binding mechanism at the urea-nano hydroxyapatite interface

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Hydroxyapatite nanoparticle (HA-Np) coatings have recently gained popularity in applications such as biosensing, controlled therapeutic drug release and slow release of agro fertilizer. However, the influence of the surface morphology of these nano-coatings in its interaction with biomolecules is yet to be understood. In this research we report the use of urea as a model molecule to investigate its interaction with two morphologically different HA-Np surfaces. Urea is an important functional group in bio molecules with a broad range of bio-activities due to its unique hydrogen binding capabilities. It has also been used in medicinal chemistry for the design and optimization of various therapeutic agents.

Morphologically different HA-Np coatings that predominantly expose (100) and (002) planes were deposited on Quartz Crystal Microbalance (QCM) sensors. Urea adsorption was monitored *in situ* and in real time onto the above two different QCM surfaces in the phosphate buffer solution (PBS). The Empirical Hill Model (EHM) satisfactorily describes the adsorption data obtained through the above experiments with a high coefficient of determination. The model indicates cooperative binding between HA-Np and urea. The surface of HA-Np contains multiple binding sites and urea possesses an affinity to those multiple binding sites. Further, the modelling information reveals that the cooperative parameter of the calcium-rich (100) plane is higher than the phosphate-rich (002) plane. This suggests that the carbonyl group of urea binds through an ion dipole bond to calcium at the (100) plane. This is in addition to the H-bonding of the amine groups of urea to the hydroxyl groups in HA-Np. The Hill parameters also reveal that the packing fraction is approximately similar for both HA-Np surfaces indicating either vertical or horizontal packing of urea. The findings provide important information in the design and optimization of HA-Np coatings with controlled consistency for the above said applications.

Keywords: morphology, nano-hydroxy apatite, Quartz Crystal Microbalance, urea

Acknowledgement: Financial assistance given by the National Research Council (NRC Grant: 15 004).

Assessment of social vulnerability for natural coastal hazards in Kalpitiya DS

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Determination of vulnerability of natural hazards is vital for the wellbeing of coastal communities as vulnerable groups are most likely to be affected adversely in a disaster event. The degree of vulnerability largely affects the ability to prepare for, respond to, and recover from disasters. This study focuses on the Kalpitiya peninsula in the North Western coast of the island which is a sensitive landscape for many natural disasters with threats of sea level rise, flood and droughts. Vulnerability indicators were computed for 10 selected GN divisions based on the predesigned conventional standard of UNHABITAT and the World Bank. Primary and secondary data were collected from relevant officials and organisations. In addition, data was collected from 100 individuals using a questionnaire. The vulnerability indicators used include gender, age range, employment status, educational level, income level, residence ownership, distance to ocean and past experience of disasters. Life line facilities (LLF) included access to water, electricity, water-sealed toilet, waste disposal service, houses with permanent roof and communication/ information facilities. Statistical analysis was carried out using SPSS package and vulnerability maps were prepared using GIS ArcMap software. Drought was found to be the disaster with the highest impact on the community, which affects both domestic and agricultural activities. The analysis attempted to capture risk groups with high vulnerability: Women (53% of the community), children below school age (4%), elderly people of over 65 years of age (8%) and children with special needs (4%). The LLF analysis revealed that 22% of the population has no access to safe potable water and 14% had no electricity facilities. Eighty eight percent of the community has no waste disposal services and 14% live in houses without a permanent roof. Computed Pearson's Correlation Coefficient between income level and education level was +0.51 while between access to communication system and age range was +0.41. The vulnerability map presents locations of different risk groups. This case study demonstrates the essential need to integrate social dimensions in disaster risk reduction programmes.

Keywords: *coastal hazards, communities, disaster vulnerability, Kalpitiya*

Hydroxyapatite based nanocomposites to remove As (III) and As(V) from water

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Safe drinking water is an essential need for everyone and identification of cost-effective, alternative methods that can remove toxic contaminants from water is important. Point of use water filtration is considered as one of the most cost-effective methods to remove inorganic contaminants from water as this method consumes no energy. In this work arsenic (a mixture of As(III) and As(V)) was considered as the target pollutant, as higher levels of arsenic can cause adverse health effects. Hydroxyapatite (HAP) and its nanocomposites have been identified as some of the best materials in water purification as they have versatile adsorption properties. Therefore, this work intended to compare the arsenic adsorption capability of five different HAP based nanocomposites in order to identify the best material for arsenic adsorption. Synthesis of HAP incorporated nanocomposites with four biopolymers, namely chitosan, carboxymethylcellulose, sodium alginate and gelatin was carried out using a simple *in-situ* method. In addition to the above, titanium dioxide (TiO₂) incorporated HAP was also synthesized. The synthesized materials were named as HAP-CTS, HAP-CMC, HAP-ALG, HAP-GEL and HAP-TiO₂ respectively. The characterization of the materials was carried out using Fourier-Transformed Infra-red Spectroscopy (FTIR), Scanning Electron microscopy (SEM) and X-ray Diffractometry (XRD), in order to study the functional groups, morphology and crystallinity and to confirm the successful synthesis of the nanocomposites. Adsorption studies carried out for a mixture of As(III) and As(V) at 1000 ppb initial concentration, indicated that HAP-CTS is the best nanocomposite for arsenic removal with respect to the four biopolymer based nanocomposite with 94% adsorption capacity within 10 minutes. However, HAP-TiO₂ was identified as the overall best material for arsenic removal, as it resulted in the highest adsorption capacity of 96% within a contact time of 5 minutes.

Keywords: *adsorption, Arsenic, biopolymer, hydroxyapatite, titanium dioxide*

Acknowledgement: *National Research Council (Grant No. 2016 –NRC-TO 16-18)*

The design of drug loaded electrospun fiber mats for the antimicrobial treatment of orthopedic implant-related infections

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Human synovial joints, such as the hip and the knees, are affected by arthritis, damaging the natural articular cartilage joint surface. The diseased joint can be treated by replacing it with a joint replacement implant and post-surgery therapies include, prophylactic systematic antibiotic and anti-inflammatory agents. However, there are several down sides of systemic therapies such as poor patient compliance, low penetration of drugs into tissues and organ-specific toxicity. Therefore, a better solution would be to locally administer drugs through a drug coated implant, enabling controlled drug release over a period. Here, we report the development of a localized delivery system of fusidic acid (FA) and hydrocortisone (HY) using electrospun fiber mats, composed of poly(vinylpyrrolidone) (PVP) and ethyl cellulose (EC) and kaolin (KA). The results of DSC and XRD showed the much-needed amorphous nature of both FA and HY in electrospun fibers with respect to their crystalline neat forms. Therefore, developed electrospun drug-loaded nanofibers exist as nanosolid dispersions which can overcome the dissolution barriers of poorly water-soluble crystalline drugs such as FA and HY. The drug-loaded formulations showed good antibiotic encapsulation (~80%–100%), and in-vitro drug release studies display sustained release over a period of 5 days, with 80% of HY being released over 3 days and with 60% of FA released over 5 days.

Keywords: *electrospinning, Fusidic acid, hydrocortisone, kaolin, implants*

Acknowledgement: *National Science Foundation (Grant No. NSF/SCH/2018/02)*

LcaR: A GntR regulator of *Pseudomonas aeruginosa* regulates medium chain alkane degradation

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Soil and water pollution is a serious health problem. Contamination of water and soil with crude oil affects food chains and food webs. Crude oil is composed of a complex mixture of different compounds. The largest fraction (~50%) of crude oil is composed of alkanes. Several bacterial species are specialized in degrading alkanes. Among them *Pseudomonas aeruginosa* is chosen for this study as it is a ubiquitous, opportunistic pathogen which has a remarkable ability to degrade alkanes. It encodes two alkane monooxygenase genes which facilitate transformation of alkanes into fatty acids. However, bacteria regulate their membrane fluidity by regulating biosynthesis of saturated and unsaturated fatty acids so as to maintain their membrane structure and function in different growth conditions. Characterization of the regulatory mechanism of fatty acid biosynthesis helps to develop novel strategies to inhibit the infections as well as promote the alkane degradation in contaminated sites. Electrophoretic mobility shift assay and ligand assay revealed that LcaR binds to the intergenic region in between *alkB2* and *LcaR* genes. Tetradecanal and Hexadecanal attenuate DNA binding of LcaR upon binding with an IC₅₀ value of 5.33 ± 0.60 ug/ml and 0.05 ± 0.02 µg/ml respectively. In conclusion, upon binding, medium chain alkanals alter the conformation of LcaR. Thereby reduces the affinity of LcaR to specific sequences in the chromosome and alter the gene expression of adjacent genes in the *alkB2* operon. These findings revealed that alkanals which are intermediate compounds in the alkane degradation pathway control the expression of alkane monooxygenase 2 in *Pseudomonas aeruginosa*.

Keywords: *Alkanes, GntR, Pseudomonas aeruginosa*

Acknowledgement: *National Science Foundation, Sri Lanka. (Grant No. NSF/RG/2015/BT/03) for financial assistance*

Enhancement of photocatalytic activity of nano/micro Cu₂O/rGO composites by Cu particles

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Cuprous oxide (Cu₂O) and reduced graphene oxide (rGO) composites were successfully produced by a chemical reduction method using ascorbic acid as the reducing agent. Initial mass percentage of Cu₂O to GO and the reducing time were identified as key parameters for optimizing photocatalytic activity of the composite. During the reduction process, partial reduction of Cu₂O occurred in addition to reduction of GO. As a result, Cu particles were formed in the composite that enhanced the charge separation in the Cu₂O/rGO composite. Photocatalytic activity was monitored using the photo-degradation of methylene blue (MB) under visible light irradiation. The Cu₂O/rGO composites were characterized by X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM). XRD confirmed the formation of Cu and rGO. A 125:10 mass ratio of initial Cu₂O:GO and 30 min of reduction, produced optimal photocatalytic performance by photodegrading MB completely within 90 minutes. In contrast, pure cuprous oxide particles did not show significant photodegradation in the presence of visible light. The resulted enhanced photocatalytic activity of the Cu₂O/rGO composites can be attributed to both the efficient charge separation and transportation process due to formation of Cu particles and rGO at the liquid interface and increased adsorptivity.

Keywords: *cuprous oxide, graphene, methylene blue, photodegradation, visible light irradiation*

Acknowledgement: *Financial assistance from the research grant of National Research Council (16-094) is gratefully acknowledged.*

Method validation for simultaneous determination of macro and micro elements in rice by ICP- MS and phosphorous by UV- Visible spectrometry

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This study aimed to validate the analytical methods for simultaneous determination of 9 elements, namely, sodium, potassium, magnesium, calcium, boron, aluminum, barium, beryllium and antimony, in rice by inductively coupled plasma-mass spectrometry (ICP- MS) after closed-vessel microwave digestion and determination of phosphorous content in rice by UV- Visible spectrophotometry after acid digestion. The validations were conducted using the evaluation of performance criteria such as linearity, working range, limit of determination (LoD), limit of quantification (LoQ), precision (repeatability and reproducibility) and uncertainty, with the use of an accuracy profile. In parallel with the validation, 26 rice samples collected randomly from local markets in Sri Lanka were analyzed. In method validation, linearity for each element was determined using the correlation coefficient of the calibration graph which exceeded 0.9990. LoD obtained for all elements ranged from 0.059 mg/ kg for beryllium to 105 mg/ kg for phosphorous and consequently, LoQ ranged from 0.072 mg/ kg for beryllium and antimony to 107 for phosphorous. Precision was determined using repeatability and reproducibility. Relative standard deviation (RSD) of repeatability was within the range, from 0.3% to 10.3%. RSD of reproducibility was within the range, 0.7% - 10.1%. The accuracy of the validated method was determined using recovery percentages for three different spike levels which represented the calibration range for each element. 10%, 50% and 80% of the highest concentration levels, derived from the highest working calibration standard for each element were spiked to investigate the recovery percentages. Recovery percentages of spiked samples were within the range of 78.5% -108%. Furthermore, the ICP-MS and UV-Visible spectrophotometric methods are excellent tools for the detailed characterization of the mineral composition of rice samples.

Keywords: *ICP- MS, method validation, performance criteria, UV- visible spectrophotometry*

Acknowledgement: *Industrial Technology Institute (Treasury Grant No. TG 18/146)*

Antioxidant and anti-inflammatory potential of the aqueous leaf extract of the Sri Lankan variety of *Plectranthus amboinicus*

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Plant based remedies play an important role in healthcare due to their low side effects as compared to synthetic drugs. As such, there is much interest in natural remedies to serve as antioxidant and anti-inflammatory agents. In this study, the aqueous leaf extract of the Sri Lankan variety of *Plectranthus amboinicus* (Kapparawalliya), prepared according to the method of 'kasaya' (ALEPA) in traditional medicine was used. ALEPA gave a total phenolic content of 138.76 ± 2.10 mg gallic acid equivalence/g in the Folin Ciocalteu assay and the total flavonoid content was 114.8 ± 13.2 mg quercetin equivalence/g in the AlCl_3 colorimetric assay. Flavonoids have potent antioxidant activity. The DPPH (2, 2-diphenyl-1-picrylhydrazyl) radical scavenging activity of ALEPA (500-5000 ppm) ranged between $12.0\% (\pm 0.685)$ – $79.9\% (\pm 0.438)$, whereas ascorbic acid (20-500 ppm) ranged between $0.8\% (\pm 0.253)$ – $95.7\% (\pm 0.503)$.

A considerable reducing power was observed by the reducing power assay. Reducing properties are related to the antioxidant action by donation of a hydrogen atom to break the free radical chain.

The hydroxyl radical is a potent reactive oxygen species in the biological system and can cause cell damage. Hydroxyl radical scavenging activity of ALEPA (400-1800 ppm) was between $23.5\% (\pm 0.667)$ – $42.0\% (\pm 0.907)$, whereas ascorbic acid showed $28.2\% (\pm 0.471)$ – $52.5\% (\pm 0.634)$ activity for the same concentration. Excess production of nitric oxide free radicals in the body cause several diseases such as inflammation, cancer and other pathogenic conditions. Nitric oxide radical scavenging activity assay of ALEPA (5-100 ppm) was between $16.5\% (\pm 1.56)$ – $30.7\% (\pm 2.29)$ whereas ascorbic acid (100-600 ppm) showed $13.9\% (\pm 1.561)$ – $43.3\% (\pm 1.73)$. The human red blood cell assay of ALEPA (75-200 ppm) showed protection of $9.9\% (\pm 0.587)$ – $21.8\% (\pm 0.556)$ whereas aspirin showed $37.0\% (\pm 0.459)$ – $52.1\% (\pm 0.561)$ for the protection at the same concentration. The aqueous leaf extract (prepared according to the method of 'kasaya') of *Plectranthus amboinicus* possesses antioxidant and anti-inflammatory activity and hence could be developed as a remedy to combat many diseases.

Keywords: *anti-inflammatory activity, antioxidant activity, Plectranthus amboinicus*

Thermal modeling of cometary nuclei to monitor volatile sublimation driven evolution of the nuclear shape and rotation

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A new model was developed to evaluate the mass loss of a cometary nucleus to understand the behavior of the changing shape of a comet nucleus. The surface of a comet was divided into triangular facets, based on longitudes and latitudes and calculations were carried out for all triangular facets. Change to the shape of the nucleus was derived by determining the reduction of the radius vectors of facets (δr_c) from the center of the nucleus of the comet. The equation of energy balance was obtained by equating the incident solar energy to the sum of reflected energy, re-radiated heat, and energy absorbed for sublimation. Finally, an equation was obtained for the rate of change of radius vector as a function of the temperature, heliocentric distance, and the zenith angle. Some assumptions, which have secondary effects on the final results, were made to reduce the computational time. This mass loss and the new shape could be used to evaluate the change of the rotational state of the nucleus. The rotational state evolves due to torques caused by sublimating gases and the changes to the moments of inertia due to the changing shape of the nucleus.

Keywords: *comets, cometary nucleus mass-loss, shape model, sublimation*

Variation in free and total amino acid profiles of selected Sri Lankan rice varieties upon milling

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The study presents the variation in free amino acids (FAAs) and total amino acids (TAAs) in rice upon different degrees of milling. With the use of 0.2 g of the sample, amino acid levels in two rice cultivars resulting from three degrees of milling (DOM) (4%, 7%, well milled) and the resulting bran collected, each in three replicates were studied. FAA and TAA compositions varied significantly ($p < 0.05$) across the studied degrees of milling. For both cultivars, TAA content in the well refined rice, reduced to (70 ± 2) % of the TAA levels observed in the unmilled rice. Milling resulted in significant reduction in both total essential amino acid (TEAA) and total non essential amino acid (TNEAA) contents. Compared to unmilled rice, the levels of TEAA and TNEAA in highly refined white rice were reduced to (76.7 ± 2.3) % and (76.5 ± 0.8) % respectively. Further, the levels of non-proteinogenic amino acids which possess health promoting functional properties, gamma amino butyric acid (GABA), also decreased by (39.8 ± 5.6) % from the levels observed in unmilled rice. Moreover, the ratio between FAAs with sweet and sour taste to amino acids with bitter taste was significantly enhanced with increasing DOM and hence, could be one of the contributing factors for the increased consumer preference observed with well refined rice. In addition, significant variations in FAAs and relatively lesser variation in TAA distribution were observed in the bran collected from the various milling fractions, reflecting the distribution of FAA and TAA inside the rice granule. Therefore, the findings revealed that the nutritive value of rice is significantly reduced with increased DOM. Hence, from a nutritional perspective, the findings presented in this study provide an insight to the consumers and nutritionists in deciding food consumption patterns, and rice producers in revisiting their processing techniques.

Keywords: *free amino acids, GABA, milling, rice, total amino acids*

Variation of recent lightning activities over Sri Lanka based on data from the Lightning Imaging Sensor on International Space Station

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Variations of recent lightning flash activities over Sri Lanka were analysed using lightning flash data from May 2017 to April 2019, obtained from the Lightning Imaging Sensor (LIS) on board NASA's International Space Station (ISS). Diurnal, latitudinal, seasonal and annual variation of lightning flash density over Sri Lanka were studied on a 0.2° Latitude \times 0.2° Longitude grid and a raster lightning flash density map was generated using Geographic Information System (GIS) software (ArcGIS 10.1 version). Lightning mapping systems can be used to minimize the harmful effects of lightning by providing early warnings of lightning hazards in Sri Lanka. According to this study, the maximum lightning flash density was recorded in the first inter monsoon. The maximum value of $2.77 \text{ flashes km}^{-2} \text{ month}^{-1}$ was observed for the latitudinal belt 6.5500° N - 6.7500° N . In all four seasons, activity increased with increase in latitude within the southern part of the Sri Lanka. However, in the northern part of the Island, activity decreased with increase in latitude. The maximum lightning flash density occurred in the first inter monsoon season. During this season, the flash density was $35.00 \text{ flashes km}^{-2} \text{ year}^{-1}$, and occurred at $6.8350^{\circ} \text{ N}/80.2560^{\circ} \text{ E}$. The maximum annual lightning flash density was $42.00 \text{ flashes km}^{-2} \text{ year}^{-1}$ and occurred at $6.8060^{\circ} \text{ N}/80.2740^{\circ} \text{ E}$. The mean monthly lightning flash counts show that, most of the lightning flashes occurred during the period from March to April with peak activity in April. The flash density over the sea was significantly low compared to that over land. Seasonal total flash counts during the first inter monsoon and southwest monsoon were high compared to other seasons but normalized seasonal total flash counts were observed to be high during the first and second inter monsoon seasons. Thus, lightning activities during the inter monsoon season are more intense. The annual variation of flash counts shows principal maxima in April and secondary maxima in March. The diurnal variation of maximum flashes was observed between 15.00-16.00 local time and minimum between 01.00- 02.00 local time. The results clearly show that maximum lightning activities occur during the late afternoon to evening hours.

Keywords: *ISS data, LIS data, Lightning, Lightning flash density*

Spatial variation of lightning activities associated with the elevation profile of Sri Lanka

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The relationship between the elevation and lightning flash density is of interest for a number of applications such as lightning risk analysis, performance evaluation of lightning location systems (LLS), and climate studies. Variation of lightning flash activities associated with elevation in Sri Lanka was studied using the lightning flash data obtained from the Lightning Imaging Sensor (LIS) on board NASA's Tropical Rainfall Measuring Mission (TRMM) satellite. The LIS data for the period from 1998 to 2014 were gridded to $0.20^\circ \text{Latitude} \times 0.20^\circ \text{Longitude}$, to analyze the lightning flash density over Sri Lanka and a raster lightning flash density map was designed using Geographic Information System (GIS) software, ArcGIS (version 10.1). Elevation data of the country obtained from the Survey Department of Sri Lanka, consists of 0 m, 150 m, 300 m, 600 m, 1200 m and 2400 m contour lines relative to sea level. According to this study, a maximum flash density of 14 flashes $\text{km}^{-2} \text{ year}^{-1}$ and 76.08% of lightning flashes were recorded in the region of 0-150 m in the first inter monsoon season. In the southwest monsoon season, a second maximum flash density of 10 flashes $\text{km}^{-2} \text{ year}^{-1}$ and 77.02% of lightning flashes were recorded in the region of 0 m and 150 m. Furthermore, a maximum flash density of 6 flashes $\text{km}^{-2} \text{ year}^{-1}$ and 74.04% of lightning flashes were recorded in the region of 0-150 m in the second intermonsoon season and in the northeast monsoon season, whereas a maximum flash density of 8 flashes $\text{km}^{-2} \text{ year}^{-1}$ and 77.84% of lightning flashes were recorded in the region of 0-150 m. Although, the maximum flash density in the two monsoon seasons and two inter monsoon seasons were recorded in the region of 0-150 m, the recorded locations of the maximum flash density changed with the season. Generally, annual lightning activities near the coastal line (0 m contour line) were lower. Lightning activities along the coast line in the southwest region are relatively higher than those in other sea level areas in the country. According to the annual variation of lightning activities, the maximum number of flashes (76.15%) was recorded in the 0-150 m region. About 0.10% of lightning flashes were recorded over the highlands ($>1200 \text{ m}$) and lightning activities over this region were lower than in other areas of the country. Furthermore, the maximum average annual flash density, 28 flashes $\text{km}^{-2} \text{ year}^{-1}$, was recorded over the region between 0-150 m. It was observed that increase in elevation was not a dominant factor that contributes to enhancing the lightning activities over a region. The study suggests that lightning protection systems are essential in structural constructions over the 0-150 m region.

Keywords: *elevation profile, lightning, lightning flash density, lightning risk analyses*

Factors associated with the emotional abuse of elderly people living in the Galle MOH area: A case study

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Elder abuse is predominantly seen as a social welfare issue and subsequently a problem of aging. Currently it has developed into a public health and judicial problem. Elder abuse is mainly categorized into four categories: physical abuse, emotional abuse, financial abuse and neglect. Emotional abuse can be psychological, consisting of humiliation, insults, intimidation and verbal harassments of elders. The aim of the study is to identify the factors associated with emotional abuse of elders. The study group comprised 365 elders in the Galle MOH area. The mean age was 69.65 and 89.3% of the 365 were Sinhalese. Actual Abuse Tool which comes under Screening Tools and Referral Protocol (STRP) was used to identify the emotionally abused elders. Among the 365 elders, 23.3% were emotionally abused. A majority of emotionally abused elders were female and were living with their children. Around 80% of emotionally abused elders were dependent on their care giver and 73% were suffering from non-communicable diseases. Around 91% of emotionally abused elders did not have sufficient savings and 77% of them had no income source. Marital Status, education level, whether they had major losses in their life, and the care giver are the factors found to be associated with the emotional abuse status. According to the binary logistic model, widowed or separated elders have less chance of being emotionally abused; as an odds ratio, it is 19.5 times less. Elders who have not had major losses during the last five years have an 18.9 times higher chance to be emotionally abused compared to those who have had losses. Education has a significant impact on emotional abuse; less educated elders have a higher chance of being emotionally abused. It is important to note that elders under the care of a spouse have a 126 times higher chance of being emotionally abused than those under the care of their children.

Keywords: *Actual Abuse Tool, emotional abuse, non-communicable diseases, Screening Tools and Referral Protocol*

Suitability of six microsatellite markers for evolutionary genetic studies of Asian tiger mosquitoes in Sri Lanka

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Genetic markers are used to estimate diversity among populations from which spatially, temporally and evolutionary important inferences on populations are deduced. Microsatellites are one such popular marker that plays a vital role in evolutionary genetics. The Asian tiger mosquito or *Aedes (Stegomyia) albopictus* is considered an important vector of numerous arboviruses including dengue. As such, in this study, six microsatellites were examined for their suitability to be used in evolutionary genetic studies of *Ae. albopictus* populations in Sri Lanka. *Ae. albopictus* larval samples were collected from five areas in Sri Lanka (Kalamulla: N=32; Imbulgoda: N=19; Palinagar: N=29; Killinochchi: N=19 and Karaveddy: N=23). Genomic DNA was extracted, and PCR amplified for six microsatellite markers (Albtri-3, Albtri-18, Albtri-20, Albtri-25, Albtri-44 and Albtri-45). Allelic data were analyzed using FSTAT 2.9.3, Genepop 4.6 and MICROCHECKER 2.2.3 software. A total of 63 alleles with an average of 10.5 alleles per locus were observed among samples. Allelic richness averaged over loci ranged from 5.498 to 6.880 with high heterozygosities (H_O :0.665-0.747; H_E :0.685-0.785). When checked for conformity to the Hardy Weinberg Equilibrium (HWE), two out of 15 tests showed significant deviations ($P<0.0017$), accompanied with inbreeding ($F_{IS}=0.1$; $P<0.01$). Likewise, a significant linkage disequilibrium (LD) was observed between one marker pair ($P<0.00067$). However, since this represents only one out of 75 tests conducted for LD, it is unlikely to reflect true allele co-segregation between the six markers. Further, there were no large allele dropouts in either of the six markers, although five out of 30 tests showed possible occurrences of null alleles. However, none of them have occurred consistently in all five populations. Our results indicate that the selected microsatellite markers are appropriate candidates for evolutionary genetic studies of *Ae. albopictus* populations in Sri Lanka, in terms of high marker variability, conformity to HWE and lack of consistent LD.

Keywords: *Ae. albopictus*, evolutionary genetics, Hardy Weinberg Equilibrium, linkage disequilibrium, microsatellites

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An investigative study of capacitor bank failures in industrial facilities due to supply system irregularities

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Capacitor banks play a crucial role in improving the power factor of electricity consumed by bulk consumers such as factories. At the same time, the electricity supplier is not burdened by the excessive demand of reactive power. Heavy use of predominately inductive motors in many operations is the root cause for keeping a lower than stipulated power factor (lagging) in factories. Since capacitors have a leading power factor they counterbalance the shift caused by the inductive load, making the load appear almost purely resistive to the supply but still lagging in nature. This improvement of power factor satisfies the requirements of the supplier, avoiding blackouts due to excessive demand of power. Moreover, the supply company may have to install higher ratings of transmission and distribution resources to supply the additional load current to battle with this loss. In order to identify whether there are common mode transients in the power system in each phase, a high voltage probe connected to the 230 V_{rms} system line and the system ground was used. Voltage transient waveforms were captured directly at the switch contact or at the distribution panel when switching operations took place. Through this experimental approach, the recorded maximum voltage peaks reached values as high as 980.5 V while the average value reached was 783.6 V, which were higher than the allowed (1.1 times) nominal supply peak value fluctuation. When the KVAR values of capacitors were calculated based on the observations it was found that the calculated KVAR values are over 5 times than the actual allowed standard values (1.35 times). It is perceived that voltage impulse of load switching, poor or high resistance grounding, utility fault clearing, and repetitive breakdown of switch contacts were the reasons behind the transients observed. Temperature variations also contribute to the failures by surpassing the recommended values.

Keywords: *capacitor bank, induction motor, Overvoltages, reactive power*

Fuzzy linear regression model to assess the dispersal risk of invasive alien plant species

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Invasive Alien Plant Species (IAPS) is recognized as a serious threat to the ecosystem as it has the ability to displace native species, reduce wild life habitat and alter natural processes. Management of invasive species can appear to be a complicated and unending task. To manage the spread of these species, it is very important to quantify their level of risk. Risk assessment of IAPS is at present a manual process. The risk assessment includes a number of questions regarding the risk factors contributing to the invasiveness of the plant species and the scores are predefined answers to each of these questions. Most of the parameters in risk assessments are accompanied by imprecision and uncertainty. In such cases, fuzzy set theory plays a vital role in modeling the uncertain systems. In this work, dispersal, which is one of the important biological traits of invasive potential, has been considered. The dispersal factors, seeds per fruit, seed rain, seed viability and dispersal strength are chosen as the model parameters. These factors have been taken from the National Risk Assessment protocol (NRA) of Sri Lanka. The fuzzy multiple linear regression technique has been used to aggregate the four risk factors. The unknown coefficient parameters are estimated in the form of fuzzy numbers, based on the work done by Pamela McCauley Bell and Heng Wang. For this evaluation, a data set of 19 invasive species was taken from the NRA of Sri Lanka. Since the model output is in the form of a fuzzy number, we investigated whether the score given in the NRA is within the fuzzy interval. Also, the model was validated using known invasive and non-invasive species in Sri Lanka.

Keywords: *fuzzy numbers, Invasive Alien Plant Species (IAPS), multiple linear regression, risk assessment*

Haplotype analysis of two X-chromosome STR clusters in Sinhalese population

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Haplotype analysis of closely associated markers is a powerful tool in kinship analysis, especially when short tandem repeats (STR) alone fail to resolve uncertainty in relationship analysis. Since the X-chromosome recombines only in females, X-STRs show stronger linkage disequilibrium (LD) compared to those on autosomes. However, because LD between X-STR loci has proven to be population-specific, the appropriate use of X-STR haplotypes requires direct estimation of haplotype frequencies from the population of interest. However, no studies have been carried out on Sri Lankan ethnicities so far to investigate the extent of X-STR allele co-segregation. This study therefore aimed to examine the level of LD between two X-STR clusters, DXS10079-DXS10074-DXS10075 (cluster I) and DXS6801-DXS6789-DXS6809 (cluster II) and to estimate the frequencies of haplotypes defined by them among a sample of Sinhalese population. To achieve this, DNA was extracted using Chelex method from finger pricked blood samples collected from 120 Sinhalese males. The six X-STR markers were amplified using previously published primers and were resolved with capillary electrophoresis. Genotyping data obtained were analysed with Arlequin 3.5.2.

Numbers of alleles observed for cluster I, DXS10079-DXS10074-DXS10075 and cluster II DXS6801-DXS6789-DXS6809 were 8-9-7 and 4-10-9, respectively. Accordingly, clusters I and II can produce 504 and 360 different haplotype combinations, respectively. However, only 70 (cluster I) and 68 (cluster II) haplotypes were observed for the two clusters within the study population. The frequencies of the most common haplotypes of clusters I and II were 0.033 and 0.050, respectively. When exact test for LD was performed for the loci pairs within each cluster, a significant LD was detected between DXS10079-DXS10074 of cluster I ($P=0.0007$) and DXS6789-DXS6809 ($P=0.009$) of cluster II. These results strongly suggest that haplotypes of the studied X-STR clusters would provide a powerful tool for kinship testing and relationship investigations among the Sinhalese population.

Keywords: *haplotype analysis, kinship analysis, linkage disequilibrium, Sinhalese, X chromosome STR*

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A Study of the radioactivity level in the Eppawala apatite deposit

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Phosphate deposits are potential sources of unconventional uranium and thorium resources. Hence, workers at such a mining sites can be exposed to a higher than the acceptable level of radioactivity. In order to investigate this hypothesis, samples from the phosphate deposit in *Eppawala*, in the North Central Province of Sri Lanka, was analysed in order to identify and quantify the radionuclides. The collected samples included 13 subsamples of 2 underground cores from H1 and H2 locations and 14 superficial samples collected from 8 different locations. All the samples were prepared as per standard procedures and analyzed by Gamma Spectrometry for radioactivity measurements. Obtained results included activity concentrations of ^{40}K , ^{210}Pb , ^{226}Ra (^{238}U), ^{232}Th and ^{235}U of surface samples to be 13 ± 2 to 38 ± 4 (23 ± 2), 23 ± 4 to 93 ± 15 (40 ± 7), 42 ± 3 to 213 ± 15 (76 ± 5), 186 ± 19 to 502 ± 47 (293 ± 28) and 2 ± 0.6 to 13 ± 3 (5 ± 1) Bq kg⁻¹ respectively. The average annual effective dose for the Eppawala apatite deposit was 0.26 ± 0.02 mSv. This value is far below 20 mSv per year, the permissible radiation dose level for a radiation worker as well as 1 mSv per year, the permissible radiation dose level for the general public. According to the results, the radiation dose received by a member of the public using Eppawala rocks as fertilizers is negligible, compared to the average annual effective dose from natural sources. This study revealed that Eppawala apatite rock has radioactivity levels far below the permissible level. However, the environmental impact due to radiation on mining of the phosphate deposit is worth investigating.

Keywords: *gamma spectrometry, Eppawala apatite, phosphate, radionuclide*

Removal of textile dyes using Mg-doped hydroxyapatite nanoparticles and modified rice husk

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Textile dyes, often retained in industrial effluents, are harmful to the environment. Hence, efficient removal is needed before they are released into streams. While many conventional treatment techniques are being used, adsorption is a convenient and effective means of dye removal. In this study, nano hydroxyapatite (nano-HAP), nano-HAP doped with Mg (Mg-doped HAP) and modified rice husk (RH) have been utilized as the adsorbents for removal of four types of textile dyes. Lanaset Yellow 2R, Malochite Green, Erionyl Turquoise, and Congo Red were used to represent acid, basic, reactive and direct dyes respectively. Adsorption capacity and percentage removal of dyes were calculated for the above sorbents and were compared with commercial HAP, activated carbon (AC) and raw rice husk. Nano-HAP and Mg-doped-HAP were synthesized using a modified wet chemical method and characterized by X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM) and Energy-dispersive X-Ray Analysis (EDX). Morphology of nano-HAP shows needle-rod shaped particles with a length 60 – 80 nm. EDX analysis gives a Ca/P ratio of 1.63 and Mg/Ca ratio of 1.39 for doped HAP. Modification of RH was done chemically (using citric acid) and thermally (at 420 °C) and the latter has a porous nature. It was concluded that the Mg-doped-HAP nanoparticles were more effective as adsorbents for Erionyl Turquoise, Malachite Green and Congo Red while thermally treated RH was the best adsorbent for Lanaset Yellow. Percentage removal values were 98.4, 98.6, 98.4 for Erionyl Turquoise, Malachite Green and Congo Red each on Mg-doped-HAP, and 62.9 for Lanaset Yellow on thermally treated RH. Thermal treatment of RH showed more promising results compared to chemically treated RH. Effect of removal efficiency on initial dye concentration, adsorbent dosage and contact time were also studied.

Keywords: *adsorption, dyes, hydroxyapatite, textile, removal*

The impact of the geomagnetic storm of 7 - 8 September 2017 on the geomagnetic field around Sri Lanka: A case study

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High solar activity can affect both space-based and ground-based systems such as high-voltage lines, communication, navigation systems and satellite systems. Geomagnetic storms can be used to study the influence of solar activity on Earth. This study focuses on a geomagnetic storm which occurred during the first half of September, 2017 due to a highly active region on the sun. Solar active region 2673 was one of the most complex sunspots in solar cycle 24, generating 27 M-class flares and 4 X-class flares. As a result of increased solar activity in this region, a geomagnetic storm reached Earth on 7 and 8 September 2017. The geomagnetic storm consisted of two consecutive magnetic storms, separated approximately by 13 hours. Local geomagnetic variation measurements were taken from the Magnetic Data Acquisition System MAGDAS-9 observatory in Colombo, Sri Lanka (6.97°N, 80.07°E). The geomagnetic disturbance that occurred on 7-8 September 2017 caused a minimum value of -124 nT in the Dst-index. Because of the very low value of the Dst-index, this geomagnetic storm is considered as an intense storm event. According to the National Oceanic and Atmospheric Administration (NOAA) classification, this could be identified as a G1-class geomagnetic storm. The H-Component of the geomagnetic field around Sri Lanka had dropped dramatically during the storm time. Based on previous data, 6 September can be considered as a day with natural geomagnetic variation. When the night time minimum value of the H-Component is considered, in Sri Lanka, the night of 6 September has a value of 40962 nT and for the nights of 7 and 8 September the values were 40779 nT and 40752 nT, respectively. Night-time geomagnetic variations on 7 and 8 September showed a lower night time minimum value of the H-Component than that of 6 September. This is due to ring current generated by the geomagnetic storm.

Keywords: *geomagnetic storm, MAGDAS, solar flare, space weather*

Acknowledgment: *Financial assistance by NRC Research Grant 16-098 is acknowledged.*

Homologs of Rv3095: in the quest of finding its role in *Mycobacterium tuberculosis*

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Globally, tuberculosis is one of the top ten causes of death generated from a single infectious organism. Drug-resistant TB continues to be a major public health risk. Discovery of novel and alternative drug targets is of great importance due to the surfacing of multi-drug resistant varieties. The interest of this work is on MarR (Multiple Antibiotic Resistance Regulator) homologs that are responsive to small molecular ligands. Rv3095, a member of the MarR family transcriptional regulator is previously shown as a potential drug target for *M. tuberculosis* and is responsive to carbohydrates, mainly to xylan. Here we show the prevalence of the transcriptional regulator Rv3095 homologous systems in other environmental species of mycobacteria and some related actinomycetes with phylogenetic analyses. Homologous sequences having a high identity from blast search results were aligned in clustalW and the phylogenetic tree was constructed with MEGA4, based on neighbor joining method. Though the homologs shows a complete similarity to a transcriptional regulator of another infectious species, *M. canetti*, it also shows similarities in other NTB bacilli: *M. szulgai*, *M. angelicum*, *M. marinum*, *M. conspicuum* and *M. moriokaense* which are originally found and isolated from environmental sources such as soil, fresh water and marine water. Besides mycobacteria, most of other species predicted to encode Rv3095 homolog are actinomycetes, where most of them are isolated from soil. Rv3095 homologs in soil bacteria validate the hypothesis that the regulator of *M. tuberculosis*, which regulates the xylan degradation pathway, is a retention from ancestral soil mycobacteria as the human host lacks the substrate xylan. However, retention of this system in its complete integrity suggests an alternate role in the organism. Characterizing the pathogen with a phylogenetic tree reveals homologs that reinforces the fact that some carbohydrates (like xylan) have the potential of being drug leads to combat tuberculosis.

Keywords: Carbohydrate, Ligand, *Mycobacterium tuberculosis*, Xylan

Acknowledgment: National Research Council, Sri Lanka for financial assistance (Grant No: 15-063).

**Nano-manganese oxide and reduced graphene oxide doped polyacrylonitrile fiber mats
as potential electrodes for capacitive deionization (CDI) technology**

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Capacitive deionization (CDI) is a technique where ions in water is removed by electrosorption of them onto electrodes. In this study, nano-manganese dioxide (MnO₂) doped polyacrylonitrile (MnPAN) composite fibers were fabricated by electrospinning. The fibers with optimized nano-MnO₂ content were further doped with reduced graphene oxide (rGO). The synthesized fibers were characterized using scanning electron microscopy (SEM), transmission electron microscopy (TEM), energy dispersive spectroscopy (EDS), and confirmed the incorporation of both type of nanomaterials in the composite fiber structure. The electrochemical characteristics of the electrode material were examined using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and constant current charge-discharge cycles (CCCD). Composite fibers with 17% (w/w) MnO₂ and 1% (w/w) of rGO were observed to have the best electrochemical performance, with a specific capacitance of 244 F/ g at 10 mV/ s scan rate. The electrode system was used to study the removal of sodium chloride (NaCl), Cd²⁺ and Pb²⁺ ions. The results indicated that NaCl shows the highest electrosorption (20472 C/g) compared to the two heavy meatal salts (14260 C/g for Pb²⁺ and 6265 C/g for Cd²⁺), which is most likely due to the ease of mass transfer of the lighter Na⁺ and Cl⁻ ions. Between the two heavy metals, Pb²⁺ shows more electrosorption on these fibers than Cd²⁺ ions. Hence it is clear that the proposed binder free, electrospun MnPAN electrodes has the potential to be used in desalination as well as applications requiring the removal of heavy metals.

Keywords: *capacitive deionization, electrospinning, manganese oxide, nanofibers, polyacrylonitrile*

Fibrous keratin protein bio micro structure for efficient adsorption of silver nano particles from water: Surface charge mediated interfaces for metal particle adsorption

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Wool fibers abundant in keratin protein were used to prepare a novel bio absorber for removal of silver nanoparticles from an aqueous suspension. Amino acids of these protein structures with chemical moieties rich in amine, sulfur and carboxylate were functionalized using a simple surface hydrolysis technique in alkaline medium. The surface treatment has allowed the wool fiber material to show a comparatively high adsorption capacity for silver nano particles (Agnp) in an aqueous suspension. It was observed to have 98 % removal of Agnp from the aqueous medium. Interestingly, the prepared wool materials showed a surface charge mediated adsorption phenomenon where amine functional groups were protonated in the presence of acetic acid in the suspension medium. FT-IR, NMR, EDX, CHNS and XPS studies confirmed the partial removal of cuticle cells which sheath the hierarchical microstructure of the wool fiber due to the alkaline hydrolysis. The morphological change of wool yarn due to the hydrolysis was observed using AFM and SEM which showed partial removal of cuticle cells and exposure of internal fibril structure. Chemical and physical changes on the wool fiber due to surface hydrolysis have played a crucial role in generating the exceptional adsorption capacity of 188.68 mg/g (qm) at 298 K, which is higher than several previously reported qm values for the silver nano particles. Adsorption data fit the pseudo-first order kinetic model and equilibrium data fit the Langmuir isotherm model. With the combination of high adsorption capacity and easy fabrication, surface hydrolyzed wool (0.5 M wool) could be a promising bio material to remove silver nano particle from an aqueous medium modulated by acetic acid.

Keywords: *adsorption, alkaline, hydrolysis, protonation, silver, wool*

Best agricultural management practices to minimize greenhouse gas emission in coastal salt-affected paddy fields in Sri Lanka

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Production of rice in Sri Lanka is vital as it is considered to be the staple food of the country. Sea level rise due to climate change affects the salinity intrusion in soil in the coastal region of Sri Lanka. Traditional practices in cultivation of rice have not been effective for high yield production (HYP) in this region. This study was initiated to identify the best agricultural management practices (BMPs), with low greenhouse gas (GHG) emissions, supporting the climate change mitigation on salt-affected paddy soils, as it would eventually help sustain the rice production in such areas of Sri Lanka. The research was carried out in Madampe, in the Puttalam District during the Maha season (the North-East monsoon from September to March, specific to Sri Lanka). The newly improved salinity tolerant variety BG 310 was planted in this particular salinity affected (EC- Sat. 2-4 dS/m) geographical location to study the change in GHG emissions. Four different management options, namely maintaining a 2-3 cm water level until milking, organic matter addition, broadcasting and transplanting techniques, were considered variably in 4-plots within each field, including a control. The closed chamber method was used to collect three replicates of samples in each management option. Collected gas samples were analyzed using gas chromatography. CH₄, N₂O and CO₂ emissions were measured starting from the date of seeding (broadcasting or transplanting) onwards at weekly intervals. The weekly CH₄ and CO₂ fluxes ranged from 0.27 to 0.628 mg m⁻² hr⁻¹ and -115.05 to 549.78 mg m⁻² hr⁻¹, respectively. Emission of N₂O was negligible; organic matter addition seemed to reduce denitrification though intermittent water supply (with dry and wet periods) seemed do induce it; but the N₂O emissions detected were still too low. The lowest GHG emissions were observed when intermittent irrigation water supply, addition of organic matter and transplanting method were applied as the combination of BMPs.

Keywords: *Best Management Practices, greenhouse gas emissions, salinity intrusion, salinity tolerance*

Acknowledgement: *Grant from Asia-Pacific Network for Global Change Research (APN)*

Serum TNF- α , IFN- γ , IL-1 β and IL-10 levels in oral and oropharyngeal cancers

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Oral cancer (OC; C00-C06, C09) and oropharyngeal cancer (OPC; C10) are considered as important components of the burden of cancer in two thirds of the developing countries, worldwide. Human papillomavirus (HPV) is an established etiological agent of OC and OPC. Cytokines are a group of signaling molecules that mediate and regulate host immunity and inflammation with a probable significant role in carcinogenesis. This study aimed to compare the serum levels of TNF- α , IFN- γ , IL-1 β and IL-10 in OC and OPC patients against healthy individuals. These serum cytokine levels were also analyzed in human papilloma virus (HPV) positive OC/OPC cases. This case-control study used 380 oral and oropharyngeal patients (OC; n=203, OPC; n=177) and age and gender matched non-cancer healthy controls (n=380). Serum cytokine levels were quantified using Sandwich Enzyme Linked Immunosorbent Assay kits. Diagnostic accuracy was evaluated by Receiver Operating Characteristic (ROC) curve analysis. Polymerase chain reaction (PCR) was used to detect HPV DNA in OC/OPC tumour tissue. Levels of all tested cytokines were significantly higher in OC /OPC patients than in controls ($P < 0.05$). HPV DNA was detected in 12.63% (10.34% in OC and 15.25% in OPC) of cases. The level of TNF- α ($p = 0.02$) and IFN- γ ($p = 0.02$) was significantly higher in both OC/OPC patients infected with HPV compared to HPV negative OC/OPC patients. TNF- α can be used with 98.9% accuracy in discriminating OC/OPC cases from normal controls; this value for IFN- γ , IL-1 β and IL-10 were 93.2%, 89.6% 96.6%, respectively. The Th1:Th2 cytokine ratio of both TNF- α :IL-10 (1.13 ± 0.15) and IFN- γ :IL-10 (1.12 ± 2.2) showed a significant increase in OC/OPC patients compared to healthy controls ($p < 0.05$). Increased levels of serum TNF- α , IFN- γ , IL-1 β and IL-10 with a concurrent Th1 cytokine-biased, pro-inflammatory immune response detected in OC /OPC suggest that the results of the study will have potential value in the diagnosis of OC and OPC.

Keywords: *Human papillomavirus, IL-1 β , IL-10, Oral and oropharyngeal cancers, Serum cytokines, TNF- α , IFN- γ*

Acknowledgement: *University of Colombo (Grant No. AP/3/2/2017/CG/26) and National Research Council (Grant No. 13-130)*

The significance of motions in gravitational lensing time delays

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In astronomy, gravitational lensing is used as a method to measure the mass distribution of the universe, search for exoplanets, and to measure the size and age of the universe. A photon coming from a faraway source can produce multiple images due to the gravitational lensing effects of a nearby object such as a galaxy. There is a difference in photon arriving times in these multiple images which is known as gravitational lensing time delay. Objects involved in this scenario, the source, the lens and the observer, have random peculiar motions, irrespective of cosmological expansion due to dark energy. In the present context, when gravitational lensing time delays are calculated, the peculiar motion of the objects is neglected. In this research we have calculated more realistic time delays considering the peculiar speeds of the objects concerned. We have identified that the peculiar motion of the lens has a notable effect on the gravitational lensing time delay. The change in time delay difference due to the peculiar motions is in the order of 5-10 % of the time delay calculated without the peculiar motions. Therefore, this value is significant and cannot be neglected in calculating gravitational lensing time delays.

Keywords: *gravitational lensing time delay, peculiar speeds*

Graphite/Chitin nanofiber hybrids for screen printable capacitive paper devices

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Graphite based conductive inks are being investigated for a host of potential applications, including printed circuit fabrications, energy storage, energy harvesting and electrochemical sensors. However, the various challenges in performance and functional characteristics including printability, fast drying, and smudging of these inks have inhibited rapid adaptation. Therefore, novel formulation systems and unique sensing strategies are required to step up to the challenge and provide inks with good electrical properties, along with the acceptable functional behaviours in printed circuits. Chitin nanofibers (CNFs) have been identified as a potential candidate to elevate the functional characteristics of the ink with minimal impact to their electrical properties due to their unique interaction behaviour with graphite particles. Therefore, screen printable carbon inks with different graphite CNFs ratios have been tested and an optimized formulation was identified based on various factors including printability, electrical performance, durability and the tendency to smudge. The prints were also characterized using scanning electron microscope and Raman spectroscopy. At best formulation conditions the graphite ink resulted in a sheet resistance as low as 90 – 120 Ω/sq with acceptable printability (grade 8) and print characteristics (crack durability, grade 10 and resistance to smudging grade, 6). It was identified that to demonstrate the applicability of the Graphite-CNFs hybrid ink systems for practical applications, a unique electronic detection strategy, optimized to the resulting electrical properties of the inks, is required. Therefore, two electronic detection strategies involving a resistor capacitor couple circuit and another employing a relaxation oscillator was developed to sense the change of capacitance to touch on paper devices. The functionalities of the resulting prints for On/Off switch, variable resistor, proximity sensor and a data storage device have been demonstrated successfully.

Keywords: *capacitive sensing, chitin nanofibers, graphite ink, paper devices*

Synthesis of vanadium pentoxide impregnated hydroxyapatite and its application in drinking water purification

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Chronic Kidney Disease of unknown etiology (CKDu) is one of the major health problems related to polluted drinking water. It is reported that this is the leading cause of deaths in the North Western and Central Provinces of Sri Lanka. In these areas, more than 50% of the population use ground water for domestic purposes. Hence, there is a high probability that they would intake elements of geogenic origin, if present in ground water. One such element that has been suspected to be the major cause for CKDu is fluoride. In this study, microporous hydroxyapatite (mPHAP) crystals were synthesized with ammonium metavanadate to form vanadium oxide (VO) impregnated hydroxyapatite. The synthesized composite was characterized using SEM, SEM-EDX, XRD and FT-IR. The uniform distribution of VO throughout mPHAP was confirmed using SEM-EDX data. Synthesized hydroxyapatite-vanadium pentoxide (mPHAP-V₂O₅) was analyzed for the removal of fluoride ions. Results indicated that the equilibrium fluoride adsorption capacity on the composite was 28.1 mg/g and is a three-fold improvement compared to neat PHAP (9.1 mg/g), and two-fold improvement compared to neat V₂O₅ (13.4 mg/g). Fluoride adsorption on mPHAP fitted to the Freundlich adsorption isotherm indicating surface heterogeneity. According to kinetic studies, fluoride adsorption on mPHAP-V₂O₅ was found to be first order.

Keywords: *adsorption isotherms, microporous hydroxyapatite, vanadium pentoxide*

Acknowledgement: *National Research Council (NRC Grant No. TO 16-18)*

FACULTY OF TECHNOLOGY



Health and Well-Being

29 November 2019

**MESSAGE FROM THE DEAN
FACULTY OF TECHNOLOGY**

Senior Professor J. K. D. S. Jayanetti



I am delighted to send this message on the occasion of the Annual Research Symposium, 2019 of the University of Colombo which is held under the theme, “Health and Well-Being”.

With a vision to producing technology professionals and innovators to serve societal needs with a focus on modern technologies, the Faculty of Technology conducts this year’s Annual Research Symposium under the theme, “Role of Technology in Health and Well-Being”. As a new Faculty, it is very encouraging that 9 technical papers have been accepted for presentation at this year’s symposium.

Currently, the Faculty of Technology is in the process of establishing the facilities necessary to conduct high quality research with a focus on human well-being and national development. The objective of the Faculty is to engage in research which eventually leads to commercially viable research outputs. I am confident that the outcome of the symposium will greatly contribute to enhancing the research and innovation culture of the Faculty, while paving the way to attaining its objective.

I would like to extend my sincere appreciation to the Vice-chancellor, Symposium Chair and her team, the Faculty of Technology Symposium Organizing Committee and the Keynote Speaker for their commitment and dedication to make this event a success. Further, I congratulate all the researchers who are presenting their research work and wish them all the very best in their future endeavors.

FACULTY OF TECHNOLOGY

PROGRAMME

29 November 2019

8.30 am	Arrival of the Guests and Registration of the Participants
8.45 am	Lighting of the Oil Lamp and National Anthem
9.00 am	Welcome Address <i>Senior Professor J. K. D. S. Jayanetti, The Dean, Faculty of Technology, University of Colombo</i>
9.10 am	Address by the Chief Guest <i>Senior Professor Chandrika N. Wijeyaratne The Vice Chancellor, University of Colombo</i>
9.20 am	Keynote Address <i>Senior Professor Veranja Karunaratne Vice Chancellor, SLINTEC Academy, Sri Lanka</i>
10.10 am	Vote of Thanks <i>Dr. J. J. Wewalwela Coordinator - Faculty Symposium</i>
10.15 am	Refreshments
10.30 am	Technical Sessions
12.30 pm	Lunch Break
1.30 pm	Technical Sessions
2.00 pm	Closing Ceremony

INTRODUCTION TO THE KEYNOTE SPEAKER

Senior Professor Veranja Karunaratne

University of Peradeniya & SLINTEC ACADEMY



Professor Veranja Karunaratne obtained his B.Sc. Special Degree in Chemistry with First Class Honors from the University of Colombo, Sri Lanka and Ph.D. in Synthetic Organic Chemistry from the University of British Columbia, Canada. He is a Senior Professor at the Department of Chemistry, University of Peradeniya, Sri Lanka and currently the Vice Chancellor of SLINTEC ACADEMY, Sri Lanka. Professor Karunaratne's research interests are in the areas of synthetic chemistry, bioactive natural products from endemic plants & lichens, lichen taxonomy and nanotechnology. He has supervised 16 Ph.D. and 10 M.Phil. students and has authored more than 155 research publications and 220 abstracts leading to an h-index of over 30. He has 50 national and international patents to his credit. Prof. Karunaratne has received many national and international awards for his scholarly work and research. Those awards include Knight of the Order of Academic Palms Awarded by the Government of France in 2012, National Science Foundation Special Merit Award for outstanding research, General Research Award by the Sri Lanka Association for the Advancement of Science, National Science Foundation Science & Technology Award and Presidential Award for Scientific Publication from 2001 to 2017. He is an Elected Fellow of the National Academy of Sciences and a Fellow of the Royal Society of Chemistry. He has been a Visiting Professor at the University of British Columbia from 2003 to date. Professor Karunaratne served as the Head of the Department of Chemistry, University of Peradeniya, Sri Lanka and Science Team Leader and Associate Director of the Sri Lanka Institute of Nanotechnology.

KEYNOTE ABSTRACT

The role of technology in health and well- being

Senior Professor Veranja Karunaratne

University of Peradeniya & SLINTEC ACADEMY

A number of digital innovations are transforming healthcare — and they are on the rise. Many innovations are already on the market and they have changed healthcare radically. The following are several areas scientists are pursuing: one of the most difficult and expensive diagnoses is that of heart failure, which has a mortality rate similar to cancer. New wearable sensing technology gives both patients and doctors continuous data on how a malfunctioning heart is working. Importantly, 3D printing applications in medicine is showing new pathways for patient care. For example, 3D printers are being used to replicate multidimensional models of challenging areas inside patients. Surgeons can use the models and mimic a number of possible operation replicas prior to doing the actual surgery. In addition, 3D printing can be used in replicating bones or other organs in the body. Data is very important in the healthcare industry. Data can range from analyzing diagnostic reports to filing patient-treatment histories. Healthcare facilities have vast amounts of information for storage. IBM says that advanced super-computers now being used by physicians make more precise diagnoses and endorse treatments.

Today, in the healthcare sector, mobile apps are widely used. Doctors and patients are uncovering new ways to use technology to monitor personal health such as tracking daily sleep patterns, counting calories in food we ingest, researching treatment options. In addition, advances in nano technology is helping treatment of neuro degenerative disorders such as Parkinson's diseases and Alzheimer's disease. Applications of nano technology in tuberculosis treatment, dentistry, ophthalmology surgery, visualization, tissue engineering, antibiotic resistance, immune response are impressive.

In the area of general well-being, the foods we consume have assumed a renewed importance, as important as the medicine we take. The world population is projected to become 9 billion by 2050; the land area used for agriculture (currently 38 %) along with doubling food demand would lead to a reduction in biodiversity and ecosystem

services. Therefore, supplying nutritious food to all inhabitants has forced agriculture to use smart technologies in food production. In this connection scientists are turning their attention on novel fertilizer systems which not only use lesser amounts but also enhance the yield of the crop.

FACULTY OF TECHNOLOGY

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Development of a robotic arm feeding mechanism for chilli milling process

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In chilli processing plants, it is necessary to maintain a uniform feeding rate to the mill for maintaining the quality of the product. A robotic arm feeding mechanism was developed for feeding chilli to a grinding mill with a controllable feeding rate. The rate of feeding is important in achieving the throughput, efficiency of milling and the required particle size in micro-pulverizer type chilli mills. Bucket or auger feeding cannot be used since chilli is not free flowing due to its physical nature (long narrow conical shape with glossy surface). At present, manual feeding is practiced and the production rate varies leading to several quality issues and the cost of production cannot be optimized. The environment of the chilli processing plant is uncomfortable for the operators due to the volatile compounds and dust particles generated in milling and the temperature usually rises above 42°C. A robotic arm feeding mechanism with a finger grabber was fabricated and automated using PIC16F684 micro-controller and an ATmega328 micro-controller, micro switches, DC motors, stepper motors, for this purpose. The robotic arm grabber was placed at the top of a chilli containing trough (10.5×2.5×1.25 m) and the finger grabber could grab 1.64 ± 0.13 kg of chilli from the bulk in a single operation. The average time taken for one complete cycle of grabbing chilli, lifting the grabber, turning the arm on to the conveyer and releasing chilli, varies from 13s to 27s depending on the height of chilli in the trough. The feeding rate varies from 440.60 and 218.66 kg/h when chilli is grabbed from the top and the bottom layers respectively. The feeding rate is automatically controlled according to the power consumption of the chilli mill, measured using a hall-effect sensor and communicating with the robotic arm using Bluetooth technology.

Keywords: *chilli feeding, microcontroller, robotic arm stepper motor*

**Application of open source mapping GIS technology for urban flood disaster
preparedness: a case study of the Kalu Oya and Mudun Ela basins**

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The rapid urbanization in and around the city of Colombo during the recent decades has been constantly attempting to direct the urban density dissemination towards the north-eastern direction of the declared metro area. Among the contemporary environmental issues in this region, urban floods have become one of the key concerns where the unpredictable behaviour of the rainfall patterns and the ever-growing built-up density cross on to multiply the damage occurring in every event. The congested built-up environment in this urbanizing context, with higher social and physical features, distressfully increase human risk and vulnerability level correlated to flood occurrences. Rather than focusing on post-disaster relief actions, it is highly important to address urban flood preparedness to ensure the wellbeing of urban populations. Within this context, the current paper investigates the applicability of open source mapping (OSM) GIS technology for urban flood disaster preparedness in the context of the rapidly urbanizing Northern Colombo suburbs. The study utilized the OSM approach to reach the community in the identified flood prone region and the effects of flooding pinpointed by them is critically analysed by developing a flood zones guide framework as a holistic geophysical system map. The results reveal that the present urban settlement pattern, which is expansively consuming the urban wetlands complex of the region, is relatively responsible for the occurrence of frequent urban floods in the region. Open source advance mapping therefore strengthens capacity to identify the locational positions of vulnerable populations while providing the capacity to alter the built environment in a way that is compatible to overall spatial environment system functions. The connection between urban flood preparedness and human wellbeing in the region needs immediate attention at both community and administration levels in order to face the future disaster risks which will become worse with climate change effects.

Keywords: *built environment, disaster preparedness, GIS, open source mapping, urban floods*

Suitability of graphene oxide as a sensing material for detection of glycated proteins

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Diabetes and its complications are rapidly increasing worldwide and becoming a leading cause of morbidity and mortality the world-over. Glycated proteins (GPs) derived from foods and especially produced under *in vivo* conditions are known to play a crucial role in the development and progression of several diabetic complications. A number of different sensing materials and techniques have been studied for the detection of *in vivo* produced GPs in particular. However, to date, there is no commercialized biosensor for the detection of GPs. This project investigates the suitability of graphene oxide (GO) as a sensing material in the detection of GPs. Bovine Serum Albumin-glucose model was used in the production of GPs *in vitro*. A reaction mixture containing 50 µL of GPs and varying levels (50-250 µL) of 1 mg/mL GO and distilled water (n=3 each) were used for the fluorescence measurements at excitation and emission wave lengths of 370 and 440 nm respectively, employing a multimode micro plate reader. Distilled water and a reaction mixture without GO were used as the blank and control respectively. GO was slightly reduced by a heat treatment (400 °C, 1 h) and the entire experiment was repeated using reduced GO (rGO). Further, the Fourier Transform Infrared Spectroscopy (FTIR) technique was used in identifying the functional groups of samples in the wavenumber range of 750 - 4000 cm⁻¹. The study revealed that the fluorescence quenching ability of GO verses GP can be increased by increasing the dose of GO and it can be reduced by reducing the oxygen content of GO. The FTIR spectra showed a significant decrement in the intensity of the GP spectra peak at 1750 cm⁻¹(C=O) with the incorporation of GO. Hence, GO can be identified as a material of high potential for detection of GPs and its properties can be further improved by optimizing the synthesis and reduction processes.

Keywords: *glycated proteins, graphene oxide; reduced graphene oxide; sensor material*

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Photocatalytic application of nano Cu₂O/Cu/rGO composite as a depollutant

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There is a renewed interest in using metal oxide semiconductors for environmental remediation. They are used as photocatalysts for the removal of organic pollutants in water. The photocatalytic activity of some metal oxide semiconductors can be increased by introducing graphene. A cuprous oxide and graphene based photocatalyst was successfully synthesized and applied for the degradation of an organic pollutant in water. Electrodeposited Cu₂O and Graphene Oxide (GO) were used as the starting materials for the preparation of the composite catalyst. Cu₂O was potentiostatically electrodeposited on titanium electrodes and Cu₂O/Cu/rGO composite was produced by mixing Cu₂O and GO and then reducing the mixture using ascorbic acid. It was observed that Cu₂O is partially reduced to Cu in addition to the reduction of GO to graphene (or reduced graphene oxide, rGO). The photocatalytic activity of the catalyst prepared in this manner was tested for Methylene blue (MB) degradation under visible light irradiation. All the samples were characterized using SEM, XRD, FTIR and UV-Vis spectroscopy. There was only a minimal degradation of MB by pure Cu₂O, whereas, complete degradation was observed with the optimized catalyst. Therefore, it can be concluded that the presence of reduced graphene oxide has a synergistic effect on the photocatalytic activity of the composite catalyst. Furthermore, these photocatalytic composites were also successful in the degradation of commercially available water soluble fabric dyes, showing its promise to be used as a potential water de-pollutant in the garment industry.

Keywords: *Cuprous oxide, environmental remediation, fabric dye, graphene, visible light irradiation*

Universal 16S primer bias in the reduction of power in modern DNA sequencing technologies in determining bacterial community structures

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The recent advances in Next-Generation Sequencing (NGS) technologies have revolutionized methodological approaches in many scientific research areas, including microbiology. However, drawbacks in the Polymerase Chain Reaction (PCR) can significantly hinder the power of these NGS technologies, especially in exploring the microbial communities in environmental samples using taxonomic markers such as 16S rRNA gene. In this study, we used two common bacterial-specific 16S rRNA gene primer sets: 1) F63/R1389 and 2) TX9/R1391. The F63/R1389 primer set was used with the Terminal Fragment Length Polymorphism (T-RFLP) fingerprinting technique and Sanger DNA sequencing, whereas the TX9/R1391 primer set was used with 454 and Sanger DNA sequencing to determine the bacterial community structure in the same DNA extract from a groundwater sample. With the F63/R1389 primer set, the T-RFLP found only a single bacterial species present in the sample, but Sanger sequencing suggested that it was a mixed bacterial community and the Candidate Division TM7 could be the major component in the sample. Interestingly, with the TX9/R1391 primer set, 454 sequencing indicated that *Acetobacterium* was the major taxon in the sample, and the Candidate Division TM7 was a minor component. The virtual primer annealing analysis suggested that the F63/R1389 primer is poorly matched with the relevant 16S rRNA gene region of *Acetobacterium* although it is a well-studied bacterial genus. Therefore, we suggest validating the results of any 16S rRNA gene-based microbial community analysis work using multiple primer sets and different molecular techniques to avoid primer annealing biases. Further, newly emerging 3rd generation DNA sequencing technologies such as single-molecule real-time sequencing, Fluorescence Resonance Energy-Transfer and Oxford Nanopore platforms that bypass the PCR step and can obtain longer read lengths from individual molecules of a DNA isolate in real-time will provide better solutions to avoid this type of primer bias issue.

Keywords: 16S primers, bacteria, microbiome, next-generation DNA sequencing

Heavy metal accumulation in selected vegetables grown under diverse farming systems in Nuwara-Eliya, Sri Lanka

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Heavy metal accumulations in vegetables pose a direct threat to human health. Regular monitoring of these heavy metals from effluents, sewage and vegetables are essential for preventing excessive buildup of the metals in the food chain. This research was conducted to determine heavy metal accumulation in selected common vegetables cultivated in the Nuwara-Eliya District of Sri Lanka under four different farming systems: organic, Inorganic, Department of Agriculture recommended and site specific fertilizer recommendation including *Daucus carota*, *Raphanus sativus*, *Brassica oleracea*, *Allium ampeloprasum*. A composite sampling technique was used for the research with three replicates. Each vegetable (a 500g sample) was washed with deionized water. Samples were cut into small pieces and oven dried. The dried samples were ground into a fine powder and used for the analysis of heavy metals namely As, Cd, Pb by the AOAC official method. One gram of grounded powder was transferred into a digesting tube containing 5ml of analytical grade Nitric Acid. The content of the tube was heated for 15minutes in a Microwave Digester and cooled. 20ml of deionized water was added and the mixture was passed through a filter (Whatman No. 540). Filtrates were diluted to 100 ml using 3M HNO₃ and allowed to settle. The filtrate was analyzed for total As, Cd, and Pb with an Atomic Absorption Spectrophotometer. All the solvents, excluding plant materials, were used in the blank. The results revealed that, As, Cd and Pb were present in all the samples ranging from 0.0313 to 0.0058 mg/l, 0.12 to 0.0062mg/l, 0.17 to 0.0013mg/l respectively. The heavy metal content in *Brassica oleracea*, *Allium ampeloprasum* and *Daucus carota* was comparatively lower than that in *Raphanus sativus*. Arsenic and Cadmium were found to be the most abundant heavy metals. The levels of heavy metals were observed to be lower than those of regulatory standards and the most appropriate farming system was found to be the organic farming system with site specific fertilizer recommendation.

Keywords: *accumulation, farming systems, Heavy metals, human health, vegetables*

Anti-glycation and glycation reversing potential of selected traditional foods of Sri Lanka

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Diabetes mellitus is a chronic metabolic disease characterized by hyperglycemia. The prolonged hyperglycemic condition in diabetic patients induces non-enzymatic protein glycation reactions leading to long-term diabetes complications. Thus, anti-glycation agents would be of great importance in the management of diabetes mellitus. Sri Lanka is a country that has a variety of traditional foods that are claimed to have a number of health benefits according to traditional Sri Lankan medical knowledge. However, only a very few studies have been reported to date on the anti-glycation properties of such foods. This study evaluated the anti-glycation and glycation reversing potential of selected traditional foods in Sri Lanka. Five Sri Lankan traditional foods were used in this study: Oluhaal (seeds of *Nymphaea pubescens*), Thana Hal (*Setaria italica*), Rathnamali rice (*Oryza sativa*), black gram or Udu (*Vigna mungo*) and Amu (*Paspalum scrobiculatum*). Methanolic extracts of seeds were evaluated for anti-glycation and glycation reversing activities in the Bovine Serum Albumin (BSA) glucose model *in vitro* (n=3). Significant differences ($P<0.05$) were observed among the selected traditional foods for both anti-glycation and glycation reversing abilities. The highest anti-glycation activities were exhibited by Oluhaal, Rathnamali rice and Amu while for glycation reversing ability Oluhaal showed the highest activity. For both anti-glycation and glycation reversing abilities Udu and Thana Hal had the lowest activity. The IC_{50} values of Oluhaal, Rathnamali rice and Amu for anti-glycation activity were 41.67 ± 5.22 , 45.35 ± 0.80 and 47.40 ± 0.86 $\mu\text{g/mL}$ respectively. The order of potency was Oluhaal=Rathnamali rice=Amu. For glycation reversing ability the order of potency was Oluhaal>Rathnamali rice>Amu and EC_{50} values were 28.22 ± 2.11 , 56.41 ± 8.02 and 115.22 ± 3.61 $\mu\text{g/mL}$ respectively. The observed anti-glycation activities of selected traditional foods were significantly low compared to the reference standard rutin (21.88 ± 2.82 $\mu\text{g/mL}$). It is concluded that selected traditional foods of Sri Lanka have varying levels of anti-glycation and glycation reversing activities and Oluhaal has the highest activities among the studied foods.

Keywords: Sri Lankan traditional foods, anti-glycation activity, glycation reversing ability, diabetes complications management

Acknowledgement: This research is supported by the Accelerating Higher Education Expansion and Development (AHEAD) Operation of the Ministry of Higher Education funded by the World Bank.

Early glass productions in the Anuradhapura period: The Yodhawewa archaeological investigation in Mannar, Sri Lanka

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It was in the 1890s archaeological data revealed that Mannar was an important archaeological site. Mannar became a major commercial hub during the Anuradhapura period, when it became a famous port on the Western trade routes. Therefore, the Mannar area was investigated to determine the geochemical features of the region and to reveal its ancient glass production technology by excavating an ancient glass production site, including a furnace and soils. The composition of soils, slag and artifacts collected from the site were subjected to elemental analysis by XRF (X-ray fluorescence) at Shimane University Japan (Rigaku). Samples of burnt timber detected from the cultural layers of the archaeological excavation were analyzed chronologically by Carbon 14 at Beta analysis, USA. The highest concentrations of Ca and Fe are recorded in the slag and are between 0.76-9.47 and 6.49-29.11 wt% respectively. The highest values for As, Zn, Ni, Cr, V, Sr, Y and Nb were also recorded in the slags while Zr is highest in the profiles. The inner and outer parts of the furnace did not show much difference in chemical composition for the measured elements, indicating that almost similar materials have been used in both parts. The iron content in the soil profiles increased from the top to the bottom while profiles one and two showed very high values for Cu (166-470ppm). Provenance indicates that the soils in profiles 1, 2 and 6, around the furnace, the furnace pit, M2 and M4 from the context falls on the line between Dacite (DAC) to Rhyolite (RH) and acquires composition close to Upper Continental Crust (UCC). About 4000 artifacts acquired from archaeological exploration and excavations were classified based on materials. Factors related to the manufacture of glass was discovered where crucible pieces, glass slags, glass fragments, and glass beads of many colours were found, indicating the existence of knowledge on preparation of coloured glass. The dating discloses that the land had been used for manufacturing activities from the beginning to the Middle Ages (1AD - 8 AD centuries) of the Anuradhapura period.

Keywords: *archaeology, artifacts, glass manufacture, geochemistry*

Archaeological and geochemical analysis of a proto historic burial site at Galgamuwa in Andarawewa

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In the proto historical period (6th Century BC, 2500 years ago) people had settled in Galgamuwa Andarawewa megalithic burial site which is situated in the Anamaduwa Secretariat Division in the North Western Province of Sri Lanka. Different types of burials have been found in several places in this region. The aim of this study was to determine the age, distribution and geochemical variation of the site. Geochemical variation of soil samples from the context (n=12), glass bead samples from the furnace (n=3) and slag (n=2) were analyzed using X-Ray Fluorescence (XRF) for 22 major and trace elements. Archaeological evidence through the field survey and excavations has been done where natural hollow (pathaha), a bead production site (Furnace) and a monastery complex near the burial site have been identified. During excavation 34 cist burials on the surface level were found and two cist burials were selected for excavation. The XRF results of slag show that Pb (483-470 mg/Kg) and Cu (855-1083 mg/Kg) are very high (Upper Continental Crust Pb=20, Cu=25 mg/kg). The slag consists of a white (glass) and dark (slag) part while the white part of the slag contains higher Pb and Cu than the dark part and halides F, Br and I are almost similar in the white part and dark part. The glass beads of the Andrawewa furnace show that Pb, Cu and As ranges between 390-2920, 275-1411 and 12-127 mg/Kg respectively, which is also very high and is higher than in the slags. However, the Fe and Ti concentrations are much lower in the glass bead and slag than in the contexts though P₂O₅ is higher in the bead samples, indicating the removal of Fe and Ti from the beads and the slags. The soil samples from the context of the area do not show high concentrations for almost all the measured elements, thus indicating that the soils are local while the glass beads may have been prepared with sands brought from other areas. The sand and materials used to prepare the glass should have contained high Pb, Cu and As and may have been plagioclase in origin, due to high Pb. The carbon dating indicates that this burial belongs to the period from 500- 507 B.C which is the Proto-historic period.

Keywords: *Archaeological, burial site, geochemical, glass bead, slag*

SRI PALEE CAMPUS



Media, Arts and Sustainable Development

20 December 2019

**MESSAGE FROM THE RECTOR
SRI PALEE CAMPUS**

Professor R. C. K. Hettiarachchi



As the rector of the Sri Palee Campus, and on behalf of the academics of the campus, it is with great pleasure that I send greetings to the University of Colombo Annual Research Symposium 2019. This year's conference theme is health and well-being, which is well suited to the current challenges of the world. The disastrous climate in which we live, which is a threat to the humankind, is created by human beings. We are not too late to understand the reality of our current plight; lamenting will not offer us any solution. There is a great saying that encapsulates the need of the hour: 'Better late than never'. The theme of the year's symposium seems very timely and commendable under these circumstances. Several prominent guest speakers and hundreds of presenters will share their thoughts on the current global issues pertinent to the health and well-being of people today.

Symposium is the event that we can showcase our thrust for knowledge. It symbolizes the direction that a community march forward. We will be able to generalize what will happen in the future based on what we know about the phenomenon at this time. Expertise from all faculties, institutions and the campus will present their empirical generalizations on a variety of topics to interest everyone. I am delighted that the academics of the Sri Palee campus also have contributed to the symposium with their interest.

There are many factors that contribute to the success of a conference. The diligence and the dedication of the committees is the most remarkable factor that helps to make any event success. We should appreciate their work and also we have to appreciate the volunteers who have given unselfish support to make this event a success. We hope that all of our experience at this year's conference will be informative and memorable. Our heartiest congratulation to all presenters whose endeavors will remain in the world to keep the world a safer place to all living beings.

SRI PALEE CAMPUS

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Exploring ‘Edutainment’ through stage drama: Children’s theatre productions in Sri Lanka.

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The medium of ‘edutainment’ is created with the intention of engaging the participant while simultaneously imparting knowledge. Edutainment, originally created for entertainment, is also deemed to be useful in educational contexts for teaching. The word ‘Edutainment’ is a combination of ‘education’ and ‘entertainment’. An understanding of the actual etymology of these two words can help explain its meaning. Edutainment is any communication project that sets out to use popular culture to educate and challenge people. Edutainment is not a theory but a strategy to bring about individual and social change. It uses popular entertainment formats to confront serious social issues in an innovative/interesting way. In 1977 the Open Economic policy made sweeping changes to the existing social system in Sri Lanka, bringing with it consumerism and pop culture, which changed the existing value systems. The newly introduced television industry also had a direct impact on society at all levels. Further, the education system was hard hit by competition, placing heavy pressure on both children and their parents. The objective of this study is to examine how the late Somalatha Subasinghe’s children’s drama productions “kathandara deka”, “Himakumari” , “Gamarala” and “Rathmali” are used as an edutainment process to discuss the plight of children who are at the epicenter of social and political changes. The aim of the study is to identify how the edutainment process creates social cohesion among the audience and performers and changes attitudinal behavior in society. This research is based on a qualitative study of literature on related topics, participatory research, group discussions and workshops for children based on applied theatre of edutainment methods. Edutainment theatre attracts and holds through the engagement of people’s attention and emotions. The findings highlight the fact that edutainment is a very successful and innovative modern strategy of imparting knowledge in a soothing environment.

Keywords: *applied theater, edutainment, popular culture, open economy, social cohesion*

A review of applications of video mining and related technologies

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Recently, video has become the mostly used multimedia due to its highly useful information and entertainment capability. People have access to a tremendous amount of videos both on television and via the internet. Moreover, technological advances in sensors, networks and storage have led to an exponential growth in multimedia databases. Hence, video mining is identified as an emerging technology in the field of data mining. This research was conducted with the aim of identifying applications of video data mining and the techniques used in different situations. In this study, a theoretical literature review was conducted with the most recent research papers which have presented various video mining applications and techniques. According to the findings of the study, the applications which use video mining diverge in many areas including security and surveillance, personal entertainment, medicine, sports, news video, educational programs and movies. Moreover, video data analysis is used to extract specific scenes: highlight scenes of sports programs, scenes of mountains, sea, indoor, outdoor, and to detect specific events such as pause, gesture, walking, running, laughing, surprising. It was also found that video clustering techniques which were used in different applications use hierarchical clustering. In addition to that, different frameworks have been proposed by many researchers to analyse video to enable semantic video classification and video summarization and to detect interesting patterns. However, in-depth research is still required on several critical issues to ensure further developments in the field of video mining.

Keywords: *multimedia databases, semantic content, video mining*

From tradition to modernity: A study of changing performance and stage practices in colonial Ceylon (Sri Lanka)

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The Portuguese, who came to Sri Lanka in 1505, were the first Europeans to visit the country in modern times. In 1517 they founded a fort in Colombo and subsequently extended their control over the coastal areas. The Dutch invaded the country in 1669 and Colombo came under Dutch rule in 1656. By 1660 the Dutch controlled the whole island, except the kingdom of Kandy. In 1796, Great Britain gained control of the Dutch controlled coast of Ceylon and, in 1815, the kingdom of Kandy was captured by the British, ending over 2300 years of Sinhalese monarchy. British colonial rule lasted until 1948, when the country gained independence. Colombo port became the foremost point of contact with the outer world, as it surpassed Galle port in its importance and Colombo became both the administrative and commercial center of the colony. The Suez Canal, opened in 1867, resulted in a wider level of economic and cultural inter-communication and exchange with Europe. Thus, during this time, one could observe a vast number of cultural troops visiting the island, bringing new kinds of entertainment with dance, music, drama, magic and circus both from eastern and western regions. My study focuses on investigating how these cultural processes, activated during colonial times, influenced the practices of modern Sri Lankan theatre and stage. In order to satisfy the objectives of the research, a qualitative research method was used. Therefore, research was mainly based on a rigorous and systematic survey of literature and analysis including finding and processing valuable historical data using archives, libraries and small-scale, in-depth qualitative interviewing. The sample consisted of both human input and materials (documentary evidence). Finally, it can be concluded that the European theatre and performance style, introduced to the country in colonial times, has overcome traditional Sri Lankan theatre. The English speaking middle class was the special audience for this performance.

Keywords: *Asian theater, colonial period, European theatre, traditional theater, theatre performance*

The impact of globalization on local media language

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The interconnectedness of human beings, irrespective of borders and the uneven distribution of resources, can be defined as globalization. Globalization also refers to the spread of ideas and language worldwide. Communication is the main means of interconnectedness. It is natural that a common consciousness is being created through a shared culture, with the increased exchange between human beings across borders. As concepts are commonly represented by language, it plays a leading role in creating a common consciousness. With the presence of globalization, language seems an ever changing phenomenon. Evolution is an inherent feature of language and cultural transmission is a special attribute of language. This research was an attempt to investigate how globalization is reflected in language and how the language of media mirrors the presence of global culture over local languages. The study focused on programmes on three national media channels: Sirasa FM, City FM and Hiru FM. This study qualitatively and quantitatively examined the language used by radio presenters of these national radio channels. The use of contemporary language by presenters of popular programmes of these radio channels was analysed. Content analysis and discourse analysis were employed to analyse the data. The language data of the presentations were analysed to determine the impact on phonetics (pronunciation), morphology, syntax, semantics and pragmatics. Attempts were also, made to identify the impact to lexicon and culture. The findings indicate that pronunciation impact is significant. Presenters attempted to imitate foreign accents yet produced a hybrid variety of pronunciation. Results revealed that the morphology and syntax of the local language seemed to have undergone significant influence. Linguistic culture can be defined as, the ideas, values, beliefs, and any other cultural variables that people bring to their perceptions and use of language from their culture. Results seemed to show that linguistic culture was significantly influenced by globalization. It can be concluded that standardizing a hybrid variety of language through media and introducing a new linguistic culture has resulted in the presence of globalization.

Keywords: *globalization, hybrid language, linguistic culture, local language, media language*

The impact of new media technologies in changing traditional communication patterns to foster development of rural communities in Sri Lanka: The Mawanella electorate

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Sri Lanka is a developing third world country in the South Asian region. According to the Department of Census and Statistics, in 2012 the total population of the country was reported as 20,359,439. 77.4% of the total population live in the rural sector. Thus, in Sri Lanka, the rural community still plays a substantial role in the development of the country. Traditional rural societies in Sri Lanka exchanged information through many forms and means such as two way process communication, through the opinions of leaders, and posters as well as group discussions. Later, they shifted to radio, television and newspapers as modern media. In particular, the role of traditional media was remarkable in providing information for the social development of the people in the rural societies. However, in parallel with the advancement of communication and the introduction of new technologies in new media, the masses have experienced changes in every aspect of their life, especially in how they acquire and disseminate information. Therefore, the main objective of this research is to study the impact of new media technologies on the rural masses and their social development process. The research focus is, how new media technology has influenced traditional communication strategies and how new media technologies have been used to transmit information. The data for this research was collected from five villages in the Mawanella electorate. The researcher used the techniques of observation, interview and questionnaire to collect empirical data in the field. The results of this research indicate that the rural environment in modern Sri Lanka has changed almost entirely due to the usage of new media formats created by media technologies. Accordingly, the above results show that the impact of new media technologies on the rural community is significant.

Keywords: *new media technology, Sri Lankan rural society, traditional media*

Harnessing the potential of women for their liberation from patriarchal grips

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It is a proven fact that media can bring about social transformation by raising the consciousness of people whose access to reality has been blurred by dubious politics and nationalist parochialism. In the context of cultural diffusion, people may be deceived by narrow-minded gendered axioms such as ‘woman’s wisdom only extends to the length of the kitchen spoon’s handle’ or ‘the woman is made for man’. Stereotypical representations of women in various modes have failed to decolonize the mindsets of people from the patriarchal perception of as intrinsically handicapped. Television however has also positively influenced the traditional way we perceive the world, paving the way for viewers to keep pace with the changing patterns of life around the world. In this paradigm shift, Sri Lankan tele-dramas are taking long strides toward some palpable attitudinal changes even of the conservative people whose mind sets are conditioned by a parochial and patriarchal ethos. Consequently, viewers witness the potential of women being uplifted through various programmes in an attempt to foster a collaborative effort to renegotiate an optimal path to create a just society in which the man-woman dichotomy does not lead to power imbalances. Emerging subjectivities acquired by Sri Lankan women through transforming socio-economic contexts contribute to building a collective Sri Lankan identity. In this research, the cultural, economic and political transformations that molded women’s subjectivities are captured through feminist perspectives in selected Sinhala tele-dramas. This enabled the researcher to show how female characters ‘liberate themselves’ from patriarchal power structures. The portrayal of Sri Lankan women offers unique identities to women and promises a Sri Lankan voice and a mode for a post-colonial feminism. The findings of the research have revealed that Sri Lankan women are stepping out of conventional boundaries that inhibited their upward mobility.

Keywords: *electronic media, liberation, patriarchy, Sinhala tele-drama, woman*

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27 November 2019

MESSAGE FROM THE LIBRARIAN

Dr. Pradeepa Wijetunga



I feel privileged to pen this message on the occasion of the Annual Research Symposium of the Library Network, which will be held on 27 November 2019, for the second consecutive time. This is the most significant annual event in the calendar of the library network. The theme of the sessions is “*Information for health and well-being*” and 12 related research papers will be presented by the librarians covering areas such as information behaviour, bibliotherapy, bibliometric and scientometric analysis and computer ergonomics, reflecting the diverse research interests of our librarians, related to health and well-being.

There is an indispensable role to be played by the librarians in the avalanche of biomedical information in the 21st century. Librarians have the power of advancing patient care, research, education and community service missions of health-related institutions, through expertise in health information, scholarly communication and knowledge management. This research session will indeed provide ample opportunity to deliberate on the role of the university librarians as an integral part of health care teams in the future.

I am truly thankful to Senior Professor Chandrika. N. Wijeyaratne, the Vice-chancellor of the University of Colombo, for accepting our invitation to grace the occasion as the Chief Guest and to Dr. Ruvaize Haniffa, Member of the UGC and Chairperson of the Standing Committee of Library and Information Science (SCOLIS) of the UGC, for gracing this occasion as the Guest of Honor. I am indeed thankful to Professor Saroj Jayasinghe, the Head of the Department of Clinical Medicine, Faculty of Medicine, University of Colombo, for joining us today to deliver the Keynote Address. I would like to express my sincere gratitude to all my colleagues in the Library Network for their tireless efforts to make this event a success. Finally, I would like to convey my best wishes to all the distinguished invitees, panelists, session chairpersons and researchers for a very productive event.

THE LIBRARY NETWORK

PROGRAMME

27 November 2019

8.30 am	Registration
9.00 am	National Anthem & Traditional Lighting of the Oil Lamp
9.10 am	Welcome Address by Dr. (Mrs.) Pradeepa Wijetunge Librarian & Conference Chair
9.20 am	Address by the Chief Guest Senior Professor Chandrika. N. Wijeyaratne Vice-Chancellor, University of Colombo
9.30 am	Address by the Guest of Honor Dr. Ruvaiz Haniffa Chairman Standing Committee on Library and Information Sciences (SCOLIS) University Grants Commission
9.40 am	Keynote Address by Professor Saroj Jayasinghe Head, Department of Medical Humanities Faculty of Medicine, University of Colombo
10.15 am	Vote of Thanks by Mrs. K.K.N.L. Perera Conference Convener
10.20 am	Refreshments
10.45 am	Technical Session 1
12.15 pm	Lunch
1.00 pm	Technical Session 2
2.45 pm	Valedictory Session
3.00 pm	Refreshments

INTRODUCTION TO THE KEYNOTE SPEAKER

Professor Saroj Jayasinghe

MBBS (Hon), MD (Colombo), MD (Bristol), FCCP, FRCP (Lond), PhD (Colombo)



Professor Saroj Jayasinghe is the Chair Professor of Medicine at the University of Colombo and a senior consultant physician at the National Hospital of Sri Lanka, Colombo. He is the Founder Head of the Department of Medical Humanities, the first such department in Sri Lanka and in the region.

He was a key figure in the curriculum reforms of the Faculty of Medicine in the 1990s and the founder director of the Medical Education Development and Research Centre (MEDARC). He qualified with MBBS (Hons) in 1979 from the University of Colombo and obtained the MD in Medicine from the Postgraduate Institute of Medicine. He passed the MRCP (UK) in 1984 and was awarded the FRCP (London), and is a fellow of the Ceylon College of Physicians.

He was the first postgraduate with MD (Colombo) to be awarded a research doctorate (MD Bristol) for a thesis on paracetamol metabolism. He was awarded his third doctorate, a PhD from the University of Colombo for his thesis on poverty and health in the urban poor.

His current research interests are in the study of kindness and compassion in medicine, language and health literacy, systems science in health, and medical device development. He has several publications and conference presentations to his credit. He is on the editorial boards of the Ceylon Journal of Medical Sciences and Journal of Urban Health and the BAU Journal of Urban Health and Wellbeing.

KEYNOTE ABSTRACT

Information for Health and Wellbeing: Health Literacy Gap and Languages

Professor Saroj Jayasinghe

Head, Department of Clinical Medicine, University of Colombo

The health and wellbeing of individuals and populations are often influenced by wider determinants such as social systems, environmental pollution, culture, and to a lesser extent by the health system.

Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand the basic health information and services needed to make appropriate health decisions for themselves, their families and their communities. It is an evolving concept and means more than simply being able to "read pamphlets", "understand food labels" or "comply with prescriptions from a doctor".

Access to reliable health information is a key component of health literacy. This is a responsibility largely in the hands of the government and health systems which are obliged to present clear, accurate, appropriate and accessible information for diverse audiences.

Sri Lanka faces a unique challenge in this regard because health related knowledge is mainly in the English medium, while a larger proportion of the population has poor knowledge of English. The situation is worsened by English being used as the language of communication by the health profession, and almost all communications in the health sector continue to be in English, thus effectively widening the health literacy gap.

Library networks, universities and local organizations have a responsibility towards bridging this gap, perhaps using modern technologies such as artificial intelligence.

LIBRARY NETWORK

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A bibliometric analysis of trends in global dengue research from 1989 to 2018: based on Scopus

S. Alikhan

Library, University of Colombo, Sri Lanka

The World Health Organization (WHO) emphasised that dengue is one of the neglected tropical diseases, yet the spread of this disease has been increasing dramatically. The objectives of this study are to: 1) identify the bibliographic trends in spatial and temporal contexts 2) explore the trends of co-authorship among countries and 3) recognize the subject pattern of dengue related publications. The data were collected from the Scopus database between the years 1989 and 2018, when a trial access of the same was available in February 2019. The keyword “dengue” was used to extract review articles (RAs) and retrieved 976 items. Arcmap, MS Excel and VOSviewer were used to analyse and visualise the data. 85 countries have contributed RAs and the top 25 most-active countries account for 86.2% of the total. The USA, India, Brazil and the United Kingdom have the highest publication output with 19.1%, 6.4%, 6.1%, and 6.0% respectively, followed by Singapore (5.3%), China (including Taiwan) (5.2 %) and Thailand (4.5%). Temporal trends indicate that publications are significantly low in the first fifteen years, with considerable fluctuations in each year. Publications have increased in 2003 (18 RAs) and reached the peak in 2018 (117 RAs). Five clusters of co-authorship collaboration were identified, where the United States, Singapore, Thailand, China and South Korea are the largest. The co-authorship collaboration indicates that a considerable research association was held between the North and South. The study on subject patterns revealed an expansion of topics. i.e. during 1989 -2003, dengue, dengue virus, epidemiology and diagnosis have been the research areas. From 2004-2018, new topics like dengue fever and vaccine, diagnosis, *Aedes aegypti* mosquito vectors and antiviral therapy have emerged. Overall, this study reveals that dengue related publications are increasing globally, with strengthening collaborations between countries, intuitions and authors.

Keywords: *bibliometric analysis, dengue, Scopus database, VosViewer*

Research papers in the Ceylon Medical Journal between 2009 and 2018: A scientometric analysis

S. S. Johoran

Library, University of Colombo, Sri Lanka

A scientometric analysis of research articles published in the Ceylon Medical Journal was carried out with the objectives of 1) mapping the year-wise distributions of papers, 2) examining the authorship patterns and 3) determining the degree of collaboration between the authors. Ten volumes of the said journal containing 40 issues from 2009 -2018 were considered for the present study. Only the research articles (230) published in these 40 issues were considered and others were excluded from the study. Findings revealed that the highest number of research articles (33) were published in 2017 with a gradual increase, except in 2018 where a marginal decrease is found. Out of the 230 contributions, only 23 papers (10%) are single authored and the rest (90%) are multi authored. The highest number of multi- authored papers (28) were published in the year 2017. The average degree of collaboration is 0.90 during the study period, which indicates that there was a high level of collaboration between authors. Out of the 230 research articles, the majority (196, 85.22%) were published by Sri Lankan authors and only 14 articles (6.09%) were published by international authors. It seems that there was a minimal collaboration of Sri Lankan authors with foreign authors (8.70%). Authors from countries such as the United States, Japan, Australia, Malaysia, India, Hong Kong, United Kingdom, New Zealand, Singapore, Nigeria, Finland, Norway and Turkey have contributed to this journal. The highest number of author contribution is from India, consisting of 20 authors followed by the United Kingdom with contributions by 11 authors. This study concludes that the majority of the research papers are by multi authors and by the Sri Lankan authors. The degree of collaboration indicates that there is a high degree of author collaboration. The level of foreign collaboration is minimal. This study may help those who wish to map the scientometric patterns of journals.

Keywords: *authorship pattern, Ceylon Medical Journal, degree of collaboration, Scientometric analysis*

Awareness of IT-based Outbound Services (ITBOSS) provided by the Sri Lankan health sector

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Globally, health the sector has invested heavily in IT-based Health Services including ITBOSSs. The Sri Lankan health sector also has introduced many ITBOSSs, but observations proved that many would-be users are not aware of them. The objectives of this study were to 1) Identify the ITBOSSs provided in Sri Lanka and 2) Identify the awareness of the public about them. To achieve the first objective, four public and four private organizations plus two web-based health service providers were selected by using purposive sampling technique. Out of the ten organizations identified to satisfy objective one, two government and four private hospitals were selected eliminating the others, which are not visited by patients directly in order to accomplish the second objective. Although the private hospitals selected had several branches, only the Colombo City branch was selected due to time and resource limitations. 600 individuals were selected using the convenient sampling method, to gather data using a self-administered, structured questionnaire. A major limitation of the survey was the lack of time and resources to conduct a comprehensive survey covering more health service providers and would-be users. Respondents consisted of 70% males, 30% females, and 54% in the age group of 35-50 years while 38% are between 20-34 years and 8% are between of age 51-65 years. It was established that nine ITBOSSs exist: Web-based online and Mobile App-based Doctor Channeling, Tele Doctor, Ongoing appointment number service, Medicine to doorstep, Health Care to doorstep, Health Records portal, Online Lab Report service, and Suwasariya ambulance service. 100% of the respondents are aware of Suwasariya and 73% are aware of the Web-Based Online Doctor Channeling; however, only less than 48% are aware of the other services. The respondents in the age group 20-35 have the maximum awareness, while those between 51-65 years of age have the least awareness of the services. The launch of a mass scale promotion campaign by the service providers using all media to promote these services among the Sri Lankan public is recommended.

Keywords: *awareness, health services, IT-based outbound services, public, Sri Lanka*

**Information source preferences of women with breast cancer:
A hospital-based study in Sri Lanka**

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This study assessed the preferences for information sources among Breast Cancer (BC) survivors who attend the out-patient clinics or wards of the National Cancer Institute, Maharagama, Sri Lanka. The main intention of this study is to find the most preferred information source of BC survivors which would be used to develop an educational package on “Information on BC”. A total of four hundred (400) breast cancer survivors who were histologically confirmed and not having major mental health problems were recruited using the consecutive sampling method. The preferences for information sources of the study units were inquired into using a questionnaire administered by trained data collectors. Responses revealed that the affected women desired information from mass media sources either in electronic or printed form and from health care personnel or through informal ways like family and extended family, friends, relations, neighbours, breast cancer survivors, social workmates, etc. The vast majority of the study units (n=350, 87%) strongly indicated that the most preferred source of information on BC was either the locally developed booklet or pamphlet. The majority of study units (n=312, 78%) preferred the specialist doctor, as the source of information. Among the informal methods specified, the majority of subjects preferred family or extended family as the source of information on BC (n=315, 78.8%). Consistent with the p-value in chi-square test, association between age of the respondent and the mean score for preferred source of information revealed that younger women (age ≤ 37 years) (p<0.001) and women who received higher education (passed GCE (A/L) or higher) (p<0.001) preferred a booklet/pamphlet as their most preferred information source. Earlier studies revealed that patients preferred to receive verbal and written information over other information sources such as videos and web-based information. Scientists further emphasized that only a certain amount of information from verbal communication can be remembered by the patients, but written information refreshes their memory. As reported previously, the current study suggests that information on BC should be as a booklet/pamphlet for every younger woman and those who received higher education, since it is easy to carry and read when needed.

Keywords: *breast cancer, information needs, information sources*

The project was approved by the Ethics Committee in the Faculty of Medicine, University of Colombo, Sri Lanka [EC-10-035]. Acknowledge University of Colombo for funding the study [Research grant AP/3/2012/PG/05].

Use of information sources by and factors affecting access to information of visually impaired undergraduates

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This study was conducted to find out the use of information sources by the visually impaired undergraduates and the issues faced by them in accessing information. The target population was 43 undergraduates with visual impairment. Out of them, 42 (98%) were interviewed. The interview schedule covered demographic details, main sources of information and issues encountered in general and in the Internet context. The majority of the respondents are males (52%) and are in the age bracket of 21-24 (76%). Out of the 42 respondents, 23 can read only braille whereas 19 can read printed text but with difficulty. In searching of information, 34 students (81%) use the Main Library of University of Colombo and 32 students (76%) use electronic information resources. The Center for Disabled Students of the university, purchases made by them and libraries of other institutions are alternative sources of information for them. The respondents mentioned 18 different issues in using information in general, where lack of audio books (71%) and the need to depend on others to search for information (48%) were the main issues. Lack of braille books (12%) and lack of audio books of award winning Sinhala novels (12%) were the other two issues mentioned. More than half of the respondents use the Internet daily (57%), 24% use it a few times a week and only a few stated (10%) that they rarely use the Internet. Six issues related to the use of the Internet were identified, in which less user-friendly to be read through screen readers (71%) and difficult to find information because of the given format (67%) were the two major issues. Enhancing the audio book collection both in Sinhala and Tamil, establishing a special assistance mechanism for visually impaired users and training both users and the library staff in searching information in the Internet are recommended.

Keywords: *electronic information resources, information sources, the Internet, visually impaired undergraduates*

**Women's knowledge about risk factors and early detection methods of breast cancer:
A case study of the Library Network, University of Colombo**

P.K.S. Manatunga

Library, University of Colombo, Sri Lanka

Breast cancer has been identified as the most prominent cancer type which affects women worldwide and there is a gradual increase of breast cancer incidences yearly in Sri Lanka. Late diagnosis of breast cancer at advanced stages results in less or no benefit from any form of treatment. Identifying breast cancer risk factors and early detection methods could be recognized as two major variables, which affect early diagnosis and screening. The objective of this study is to find the extent of knowledge held by the female employees of the Library Network of the University of Colombo on the above two variables. Data were obtained from 40 women, which is the total population, using a self-completion, closed ended questionnaire and descriptive analysis was done. The most frequently identified risk factor was early age at menarche (75%). The present study revealed that women, who are employed in the Library Network, have inadequate knowledge about several risk factors, including late age at menopause, high alcohol consumption and high animal fat intake and also a false belief that giving birth to more than 5 children and first gestation before the age of 25 as non-risk factors. Healthy diet was identified by the majority (80%) as a possible preventive measure. Mammography and self-breast examination as methods for early detection was identified by 77.5% and 82.5% of the participants respectively. Of the 40 participants, 4 and 29 are likely to have a good ($\geq 75\%$) and average knowledge (75%-50%), about risk factors and their prevention respectively, while others have a fair (50%-25%) knowledge. Average knowledge of the academic staff on the same factors is 65.15%, while that of the non-academic staff is 54.80%. The most often cited sources of information about risk factors and early detection methods were newspapers (75%) and the medical officer (7.14%) was the least cited source. The study recommends the need for enhanced educational programmes to improve knowledge about breast cancer risk factors and early detection methods. The findings of this study and further studies could be used for successful knowledge generation among females in Sri Lanka. Future studies should focus on knowledge about breast cancer and the influence of socio-economic variables in order to develop an institutional framework and policy guideline to enhance adequate and urgent dissemination of information about breast cancer among all women in the system.

Keywords: *breast cancer, early detection methods, knowledge generation, risk factors*

Health information-seeking patterns of mothers of preschoolers: A case study

W.P.G.L.Perera

Library, University of Colombo, Sri Lanka

Information is an indispensable commodity for the day to day activities of anybody. Health information is specific to various types of human groups. Children are exposed to various illnesses when they start attending pre-schools. For the parents of a preschooler, having access to health information is important for good health as well as prevention and treatment of different kinds of health conditions. This can be considered as an advantage for the well-being of the children. Different people have different information needs and information-seeking patterns according to their necessities. This is grounded in their socio-cultural lifestyles. The intention of this study is to identify health information seeking patterns of mothers of preschoolers. It was carried out as a case study using a selected pre-school in the Kesbewa urban council area, with the participation of the mothers of these preschoolers. The total population was 150. A survey method was adopted to collect primary data for this research, using questionnaires. A printed questionnaire was used and the responses from the mothers were collected on-site. This study found that the majority of the mothers need information related to nutrition (75%), food (78.1%) and child psychology (34.4%). Most respondents (81.3%) resort to the television for health information. The secondary and tertiary information sources are their parents (71.9%) and midwives (68.8%). Further, this study indicated that the majority (93.8%) of the respondents are not using any library for their health information needs. The highest number of respondents (84.4%) have the habit of searching for health information using their smartphones. It was discovered that most of the mothers are not aware of trustful sources and that they believe the information on the television. The study recommends some suitable awareness programs for these mothers, to facilitate their children's well-being. The training responsibilities could be assumed by the Municipal council with the collaboration of the family health service officers and information professionals.

Keywords: *health information, information seeking patterns, pre-school, mothers, well-being*

**Global research on health implications related to spirit possession: A scientometric review
using the PubMed database**

K. K. N. L. Perera

Library, University of Colombo, Sri Lanka

Spirit Possession (SP) is generally termed as an abnormal human behavior triggered by spirits which are believed to inhabit the human body. The aim of this study was to map research productivity on SP based on the articles indexed in PubMed. The articles related to SP dated from 1990 to 2018 were retrieved from PubMed. A total of 88 articles were included for the analysis. They were published in 58 journals. ‘*Culture, Medicine and Psychiatry*’ was identified as the most productive (11 articles; 12.5%) journal, followed by ‘*Transcultural Psychiatry*’ (8 articles; 9%) and the ‘*Journal of Religion and Health*’ (4 articles; 4.45%). Uganda was the leading country with a highest number of published articles (9 articles; 10.22%), followed by the United Kingdom (7 articles; 7.95%), India (5 articles; 5.68%) and Ethiopia (5 articles; 5.68%). The highest number of articles were published in 2016. A large portion of articles (29 articles; 32.95%) were published by African countries. ‘Mental health’, ‘trauma’ and ‘culture’ were found to be the most frequently used MeSH terms. 10.22% of the publications (9 articles) have focused on involuntary mass SP in different populations, while 6.81% of the publications (6 articles) have focused on traditional healing methods related to SP. 7.95% of the articles (7 articles) have an association with the term ‘epilepsy’. There is a weak positive correlation (0.171) between the number of citations and the journal impact factor. 59.09% (52 articles) of papers are multi-authored, whereas 40.9% (36 articles) of papers are single authored. The degree of author collaboration is 0.59. The mean relative growth rate (R) of global SP articles is 0.16. The pattern of R values neither showed a positive nor a negative growth rate of SP articles published over the time period that was considered for this study.

Keywords: *PubMed, research productivity, Scientometric, Spirit possession*

Musculoskeletal health issues related to computer ergonomics in Library paraprofessional staff: A case study at the University of Colombo Library

M.A.L. Silva

Library, University of Colombo, Sri Lanka

Penetration of computers to the Libraries have changed the traditional work of library paraprofessionals, forcing them to work long hours in front of the computer. Improper use of computers for a prolonged period of time increases the risk of adverse health effects. Computer ergonomics were given a major concern as patients suffering from musculoskeletal conditions have increased globally over the past decades. Although in the European countries numerous studies have been carried out on ergonomic health issues especially on musculoskeletal discomforts, in the Sri Lankan university library context there is a dearth of studies on computer ergonomic health issues. The present study attempts to identify health related issues pertaining to musculoskeletal conditions of the library paraprofessionals related to use of computers at the Library of the University of Colombo and to provide recommendations to improve the working environment. The population consisted of 42 Library paraprofessionals. Krejcie and Morgan's (1970) recommendations were adopted to maintain the sample size, which was 38 and stratified random sampling technique was used to draw the sample. A questionnaire was administered to collect data and was descriptively analysed using SPSS (23). According to the findings, pain in the neck (53.33%), pain in the wrist (46.67%), shoulder pain (43.33%) and upper back pain (43.33%) are the main musculoskeletal discomforts, whereas pain in the elbow (20%) is identified as the least experienced discomfort. The respondents (70%) are aware of the correct sitting posture while working on the computer and 46.67% are changing the distance between the monitor and the seat frequently which negates the recommended workstation practices. The wrist/palm support is not available for 53.33%, whereas 73.33% lack of foot rest. Chi-Square test proved that there is a significant relationship between pain in the neck and height of the computer desk ($P=0.038$), whereas upper back pain revealed a significant relationship between height of the computer desk ($P=0.037$) and distance of the keyboard ($P=0.037$). Furthermore, height and distance of the keyboard have a significant relationship with pain in lower back ($P=0.001$), muscle ($P=0.02$), fingers ($P=0.04$) and lower arm ($P=0.04$). To reduce health problems Library management should organise workstation ergonomic training sessions to paraprofessional staff to provide knowledge and skills to optimise their workstation configuration and provide ergonomically safe working equipment.

Keywords: *computer ergonomics, library paraprofessional, musculoskeletal discomfort*

Information needs and usage of Paramedical professionals in Sri Lanka

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Library, University of Colombo, Sri Lanka

A substantial portion of the workforce of the health sector is made up of Paramedical professionals (Paramedics), who extend supportive skill measures to clinicians in the diagnosis or treatment of ailments. Hence, it is crucial that all required resources are readily available to them to discharge timely and high-quality health services, where information plays a vital part. A review of literature reveals vast distinctions in their information requirements across sub-categories and nations. Further, several performance related problems can be eliminated by the hospital authorities by making the Paramedics information-rich. Therefore, a systematic investigation is essential to understand the information needs and usage patterns of Paramedics in Sri Lanka. Hence, this study is undertaken with the objective of identifying the professional information needs, information channels, preferences, and the problems encountered by the Paramedics in accessing information. This quantitative research with a deductive approach used questionnaires to collect data from the entire population of 51 Paramedics serving a reputed private hospital in Colombo. The internal consistency was tested to be good using Cronbach's alpha (0.886). The findings indicate that there are 60.8% males and 39.2% females, with majority (37.3%) between 41-50 years of age and having 1-10 years of experience (39.2%). Although, their ICT and Information Literacy levels are moderate with mean values of 2.43 and 2.47 respectively on a 3-point Likert scale, they have high interest (mean: 2.71) to improve the same. Three main needs for information were identified: patient care (76.5%), staying up-to-date (72.5%) and own higher studies (31.4%). The frequency of information seeking also corresponded with the above purposes: daily for patient care, weekly for staying up-to-date and occasionally for their higher studies. Chi-square test proved that their affiliated departments together with tasks-performed exert a highly significant influence on their information needs. The findings also reveal that 80.4% of Paramedics prefer to use both printed and electronic forms of information. The Internet (90.2%), knowledge of colleagues (74.5%) and personal collections (58%) are the mostly used general information resources by the said Paramedics, in addition to various other subfield-specific resources. Further, 76.5% of them are well satisfied about the accuracy of the information in their field, yet they are less content on availability (49%), cost (17.6%) and timeliness (15.7%). Limited access to information resources (78.4%) and lack of time (64.7%) are the common problems encountered by the Paramedics in securing professional information, and they believe that these issues can be overcome by establishing a library within their hospital with field-specific collections. These results would be an eye-opener for the information professionals to support the Paramedics by enhancing the availability of information required.

Keywords: *information needs, information sources, paramedical professionals, paramedics*

Introducing bibliotherapeutic services in the university environment: Student counsellors' view

S. D. Somaratna

Library, University of Colombo, Sri Lanka

Bibliotherapy is using books or involving in literature related activities to help people in solving the issues that they may be facing at a particular time. It has been well recognised worldwide and this therapy holds great promise in helping people to better address concerns of negative emotion and personal development. Bibliotherapeutic services are being practiced in several universities in developed countries as a counselling method, but there is very little evidence in the Sri Lankan scenario. Hence, the aim of this study was to discover the university student counsellors' view on introducing bibliotherapeutic services in the university environment. Semi-structured interviews were conducted with the student counsellors at the University of Colombo to explore their views on bibliotherapy as a counselling tool. Fifteen student counsellors of the University of Colombo were interviewed, from the faculties of Science, Education, Arts and Management and from the Library. The student counsellors of the university basically practice multiple counselling methods; short-term individual counselling (100%) and long term group counselling (40%) except one, who practices bibliotherapy technique too as the counselling method. Among them only six were aware of the bibliotherapy technique of counselling. The majority of them (86.67%) believe that bibliotherapeutic services will help university students to overcome their problems. According to them, bibliotherapy will be successful on students' specific issues such as family/couples issues, social /life skills, education and career issues but not on grief, trauma/loss, specific clinical diagnoses, abuse and substance. The main selection criteria for developing a collection on bibliotherapy was 'recommendation of books by counsellors' (53.33%), 'relied on peer recommendations' (40%), 'book reviews' (40%) and 'recommendations made by librarians' (20%). The majority of the counsellors (86.67%) identify university library as the best place to develop the collection and self-help materials, workbooks, poetry, easy readers, fiction, non-fiction, audio books, AV books and e-books are the suggested material types. Most of the counsellors believe that students from both genders will be equally benefited from bibliotherapeutic services, while some (26.67%) believe that the female students will be benefited over the male students. According to the findings of the study, the student counsellors of the university are in favour of introducing a bibliotherapeutic service, for needy students in the university. To introduce this service under the professional guidance and with proper training.

Keywords: *academic libraries, bibliotherapy, student counsellors, university students*

**Assessment of resources and services available in Sri Lankan health libraries to
facilitate practice of Evidence-Based Medicine**

T. Sritharan

Library, University of Colombo, Sri Lanka

The best available evidence plays a key role in informed decision making of clinical situations and in the successfulness of Evidence-Based Medicine (EBM) approaches. Medical literature is a part of clinical decision making of medical professionals and successfulness of EBM. The objective of this study was to assess the resources and services available in Sri Lankan health libraries to facilitate practice of EBM. The survey research design was used to collect data from 26 health libraries which provide health information resources and services exclusively for health professionals. Out of 26 questionnaires 20 were returned at the rate of 77%. The results of the study showed that 85% (17) of the Sri Lankan health librarians acknowledged the concept and importance of EBM approaches. The majority of the health science libraries (75%) provide support for EBM practices, even though they do not have sufficient resources and specialized departments or sections specifically related to EBM. 65% (13) of the health libraries support systematic reviews by searching for literature. The identified major issues in providing EBM are lack of resources (70%) and unavailability of trained staff (85%) to cater for the needs related to practice of EBM. All health librarians are interested in attending training programs on EBM support services. Subscription for best evidence based resources on consortium basis and training programs for health information professionals to support EBM practice were the valuable suggestions made by the participants. This study concludes that the resources and services available in Sri Lankan Health Libraries to facilitate EBM practice are scarce. Only basic or limited services such as literature searching are provided by them. The role of health librarians is very important in EBM practices. Therefore, it is recommended to acquire more evidence-based medical resources as the EBM requires acquisition and use of a complex set of skills, including the ability to locate and critically evaluate clinical relevant research literature. All health librarians should be specially trained in acquiring and providing evidence-based resources, as the availability of “relevant information” is most critical for safeguarding lives and raises the quality of medical services as well as the satisfaction of the health professionals.

Keywords: *Evidence-Based Medicine, evidence based resources, health information, health information provision, health science libraries*

NATIONAL INSTITUTE OF LIBRARY AND INFORMATION SCIENCES (NILIS)



Information Literacy for Health and Well-Being

30 November 2019

MESSAGE FROM THE DIRECTOR

Prasanna Ranaweera



It gives me immense pleasure to welcome you to the Annual Research Symposium of NILIS, University of Colombo. This year's theme, 'Information Literacy for Health and Wellbeing' was chosen in order to incorporate a broad spectrum of topics having interdisciplinary relevance. These topics range from information skills related to health and medicine, to delivering information products and services for the wellbeing of the society.

The Annual Research Symposium is an important event in our NILIS calendar because it showcases the current research being conducted by NILIS and facilitates dialogue between all stake holders. This event is also an opportunity for networking between the novices and experienced researchers, representing different faculties and institutions within the University.

It is important to note that this year we received 18 abstracts for consideration, and after a rigorous review process we were able to accommodate 12 abstracts for presentation in order to maintain the academic quality of the event.

I welcome the Keynote Speaker, Mrs. S. Arulanantham, Librarian, University of Jaffna and also a researcher, on the use of bibliotherapy for healing physical ailments. Her speech is titled "Medicine for the soul: bibliotherapy and the library".

I wish to thank the Vice-Chancellor of the University of Colombo for her decision to include the institutions in the annual University of Colombo Research Symposium, commencing from this year.

Finally, I would like to express my gratitude to the organizing committee and contributors who submitted abstracts to the symposium. I wish convey my best wishes for the NILIS symposium 2019.

NATIONAL INSTITUTE OF LIBRARY AND INFORMATION SCIENCES (NILIS)

PROGRAMME

30 November 2019

- | | |
|----------------|--|
| 08.30-09.00 am | Registration |
| 09.00-10.00 am | Inauguration |
| | Welcome Address by Mr. Prasanna Ranaweera, Director - NILIS |
| | Address of the Chief Guest, Dr. Ruvaiz Haniffa, Chairman - NILIS |
| | and Member – University Grants Commission of Sri Lanka |
| | Keynote Address by Ms. Srikanthaluxmy Arulanantham, Librarian, |
| | University of Jaffna |
| | Vote of Thanks by Dr. Ruwan Gamage, Senior Lecturer - NILIS |
| 10.00-10.30 am | Tea Break |
| 10.30 am | Paper Presentations |

INTRODUCTION TO THE KEYNOTE SPEAKER

Arulanantham Srikanthaluxmy

Librarian, University of Jaffna



Arulanantham Srikanthaluxmy is presently the Librarian of the University of Jaffna, Sri Lanka. She has completed 30 years of service in the LIS field since 1989. She has specialized in the field of Documentation and Information Science at the Documentation Research and Training Centre (DRTC), Bangalore.

She is the author of several publications in the form of books at academic level, along with research articles and conference papers. Her contribution to the social welfare is not limited to the field of Library Science but is also in other disciplines including Gender studies, Child psychology, Media studies and Literature.

Her contribution to the LIS profession at local and national level is immense. She is a member of the editorial board to the Journal 'Bibliotherapy Review' published by University of Wrocław, Poland. She was a visiting Lecturer of Library and Information Science, Development studies and Population studies at post graduate level at the University of Jaffna and at undergraduate level at University of Kelaniya. She has served as the President of the Sri Lanka Library Association (SLLA) in 2017/19 and of the University Librarians' Association of Sri Lanka (ULA) in 2015/16. She has contributed in an advisory and consultancy capacity to several public and school libraries.

She is the founder of the 'Foundation for library Awareness (FOLA)', a non-profit organization, working at grass root level and the Director of the 'Knowledge Stimulation Center'. Much of her spare time and energy is spent in developing reading promotion programs, organizing workshops and exhibitions through these organizations.

KEYNOTE ABSTRACT

Medicine for the soul: bibliotherapy and the library

S. Arulanantham

Librarian, University of Jaffna

In 2013, the National Institute of Mental Health in Sri Lanka released shocking statistics indicating that ‘one out of five persons in Sri Lanka suffers from a mental illness, and that only 20% receive treatment’. Sri Lanka ranks first among South-East Asian countries with respect to suicide. Sri Lanka ranked 67 in the Global Peace Index and World Happiness Ranking in 2018.

The primary responsibility of the librarian is to be aware of the needs of the communities they serve, and to use their knowledge and skills to meet those needs. Libraries should make a major contribution for improving society’s health and wellbeing. The Sri Lankan population is predicted to increase by 262 per day. This means that we have a new reader born every 6 minutes.

As LIS professionals, we have two questions in before of us. The first is how to help this specific reader community. The second is to identify services that can be used to overcome this situation. Reading for healing or bibliotherapy has proved to be a positive solution with our past research and experience, especially during the post-war era.

This keynote addresses how librarians should provide bibliotherapy as a service through both individual reading programmes and book discussion groups. It also proposes policies to support the practice of bibliotherapy. It calls for libraries to build collections with the aim of implementing bibliotherapy programmes. This ensures that the bibliotherapy tool kit consists of the most appropriate resources for the reading community that the libraries are connected to. Finally, the paper proposes developing human resources for the implementation of bibliotherapy programmes, in collaboration with medical and allied professionals.

Keywords: bibliotherapy; therapeutic use of reading; information literacy; healing with books

NATIONAL INSTITUTE OF LIBRARY AND INFORMATION SCIENCES

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Information seeking behavior of military officer-students

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Studying the information seeking behavior of a community is important in demonstrating the adaptability of the community to an information society. In higher educational institutions, information seeking behavior should be maintained at a high standard. In KDU, military officer-students follow courses while they are in service. As these students' information needs is unique, this study was carried out to investigate and identify military officer-students' activities directed at information seeking, to establish interdependencies between identified determinants and influencing factors, and to conceptualise a framework for students' activities towards information seeking. A quantitative research design was employed for the study. All the officer-students (total study population) were selected for the survey. Out of a total of 123 responded only 116 valid questionnaires were selected for analysis. The results revealed that library resources and services significantly affect students' information seeking behavior. The students are aware that they need information to bridge the gap of learning. They have a good command of finding information of their own. However, more training programmes are required to support them in enhancing information literacy.

Keywords: *information needs, information seeking behavior, military officer-students*

Positive effects of family reading on reading habits of children

K.M.A.S. Jayasooriya

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National Institute of Library and Information Sciences, University of Colombo

It is the role of the library to help develop a reader with an open and inquiring mind. Some families have together cultivated good reading habits, but some have found it difficult. Many parents are worried about children being addicted to the Web and mobile devices. Adults on the other hand are addicted to watching teledramas. Both have brought about negative consequences rather than positive ones. Therefore, a novel approach was required to assist families to effectively utilize their spare time. The library of the Uva Province Library Services Board (UPLSB) introduced the 'family reading' programme for the purpose, among 107 families in the domain area. These families were selected after making an open announcement inviting people to be part of the project. This is an ethnographic study conducted over a few years. In the first phase which started this year, the members of each family were allowed to borrow 6 books from the library for two weeks. The library closely observes the development of their information behavior and improvement of reading habits of family members over a substantial period of time. One to one interviews and group meetings were employed. Initial results have revealed that the reading habits of children as well as adults have improved through the programme.

Keywords: *family reading, library services reading promotion, Uva province*

Evaluation of the usage of a parent-teacher communication app: An exploratory case study

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National Institute of Library and Information Sciences, University of Colombo

Effective parent-teacher communication is an important aspect of creating a productive school environment. Commercial mobile apps are available to support schools in achieving this objective. The purpose of this study was to examine the extent of use and perception of teachers and parents on using the *Talkative Parent* mobile app at St. Thomas Preparatory School, Kollupitiya. Primary data was collected through a survey questionnaire administered after an end-of-term parent-teacher meeting held in June 2018. Parents of Grade 9-11 students and the teaching staff members of the same grades were respondents. Twenty teachers teaching in these grades and 150 parents (50% of the study population) were included in the sample. After an initial observation of features and use, it was identified that teachers use the app as a notice board (school, class, sports, and meetings). Parents use it as a sound board for providing feedback and direct messaging the class teacher, sports teacher, and headmaster. Eighty percent of parents had used the app for communication with class teachers. Over 80% of participants had been satisfied with the app. Over 65% of parents and teachers agree that the use of the app has positively affected the behavior of children. The study reports some weaknesses of the app as well.

Keywords: *information management, mobile apps, teacher-parent communication*

Fulfilling personal information needs and administering personal digital information by university academics: A case study of the Open University of Sri Lanka (OUSL)

K.A.V. de Costa^{1,2}, A.H.K Balasooriya¹

¹*Library, The Open University of Sri Lanka*

²*National Institute of Library and Information Sciences, University of Colombo*

Digital information plays a significant role in the present academic context. This research study was an attempt to identify the methods of digital information management and information requirements of university academics. Difficulties faced in handling their personal digital information requirements were also studied. The results of the study would be beneficial for content creators, information providers, software developers, and Web designers. A questionnaire survey and interviews were used for data collection. The sample size was thirty academics, selected from the frequent visitors to the OUSL library. This study revealed that digital information plays an important role among academic staff of OUSL. It found that the staff uses personal computers, mobile phones, laptops, tablets, digital cameras, and sound recording devices for accessing and managing digital information. Among them, mobile phones, desktop computers and laptops were the most frequently used digital devices. Google drive is the most popular storage medium. All respondents have used social media for creation, sharing, and storing personal digital information. The study also found that the majority of university academics have taken backups of important electronic files to avoid losing content. However, they expressed the inadequacy of personal Google Drive space (15 GB) for taking backups. As constraints of accessing digital information, limited access to full text scholarly databases, low relevance and coverage of search results, low prevalence of technical material in the open Web had been mentioned. It is recommended that a detailed study is conducted with a representative sample, taking information handling techniques also into consideration, in addition to devices.

Keywords: *digital information, information handling by academics, information management*

Promoting science literacy: A mission for libraries

P. U. K. De Silva

Former Assistant Professor/Science Librarian at Murray State University, USA

Science-literate individuals are better equipped to make informed decisions to face life challenges intelligently, confront issues affecting their communities and participate in civic decision-making in democratic process. Ever since Hurd coined the term “science literacy” in 1958, discussions about the importance of science literacy have continued, and definitions continue to evolve. Many proposed definitions describing the science-literate person as one who has foundational literacy skills; has the ability to interpret, reflect on, and evaluate scientific information; can distinguish science from non-science; understands the scientific process; is aware of the strengths and limitations of science; and recognizes that scientific concepts and theories are subjected to change and revision. Health literacy is closely related to science literacy and sometimes overlaps with it. Librarians play a proactive role in promoting information literacy helping their user communities to gain information-literacy skills, enabling them to become lifelong learners. The idea of librarians actively getting involved in promoting science literacy might sound overly ambitious, but in reality, it is an extension of promoting information literacy and bridging the gap between these two interrelated concepts. To plan effective science literacy programmes, science-literacy proficiency levels and information needs of their user communities must be investigated using well-designed research studies. Collaborations within and outside the library and careful planning with the support of library staff, scientists, and professionals in scientific fields are crucial in promoting science literacy. Libraries can create appealing “science spaces” that provide resources in multiple formats on different science topics and spur curiosity among library users. Interactive virtual library spaces (e.g., Library Facebook pages) can be very effective at promoting science literacy among young and technology-savvy user groups. Events highlighting special science themes coinciding with important national events (e.g., National Dengue Eradication Week) and international days (e.g., World Environment Day), and designated “science literacy weeks” can also be very productive. The promotion of science literacy by libraries and librarians undoubtedly fulfills a national responsibility toward improving the living standards, health, and well-being of citizens and safeguarding the environment.

Keywords: *information literacy, role of libraries, science literacy*

Bibliometric analysis of Sinhala medium political science textbooks published from 2011 to 2015

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National Institute of Library and Information Sciences, University of Colombo.

Written literature has massively contributed to the development of the scope of the political science discipline from ancient times. In Sri Lanka too, the study of political science has been recognized as an important academic discipline. Out of 15 UGC funded universities, 06 universities have distinct academic departments for this discipline. The aim of this study was to conduct a bibliometric analysis of Sinhala medium political science textbooks published from 2011 to 2015. The study used cumulative volumes of the Sri Lanka National Bibliography as the source of data. The books were categorized into subjects using the third summary of class number 320 of DDC classification. During the period, 156 books had been published as per the above criteria. A maximum number had been published in 2013. Maximum number of books (79) had been published under ‘politics and government’. Only 03 books had been published under the subdivision of ‘international relations’. There is no book on organized groups, international migration & colonization, and slavery & emancipation. Most authors had written one book only. Nine (09) translations were available, which is only 6% of total books. One publisher had published 22% of the total number of books. The study revealed that there is a dearth of Sinhala medium textbooks on this subject. It is either that sufficient political science literature is not available in Sinhala or that such literature has not been included in the National Bibliography. Therefore, an in-depth study of all Sinhala medium textbooks published in Sri Lanka on the topic is recommended.

Keywords: *bibliometric study, national bibliography, political science*

Impact of the university library usage by undergraduates in Sri Lankan universities on their academic performance

N. M. Karannagoda

Main Library, University of Colombo

State University libraries in Sri Lanka are maintained in complex and large spaces incurring a great expense with the assistance of a big cadre. However, statistics reveal that use of university libraries for academic purposes by undergraduates is low. As these libraries are maintained by public funds, library authorities are responsible to demonstrate their value, contribution and effectiveness for the academic success of the undergraduates. Studies reveal that enhancing student motivation to use libraries positively affect their academic achievements. The primary objective of this research is to analyse patterns of impact on academic achievement by gender, faculty and usage type etc. Other different sources used by undergraduates to gather information for academic purpose will also be explored. Finally, it is intended to introduce a systematic way to enhance library use by demonstrating benefits. A sample of 1293 undergraduates from State Universities will attend the final survey. A pilot study was conducted using 20 undergraduates selected randomly from the Faculty of Management and Finance, University of Colombo. According to the pilot study, only one library usage type (use of photocopy, scanning and other utilities) shows a positive significant relationship with the academic performance of undergraduates. The detailed study will be carried out for obtaining more meaningful results.

Keywords: *academic performance, library usage, undergraduate studies*

Using WhatsApp and Google forms to reach medical undergraduates for data collection: A preliminary study

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¹*Department of Anatomy, Faculty of Medicine, University of Colombo*

²*Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura*

Social media networks and online survey administration tools are becoming simple and user friendly. These advances provide opportunity to address drawbacks of conventional research design and administering. The objective of this analysis was to identify the response of medical undergraduates to an online survey tool and a social media network used for the same purpose. WhatsApp and Google forms were used during a descriptive cross-sectional study for assessment of knowledge, attitude and practices towards refractive error among medical undergraduates attending Universities in Colombo district (Colombo and Sri Jayewardenepura). This was conducted from 28th June 2019 to 10th August 2019. The actual sample population was 2668 and inclusion criteria were individuals who were older than 18 years and had registered themselves for a medical undergraduate course in a university located within Colombo District during 2012 to 2018. An online form was created using Google forms to collect information. Whatsapp was used for distributing the questionnaire among the selected student groups. Ninety seven percent of the study population were using WhatsApp. Among them, only 255 (9.83%) responded to the online questionnaire. 70.19% of the respondents were female; 31.37% were in the 2nd year. Among the respondents, 120 (47.06%) have tried to answer the questionnaire within the first week. We conclude that although a considerable number of medical undergraduates were using WhatsApp online communities, the response rate was markedly low. This implies that population characteristics and attitudes of online communities had a negative impact on the response rate.

Keywords: *data collection, medical research, online survey tools, social media networks*

Deployment of electronic information resources by the National Library of Sri Lanka

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³*Library, Eastern University Sri Lanka*

The proliferation of Electronic Information Recourses (EIRs) has a number of significant impacts on the usage of library resources by users. Thus, electronic environment has created significant changes in the role of librarians. The National Library of Sri Lanka is offering electronic information resources and services to its user community from 1995. Yet, no study has been conducted so far to assess the impact of these. This study was designed to find out the status and usage of electronic information resources in the National Library of Sri Lanka. The staff and readers in the National Library were selected as the study population. Twenty per cent of the total population from each category was considered the sample. The random sampling method was used to select individual respondents. It was highlighted that the National Library online catalog was greatly used. In addition to free access to the Internet, online and CD ROM databases were also used to a high degree. A significant percentage (38%) of officers used EIRs on a daily basis. They accessed these resources mainly from the office. Thirty two percent of users too used EIRs on a weekly basis. They accessed these resources mostly from home. Users were equally divided in their preference to print and electronic resources. Users suggested subscribing into more EIRs with full text accessibility, increasing the computer terminals for users with stable internet connection, providing training for handling EIRs and providing frequent user awareness programmes on available EIRs.

Keywords: *electronic information recourses, electronic information services, National Library of Sri Lanka*

Architecting usable end-user documentation: A case study at a software product company

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This mixed methods case study aims to improve the existing online end-user documentation of a software product at a selected organisation by employing the principles of information architecture. It first conducts an information ecology assessment and proceeds to evaluate how well the existing documentation supports end-users in their tasks by employing user tests and focus groups. The results indicate that whilst there is a lot of comprehensive information in the existing documentation, not all of it can be found easily. The feedback obtained via the user tests and focus groups is then filtered through Brown (2010)'s eight principles of information architecture to assess what improvements can be made within current organisational constraints. These improvements are then prototyped via sitemaps and wireframes showing what the proposed re-architecting of the end-user documentation can look like. These are then presented to the same users in the form of a tree test and wireframe evaluation. In conclusion, this study finds that addressing the information architecture of online end-user documentation via systematic user testing and review can have a positive impact on its overall usability even when working within the confines of a restricted content management system. Whilst the usability improvement cannot be quantified for the full user manual due to the limited and more empirical nature of the user tests carried out, the changes made had an immediate positive impact on actual users and addressed some of their key pain points.

Keywords: *case study, information architecture, information management, usability, user manuals*

Problems and challenges of using social media for promoting library services at the National Library of Sri Lanka

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²*National Institute of Library and Information Sciences, University of Colombo*

The study was carried out to determine the problems and challenges encountered in the use of social media for promoting library and information resources and services in the National Library of Sri Lanka (NLSL). A descriptive survey was administered by using a questionnaire and a structured interview. Data were collected from the National Library staff, users and other library professionals. Respondents' opinions about the problems that hinder the use of social media by them are, too many social media tools to learn, lack of time to use social media, lack of privacy and identity theft, confidentiality of information and lack of knowledge on how to use. The NLSL's reasons for giving less priority for promotion through social media are; inadequate funding, inadequate library staff, low interest of staff in learning and utilizing social media, inadequate training opportunities for library staff, frequent electricity failures and slow speed of the Internet. The study revealed that lack of knowledge of library staff in utilizing social media tools is the major challenge NLSL is encountering in the use of social media for promoting library and information resources and services. Low level of technology penetration and network problems are other major causes. The majority of respondents agreed that the use of social media is important to capture the attention of online users and that it helps in distance learning and knowledge sharing. Hence recommendations were made especially to officially appoint a team of experts who can administer the day-to-day operation of the national library social media team.

Keywords: *marketing of library services, National Library of Sri Lanka, social media*

Availability of reading materials for all ethnic groups: Compliance of public libraries in the Uva Province with minimum standards

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²*National Institute of Library and Information Sciences, University of Colombo*

Public libraries help in spreading literacy among the communities they serve. Sri Lanka is a country comprising several ethnic groups. To achieve democracy, equality and justice, public libraries must maintain balanced collections to cater to all ethnic groups. The official languages in Sri Lanka are Sinhala and Tamil. Sinhalese mainly speak Sinhala, while Tamil is spoken by Sri Lankan Tamils, Indian Tamils, and Moors. This study aimed to study the compliance of public libraries in the Uva Province with the standard approved by the National Library and Documentation Services Board (NLDSB) on collection mediums. The library grading standards state that the ratio between mediums of collections should be representative to the composition of populations speaking those languages in the community. First, service areas of individual public libraries in the province were identified with GIS using the location-allocation model. Then, ethnic compositions of identified service areas were analysed. Finally, ratios of ethnic composition were regressed with ratios of collection sizes of the two mediums. Results revealed that there is a very poor accordance between composition of populations and collections ($R^2 = 23.16\%$, $p = 0.000$). Therefore, it can be concluded that there is a lack of books in these two languages to match the need of the population in two major languages. Collection development taking this into consideration will increase the usage of public libraries and can promote wellbeing of the community.

Keywords: *library collection development, location-allocation model, medium of library collections*

Querying Google on weight loss: an analysis of ‘Google Trends’ in Sri Lanka

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²*National Institute of Library and Information Sciences, University of Colombo*

Obesity and being overweight are health issues reported to have a relatively high prevalence in Sri Lanka. The objective of this research was to analyse the internet search query data on searching for weight loss strategies in Google applications. The study first employed Google Keyword Planner - a tool to find similar and related search terms associated with the term ‘Weight Loss’. As a verification step, personalised interview sessions were conducted to collect ‘Weight Loss’ related search terms used by Sri Lankans. The use of these terms in Sri Lanka were then analysed with the ‘Google Trends’ tool. Country and province level analysis was conducted. Results confirm that searching for weight loss and related keywords during the past five years by Sri Lankans have increased. The interest towards ‘Keto’ (Ketogenic, low-carb, high-fat diet) observed to be significantly increasing. We also observed that the Web surfers from the Western Province of Sri Lanka search for online weight loss information more than people from other provinces. Interestingly, over the final six months of the selected study period, interest towards finding a single Facebook group on dieting has greatly increased. This provides weight loss advice which has posts in Sinhala. However, the forum posts are unauthentic. This reveals the alarming threat of false or unauthentic information being made available through social media, and people’s eagerness for looking for sensitive information irrespective of authenticity of the publisher. Based on the results, we propose that internet query data can be used to observe health-related trends in a population and forecast future information needs.

Keywords: *keyword tools, Google Keyword Planner, Google Trends, weight loss*

Use of online resources by undergraduates: A case study

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²*National Institute of Library & Information Sciences, University of Colombo*

The study investigated the use of online resources by undergraduates at the Faculty of Built Environment and Spatial Sciences (FBESS) at the Southern Campus of Kothalawala Defense University (KDU). Since it is a newly started university, the reading materials in the library are inadequate to cater to the users' needs. However, the Southern Campus library has provision to access online resources, specially the two scholarly journals databases, IEEE and Emerald, through the main library. A structured questionnaire was used to gather data from 120 undergraduates of FBESS on the use of these resources. All undergraduates accepted that they use the WWW for accessing information and 95% of the respondents use open source resources for the purpose. However, findings revealed that less than 21% of undergraduates use scholarly databases. Slow Internet speed and lack of training on the use of resources were difficulties faced by them. It is recommended that universities should focus on providing necessary infrastructure and proper awareness and training programmes be conducted. In addition to postgraduate students, undergraduates also must be motivated to use scholarly online resources.

Keywords: *online resources, use of online resources by undergraduates*