ISymRU 2021

Abstract Proceedings

International Symposium of Rajarata University

21st - 22nd December 2021

"Research and innovation towards global sustainability through rural empowerment "

Rajarata University of Sri Lanka - Mihintale

International Symposium of Rajarata University 2021
(ISymRU 2021)

Research and Innovation Towards Global Sustainability
Through Rural Empowerment

Symposium Proceedings

21-22 December 2021

Rajarata University of Sri Lanka

International Symposium of Rajarata University
Research and Innovation Towards Global Sustainability Through Rural Empowerment

Symposium Proceedings

ISSN-2235-9710 / e-ISSN-2820-2279

Cover design by: Mr. R. A. M. Nipun Dilshan

Page layout by: Ms. S. M. M. S. Jayawardhana, Ms. S. B. M. O. K. Munasinghe

Printed by: Nethwin Printers (Pvt) Ltd., No.832, *'Dalada Sevana Api'* Foundation, Gatambe, Kandy Tel./ Fax: +94 812386908

Published by: Faculty of Technology, Rajarata University of Sri Lanka, Mihintale

Partners

Acknowledgements

The organizing committee of ISymRU 2021 would like to convey their sincerest thanks to all the keynote speakers and the webinar presenters for their valuable contribution to this event. Special appreciation is due for the session chairs and the judging panels for their invaluable contribution to ISymRu 2021. Further, a deep appreciation is extended to all those who served in the selection and review panels, without their endless support this event wouldn't have been a success.

We would also like to convey our gratefulness to all the authors, presenters and delegates for sharing their valuable research findings with ISymRU 2021. The ISymRU 2021 organizing committee wishes to acknowledge the financial support provided by the Asian Development Bank, all the other sponsors, well-wishers, and all others who have financially supported the event.

Our heartfelt gratitude is extended to the faculty coordinators who worked untiringly with the organizing committee for the success of IsymRU 2021 A special mention is due for all the non-academic staff members and the students of the Faculty of Technology who volunteered their time to help organize the symposium. Finally, sincere thanks go to all academic and non-academic staff members of the Rajarata University of Sri Lanka.

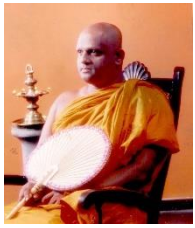
The organizing committee of ISymRU 2021 congratulates all authors, presenters and the delegates for their strong support and active participation in the ISymRU 2021.

About Symposium

International Symposium of Rajarata University - ISymRU 2021 is the 6th research symposium organized by the Rajarata University of Sri Lanka. ISymRU 2021 is a global event focused on showcasing and sharing the latest research findings and their impact on people. The university is located in the historic city of Mihintale, which is situated 14 km away from the east of Anuradhapura. The Faculty of Technology is proud to host ISymRU 2021, continuing the year-long celebrations of the 25th anniversary of Rajarata University of Sri Lanka.

As in previous years, organizers are excited about this international symposium that aims to bring scientists and experts from the national and international research community together, providing a strong forum of communication and knowledge. ISymRU 2021 will be an outstanding opportunity for networking and professional development for those who are new to scholarly communication. Undergraduate and graduate students at all levels and early professionals were encouraged to submit their work and share their research experiences. The symposium is organized around an overarching theme, "Research and Innovation Towards Global Sustainability through Rural Empowerment" and is scheduled to be held on 21st and 22nd of December, 2021. In light of the challenges presented by the global pandemic, this year's event is held using a virtual platform.

Message of the Chancellor



Universities play an important role in creating and spreading knowledge and hence, they must be prepared to establish closer co-operation with industries and enterprises, while simultaneously preserving their role of education and generation of new knowledge. Good quality higher education is the basis of innovation. It is fundamental to promote education and research and spread know-how widely in the North Central Province, in the island as well as throughout the world.

I believe that research and teaching are closely interconnected and reinforce each other. It is happy to note that currently, the academics and students of Rajarata University are working in a research-informed environment. They interact with research, thereby developing the ability to continuously renew their teaching and learning experience.

The 6th International Research Symposium of Rajarata University is organized by the Faculty of Technology and a symposium of this nature assists academia and other participants in envisaging critical concerns and new developments which helps them fabricate innovative and meaningful research. I am indeed pleased about this research orientation of the university.

I appreciate the tremendous dedication and efforts made by the Conference Chair, Conference Coordinator, the Dean of the Faculty of Technology, Vice Chancellor, Internal and external reviewers, Faculty Coordinators, and the members of the Organizing Committee in making this event a reality. I extend my best wishes to the organizing committee of the 6th International Research Symposium of Rajarata University, and I am sure that this symposium will be both an educative and intellectually stimulating discussion forum for all those who are taking part. Finally, I would like to congratulate the researchers for sharing their expertise and wish them success.

Most Ven. Eethalawatunuwewe Gnanathilake Thero
Chancellor
Rajarata University of Sri Lanka

Message of the Vice Chancellor

It is with great pleasure I write this message for the 6th International Symposium of Rajarata University 2021 (ISymRU 2021) on the theme of 'Research and Innovation towards Global Sustainability through Rural Empowerment' parallelly celebrating the 25th anniversary of the university. In addition to teaching, conducting research and dissemination of findings contribute to the larger body of knowledge, a vital task of academics. Even under the prevailing global pandemic situation, Rajarata University of Sri Lanka is shouldering its national and global responsibility, showcasing and sharing the latest research findings and their impact on people. Academics from all six faculties in various expertise namely Agriculture, Management studies, Social Sciences and Humanities, Medicine and Allied Sciences, Technology and Applied Sciences would present their research findings to the students, academia, research community, industries and general public in a virtual platform.

I specially thank the Symposium Chair Dr. Chathuranga Bamunuarachchige and his team for organizing this event under a challenging situation prevailing in the University and the country. National and International keynote speakers who will colour this event receives my greatest gratitude. Speakers from various disciplines contributing to pre-symposium webinar series deserve my big applause. Finally, I wish the international symposium 2021of Rajarata University of Sri Lanka a great success catering to local and global scientific knowledge.

Professor (Mrs) G. A. S Ginigaddara
Vice Chancellor
Rajarata University of Sri Lanka

Message of the Dean

It is my pleasure to welcome all of you to the 6th annual International research symposium of the Rajarata University of Sri Lanka (ISymRU 2021). Despite the threat of the COVID 19 pandemic, we are delighted to see a record number of articles and webinars received this year for this annual symposium. The ISymRU 2021 will bring some of the best researchers and scholars in the world to our doorstep opening great learning opportunities to young researchers in the country. At the same time, it will provide a stage to share your experience and knowledge in research and open opportunities for future collaborations. This will lay the foundation for making a sustainable research culture at the Rajarata University and other participating institutes. I must convey my sincere gratitude to the staff of the Faculty of Technology, the host faculty, and the other staff members of the University, who tirelessly worked to make this conference a great success. I invite you all to join with ISymRU and experience the richness of an International Research Conference.

Professor K. G. P. B Jayathilaka
Dean
Faculty of Technology
Rajarata University of Sri Lanka

Message of the Symposium Chair

It is with the warmest of embraces that I welcome you all to the International Symposium of Rajarata University 2021 (ISymRU 2021), the 6th Annual research Conference of the University. Faculty of Technology, the youngest member of the University, has been bestowed the honor of hosting the event this year under the overarching theme of "Research and Innovation Towards Global Sustainability Through Rural Empowerment". Although the COVID 19 pandemic has been devastating life in general, the response for ISymRU 2021 has been quite encouraging with over 250 submissions covering 10 tracks from Social Sciences and Humanities to Engineering and Technology. All submitted papers have gone through a rigorous double blind review process conducted by the *creme de la creme* of the academia. The main objective of ISymRU 2021 is to encourage the dissemination of research findings of the academia to all stakeholders including, the industry, students, and the public with the vision to uplift the standard of living in the communities.

The task of conducting an international research symposium of this magnitude under trying times is a daunting task to say the least. However, with the help of a vibrantly active and dedicated individuals, comprising of the organizing committee, academic and nonacademic members of the university, and the sponsors, we have been able to see the light at the end of a very long tunnel. Henceforth, my gratitude goes out to all these individuals who have worked untiringly to make ISymRU a success. Finally, I take the opportunity to wish all the participants a very fruitful and invigorating two days that may lay the foundation for future research collaborations.

Dr. T. C Bamunuarachchige
Symposium Chair
The 6th International Research Symposium
Rajarata University of Sri Lanka

Keynote Speech I

New technologies to battle the perfect storm: The impact of environment and pathogens on plant health and agricultural ecosystems

Plants interact with their environment in a variety of ways, through the utilization of preformed and induced signaling processes. In brief, this requires the coordinated sensing, and signaling, associated with growth, development, immunity, and stress signaling processes. In total, it is the sum of these interactions – the connectivity to a seemingly endless array of environments – that ensure proper activation, and control, of plant growth, development, and response to stress. Over the past decade, the field of plant biology has witnessed the discovery of numerous points of convergence between immunity, growth, and development. Towards defining how these processes are regulated, I will highlight recent work in my lab that provides further definition of the molecular-genetic, biochemical, and environmental processes that control plant growth and survival. Specifically, recent research in my lab has uncovered a novel mechanism by which plants balance growth, defense, and response to drought. In addition, I will present new data that describes the development of high-resolution, point-of-contact nanotechnology-based methods for field-deployable diagnostic. In total, current work in my laboratory has developed translational approaches to not only define and engineer stress-tolerant plants, but to detect a myriad of threats that impact crop performance. The sum of this work is to better define the convergence of stress signaling in plants, and to deploy lab-based knowledge to deliver sustainable improvements in agricultural productivity and sustainability.

Professor Brad Day
Adjunct Professor
Michigan State University
Associate Vice Chancellor for Research
The University of Tennessee

Keynote Speech II

Reclaiming the 'Heart' of Education

Conversations about the right to education have intensified in the era of the pandemic. With lengthy school closures and large numbers of children around the world being denied online education due to the digital divide, the conversation revolves around access to education. In the pre-pandemic period too claims to the right to education revolved around equitable access to education. It is a valid discussion. There is strong advocacy to include the right to education in a future constitution of Sri Lanka. Many Fundamental Rights petitions before the Supreme Court and the Human Rights Commission of Sri Lanka pertain to school and university admissions under the equality clause.

However, the human right to education is not only about access; it is equally about the content and the focus of education. Sri Lanka has generally done well regarding access thanks to the Kannangara reforms. But do we meet the test of content and focus? Does the current focus of educating for the job market and to richly contribute to the GDP, of focusing on STEM subjects and 'hard skills', of quantification of learning outcomes and 'quality assurance' etc. meet the challenge of fulfilling the human right to education, and indeed the concomitant challenges of establishing and supporting a politically stable and free society with an innovative and vibrant economy?

Have we lost the main purpose, or the 'heart' of education, in favour of an artificial prescription that not only denies to us ancient wisdom on education but also tried and tested educational fundamentals adopted by advanced economies with strong democratic foundations? This is the question I will seek to address in my presentation combining human rights law, theories of democracy and comparative educational experiences.

Professor Nelum Deepika Udagama
Department of Law
University of Peradeniya
Sri Lanka

Keynote Speech III

Engineering Application of Combined Biological Nitrogen Removal Based on Anammox Process in Treating Swine Wastewater Digestate

As the largest country for livestock and poultry industry in the world, China is paying more and more attention to its environmental pollution control, in which swine wastewater is one of the key pollution sources. According to the characteristics of swine digestion quality and anammox bacteria culture, the combined biological nitrogen removal process based on anammox was proposed and applied in a full scale anaerobic-anoxic-oxic (A^2/O) system, and the carbon source dosing strategy based on the concentration of return nitrate concentration and intermittent aeration in oxic zone were adopted. TN removal efficiency reached at 65.5±6.0% in Phase 1 with decreasing external carbon dosage in influent due to the reduction of return nitrate concentration, and it increased to 83.5±6.7% when intermittent aeration was adopted in oxic zone and external carbon source was stopped adding into influent in Phase 2. As a result, the energy consumption for the swine wastewater treatment decreased from 1.93 to 0.9 kW h/m³ and 4.18 to 2.57kW h/kg N, respectively. Microbial community analysis revealed that as the only anammox bacteria detected in the process, the average abundances of *Candidatus brocadia* increased from 0.76% to 2.43%, and removal of TN through anammox increased from 39% to 77%. The relative abundance of nitrogen transformation related gene *hzo*, hzsA and *nir*S increased by 1.78, 42.25 and 2.05 times, respectively.

Professor Yuansong Wei
Director
Laboratory of Water Pollution Control Technology
Research Center for Eco-Environmental Sciences
Chinese Academy of Sciences
China

Advisory Board

Patron
Professor (Mrs) G.A.S Ginigaddara
Vice Chancellor, Rajarata University of Sri Lanka

Prof. K. G. P. B. Jayathilaka
Dean, Faculty of Technology

Prof. A. M. J. B. Adikari
Dean, Faculty of Agriculture

Prof. E. M. K. R. B. Edirisinghe
Dean, Faculty of Applied Sciences

Prof. W. P. Wijewardana
Dean, Faculty of Management Studies

Dr. S. D. Pilapitiya
Dean, Faculty of Medicine & Allied Sciences

Prof. D. Thusitha Mendis
Dean, Faculty of Social Sciences & Humanities

Dr. Shelton Perera
Consultant in Mathematics, Faculty of Technology

Prof. Nilantha Liyanage
Department of Food Science and Technology, Faculty of Agriculture, University of Ruhuna

Organizing Committee

Symposium Chair/ Editor-In-Chief
Dr. T.C. Bamunuarachchige

Symposium Coordinator
Dr. P. Kumarage

Secretary
Dr. W. M. M. D. Bandara

Chair, Editorial Committee
Dr. H. N. D. A. Perera

Co-Chair, Publishing and Registration Committee
Dr. R. G. P. T. Jayasooriya
Dr. S. K. Illangarathne

Chair, Web, Media and Publicity Committee
Mr. H. M. H. L. Herath

Chair, Food and Refreshment Committee
Ms. K. H. I. Gimhani

Chair, Finance Committee
Dr. N. D. A. D. Wijegunawardena

Chair, Ceremonial Committee
Dr. L.T. Jayasuriya

Chair, Technical Programme Committee
Mr. D. C. Weerasinghe

Faculty Coordinators:

Dr. Dharmasiri Dissanayake	Faculty of Agriculture
Dr. Gayan Thilakarathne	Faculty of Agriculture
Prof. Ajith C. Herath	Faculty of Applied Sciences
Dr. Eustace Fernando	Faculty of Applied Sciences
Prof. Percy Wijewardena	Faculty of Management Studies
Dr. Sampath Kappagoda	Faculty of Management Studies
Dr. D.M.C. Dissanayake	Faculty of Management Studies
Dr. Janith Warnasekara	Faculty of Medical and Allied Sciences
Dr. Shashanka Rajapaksha	Faculty of Medical and Allied Sciences
Prof. Manjula Ranagalage	Faculty of Social Sciences and Humanities
Dr. D. M. S. L. B. Dissanayake	Faculty of Social Sciences and Humanities

Committee Members

Dr. N. Dharmagunawardhane	Mr. U.V. R. J. Rajakaruna
Dr. Ahinsa Ranaweera	Mr. K. M. M. H. B. Senevirathna
Dr. Ajith Rathnayake	Mr. M. A. E. G. Perera
Dr. Manavi Ekanayake	Ms. U. S. A. Gunathilaka
Dr. I. M. N. Molagoda	Ms. I. P. A. U. N. K. Illuppanagama
Mr. H. K. S. de Zoysa	Ms. Y. S. R. Palihakkara
Ms. H. M. P. Preethimali	Mr. K. A. D. K. Pramod
Mr. H. M. H. T. Hikkaduwa	Mr. G. I. C. L. De Zoysa
Ms. L. D. M. Premasiri	Mr. J. M. A. I. K. Jayamanna
Ms. W.K.P. Chathurangika	Ms. E.M.T.S. Ekanayake
Ms. Rashmika Kudahetti	Ms. W.S. Jayathunga
Mr. Rajith Eranda	Ms. Gaurika Kahawala
Ms. Nishadi Parasanthika	Mr. G. M. C. Bandara

Table of Content

ISymRU 2021

Agriculture

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

Adoption of Rubber Harvesting Technologies by Self-Latex Harvesters: A Case Study in Moneragala District of Sri Lanka

Gunarathne P. K. K. S.[1] ✉, Tennakoon T. M. S. P. K.[2], Edirisinghe J. C.[3],Jayasundara K. K. I.[1]

Abstract

Self-latex harvesters (SLHs) are the people who extract (harvesting/tapping) latex from rubber (*Hevea brasiliensis*) trees in their own smallholdings. This study was carried out to evaluate the level of adoption and find out reasons for partial or non-adoption of harvesting technologies (HTs) generated by Rubber Research Institute of Sri Lanka. The study covering 297 rubber smallholdings with SLHs was conducted in 2019 through a questionnaire survey and field level observations in Moneragala district. The level of adoption was measured for nine HTs, employing three levels as not-adopted, partially-adopted and fully-adopted. Reasons for the deviations from the HTs were also recorded and prioritized. The majority have fully-adopted to the correct timing of tapping (R-1) (70%). The rest of HTs; viz. tapping system (R-2), girth (R-3) and height (R-4) at opening for tapping, cleanliness of tapping area (R-5) and tapping utensils (R-6), placement of spout (R-7) and cup (R-8) and tapping panel marking (R-9) of which the recorded fully-adopted levels were, 21%, 23%, 21%, 21%, 23%, 15%, 8%, and 37%, respectively. Except for R-1, the main reason for partial and non-adoption for the rest of the HTs was poor awareness of SLHs. The reasons except poor awareness for partial and non-adoption of HTs by SLHs were highlighted as follows; two main reasons for partial/non-adoption of R-1 were bad weather conditions and threat of bites by snakes/animals in early morning. For R-2, high rainfall on tapping days was found to have a considerable impact. In order to achieve a high tapping task, SLHs ignored practicing of R-3. One of the reasons for partial/non adoption of R-4 was the height of the harvester, who finds it difficult to operate at the opening height of 120 cm. Reason for partial/non adoption level in R-5 and R-6, was reluctance to allocate extra time for cleaning, and that of R-7 and R-8 was, not giving the due recognition by the SLHs, whilst for R-9, it was non-availability of marking stencils. The study indicated that adoption levels of HTs in Moneragala were poor. Lack of awareness was the prominent reason for low/non-adoption of HTs. Therefore, it is a vital necessity for an appropriate strategy for enhancing the adoption level of HTs among SLHs to exploit the advantages of HTs.

Keywords: *Adoption, rubber harvesting practices, self-latex harvester*

[1] Rubber Research Institute of Sri Lanka, Sri Lanka
[2] University of Sri Jayewardenepura, Sri Lanka
[3] Wayamba University of Sri Lanka, Sri Lanka
✉ Corresponding Author: kapila.s.gunarathne@gmail.com

Submergence Tolerance and Survival Mode of Twenty-Six Traditional Rice Accessions at the Seedling Stage

Shyamalee H. A. P. A.[1] ✉, Ranawake A. L.[2]

Abstract

Rice is the staple food for more than half of the world's population. The demand for rice production is increasing with the rising population in the world. At the same time, climate change has limited the cultivable land area for rice. Among many abiotic and biotic factors, flooding is one of the major factors for reducing cultivable lands in the area where rice is being cultivated under monsoon rains. Sri Lanka is also highly affected by intermittent flooding reducing rice yield drastically and increasing the cost of production by sawing seeds several times per a crop-season. The traditional rice gene pool in Sri Lanka consists of many valuable traits though they were replaced by high-yielding improved varieties with time. In the present study, twenty-six traditional rice accessions were evaluated for submergence tolerance at complete submergence stress under 9-day and 14-day separately. Two weeks old seedlings were subjected to submergence stress and seedlings have been allowed to recover for fourteen days. Survival percentage and plant height during the submergence period compared to that of control plants was recorded. *Swarna sub 1* was included as the positive control in the experiment. According to the scoring system of IRRI for submergence tolerance, *Heenati* (3707), *Mawee* (4145), *Rathuheenati* (5486), and *Swarna sub 1* showed 100% survival rates after 9-day of submergence stress. The accessions *Murungakayan* (3489) and *Pokkali* (3562) reported 88.89% and 85.71% survival rates respectively at 9-day submergence stress. The accession *Rata wee* (3466) recorded an 87.5% survival rate at 14-day complete submergence stress and *Kaluheenati* (4621) reported 71.43% tolerance at both stress levels. There was no strong correlation between plant height and survival rates at 9-day ($r=-0.096$, $\alpha=0.640$) and 14-day ($r=-0.320$, $\alpha=0.111$) submergence stress conditions. Sub1A gene has been found to play a key role in submergence tolerance in rice. The seedling elongation under the submergence stress is suppressed by Sub 1A gene expression and it is the reason for a negative correlation between submergence tolerance and height gain. In the present study, such a strong correlation has not been reported indicating that the Sub1A gene expression was not prominent among the studied rice accessions since both tolerant and susceptible rice accessions had been included in the study. The selected moderately-tolerant and tolerant rice accessions can be integrated with future breeding programs for developing submergence tolerance.

Keywords: *Submergence tolerance, survival mode, rice, seedling stage*

[1]Agriculture Research Station, Department of Agriculture, Telijjawila, Matara, Sri Lanka
[2]Department of Agric. Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka
✉Corresponding Author: shyamaleeanusha@gmail.com

Evaluation of Chemical and Sensory Qualities of Mixed Fruit Jam Made from Blended Pineapple and Papaya Incorporated with *Aloe Vera*

Basary M. R. H.[1], Premakumar K.[1], Afreen S. M. M. S.[1] ✉

Abstract

In the current world, a pattern towards advancement and utilization of *Aloe vera* based food has picked up consideration among individuals for sound health. Centering this idea as a goal, research was led to create blended mixed fruit jam by incorporating *Aloe vera* (*Aloe barbadensis*) with two significant fruits in Sri Lanka; pineapple (*Ananas comosus*) and papaya (*Carica papaya*). Considering the choices of a few fundamental examinations, different combined mixtures of *Aloe vera* with pineapple and papaya were mixed in the ratios (w/w) of 150:150: 00 (T1), 150: 150: 5 (T2), 150:150:10 (T3), 150:150: 15 (T4) and 150:150:20 (T5) and processed into jams in CRD (Completely Randomized Design) with five repetitions. The freshly made mixed fruit jams were analysed for nutritional characters and organoleptic parameters. The physico-chemical parameters such as pH, titrable acidity, total soluble solid, sugar content, ascorbic acid were analyzed .Sensory evaluation was done on a five-point hedonic scale - the taste, colour, aroma, texture and overall acceptability of the products have been assessed. Chemical analysis revealed that incorporated *Aloe vera* mixed fruit jam mean value for titratable acidity (2.10 %-1.27 %) and total sugar (47.58 %-38.04 %) diminished while ascorbic acid (6.04 -12.54 mg/100 ml), pH (4.09-4.36), TSS (68.54^0 Brix-78.34^0 Brix), moisture content (30.81%-36.25 %) were increased with the increase of *Aloe vera* pulps. The sensory qualities of freshly made mixed fruit jam supplemented with 15g *Aloe vera* was found to be much more acceptable in terms of texture, taste, aroma, and overall acceptance. The formulation of composite mixed fruit jam with higher chemical and organoleptic characteristics within the widely acknowledged standards were effective using a blend of 150g pineapple pulp, 150g papaya pulp, and 15g *Aloe vera* pulp (T4).

Keywords: *Aloe vera based food, mixed jam, nutrient analysis, organoleptic qualities, treatmen*t

[1] Department of food science, Faculty of Agriculture, Eastern University of Sri Lanka, Sri Lanka
✉Corresponding Author: afreen0899@gmail.com

Determination of the Combined Effect of Selected Parameters Affecting the Quality Retention of a Ceylon Black Tea Blend

De Silva K. T. I.[1] ✉, Karunathilake V. [2], Ekanayake E. S. K.[2], Fernando K. R.[2], Mendis B. E. P.[1]

Abstract

The aim of this study was to determine the combined effect of the elevation level and moisture content of incoming tea, blending formula and the storage condition of the end product on the quality retention of Ceylon black tea blends instead of studying their individual effects separately. Incoming tea from 2 elevation levels (high-grown and low-grown) and moisture contents (low:7-2 and high:7+2) were selected. Tea grades, Dust-1 and BOPF were used in different ratios for blending (formula-1; 50% Dust-1, 35% BOPF and formula-2; 35% Dust-1, 50% BOPF) together with Dust (7%) and Fannings-1 (8%). Finally, the prepared blends were packed in paper-based envelopes and stored in two types of storage conditions (ambient at 26.8±1.4 °C and air-conditioned at 20.6±0.6 °C). This resulted in 16 different treatment combinations of black tea. Total color of tea subjected to different treatment combinations was determined using UV-visible spectrophotometry. Combined treatment effects on moisture content and water activity were assessed over 7.5 weeks of storage. Analysis of total color, final moisture contents, final water activities, differences in moisture contents and water activities were carried out using 4*2 factorial design, subjected to ANOVA and mean separation using Duncan's new multiple range test. They showed interaction effects ($p<0.05$) at four-factor level and significant differences ($p<0.05$) between most of the treatment combinations. Trends in moisture content and water activity were analyzed using the general linear model. Results showed that there was moisture desorption in tea subjected to certain treatment combinations while moisture absorptions in the others. Sensory analyses were conducted in two consumer-oriented ranking tests and a consumer-oriented hedonic test. The data sets were analyzed using Friedman test and Wilcoxon signed-rank test respectively. SPSS 18 software package was used for statistical analyses. Final moisture content and final water activity of tea subjected to treatment combination "high-grown, low moisture, formula-2 in air-conditioned storage" resulted in the lowest values. Analysis of the trends in the variation of moisture content and water activity showed both gradual rises and falls in the trend lines. Sensory analyses revealed the best treatment combination ($p<0.05$) which is "low-grown, low moisture, formula-1 in air-conditioned storage". According to the total color analysis the treatment combination "low-grown, low moisture, formula-2 in air-conditioned storage" resulted in the lightest infusion. Results of this study provide insights into the combined effects of factors affecting tea quality and pave a direction to promote export tea trade in Sri Lanka.

Keywords: *Blending formula, ceylon black tea blends, combined effect, quality retention, treatment combinations*

[1] Department of Food Science & Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka
[2] Quality Assurance Department, Dilmah Ceylon Tea Company PLC, 111 Negombo Road, Peliyagoda, Sri Lanka
✉ Corresponding Author: fst15003@agri.pdn.ac.lk

Determination of an Optimum Warehouse Storage for Better Quality Retention of a Blended Ceylon Black Tea Standard

Fernando A. L. H. M.[1] ✉, Karunathilake V.[2], Fernando K. R.[2], Ekanayake E. S. K.[2], Mendis B. E. P.[1]

Abstract

Ceylon tea maintains a good reputation in the global market and plays a key role in the economic development of Sri Lanka employing a million people. Due to higher competition among tea-supplying countries, assurance of the quality of tea becomes a growing priority to get a competitive advantage. Tea storage conditions are major key factors that directly affect the quality of tea. Temperature and relative humidity (RH) management during tea storage at warehouses and transitions of the value chain plays a pivotal role in maintaining tea quality. This research was conducted to determine optimum warehouse storage for a blended Ceylon black tea standard to optimize tea quality while reducing the cost of storage. The specificity is that the determination of storage takes account of possible quality changing patterns of tea during main storage transitions along the value chain. Tea samples were prepared by packing tea primarily into tea bags, secondarily into paper base foil envelopes, and finally into inner and outer paper boxes. Packed tea samples were then stored at three warehouse cold room storage conditions and ambient warehouse storage condition, having temperature and RH combinations of 20-21°C/32-34%, 23-23.5°C/38-42%, 24.5-25.7°C/63-69% and 27-29°C/66-76% respectively. Tea quality parameters were analyzed first by continuously storing tea samples for a total of seven weeks at the respective warehouse storage conditions. Analysis of the same was continued by moving tea samples through simulated main storage transitions that include warehouse, shipment, and final destination storage. Samples from both approaches were analyzed for moisture, water activity, and total colour. Sensory quality parameters; flavour, colour, aroma, and overall acceptability were analyzed employing hedonic ranking tests with the participation of trained panelists. Tea stored at ambient storage conditions resulted in the highest quality deviations from the recommended levels, compared to tea stored at cold room storage conditions. Among the cold room storage conditions, tea stored at temperature and RH of 20-21°C/32-34% and 23-23.5°C/38-42% resulted in the most desirable levels of all tested quality parameters. Those two storage conditions were not significant ($P > 0.05$) for most of the tested quality parameters. By considering both quality optimization and storage cost reduction, this study determined 23-23.5°C temperature and 38-42% RH combination as the optimum warehouse storage condition.

Keywords: *Black tea, quality, value chain, warehouse storage*

[1]Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka
[2]Department of Quality Assurance, Dilmah Ceylon Tea Company PLC, 111 Negambo Road, Peliyagoda, Sri Lanka
✉Corresponding Authors: hirunimalshika93@gmail.com, ereshamendis@yahoo.com

Development of an Antioxidant Enriched Jam Using Soursop (Annona muricata), Winter Melon (Benincasa hispida) and Green Tea

Gunathilaka N. D. D. M.[1] ✉, Ellepola V. P.[1], Kahandage K. P. M.[1], Wijesinghe W. A. J. P.[1]

Abstract

There is a great potential for developing value added products from both soursop and winter melon owing to their numerous nutritional and therapeutic effects. The objective of this study was to develop an antioxidant enriched jam using green tea, soursop and winter melon. The jam was prepared without adding pectin, by mixing 2:1 ratio of soursop: winter melon, citric acid (0.1%), sugar and green tea extract. Green tea extract was used in order to provide a pleasing yellow hue to the jam while enhancing its antioxidant level owing to its rich polyphenol content. Two sensory evaluations were performed separately in order to identify the best sugar and green tea percentages for the final product. Sensory data were analyzed using nonparametric Friedman test. Based on the sensory analysis, jam with 35% sugar, 24.37% TSS (total soluble solids) and green tea extract was selected as the best formulation. Proximate composition of the product was determined using AOAC methods. Total polyphenol content and antioxidant activity were determined by Folin-Ciocalteu method and DPPH assay respectively. Final jam contained 31.79 ± 0.47% moisture, 2.26 ± 0.12% ash, 0.97 ± 0.05% fiber, 9.26 ± 0.02% fat, 1.08 ± 0.27% protein and 42.66 ± 0.24% carbohydrate. Total energy content was recorded as 308.20 ± 2.08 kcal/ 100 g. Physiochemical properties were recorded as 68.33 ± 0.28 °Brix, pH of 4.98 ± 0.03, titratable acidity of 4.68 ± 0.13% and viscosity of 56.67 ± 0.58 mpa-s. Total polyphenol content and antioxidant activity were 15.79 ± 0.07 mg GAE g^{-1} and 83.91 µg ml^{-1} respectively. The total plate counts were less than standard maximum permissible limits throughout the storage period. The product could be safely stored for two months under refrigerated conditions.

Keywords: *Green tea, jam, physiochemical properties, soursop, winter melon*

[1] Department of Export Agriculture, Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka.
✉ Corresponding Author: dilshanimadu179@gmail.com

Designing and Budgeting of a Walk-in Polytunnel to Raise Ornamental Crops in Ampara District

Sujanthika V.[1] ✉, Nashath M. N. F.[1], Akram A. T. A.[1]

Abstract

Protected agriculture has become one of the fastest growing sectors around the world in producing seasonal and non-seasonal high quality crops. Commonly different types of low-cost protected structures including walk-in tunnels and low tunnels are practiced allowing year-round cultivation of different crops. Major advantage in constructing a walk-in tunnel is workers can easily walk into it and take care of the crops as mentioned in the name itself. Especially dry zone farmers in Sri Lanka find ornamental plant production is difficult (due to unfavorable climatic conditions) and expensive. Hence, they hesitate to practice ornamental crop cultivation. Therefore, in the present study, we suggest designing and budgeting a low-cost walk-in tunnel suitable for ornamental crop production in Ampara district, Sri Lanka. It is a temporary structure made by wooden logs and bamboo sticks and covered with different thickness of polythene materials. A farmer can build this walk-in tunnel for the cost of Rs. 1200-1500 per m^2 area using a normal framed structure. To minimize walk-in tunnel installation rates, a low-cost protected environment with an area of 50 m^2 (10 m x 5 m x 3.5 m) was built using locally available pinewood coated with burnt engine oil as structural material and bamboo as framework. The poly grip assembly can be made with wooden strips and nails and the drip system can be installed for around Rs. 15,000. For a naturally ventilated walk in tunnel, gutter construction costs roughly Rs. 600 per m^2 (including the labor cost). Since the construction of this walk-in tunnel utilizes locally available low cost materials, the cost of construction of the tunnel is 45% lower than a regular tunnel.

Keywords: *Ornamental crops, pinewood, protected agriculture, walk-in tunnel*

[1]Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka, Sri Lanka
✉ Corresponding Author: vijaysuja0612@gmail.com

Identification and Characterization of a Mutation in the SLR1 and GA3ox2 Genes in Two Mutant Dwarf Rice Varieties Obtained from an Improved Local Variety

Chandrasekara T. M.[1] ✉, Abeysiriwardena D. S. de Z.[2] , Dhanapala M. P. C. S.[1]

Abstract

Dwarfism is considered a valuable trait in crop breeding. Owing to short stature, dwarf plants have a greater resistance to rain and wind damage leading to tolerance to lodging, and thus associate with increased and stable yield. Though dwarfism can be caused by different factors, defects in the perception and biosynthesis of gibberellic acids (GA_3) have been identified as the most prominent factors. In Sri Lanka, where rice is the staple food, rice supply does not consistently meet the existing demand. Therefore, the current study was conducted to characterize two dwarf mutants originating from a locally available rice variety and to determine whether the dwarf phenotype has the potential to be introduced to the breeding programs. The DNA from the dwarf mutants and the mother plant was extracted using CTAB method and was amplified using two selected primers, *OsSLR1* and *OsGA3ox2* which were designed for the *SLR1* and *GA3ox2* genes of the rice genome. *SLR1* codes for the repressor protein DELLA, which is involved in gibberellin signalling pathway, and *GA3ox2* expressors GIBBERELLIN-3-BETA-HYDROXYLASE 2 enzyme which is involved in the process of gibberellin biosynthesis. Then the amplified regions were subjected to DNA sequencing and the sequences were aligned using multiple sequence alignment and subjected to comparison in order to identify polymorphisms and indels. Several indels were identified in both dwarf phenotypes compared to the parent plant. Although some changes among the compared sequences were observed, GA_3 response assays, protein clustering and the sequencing of more gene regions associated with GA_3 signalling and biosynthesis should be carried out to verify the presence of mutations in the dwarf phenotypes.

Keywords: *Decreased lodging, DNA sequencing, dwarf phenotype, gibberellin biosynthesis, gibberellin signalling*

[1]Department of Molecular Biology and Biotechnology, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka

[2] CIC Agribusinesses, Pelwehera, Dambulla, Sri Lanka

✉ Corresponding Authors: thilinic@sci.pdn.ac.lk, chandimasd@sci.pdn.ac.lk

Animal-based Organic Substrate for Oyster Mushroom (*Pleurotus ostreatus*) Cultivation in Sri Lanka

Ruhunuge I. J. A.[1] ✉, Malhara M. K. I.[1], Kirthisinghe J. P.[2], Wimalasiri E. M.[3]

Abstract

Cultivation of oyster mushroom is widely practiced in small-scale cultivation as a self-employment cottage industry in Sri Lanka. Oyster mushroom, belongs to class *Basidiomycetes* and family *Agaricaceae*, is an efficient lignin-degrading mushroom and grows well on different types of lignocellulosic materials. Since the use of animal manure as a substrate for oyster mushrooms has not been fully investigated properly, the study was carried out to find the effect of using freely available livestock animal dung on oyster mushroom cultivation. The experiment was conducted in the grower's mushroom unit at Udathenna, Matale in 2019. The experiment was laid out in a Complete Randomized Design (CRD) with 5 treatments with 10 replicates. Five treatments were: 10 kg of paddy straw (T1), 9 kg of paddy straw + 1 kg of dry cow dung (T2), 9 kg of paddy straw + 1 kg of dry goat dung (T3), 9 kg of paddy straw + 1 kg of dry poultry litter (T4) and 9 kg of paddy straw +1 kg of dry pig dung (T5). DOA recommendation is the use of 10 kg of paddy straw and it was used as the control of the study. Ten flushes were harvested to study the number of days taken from inoculation to completion of spawn run, pinhead formation, fruit body formation and the first harvest. Further, the total yield and biological efficiency (BE) were also calculated. The results revealed that there was a significant ($p < 0.05$) difference observed in days to spawn run, pinhead formation, first flush and first harvest and total harvest per bag between T2 and control (T1). It showed that cattle dung with paddy straw is a better substrate compared to the other animal dung. It has a great positive impact on growth where the first harvest was achieved within 50 days with the highest total yield per bag (218 g) with the highest biological efficiency (44%). There was a significant ($p < 0.05$) difference in final yield per bag between T2 and control (205 g). Hence it implies that increased mushroom production can be achieved by incorporating locally accessible low-cost substrates like livestock animal dung which also reduce the production cost.

Keywords: *Biological efficiency, cattle dung, dung substrate*

[1] Department of crop management, Faculty of Agriculture, Aquinas College of Higher Studies, Colombo, Sri Lanka
[2] Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka
[3] Department of Export Agriculture, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka
✉ Corresponding Author: isuriruhunuge999@gmail.com

Domestic Floriculture Trade: A Case Study from Polonnaruwa

Dandeniya D. H. S. D.[1] , Kodithuwakkuge V. N.[2] ✉, Beneragama C. K.[2]

Abstract

The global demand for floriculture products is at a rise as the flower consumption is ever increasing. It has been identified that the floriculture trade in Sri Lanka is significantly contributing to the both export and domestic market. The floriculture sector generates more opportunities that people can engage in as self-employment. Western, North-western, and Central provinces of Sri Lanka are identified as the major contributors of the industry. Polonnaruwa (North-central province) is identified as a key location that supplied specific floriculture products to the domestic market. As identified, the main issue was the lack of details of the growers and products in many locations that cater strongly to the local market.This study was carried out to identify the present status of the domestic floriculture industry in Polonnaruwa under categories of growers, market, high demanded plant species and current issues. Primary data were collected from purposefully-selected 80 ornamental plant growers in the Polonnaruwa District through a pre-tested semi-structured questionnaire and observing the field operations, whereas secondary data were collected from research articles, ITC reports and publications on websites. Data were analyzed using MINITAB 19 statistical analysis software. Results revealed that, the most of the growers were of the age range 45-55 which was 46% of the total. There was no association between education level and monthly sales of the growers. Further no association between sales upon business age, land size, fertilizer type, and formal training of the farmers was present. Bougainvillaea (*Bougainvillea* spp.), Ivata (*Wrighita antidysenterica*), Christina (*Syzygium campanulatum*), Hibiscus (*Hibiscus rosa-sinensis*), Ixora (*Ixora coccinea*), Mandevilla (*Mandevilla sanderi*) were reported as the highest sales record per month. Among them, Bougainvillaea reported a considerable volume of sales on average 118,390 plants per month by all growers. The most selling pot size was 5½ inches. The main marketing method was interacting with a middle man. As per the respondents, not supplying to the export market was considered as a major issue. Not having a stable price, lack of technical knowledge, pests and diseases, lack of growing media were the other issues faced by growers. Adopting modern techniques, establishing more floriculture villages and requesting government support for current issues were the suggested solutions.

Keywords: *Domestic market, floriculture, floriculture trade, middle man, market availability*

[1]Department of Biosystems Technology, Faculty of Technology, University of Jaffna, Sri Lanka
[2]Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka
✉ Corresponding Author: virashmikodithuwakku14@gmail.com

A Comparative Analysis of Vitamin C Content in Fresh Juices and Branded Fruit Nectars in Sri Lanka

Banu M. S. S.[1], Patirana K. P. A. D.[1], Thennakoon T. M. C. M.[1], Gimhani K. H. I.[1], Bandara W. M. M. D. [1] ✉

Abstract

Fruits are an important part of the human diet. It provides sufficient quantities of essential elements such as vitamins and minerals. Among the available vitamins, vitamin C (ascorbic acid) is one of the most important food constituents for human health due to its significant benefits. Being a tropical country, Sri Lanka is rich in a wide variety of fresh fruits that are capable of providing the recommended daily vitamin C intake. Other than that, there are a variety of ready-to-drink fruit nectar available in the market supposedly providing similar benefits. However, there is a dearth of information on the nutritional values of such locally available nectar. Therefore, the main objective of this study was to evaluate and compare the vitamin C contents present in commercial fruit nectar and fresh fruit juices. Further, the study aimed at the determination of the best possible storage temperature for vitamin C rich fruit juices. For the study, four types of commercially available fruit nectars (i.e. mango, apple, orange and wood apple [belongs to two different brands, brand 1 and brand 2]) and six types of fresh fruit juices (mango, apple, pineapple, guava, orange and passion) were selected. Among the numerous analytical techniques that are available for vitamin C determination, the official method (AOAC) for vitamin C determination in fruit juice is the 2, 6-dichloroindophenol titrimetric method. However, due to several limitations associated with this method presented herein we have used iodometric redox back titration. This method is known as a cheap and accurate method that can even be used in routine analysis. Among the studied fresh fruit juices, guava (0.1955 g/100 ml) had the highest vitamin C level followed by the orange (0.1532 g/100 ml) and passion (0.1439 g/100 ml). However, the values obtained for the fresh fruit juices were not significantly different from their commercially available counterparts from brand 1. Fruit nectars from brand 2 always had very low levels of vitamin C. However, regardless of the brand, wood apple nectar had the highest vitamin C content (0.3717–0.3227 g/100 ml). Also, it was noticed that the levels of vitamin C in the fruit nectar brand 1 were much higher than the values declared on the labels. Therefore, it is worth mentioning that the consumption of commercially available fruit nectar can also fulfil the recommended daily intake of vitamin C. Further, it was found that there is a loss of vitamin C with the increase in temperature. The vitamin C degradation was minimal at 5 ˚C and 10 ˚C but the vitamin C degradation was quite noticeable when temperature goes beyond 20 ˚C.

Keywords: *Vitamin C, fruit nectars, fresh fruit juice, temperature, iodometric titration*

[1]Department of Food Technology, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding Author: mdbandar@tec.rjt.ac.lk

Economic Loss of Chronic Kidney Disease of Unknown Etiology; A Case Study in Madawachchiya DS Division in Sri Lanka

De Alwis D. R. H.[1], Senaratne A.[2], Dissanayake S. N.[1]

Abstract

Chronic kidney disease of unknown etiology (CKDu) is a tragic national health issue in Sri Lanka which generates severe social, economic, political and environmental implications. Besides the deaths and physiological pains, CKDu places a significant economic burden on both affected households and the country. This study assessed both direct and indirect economic losses incurred by CKDu patients and reviewed the government expenditure on CKDu during the past five years. The study used a representative sample of 46 registered CKDu patients from the Madawachchiya divisional secretariat. Primary data of the study was collected through pre-tested questionnaires and secondary data from the annual reports of the Ministry of Finance. The cost of illness method was employed to assess the economic loss of the individuals. It assumed that mean annual total economic loss consists of mean annual direct cost and mean annual indirect cost. The majority (37%) of the employed patients are farmers. The mean annual direct cost of a patient at end-stage treatment (26%) (hemodialysis) (LKR 41305.00) is nearly six times higher than that of the patients at pre-dialysis stages (73.9%) (LKR 6618.82) of illness. Also, the highest proportion of the direct cost (64.9%) is incurred for transportation to obtain medical treatments. The monthly mean indirect cost, calculated through the loss of farming income, revealed that the farming households incur the highest indirect cost (LKR 22,120) compared to other livelihoods. Furthermore, the mean annual total economic loss of the total study population is as high as LKR 151,765 with more so for patients at the hemodialysis stage (LKR 158,248). From the period of 2014-2018, the government has spent LKR 3.88 billion capital expenditure, with the highest incremental change (193%) during 2015-2016 on the disease prevention programs, construction of treatment centers, and provision of safe drinking water. Even though free medical services are available within the country, shortage of drugs, lack of facilities in government hospitals and cost of frequent hospital visits have resulted in an increase in direct costs. The study revealed that the hidden indirect cost of the disease is much higher than the direct cost of the disease. However, the government also spends substantial public expenditure on treatments and prevention measures. While continuing planned interventions by the government to improve the quality of life and financial situation of affected households, a collective effort of all responsible stakeholders is vital to eradicate the CKDu issue.

Keywords: *Cost of illness, direct cost, indirect cost, government capital expenditure*

[1]Department of Agricultural Systems, Faculty of Agriculture, Rajarata University of Sri Lanka, Sri Lanka
[2]Institute of Policy Studies of Sri Lanka, No 20/100, Independence Avenue, Colombo 07, Sri Lanka
Corresponding Author: helidealwis9613@gmail.com

Socio-Cultural Parameters Associated with Purchasing Patterns of Meat and Meat Products: A Case Study in Kurunegala District, Sri Lanka

Rodrigo S. A. C. H.[1] ✉, Nuwarapaksha T. D.[2], Liyanage K. L. D. B. P.[2]

Abstract

Sri Lanka is a multi-ethnic and multi-religious country with diverse meat consumption patterns, hence, the socio-cultural factors exert a strong influence on meat purchasing patterns of the country. A survey was conducted in Kurunegala district by interviewing 273 respondents since no such previous studies have been carried out. Ten supermarkets were randomly selected from different cities of Kurunegala district for the survey. The effect of each demographic character on purchasing behaviour of meat and meat products was evaluated by employing a univariate test. Only six percent of the respondents did not consume any type of meat. This category exhibited antipathy for killing animals (71%), religious beliefs (59%) and financial issues (53%) as the most cited reasons for being non-meat consumers. Only monthly income (p=0.017) had an influence on purchasing processed meat products while both age (p=0.012) and gender (p=0.008) showed an effect on purchasing behaviour of raw meat types. When assessing purchasing of different raw meat types, chicken (95%) was the most preferred meat type followed by beef (43%), pork (38%) and mutton (24%). According to processed meat products, the most purchased type was sausages (82%) followed by meat balls (72%), ham (20%) and bacon (12%). Above findings have proved that financial issues, religious beliefs and antipathy to animals were the major driving forces in determination of purchasing of meat and meat products. Among processed meat products, ham and bacon were not popular among the community. Therefore, maintaining an affordable price is important for people to consume meat and meat products. Popularization of other processed meat products in the country except sausages and meatballs is also suggested.

Keywords: *Kurunegala district, processed meat, purchasing patterns, raw meat, socio-cultural parameters*

[1]Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science University of Peradeniya, Sri Lanka

[2]Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

✉ Corresponding Author: chathuri.rodrigoask@gmail.com

ISymRU 2021

Basic and Applied Sciences

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

Fermented Oyster Extract-induced Osteoblast Differentiation and Bone Formation by Activating the Wnt/β-catenin Signaling Pathway

Molagoda I. M. N.[1,2,3], Jayasooriya R. G. P. T.[3], Choi Y. H.[4], Kim G. Y.[1,2] ✉

Abstract

The pacific oyster, *Crassostrea gigas*, is well-known as a nutritious food. Recently, we revealed that fermented extract of *C. gigas* (FO) inhibited ovariectomy-induced osteoporosis, resulting from suppression of osteoclastogenesis. However, since the beneficial effect of FO on osteogenesis is poorly understood, in this study it was examined in mouse preosteoblast MC3T3-E1 cells, human osteosarcoma MG-63 osteoblast-like cells, and zebrafish larvae. We found that FO increased mitochondrial activity from days 1 to 7; however, total cell number of MC3T3-E1 cells gradually decreased without any change in cell viability, which suggests that FO stimulates the differentiation of MC3T3-E1 cells. FO also promoted the expression of osteoblast marker genes, including *runt-related transcription factor 2 (mRUNX2), alkaline phosphatase (mALP), collagen type I α1 (mCol1α1), osteocalcin (mOCN), osterix (mOSX), bone morphogenetic protein 2 (mBMP2),* and *mBMP4* in MC3T3-E1 cells accompanied by a significant increase in ALP activity. FO also increased nuclear translocation of RUNX2 and OSX transcription factors, ALP activity, and calcification *in vitro* along with the upregulated expression of osteoblast-specific marker proteins such as RUNX2, ALP, Col1α1, OCN, OSX, and BMP4. Additionally, FO enhanced bone mineralization (calcein intensity) in zebrafish larvae at 9 days post-fertilization comparable to that in the β-glycerophosphate (GP)-treated group. All the tested osteoblast marker genes, including *zRUNX2a, zRUNX2b, zALP, zCol1a1, zOCN, zBMP2,* and *zBMP4,* were also remarkably upregulated in the zebrafish larvae in response to FO. It also promoted tail fin regeneration in adult zebrafish as same as the GP-treated groups. Furthermore, not only FO positively regulate β-catenin expression and Wnt/β-catenin luciferase activity, but pretreatment with a Wnt/β-catenin inhibitor (FH535) also significantly decreased FO-mediated bone mineralization in zebrafish larvae, which indicates that FO-induced osteogenesis depends on the Wnt/β-catenin pathway. Altogether, the current study suggests that the supplemental intake of FO has a beneficial effect on osteogenesis.

Keywords: *Crassostrea gigas, oyster, bone formation, mineralization, Wnt/β-catenin*

[1] Department of Marine Life Science, Jeju National University, Jeju 63243, Republic of Korea
[2] Research Institute for Basic Sciences, jeju National University, jeju 63243, Republic of Korea
[3] Department of Bioprocessing Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka
[4] Department of Biochemistry, College of Oriental Medicine, Dong-Eui University, Busan 47227, Republic of Korea
✉ Correspondence: immunkim@jejunu.ac.kr

Anti-melanogenic Effects of Anthocyanin-enriched Polyphenols from *Hibiscus syriacus* L. by Activating the ERK Signaling Pathway

Karunarathne W. A. H. M.[1] , Jayasooriya R. G. P. T.[3], Choi Y. H.[4], Kim G. Y.[1,2] ✉

Abstract

Hibiscus syriacus L. exhibited potential as a new source of food and colorants containing various anthocyanins. However, the function of anthocyanins from *H. syriacus* L. has not been investigated. In the current study, we evaluated whether anthocyanins from the *H. syriacus* L. varieties Pulsae and Paektanshim (PS and PTS) inhibit melanin biogenesis. B16F10 cells and zebrafish larvae were exposed to PS and PTS in the presence or absence of α-melanocyte-stimulating hormone (α-MSH), and melanin contents accompanied by its regulating genes and proteins were analyzed. PS and PTS moderately downregulated mushroom tyrosinase activity *in vitro*, but significantly decreased extracellular and intracellular melanin production in B16F10 cells, and inhibited α-MSH-induced expression of microphthalmia-associated transcription factor (MITF) and tyrosinase. PS and PTS also attenuated pigmentation in α-MSH-stimulated zebrafish larvae. Furthermore, PS and PTS activated the phosphorylation of extracellular signal-regulated kinase (ERK), whereas PD98059, a specific ERK inhibitor, completely reversed PS- and PTS-mediated anti-melanogenic activity in B16F10 cells and zebrafish larvae, which indicates that PS- and PTS-mediated anti-melanogenic activity is due to ERK activation. Moreover, chromatography data showed that PS and PTS possessed 17 identical anthocyanins as a negative regulator of ERK. These findings suggested that anthocyanins from PS and PTS inhibited melanogenesis *in vitro* and *in vivo* by activating the ERK signaling pathway.

***Keywords**: Hibiscus syriacus L., anthocyanin, melanin, tyrosinase, ERK*

[1] Department of Marine Life Science, Jeju National University, Jeju 63243, Republic of Korea
[2] Research Institute for Basic Sciences, jeju National University, jeju 63243, Republic of Korea
[3] Department of Bioprocessing Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka
[4] Department of Biochemistry, College of Oriental Medicine, Dong-Eui University, Busan 47227, Republic of Korea
✉ Correspondence: immunkim@jejunu.ac.kr

An Aqueous Extract of Freeze-Dried Protaetia brevitarsis Larvae-induced Immunostimulation by Activating the NF-κB Signaling Pathway

Jayasingha J. A. C. C.[1,2], Jayasooriya R. G. P. T.[3], Choi Y. H.[4], Kim G. Y.[1,2] ✉

Abstract

White-spotted flower chafer (*Protaetia brevitarsis*) larvae are a potential nutritional supplement and have been used in traditional Asian herbal medicine. In this study, we found that an aqueous extract of freeze-dried *P. brevitarsis* larvae (AEPB) promotes immunostimulation in RAW 264.7 macrophages. No significant cytotoxicity was observed below 800 μg/mL AEPB. Moreover, AEPB treatment enhanced the production of nitric oxide (NO), prostaglandin E2 (PGE2), interleukin (IL)-6, and IL-12 through the upregulation of their regulatory genes. AEPB also promoted the nuclear translocation of nuclear factor-κB (NF-κB), and pyrrolidine dithiocarbamate, an inhibitor of NF-κB activation, remarkably prevented the expression of AEPB-induced inducible NO synthase (iNOS), cyclooxygenase-2 (COX-2), IL-6, and IL-12, indicating that AEPB promotes the production of immunostimulants such as NO and PGE2 and pro-inflammatory cytokines such as IL-6 and IL-12 in RAW 264.7 macrophages by activating the NF-κB signaling pathway. Moreover, AEPB upregulated the extracellular expression of Toll-like receptor 4 (TLR4) and subsequently increased myeloid differentiation primary response 88 (MyD88) and IL-1 receptor-associated kinase 4 (IRAK4) expression, which indicates that AEPB activated the NF-κB signaling pathway through the TLR4-mediated MyD88 and IRAK4 axis. Collectively, this study provides evidence that AEPB is a promising nutritional supplement for stimulating macrophage-mediated immune responses.

Keywords: *Protaetia brevitarsis, nuclear factor-κB, toll-like receptor 4, immunostimulation*

[1] Department of Marine Life Science, Jeju National University, Jeju 63243, Republic of Korea
[2] Research Institute for Basic Sciences, jeju National University, jeju 63243, Republic of Korea
[3] Department of Bioprocessing Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka
[4] Department of Biochemistry, College of Oriental Medicine, Dong-Eui University, Busan 47227, Republic of Korea
✉ Correspondence: immunkim@jejunu.ac.kr

Gamma-Aminobutyric Acid (GABA)-induced Growth Performance in Zebrafish Larvae via $GABA_A$ and $GABA_B$ Receptors

Athapaththu A. M. G. K.[1,2], Jayasooriya R. G. P. T.[3], Choi Y. H.[4], Kim G. Y.[1,2] ✉

Abstract

Insulin-like growth factor-1 (IGF-1) primarily increases the release of gamma-aminobutyric acid (GABA) in neurons vice versa and is also responsible for the promotion of longitudinal growth in children and adolescents. Hence, we, in this study, investigated whether exogenous GABA supplementation activates IGF-mediated growth performance. Treatment with GABA in zebrafish larvae at 3 days post fertilization (dpf) significantly increased total length from 6 to 12 dpf concomitant with the upregulation of growth-stimulating genes, including IGF-1, growth hormone-1 (GH-1), growth hormone receptor-1 (GH-R1), and cholecystokinin (CCKA). In peculiar, at 9 dpf, GABA increased growth rate from 3.60 ± 0.02 to 3.79 ± 0.03, 3.89 ± 0.02, and 3.92 ± 0.04 mm at 6.25, 12.5, and 25 mM comparable to 4 mM β-glycerophosphate (GP)-treated larvae (3.98 ± 0.02 mm). Additionally, the highest concentration of GABA (50 mM) induced 50% death in zebrafish larvae at 12 dpf. GABA also enhanced IGF-1 expression and secretion in preosteoblast MC3T3-E1 cells concomitant with high level of IGF-1 receptor (IGF-1R). In zebrafish larvae, GABA-induced growth performance remarkably decreased in the presence of an IGF-1R inhibitor, picropodophyllin (PPP), which indicates that GABA-induced IGF-1 enhances growth performance via IGF-1R. Furthermore, we investigated which GABA receptors affect growth performance along with IGF-1 activation. The inhibitors of $GABA_A$ and $GABA_B$ receptors, bicuculline and CGP 46381, considerably inhibited GABA-induced zebrafish growth rate accompanied by a marked decrease of growth-stimulating genes, including IGF-1, GH-1, GHR-1, and CCKA, but not with an inhibitor of $GABA_C$ receptor, TPMPA. Additionally, IGF-1 and IGF-1R expression was also impaired in bicuculline and CGP 46381-treated MC3TC-E1 cells, but not with TEMPA. Furthermore, treatment with bicuculline and CGP 46381 significantly downregulated GABA-induced IGF-1 release in MC3T3-E1 cells. These data indicate that GABA stimulates IGF-1 release via $GABA_A$ and $GABA_B$ receptors, leading to promotion of growth performance via IGF-1R.

Keywords: *GABA, IGF-1, GABA receptors, growth performance*

[1] Department of Marine Life Science, Jeju National University, Jeju 63243, Republic of Korea
[2] Research Institute for Basic Sciences, jeju National University, jeju 63243, Republic of Korea
[3] Department of Bioprocessing Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka
[4] Department of Biochemistry, College of Oriental Medicine, Dong-Eui University, Busan 47227, Republic of Korea
✉ Correspondence: immunkim@jejunu.ac.kr

Indirubin-3′-Monoxime-Induced Paraptosis by Transmitting Ca^{2+} From Endoplasmic Reticulum to Mitochondria

Kavinda M. H. D.[1,2], Jayasooriya R. G. P. T.[3], Choi Y. H.[4], Kim G. Y.[1,2]

Abstract

Indirubin-3′-monoxime (I3M) induces cell death in many cancer cells; however, whether I3M regulates paraptosis is unclear. The present study aimed to investigate I3M-induced paraptosis. We found that I3M induced small vacuole formation in MDA-MB-231 breast cancer cells and transient knockdown of eIF2α and CHOP significantly downregulated vacuolation in the ER and mitochondria, as well as cell death in response to I3M, indicating that I3M-meditaed paraptosis was upregulated by ER stress. Moreover, I3M accumulated ubiquitinated proteins via proteasome dysfunction, which stimulated ER stress mediated Ca^{2+} release. A Ca^{2+} chelator significantly downregulated vacuolation in the ER and mitochondria as well as cell death, suggesting that Ca^{2+} was a key regulator in I3M-induced paraptosis. Our results also revealed that Ca^{2+} finally transited in mitochondria through mitochondrial Ca^{2+} uniporter (MCU), causing I3M-mediated paraptosis; however, the paraptosis was completely inhibited by, ruthenium red, an MCU inhibitor. I3M induced proteasomal dysfunction-mediated ER stress and subsequently promoted Ca^{2+} release, which was accumulated in the mitochondria via MCU, thus causing paraptosis in MDA-MB-231 breast cancer cells.

Keywords: *Indirubin-3-monoxime, paraptosis, proteasomal dysfunction, endoplasmic reticulum stress, reactive oxygen species*

[1] Department of Marine Life Science, Jeju National University, Jeju 63243, Republic of Korea
[2] Research Institute for Basic Sciences, jeju National University, jeju 63243, Republic of Korea
[3] Department of Bioprocessing Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka
[4] Department of Biochemistry, College of Oriental Medicine, Dong-Eui University, Busan 47227, Republic of Korea
Correspondence: immunkim@jejunu.ac.kr

In silico Investigation of Binding Properties of Steroids Molecules Interacting with Androgen Receptor

Illangasinghe J. L. K.[1], Weerasinghe S.[1] ✉

Abstract

Prostate cancer (PC) is one of the most prevalent cancers in male worldwide. Androgen receptor (AR) is an essential protein receptor of cells in the prostate gland to induce uncontrolled proliferation. The AR, a member of the steroid hormone nuclear receptor superfamily, plays a key role in regulating gene expression in a variety of tissues including the prostate. Thus, AR is one of the primary targets in the development of new chemotherapeutic for treatments mainly of prostate cancers. In addition, AR is considered as a potential drug target for breast cancers, ovarian cancers and pancreatic cancers. Chemoprevention of cancers by using natural products is well accepted clinical practice nowadays. Natural products such as plant sterols show remarkable anticancer activity, besides other activities. Such seven steroidal alkaloids of plant origin were selected form "Sri Lankan flora" information system (https://science.cmb.ac.lk/tools/slflora/) to investigate the potency to develop cytotoxic drugs for treating multidrug resistant cancer. In this study, seven natural steroid molecules which are structurally similar analogues of natural androgens such as testosterone and dihydrotestosterone (DHT), were chosen as lead molecules targeting AR as a therapeutic receptor. The hydroxyflutamide (HFT) was selected as the synthetic drug candidate for the comparison. The molecular docking simulation results show that two of the selected natural steroids have the close binding energies to both DHT and HFT. Moreover, molecular interaction analysis revealed that these two steroids, chonemorphine and stigmasterol interact with the active site residue R752 of AR in the similar manner to DHT and HFT. The approximate binding energy of the ligand with the receptor is given by the grid score as a summation of electrostatics and van der Waals energies. The best grid scores of the reference ligands, dihydrotestosterone and hydroxyflutamide were −24.1 kJ mol^{-1} and -27.7 kJ mol^{-1} respectively. However, chonemorphine shows -26.5 kJ mol^{-1} of closer grid score to the reference ligands. Further, the stigmasterol also shows a closer grid score of -30.6 kJ mol^{-1}. According to the results, the approximate binding energy of both chonemorphine and stigmasterol are more compatible with the binding energy of hydroxyflutamide and DHT. Furthermore, Chonemorphine and stigmasterol are steroidal alkaloids that have already been identified as potential medicinal agents for various diseases in folk medicines. Therefore, this study shows that chonemorphine and stigmasterol could be used as lead molecules to develop novel drug(s) in multidisciplinary manner for PC patients eliminating side effects.

Keywords: *Molecular docking, steroids, nuclear receptors, cancers, molecular dynamics*

[1]Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka
✉ Corresponding Author: weera@chem.cmb.ac.lk

Academic, Athletic and Career Athletic Motivation as Predictors of Academic Performance Among Student-Athletes at the University of Peradeniya

Wilwalaarachchi N. K.[1] ✉ , Bandara W.[2], Weerasingha B. R. G. T. K.[1]

Abstract

Academic motivation as a predictor of academic performance for university athletes has been debated in the literature. The main objective of the present study was to determine the extent to which academic and athletic motivation can predict the academic performance of student-athletes at the University of Peradeniya. An additional purpose of this study was to investigate whether there are differences in motivational factors and academic performance between student-athletes who have started their sports career at the school level and those who have started their sports career at the university level. A total of 191 student athletes who actively partake in sports were selected using stratified sampling technique. A survey was conducted to collect data using student athletes' motivation towards sports and academics questionnaire (SAMSAQ) which had three main components: academic motivation (AM), student athletic motivation (SAM) and career athletic motivation (CAM). The SAMSAQ was a 30-item instrument where the participants responded on a 6-point Likert-type scale from 6 (very strongly agree) to 1 (very strongly disagree). A separate data collection form was used to collect the demographic data. The data analysis was done using the Statistical Package for Social Sciences (SPSS) 22 and the significance level used was 0.05. The mean GPA of the sample was 2.95 (SD$\pm$0.45). The mean motivation scores for AM, CAM, and SAM were 60.57 (SD$\pm$6.96), 18.32 (SD$\pm$3.72), and 33.64 (SD$\pm$3.52), respectively. Academic motivation ($r = 0.263$; $p < 0.01$) and CAM ($r = -0.191$; $p < 0.01$) were strongly related to GPA. However, SAM was not related to GPA. There was no significant difference in motivational factors and academic performance between student athletes who had started their sports career at the school level and those who had started their sports career at the university level. The findings from this study suggest that academic motivation can serve as a predictor of academic performance in university student-athletes specifically at the University of Peradeniya. Moreover, it is also helpful to note that, in this study, high career athletic motivation is strongly and negatively correlated with GPA, which means that the students who maintain their highest motivation levels towards career athletic goals have a negative effect on their GPAs.

Key words: *Student-athletes, motivation, academic performance*

[1]Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka.
[2]Department of Oral Medicine and Periodontology, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka.
✉ Corresponding Author: wilwalaarachchinipuna@gmail.com

Characterization of Netiyagama Soil (Sri Lanka) for the Fate of Fluoride in Groundwater

Heenkenda K. Y.[1] ✉, Shabnam M. F. A.[2], Jayawardhene G. G. D. P.[1], Rukshagini P.[1], Herath A. C.[2], Weerasooriya R.[1]

Abstract

Inhabitants from the dry zone of Sri Lanka are vulnerable to serious health problems due to a lack of safe drinking water because of high fluoride and salinity. Major parameters that control the fluoride fixation are pH, soil organic matter, soil salinity, clay content, and the presence of Al, Ca, Fe, and P. We aimed at determining the geochemical provenance of fluoride in dry zone groundwater. Soil samples from Netiyagama ("8.328764N, 80.587615E") were collected to study the relationship between soil properties and fluoride geochemistry of three main soil horizons; Horizon A (0-30 cm), Horizon B (30-80 cm), and Horizon C (80-110 cm). Soil pH values of the horizons were 6.96, 6.27, and 6.94, where Horizon B was influenced more by the acid-forming ions in soil than the other horizons. The electrical conductivity values 72.17 µS/cm, 20.63 µS/cm, and 25.30 µS/cm, respectively suggest the non-saline nature of all horizons as its less than 1000 µS/cm. Soil organic matter content (OMC) along horizon gradient from A to C were 2.94%, 0.98%, and 0.19%, respectively. Similarly, C, H, N content decreased along the horizon gradient correlating with the OMC. Fluoride in organic matter and soil can decrease the growth and activity of microorganisms. According to the surface titration study carried out at three ionic strengths of NaCl (0.1, 0.01, 0.001 M), it was observed that the net charge of the three horizons was negative in all pH. The net negative charge results in a high CEC than anion exchange capacity with large buffering capacity. The soil cation exchange capacity values determined by the ammonium acetate method were 13.5 $cmol^{+}kg^{-1}$, 17.4 $cmol^{+}kg^{-1}$ and 14.1 $cmol^{+}kg^{-1}$ respectively. The pH variation results were obtained within 4-9 range in $NaNO_3$ (0.1, 0.01, 0.001 M). Horizon B showed the highest fluoride adsorption of 59.3%, 47.9%, and 56.2%, respectively. The pH in water is the master variable that controls the fluoride uptake by the soil surface. The pH increased after fluoride adsorption in an acidic medium and vice versa. It can be concluded that fluoride adsorption onto soil occurs by ligand exchange with hydroxyl present on surface sites. The results presented will pave the essential first step in proposing new water purification methods for community water supplies.

Keywords: *Horizons, fluoride, netiyagama, soil*

[1]Research Assistant, National Institute of Fundamental Studies, Kandy, Sri Lanka
[2]Undergraduate, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding Author: kushanie.he@nifs.ac.lk

Corrosion Inhibition Ability of Cinnamon Oil on Aluminum in Alkaline Medium

Rajapaksha R. Y. H.[1] ✉, Priyantha H. M. D. N.[1]

Abstract

Aluminum (Al) is one of the most common metals used in industrial applications, such as in alkaline batteries, packaging of medicine and kitchen utensils. Raw aluminum shows a very high affinity toward oxygen, and consequently, aluminum surfaces, when exposed to air or any other oxidizing agent, a thin, hard film of aluminum oxide is quickly formed. The aluminum oxide film formed is corrosion- resistant within the optimal pH value in the range from 4 to 9. Acids and bases break down the oxide layer, thereby opening up the raw aluminum surface, which subsequently undergoes the corrosion in the form of pitting. Therefore, it is important that suitable corrosion inhibition methods be employed to enhance the stability of the aluminum surface. The corrosion inhibition property of cinnamon oil extracted from *Cinnamomum verum* leaves was studied using open circuit potential measurements, linear polarization and Tafel extrapolation technique and electrochemical impedance spectroscopy (EIS). All these methods confirm that cinnamon oil exhibits strong corrosion inhibition characteristics toward Al. In particular, the corrosion inhibition efficiency, determined through EIS, is increased from 76% to 97% when the concentration of NaOH is decreased from 0.070 mol L^{-1} to 0.010 mol L^{-1}. Moreover, increase in solution temperature from 313 K to 333 K causes inhibition efficiency to drop down from 99% to 75% according to EIS measurements. The results suggest that cinnamon oil acts as an effective corrosion inhibitor for Al at lower concentration of NaOH solution at lower temperatures.

Keywords: *Alkaline, aluminum, cinnamon oil, corrosion, inhibition*

[1]Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka
✉Corresponding Author: yasodahrajapaksha@gmail.com

Corrosion Inhibition of Mild Steel Using Polyaniline and Clove Oil Composites in Acidic Medium

Wijesundera S. K.[1] ✉, Priyantha N.[1]

Abstract

Mild steel (C: 0.16% - 0.18%, Mn: 0.70% - 0.90%, Fe: 98%), also known as plain-carbon steel, is now the most common form of steel because of low price and suitability of its properties for many applications. However, the major challenge is its low resistance to corrosion, especially in acidic environments. Many inorganic inhibitors containing phosphates, chromates and other heavy metals are now being gradually restricted by environmental regulations due to their toxicity and disposal difficulties. Synthetic organic inhibitors are also applied for corrosion inhibition; but it is limited due to high cost of manufacturing and their toxicity to the environment. Therefore, it is desirable to produce eco-friendly, biodegradable green corrosion inhibitors to replace inorganic and synthetic organic inhibitors. Many natural plant extracts have proven efficient as corrosion inhibitors. Recent studies show that the mechanism of the action of green inhibitors depends on the structure of the active constituent of the plant extract. In this research, corrosion inhibition of mild steel under an acidic environment by the composite containing clove oil and the synthetic organic polymer; polyaniline, was studied. The inhibition efficiency was determined by electrochemical impedance measurements and Tafel slope analysis. Furthermore, the effect of concentration of acid and the effect of type of acid on inhibition efficiency was investigated. According to the results obtained, the highest inhibition efficiency was obtained for 0.1 mol L^{-1} of H_2SO_4 solution. The results also show that the corrosion rates do not differ linearly with concentration of H_2SO_4 and other factors also affect the corrosion rate. Moreover, the results show that the composite layer is a strong corrosion inhibitor of mild steel in H_2SO_4 and HCl media. It also shows that the composite layer does not act as a corrosion inhibitor in a nitric acid medium.

Keywords: *Inhibitors, electrochemical impedance, tafel plot, mild steel*

[1]Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka
✉Corresponding Author: swijesundera1995@gmail.com

Impacts of Knowledge Sharing through Social Networking Services on the Learning Culture of Undergraduates

Bulegodaarachchi G. J.[1] ✉, **Deegahawature M. M. D. R.**[2]

Abstract

The rapid development of Information Communication Technology leads to the evolution of Social Networking Services (SNSs) that brings new opportunities not only for socializing and marketing but also for knowledge sharing and changing learning culture. At present, social computing and literacy play a vital role in learning and knowledge sharing aspects and there is scant literature about the use of SNSs for knowledge sharing among Sri Lankan undergraduates and its impact on their learning culture. The study identifies five ways of using SNSs namely, content creation, file sharing through virtual data storage drivers, chatting and discussion, entertainment and enjoyment, and video conferencing. Accordingly, this study aims to identify the impacts of SNSs on both knowledge sharing and learning culture. Particularly, the study will explore the direct effect of those five ways on the learning culture of undergraduates and the mediation effect of knowledge sharing. Mediating factor knowledge sharing was measured by five mediating factors namely behavioral patterns, reciprocity, privacy concerns in blogs, trust in information and social network service provider, and social ties. The online questionnaire consisted of previously tested measures administered to undergraduates of Science Faculties in both state and private universities in Sri Lanka and received 170 valid responses that exceed the minimum to run regression analysis. The results of multiple regression analysis revealed that ways of using SNSs such as chatting and discussion and entertainment and enjoyment influence the learning culture of undergraduates. Subsequently, knowledge sharing mediates the ways of using SNSs as chatting and discussion and entertainment and enjoyment. The enhancement of Web 2.0, which is a highly interactive and dynamic application platform, influences learners' correlation on knowledge sharing through SNSs and speedy knowledge gathering. Moreover, the outbreak of the Covid-19 pandemic creates the global necessity of migrating education activities into electronic learning platforms (SNSs). The study recommends an improved software solution that can attribute to the desirable features on these SNS tools by connecting to learning management system, integrating the use of SNS tools in the course module designing, maintaining course module attractive and addressing privacy concerns using SNSs tools. This can enhance the learning culture of undergraduates by focusing on effective ways of using SNSs and knowledge sharing.

Keywords: *Knowledge sharing, learning culture, social networking services, undergraduates*

[1] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
[2] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
✉ Corresponding Author: g.j.bulegoda@gmail.com

Assessment of Hg in Grey heron (*Ardea cinerea*) and Oriental Darter (*Anhinga melanogaster)* Foraging in Mahakanadarawa Tank Ecosystem Anuradhapura

Jayathilake C.[1], Jayaratne R.[1]

Abstract

Heavy metals accumulate through food chains and bio magnification occurs in higher trophic levels and this in turn leads to more pronounced pathological symptoms in these animals including humans. So, continues monitoring of these heavy metal levels are quiet imperative. In monitoring the heavy metal levels, in addition to the direct analysis of soil and water, birds have been considered effective bio markers and using their feathers a non-destructive sampling method of assessing levels of environmental pollutants in many studies. Mahakanadarawa tank is surrounded by agricultural land and is heavily utilized for agricultural practices. The tank ecosystem serves as a nesting area for many species of aquatic birds. During their breeding season, nestlings depend on foods which are brought by adults from the tank ecosystem itself. Therefore, these fledglings are representing spatial and temporal heavy metal levels of the Mahakanadarawa tank ecosystem. In this study the main objective was to analyze the heavy metal levels in the dead nestlings of Grey heron (*Ardea cinerea*) who are nesting in Mahakanadarawa tank ecosystem and adults of Oriental darter (*Anhinga melanogaster)* who had been caught in fishing gear. As a preliminary survey conducted in May to July 2020, flight feathers of *Anhinga melanogaster* (n=5) and *Ardea cinerea* (n=4) were collected from dead specimens and analyzed by using ICPMS (PerkinElmer nexION 2000-B) in the Chemistry Laboratory, Faculty of Applied Sciences Rajarata University. Analytical reagent blanks and spikes were used as controls. Mercury was detected in feather samples of *Anhinga melanogaster* (0.01±0.009 ppm) and *Ardea cinerea* (0.06±0.03 ppm). Since the values of this study were well below the threshold level, the course of death of these nestlings may be due to any other reason. Although, there was no such detections in the present study, the continuous monitoring of mercury concentration is essential in Mahakanadarawa ecosystem.

Keywords: *Mercury, bird feathers, Mahakanadarawa*

[1]Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
Corresponding author: chamijayathilake1@gmail.com, ravindrajayaratne@yahoo.com

Montmorillonite Clay Modified N-(1-Naphthyl) Ethylenediamine.Dihydrochloride Composites for the Detection of Nitrogen Dioxide Gas

Kasthuri D. H.[1] , Herath A. C.[1] ✉

Abstract

Air pollution is one of the major environmental risks to human health and historical monuments. According to a 2018 report of WHO (World Health Organization) majority of the world's population is living in places where WHO air quality guidelines are not met. NO_2, a pollutant present in the atmosphere, is a major contributor to deteriorating air. The present study demonstrated the promise of a solid state NO_2 gas sensor at room temperature. Commercial Bentonite was the raw sample and purified to remove carbonates, iron oxides and organic materials which interfere with the clay identification procedure. Two composites of montmorillonite clay were modified with N-(1-Naphthyl)ethylenediamine.dihydrochloride (NEDA) by the process of diazotization in the presence and absence of ZnO. The FTIR peaks present at 1459 cm^{-1}, and 1525 cm^{-1} correspond to N=N and N-O bonds respectively for both composites which confirm the diazotization process. It was found that composite with ZnO showed promising results in the detection of NO_2 gas among other gasses such as SO_2, H_2S and NH_3 resulting in color change from yellowish brown to black. The UV-Visible absorption at the characteristic peak at 347 nm increases linearly with increase in NO_2. The FTIR peak present at 3000 cm^{-1} which corresponds to the amine salt disappears after NO_2 gas exposure. After NO_2 gas exposure, a new peak appears at 1386 cm^{-1} wavenumber in the FTIR spectrum which corresponds to the NO_2 stretch. The results suggest the feasibility of developing a NO_2 gas sensor with high degree of selectivity.

Keywords: *Bentonite, diazotization, NO_2 gas, N-(1-Naphthyl)ethylenediamine.dihydrochloride, montmorillonite*

[1]Department of Chemical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding Author: ajithch037@gmail.com

Larvicidal Efficacy of Local Plant Species for the Development of Potential Larvicidal Agents against *Aedes aegypti* L.

Wijegunawardana N. D. A. D.[1] ✉, Ramanayaka R. K. S. N.[2], Wijayawardanap M. P.[2], Weerakkody G. C.[2], Perera E. G.[1], Jayamanna I.[1], de Zoysa I. C.[3]

Abstract

Mosquitoes transmit serious human diseases causing millions of deaths every year. The use of synthetic insecticides to control vector mosquitoes has caused physiological resistance and adverse environmental effects in addition to high operational costs. Insecticides of plant origin have been reported as useful for the control of mosquitoes. Therefore, a study was conducted to identify the local plant species for the development of larvicides against the *Ae. aegypti* mosquito. Crude extracts of 32 plant species collected from the Gampaha district were pre-screened for larvicidal susceptibility assay. After 24 hours, the mortalities of *Aedes* larvae were determined. Larvae with a total absence of movement, even after-touch, were considered dead. Selected plants having promising larvicidal effects were used for the follow-up studies after preparing storable dried powder. A series of larvicidal bioassays were conducted to determine the effectiveness. Eight different concentrations of the most promising results obtained from dried powder prepared from respective plant parts were used to determine the effective concentration for controlling the natural breeding site. The egg hatching and survival rate of *Aedes* second instar larvae were measured against each concentration. Fifteen samples were identified as potential larvicides against *Aedes* out of which 13 were leaf crude extracts. The time taken for the 100% mortality ranged from 5 to 138 minutes. Positive test retesting with larvicidal bioassay was conducted for selected 9 plant leaves crude extracts having less than 60 minutes mortality time. Overall results showed clove leaves powder as the most promising treatment for dengue mosquito breeding control. It reduces larvae development by more than 80% at a concentration of 0.01g/ml. Therefore, it can be recommended for application to potential *Aedes* mosquito breeding water-holding containers. This study opens a path to reduce the *Aedes* mosquito breeding in an eco-friendly way because clove leaves are non-toxic for humans and other vertebrates.

Keywords: *Aedes aegypti, clove, dengue, larvicidal, plant extracts*

[1]Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka
[2] Rathnavali Balika Vidyalaya, Gampaha, Sri Lanka
[3] Department of Electrical and Electronics, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding Author: awijegun@tec.rjt.ac.lk

Interaction between Graphite Oxide and Sand Granules: The Effect of Temperature

Bandara P. M. C. J.[1] ✉, Kumarasinghe A. R.[2], Balasooriya N. W. B.[3], Bandara A.[4], Weerasooriya R.[1]

Abstract

Graphite oxide (GO) coated sand composites were used to remove contaminants in water. We used GO coating on the sand by heat treatment without adding a binder. GO was synthesized by improved Hummer's method. The GO was then coated on acid-purified sand as a function of system temperature for 2 hr (i.e., 50, 90, 110, 130, 150, 180, 250, and 300 ^{0}C). Repeated coating of graphite oxide onto sand granules at different temperatures resulted in a composite with enhanced stability in water. Raman, FTIR, XRD, and SEM analyses were used to characterize the composites and other precursors used. The characteristic D and G bands of GO are observed at 1350 cm^{-1} and 1595 cm^{-1}, respectively, in GO and GO sand composites. With the heating of the reaction system, the G band position redshifts and reaches an optimal at 120 ^{0}C. The redshifts indicate the reduced number of GO layers on the sand. However, the higher stability of GO on the sand was maximized at 110 ^{0}C and the lowest $\frac{I_D}{I_G}$ ratio was observed at 180 ^{0}C. The Raman spectra confirmed that GO is present on the sand surface. Turbidity data confirmed the stability of GO sand composites. The exact reasoning for these observations is not fully resolved yet.

Keywords: *Graphite Oxide, nature of the interaction, sand, temperature variation*

[1]National Centre for Water Quality Research, National Institute of Fundamental Studies, Kandy, Sri Lanka
[2]Department of Physics, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[3]Department of Geology University of Peradeniya, Sri Lanka
[4] Department of Chemistry University of Peradeniya, Sri Lanka
✉Corresponding Author: jayanibandara93@gmail.com

Removal of Cr(VI) in Aqueous Solutions Using KOH-modified biochar/ polypyrrole/Al2O3 Composite.

Amarasuriya H. S.[1], Herath A. C. [1] ✉

Abstract

Contamination of water sources by potentially toxic metal ions such as Cr(VI) is becoming a significant threat to many organisms. Among Cr compounds, Cr(VI) which exists as CrO_4^{2-}, $Cr_2O_7^{2-}$ and $HCrO_4^-$ in aqueous media is a known potent carcinogen. Many technologies were adapted for the removal of Cr(VI) from aqueous solutions. Based on literature , pristine biochar has many limitations in removing Cr(VI). Mainly, pristine biochar has a negative surface charge which decreases the efficiency of adsorbing negative ionic species such as $HCrO_4^-$. We developed a novel KOH-modified biochar/ Polypyrrole/ Al_2O_3 composite for the efficient removal of Cr(VI) ions. This work utilizes a simple synthesis method with minimal use of chemicals and experimental results suggest that this composite is a promising low-cost adsorbent of Cr(VI). The composite before and after removal of Cr(VI) was characterized by Scanning Electron Microscope(SEM), X-ray Diffraction Spectroscopy (XRD) and Fourier Transform Infra-Red Spectroscopy(FTIR). The removal of Cr(VI) in the aqueous phase was monitored by UV-Visible spectroscopy at 350 nm. pH, contact time, initial Cr(VI) ions concentration were optimized using batch adsorption method for the maximum removal of Cr(VI) ions. Composite exhibited maximum Cr(VI) removal percentage of 91.5% within 80 min at pH 2. It was found that percent removal efficiency increased from 73 to 91 when pH decreased from 8 to 2. The adsorption process between biochar composite and Cr(VI) reached an equilibrium within 80 minutes showing a rapid removal rate of over 73% within the first 20 minutes. Point of zero charge of composite was found to be about 4.0 and at pH less than 4.00, surface is positively charge which attracts negatively charge $HCrO_4^-$ electrostatically. The negative values of $\Delta G°$ calculated at different temperatures indicate that the adsorption process is spontaneous at each temperature and positive $\Delta H°$ value (36.36 kJ $mol^{-1)}$ shows that the adsorption process is endothermic. $\Delta G°$ value increases with increase of temperature thus, spontaneity increases with temperature; indicated that adsorption of Cr(VI) was endothermic and spontaneous in nature. Isotherm data showed that the adsorption followed the Langmuir model where the maximum Langmuir adsorption capacity of composite was found to be 113.97 mg/g. In addition, a higher R^2 value of 0.9923 obtained in the Langmuir model indicates that the surface of the adsorbent material is homogenous where the adsorption takes place via monolayer formation. Kinetics data followed the pseudo-second order kinetics model, which favored chemisorption.

***Keywords**: Adsorption, Hexavalent Chromium, composite, KOH-modified biochar*

[1] Department of Chemical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
✉Corresponding Author: ajithch037@gmail.com

Comparison of Electrocoagulation and Electrodialysis Water Treatment Technologies for Dry Zone Groundwater – Sri Lanka

Halpegama J. U.[1], Nanayakkara K. G. N.[2], Binghui T.[3], Herath A. C.[1], Weerasooriya R.[4]

Abstract

Most of the drinking water sources in the dry zone are highly saline. Water desalination is achieved by reverse osmosis or nano filtration membrane methods. These methods are costly and the water is often over treated resulting in water with poor solutes content. Electrochemical methods such as electrocoagulation (EC) and electrodialysis reversal (EDR) methods are emerging as alternative solutions for water desalination. Both methods viz. EC and EDR can regulate water salinity, therefore they can tune treated water for desired Total Dissolved Solids (TDS). Compared to pressure driven methods, electrochemical methods, when properly optimised,are simple, free of chemicals and robust. Therefore, in this study, response surface methodology - statistical design of experiment was used to optimise reactor parameters of both treatment processes. When tube well water (470 mg/L TDS, 183 mg/L $CaCO_3$, 0.45 mg/L fluorides, and pH 6.60) was used for the EC treatment process, 63% hardness and 97% fluoride were removed with 1.98 kW h m^{-3} energy consumption. Compared to EC, the highest hardness removal efficiency (75%) was achieved with EDR treatment technology. Therefore, EDR water treatment technology is a viable method to treat dry zone groundwater in decentralised water treatment facilities.

Keywords: *Electrocoagulation, electrodialysis, groundwater, hardness, technology*

[1] Department of Chemical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2] Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Sri Lanka
[3] Research Center for ECO-Environmental Sciences, Chinese Academy of Sciences, Beijing, China
[4] National Centre for Water Quality Research, National Institute of Fundamental Studies, Hanthana, Kandy, Sri Lanka
Corresponding Author: jayani.ha@nifs.ac.lk

The Impact of Quick Change Over on Overall Efficiency in Garment Manufacturing: A Case Study

Weerasinghe W. M. A. M.[1], Dilanthi M. G. S.[1]

Abstract

Quick Change-Over (QCO) is commonly used in lean production to reduce time wastage in garment manufacturing. The change over time of a new style is a non-value-added time. It also highly impacts on the factory's overall production efficiency. Past data indicated that the overall production efficiency of the selected factory was more than 70% without styles change overs achieved QCO. Thus, the main objective of this study was to investigate the impact of QCO on the overall production in garment manufacturing. Identifying the relationship between line feeding time and machine pre-setting date with the first three-day QCO achievement was the secondary objective of the study. The sample size was 134 new style change overs. Amongst this, only 74 styles were QCO passed. Quantitative study with correlational design was used to identify the impact of QCO towards overall production in a garment manufacturing company. The analysis process consisted of two main steps. The relationship between keeping the first three-day QCO efficiency into the correct order by handling machine preset date according to the schedule date and change over time occurring within one hour was the first step of the research. The second step analyzed the effect of the factory corresponding to three days production efficiency by handling the first three-day QCO efficiency according to the correct order. Chi-square test of Independence and simple linear regression model were used in the data analysis. The results showed that machine pre-set date and change over time had a significant impact on the QCO achievement during the first three-days. Moreover, the results showed that QCO fail styles and two days QCO fail styles had negative impacts on the factory production efficiency. The R-square value of the fitted model explained 50% of the variability created by internal factors. The variable QCO fail had -0.394 coefficient value implying that a 1% increase in the QCO fail styles causes a 39.4% decrease in the overall production efficiency. Relevant folders and parts for the external machines layout are prepared before the line feeding and fixed them to the internal machines in new layout with in first hour of style change over, trial runs are performed to observe the results, develop new motion methods to improve efficiency and investigate the possibility to implement parallel operations for machines are the recommendation of the study.

Keywords: *Garment manufacturing, lean manufacturing, overall production efficiency, quick change over*

[1] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
Corresponding Author:

Standardization and Evaluation of New Herbal Immune Booster Drink 'Suraksha'.

Wijegunawardana N. D. A. D.[1], Gunawardhana S. S.[2], Gunawardhana K. P. S.[2], Gunawardhana, S. S.[2], Ratnayake H.[3]

Abstract

With the onset of the COVID-19 pandemic, the use of medicinal plants for their immune-enhancing properties is becoming popular in human society. They can be used as safe and inexpensive alternatives for pharmaceuticals with uncertain side effects and the higher cost. However, evaluating and standardization of these herbal immune booster formulations is important to assess the quality, purity, safety, and effectiveness before they reach the market. Therefore, the aim of this study was to evaluate and standardize the new 'Suraksha Immunity Boosting Drink' formulated by the traditional health practitioners (THPs) from the Gunawardhana Ayurveda Holdings (Pvt) Ltd, Anuradhapura, in Sri Lanka under the brand name of 'Helayu'. Since testing of ayurvedic preparations using scientific methodologies is not well established in Sri Lanka, this study will not only analyze and identify the active properties of the ingredients present in this product but will also help to enhance its perceived value and establish its reputation as well, which is another necessary aspect for establishing consistency and credibility among the buyers. Six randomly selected samples from the 'Suraksha Immunity Boosting Drink' from six different manufacturing batches were evaluated for their pharmacognostic, physical, physicochemical, phytochemical, and toxicological parameters, as well as thin-layer chromatography (TLC) profiling and Fourier, transform infrared (FTIR) spectroscopy method using standard methodologies. This experimental work provided diagnostic characteristics to identify and standardize the formulation 'Suraksha Immunity Boosting Drink' (SIBD) prepared using its main ingredients. Based on the present investigation results, a monograph on quality standards for 'Suraksha Immunity Boosting Drink' can be proposed for its batch-to-batch consistency. This document can also be utilized for rapid authentication fingerprints of this formulation using its TLC and FTIR profiling.

Keywords: *Chromatography, FTIR, immunity boosting drink, TLC, toxicological*

[1] Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka
[2] Adhitya Research Laboratory, Gunawardhana Ayurveda Holdings (Pvt) Ltd, Anuradhapura, Sri Lanka
[3] Analytical Division, Techno Solutions Pvt. Ltd., Nugegoda, Sri Lanka
✉ Corresponding Author: awijegun@tec.rjt.ac.lk

Assessment of Some Toxic Metals of Commonly Consumed Rice by ICP-MS and Their Impact on Human Health

Senarathne E. M. N. S.[1] ✉, Edirisinghe E. M. R. K. B.[1]

Abstract

Natural and anthropogenic phenomena lead to accumulation of elements in the environment. Metal contamination of rice is one of the main concerns under food safety today. This study was conducted to distinguish some metal contents in rice and to assess possible health effects. Thirty two rice varieties in the Anuradhapura district were analyzed for Pb, Cd, Cr, Mn, and Ni under two groups identified as traditional and nontraditional rice varieties. Samples were digested using a microwave digestion system and analyzed using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). The most abundant metal among the studied elements was Mn in both traditional (27.85 ± 7.52 mg/kg) and nontraditional rice (23.57 ± 14.37 mg/kg). Cr levels were reported as 3.37 ± 1.14 mg/kg and 1.93 ± 0.58 mg/kg while Ni levels were reported as 0.72 ± 0.86 mg/kg, 0.88 ± 0.35 mg/kg in traditional and nontraditional rice respectively. Pb content in traditional rice (1.05 ± 0.45 mg/kg) exceeded the maximum allowable limit (0.2 mg/kg) while the nontraditional rice obtained a lower level (0.20 ± 0.10 mg/kg). Cd levels in both traditional (0.08 ± 0.07 mg/kg) and nontraditional (0.03 ± 0.02 mg/kg) groups were lower than the maximum allowable limit (0.4 mg/kg). Health risk exposure through rice consumption was calculated for 60 kg body weight. Target Hazard Quotient (THQ) for Pb in traditional and nontraditional groups were 37.62 and 7.08 mg/kg respectively while THQ <1 for other elements in both groups. Noncarcinogenic risk from long-term exposure to Pb was significant for traditional and nontraditional groups showing Target Hazard Quotient >1. Recommended weekly tolerable consumptions for traditional rice are 1.42, 0.41, 0.43, 2.94, 5.03 kg and for nontraditional rice are 7.56, 0.72, 0.51, 2.39, 12.77 kg in order to avoid the adverse effect of Pb, Cr, Mn, Ni, Cd respectively.

Keywords: *Human health, ICP-MS, rice, toxic metals*

[1]Department of Chemical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding Author: sathsarasenarathne@gmail.com

Development of Blue Pea Flower Extract Incorporated Set Yoghurt

Jayathissa R.P.S.D.[1], Kularathne W.P.P.[1], Peiris T.S.K.[1], Harthika M.[1]✉, Jayanath N.Y.[2], Suraweera T.L.[3]

Abstract

There is a considerable interest in natural antioxidants because of their potential nutritional and therapeutic value. The blue pea flower (*Clitoria ternatea*) is one of the major tropical flowers with high antioxidant capacity, attractive colour, and colour stability in. Previous study showed that the extract of blue pea flower is a good source of antioxidants. Thus, this study was conducted to develop a blue pea flower extract incorporating set yoghurt to improve the antioxidant capacity and to make it more attractive to the consumer. The blue pea flower was incorporated in powder form and liquid form separately for yoghurt preparation aiming to find the best method of incorporation to get a desirable homogeneous product. Thoroughly washed flowers were dried at ambient temperature for three days until a constant weight was observed. Then the dried flowers were ground into a fine powder using mortar and pestle. For a series of yoghurt production, this ground powder was directly used and for another series, blue pea flower extract was obtained using sonicator assisted hot water extraction where extraction was carried out at 50 ^{O}C for 30 minutes. A set of yoghurt samples were prepared with different concentrations of extracts. Three formulations of yoghurt incorporated with liquid extract of 10%, 20%, and 40% (v/v) and four formulas of yoghurt incorporated with a powdered blue pea flower of 1%, 2%,3%, and 4% (v/w) were developed. A preliminary sensory evaluation was carried out to determine the most preferred yoghurt formula. Both blue pea flower powder incorporated yoghurt and blue pea extract incorporated yoghurt were examined through sensory evaluation. A ranking test was done by using 40 untrained panellists and results were analysed using the Friedman test. According to the results; the most preferred formulations were yoghurt samples added with 2% (w/w) blue pea flower powder and yoghurt added with 10% (v/v) blue pea flower extract. These two formulations were selected for further quality evaluation and storage studies.

Keywords: *Anthocyanin, antioxidant, blue pea flower, sensory, stability*

[1] Department of Food Technology, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka
[2] Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka
[3] Department of Plant, Food and Environmental Sciences, Faculty of Agriculture, Dalhousie University, Truro, Nova Scotia, Canada
✉ Corresponding Author: mharthik@tec.rjt.ac.lk

Trend Analysis of Rainy Days of Kandy in Sri Lanka

Wijerathna L. P. S. D. N.[1], Meegahakotuwa U. S.[2]

Abstract

The rainfall of Sri Lanka is of multiple origins including monsoonal, convectional, and depression. Rainfall variability over space and time must be regarded as the most significant aspect of the monsoon climate of Sri Lanka. Kandy is located on the western slope of the central highlands. The highlands are an important catchment area for the river systems of Sri Lanka. The main objective of this study was to examine the trend analysis of rainy days in Kandy. The value for a rainy day has been taken with a minimum of 0.3mm rain/per day according to the definition given by the meteorology department. The total monthly rainy days have been collected in Kandy station from 1961 to 2020. The rainy days trend over the last 60 years periods were estimated using the linear regression analysis. The Mann-Kendall statistical test was applied to identify significant or non-significant monotonic trends in the annual and seasonal time series. The study revealed that annual rainy days have shown a statistically significant ($p<0.05$) decreasing trend during 1961-2020. However, trend analysis of the rainy days in the first inter monsoon (FIM), second inter monsoon (SIM), north east monsoon (NEM) seasons does not show a monotonic decreasing or increasing trend at the 95% confidence level according to the Mann-Kendall statistical test. In contrast, the south west monsoon (SWM) rainy days demonstrate a decreasing trend at the same level of confidence. The trend computation for the study period of rainy days in the months of July and August have shown a statistically significant ($p<0.05$) negative trend in Kandy. The study clearly revealed that the rainy days have a significant decreasing trend during the last 60 years and especially in the SWM season in Kandy. SWM is the dominant rainfall season in the Wet Zone of Sri Lanka. The decreasing trend of annual and SWM rainy days will have negative consequences to the irrigation, domestic, industrial water supply, hydro power generation, plantation agriculture, other human activities and natural environmental process of Kandy.

Keywords: *Mann-Kendall test, rainy days, seasons, significant, trend*

[1] Kingswood College, Kandy, 20000, Sri Lanka
[2] Mulgama College, Gampola, 20500, Sri Lanka
✉ Corresponding Author: wijerathnaw1972@gmail.com

Magnetically Retrievable Iron Oxide Nanoparticle Platform for Biosensor Development

Gaminda K. A. P.[1], Abeysinghe D. T.[1]✉, Jayasinghe C. D.[2], Senthilnithy R.[1]

Abstract

The detection of various targets using biosensors has gained much attention throughout the past few decades. Generally, these biosensors are composed of target recognition site and signal transduction site. Usually, the target recognition site of the biosensors is composed of macromolecules such as carbohydrates, protein, peptides, and nucleic acids, due to their remarkable ability to bind to a specific target. The immobilization of these macromolecules is associated with different types of chemical attachments which include the alteration of the molecules. The signal transduction site of the biosensors utilized the fluorescence or colorimetric signal for the detection of the target. Therefore, these biosensors provide higher specificity, accuracy, and on-site monitoring of the target compared to the conventional analytical methods. Different types of biosensors are available to detect various targets, but these biosensors cannot be reused or recycled. Even though the biosensor is used, it has to be discarded and this causes the accumulation of waste materials in the environment. Hence, to overcome these drawbacks, the incorporation of the nanomaterial into the biosensors is advantageous. In this study, magnetically retrievable (3-Aminopropyl)triethoxysilane (APTES) functionalized iron oxide nanoparticles were developed as a novel immobilization platform for biosensors. The magnetite core of the iron oxide nanoparticles was synthesized *via* the co-precipitation method and the magnetite nanoparticles were coated with APTES. The freely available amino group ($-NH_2$) of the APTES is utilized to immobilize the macro-molecules on the nanoparticles *via* bio-conjugation. This limits the use of hazardous chemical alteration of the biomolecules. Since the biosensor is based on the magnetically retrievable platform, used biosensors can be recycled and reused effectively due to their magnetic properties, and bio-conjugation provides easy modifications of the biosensor. The synthesized APTES functionalized iron oxide nanoparticles were confirmed by the Fourier transform infrared spectroscopy (FT-IR) spectrum and the scanning electron microscopy (SEM) images which exhibit the rod-shaped iron-oxide particles with an average size of 25-30 nm. Compared to the other nanoparticle synthesis methods, co-precipitation method is simple, cost-effective, and time-saving.

Keywords: *Co-precipitation, magnetite, APTES*

[1]Department of Chemistry, The Open University of Sri Lanka, Nugegoda, Sri Lanka
[2] Department of Zoology, The Open University of Sri Lanka, Nugegoda, Sri Lanka
✉ Corresponding author: dtabe@ou.ac.lk

Identification of Suitable Substitutes for Calcium nitrate Usage in Coir Substrates Industry

Kanchana G. S.[1] ✉, Rathnayaka K. R. M. R. B.[2], Lochana E. A. L.[1], Premathilaka U. G. A. T.[1]

Abstract

Coco-peat, a byproduct of the Cocos nucifera plant, is an important soilless plant growing medium with high sodium, potassium, and low calcium content. Buffering coco-peat with Calcium nitrate prior to medium preparation is critical for increasing fertility by changing ion concentrations through cation exchange capacity and ionic voltage. Calcium nitrate usage has been deemed unlawful due to the harmful impacts of the nitrate group on the natural environment. The objective of this study was to investigate a viable chemical alternative for coco-peat as an industrial buffering agent. It was laid out under two factor factorial design with Calcium nitrate, Calcium carbonate, Calcium oxalate, Calcium citrate and Calcium bicarbonate. Four replicates were prepared from each chemical. Since the industry norm for Calcium nitrate application is 10 kg per ton of coco-peat, a standard buffering solution was made using 10 g of Calcium nitrate in a 250 ml solution. 10 g, 20 g, and 30 g of mentioned chemicals were dissolved in 200 ml and 250 ml solutions separately to investigate the effect of different concentrations on electrical conductivity (EC). For each trial, 1 kg of coco-peat was used. Calcium ion concentrations in buffered coco-peat were determined using EDTA titrations and Flame Photometer analyses. General Manova Analysis was used for Analysis of Variance at ($P \leq 0.05$). Mean calcium ion concentration, EC and pH of Calcium nitrate treated samples were (1.03 ± 0.0168) %, (1480 ± 0.051) mS/cm and 6.485 ± 0.115 respectively. These values were used as control sample values to compare with other buffered samples' results. From analyzed results, 30 g of calcium citrate in 250 ml and 200 ml solutions have given parallel values with Calcium nitrate treated samples with its high solubility and buffering capacity beyond selected chemicals. A significant difference of EC values of coco-peat samples was identified from the EC of raw coco-peat samples (1480 ± 0.051) mS/cm. The cost per 500 g of each chemical was compared according to the Organic Trading's (Pvt) Ltd rates, and no significant cost difference between Calcium nitrate and Calcium citrate was identified. Overall results suggest that Calcium citrate performs similarly compared to Calcium nitrate and further studies on use of Calcium citrate for buffering coco-peat medium is required. Furthermore, more studies should be carried out on the use of Calcium citrate-enriched natural resources to improve the efficacy of buffering coco-peat in green technology while being environmentally benign.

Keywords: *Buffering, Calcium citrate, Calcium nitrate, Coco-peat, Soilless plant growing media*

[1]Department of Export Agriculture, Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka
[2]Tropicoir Lanka (Pvt) Ltd, Sri Lanka
✉Corresponding Author: sewwandikanchana.g@gmail.com

Effect of *Cyclea peltata* (Kahipiththan) on Human Blood Coagulation

Wanigasekara A. M. D. N.[1] ✉, Lokuwalpola D. V.[2], Premasinghe B. G. N. R. M.[3], Karunarathne E.D.C.[4]

Abstract

Cyclea peltata leaf extract has been traditionally used as a remedy to control bleeding from fresh wounds. However, the potential of this leaf extract as an external blood coagulant was not studied in depth to rationalize its pharmaceutical significance. Thus, the present study was undertaken to evaluate the effect of *C. peltata* leaf extract on *in-vitro* human blood coagulation. Blood samples drawn from 25 healthy individuals of both sexes belonging to the age range of 25-30 years were analyzed using Lee and White method. Separate sets of test and control samples were run simultaneously. Leaf extract of *C. peltata* (0.5 mL aliquot) was added to three Kahn tubes and they were the test sample set. Similar volume of normal saline in triplicate was used as the control. Drawn blood (1.0 mL) was added to all six tubes of test and control sets immediately and both sets of tubes were incubated at 37ºC in a water bath. Each tube was observed for the occurrence of undisturbed clot formation. Average clotting time was calculated for both the test set of tubes and control set of tubes. The obtained value for the sample set per individual was compared with the same set of controls. A statistically significant reduction in average clotting time ($p \leq 0.05$) was reported for the test set of tubes containing *C. peltata* leaf extract than the control that of the control set. These preliminary observations suggest that *C. peltata* leaf extract has a potential to affect positively on human blood coagulation.

Keywords: *Blood coagulation, clotting time, Cyclea peltata*

[1]Department of Biochemistry, Faculty of Medicine, University of Ruhuna, Galle, Sri Lanka
[2]Department of Chemistry, Faculty of Science, University of Colombo, Colombo, Sri Lanka
[3]Department of Chemistry, Faculty of Science, University of Kelaniya, Kelaniya, Sri Lanka
[4]Prof. Janitha Liyanage Central Laboratory, Gampaha Wickramarachchi University of Indigenous Medicine, Yakkala, Sri Lanka
✉Corresponding Author: dharaninirasha@gmail.com

Extraction Methods for Pectin from Fruit Wastes – A Review

Prabuddhi A. P. R.[1] ✉, Dissanayaka D. M. U. P.[1], Sandamini A. A. D. T.[1], Gimhani K. H. I.[1]

Abstract

Pectin is a light brown powder which is widely used as a food additive in the food industry and a good source of dietary fiber. Further, it is a heteropolysaccharide which can be found in many fruit wastes such as peels, seeds, pulp, and pomace. The aim of this review is to assess the use of different extraction techniques for pectin extraction from fruit wastes. Recent studies involving pectin extraction from fruit wastes were reviewed to find out the efficiency, feasibility, advantages and the drawbacks of different extraction techniques. Both conventional and novel extraction techniques are used in pectin extraction from fruit wastes. Conventional extraction techniques which are mostly used in the industry involve use of acids with heating. Hydrochloric, nitric, citric, acetic, phosphoric, and sulphuric acids are commonly used in acid extraction. Acid strength, extraction time, and the temperature are leading factors for the yield of pectin. Major drawbacks of the conventional methods such as slowness, high cost, use of large amounts of chemicals, and adverse impact on the environment have led to more attention on the application of novel extraction techniques. Novel extraction techniques which include microwave assisted extraction, enzyme assisted extraction, ultrasound assisted extraction, high hydrostatic pressure extraction, dielectric barrier extraction, and use of subcritical fluids have shown promising advantages over conventional methods. Most importantly, these methods give a higher yield while taking less time for pectin extraction. Also, it has been shown that pectin extracted using these novel techniques has improved qualities in terms of structural features, functionality, sensory, and chemical characteristics. Further, those techniques are able to reduce the usage of chemicals in turn, minimizing the impact on the environment. However, methoxyl content, equivalent weight, degree of esterification, and the yield of extracted pectin are highly dependent on the type of fruit waste, maturity of the fruit, and the extraction conditions. To conclude, pectin is extensively used in the food industry as a thickening agent, gelling agent, and a stabilizer. Fruit wastes are good sources of pectin which can be used to extract pectin for commercial purposes. Quality and the yield of the pectin are two governing factors in selection of an extraction method. Novel extraction techniques are more advantageous compared to conventional methods. However, extraction conditions need to be optimized to preserve the quality and to increase the yield of pectin.

Keywords: *Extraction methods, fruit wastes, pectin*

[1]Department of Food Technology, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding Author: apranush@gmail.com

ISymRU 2021

Education, Language and Distance Learning

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

A Comparative Study of the Novel Madol Doova by Martin wickramasinghe and its English Translation by Ashley Halpe

Jayasinghe H. S.[1]

Abstract

The translation is a broad area that involves numerous factors rather than converting written words from the source language (SL) to the target language (TL). Hence, language and culture are two important aspects that cannot be disregarded, especially in literary translations. The disparities of translations arise when translating a text which belongs to a different cultural context. The methodology adopted in this research study is qualitative. The primary data was collected by referring to Martin Wickramasinghe's *Madol Doova*, and the secondary data were mainly collected through its English translation by Ashley Halpe. The similarities and the differences in the two texts were noted concerning the usage of idiomatic expressions and figurative language. It was observed that Halpe has directly used the socio-cultural terms in the translation. For example, *mala ilawwa* (Halape 2002: 16), *gal-ibba* (Halpe 2002: 27), *Porisadaya* (Halpe 2002: 34), *mahadenamutta* (Halpe 2002: 84), *andara demala* (Halpe 2002: 84). These are some unique terms associated with the socio-cultural environment that prevailed in Sri Lanka especially around the time when this book was published. Hence, Halpe may have wanted to maintain the socio-cultural environment through his translation by using these direct terms. When analyzing the translation, it is clear that since there are no equivalent terms in the TL, Halpe has adopted the technique of borrowing. The usage of some direct translations was also observed. For example, *"Inda! The silly old coquette!"* (Halpe 2002: 20), *"He's a tough nut all right"* (Halpe 2002: 36), *"Sons of she-devils!* (Halpe 2002: 16). These direct translations may confuse the English readers since it is culturally distant to them. However, it is familiar to the Sinhala-English bilingual community. Nevertheless, translating the source text is not easy as the cultural background, cultural terms, and characters belong to a different context of the target language. The language used by Wickramasinghe is also challenging since the book belongs to 1947. In conclusion, it can be stated that Halpe has tried to maintain the spirit of the original text by using simple language. However, as the researcher believes, the translation appears culturally distant to the readers who are non-native because Halpe was mainly focusing on a Sinhala-English bilingual community. Nevertheless, Halpe's effort in maintaining the socio-cultural environment can be considered as successful especially to the bilingual readers.

Keywords: *Bilingual community, literary translation, local context, socio-cultural terms*

[1] University of Colombo School of Computing, UCSC Building Complex, 35, Reid Avenue, Colombo 7, Sri Lanka
Corresponding author: sasajaya93@gmailcom

A Diachronic Analysis of the 2015 Presidential Election News in Sri Lankan English Newspapers

Nandarathna B. G. D. S.[1], **Samarasinghe A. G. S. M.**[2]

Abstract

"Diachronic Analysis of the 2015 Presidential Election News in Sri Lankan English Newspapers" is a study which was done in order to recognize the elements of stance in the news articles published in Sri Lankan English newspapers before and after the 2015 presidential election in Sri Lanka. This study was done by using data which were downloaded from the online publications of two Sri Lankan English newspapers; 'The Sunday Times' and 'The Sunday Observer' and the analysis was done by using the corpus-based linguistics tools. The keywords lists and concordance lines of keywords from the data downloaded from newspapers were created by using the WordSmith 5 corpus linguistics tools. A keywords analysis and a concordance lines analysis of a number of selected keywords of the two newspapers were done with the intention of seeking out evidence of stance before and after the election. It was found that the newspapers bear different attitudes about the selected keywords for the analysis and most of the stances they had before the election about the selected keywords, had changed after the election. Newspapers are considered as an important medium in reporting the elections in Sri Lanka. The newspaper industry in Sri Lanka is a very lively one with a wider accessibility, since most of the newspapers have online editions too. Therefore, this study is very significant, because this was the first time that a corpus linguistic methodology was used to carry out an empirical study about how the 2015 presidential election was reported by the Sri Lankan English newspapers press.

***Keywords**: Concordance lines, corpus-based linguistics tools, diachronic analysis, keywords analysis*

[1] Department of English Language Teaching, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka, Sri Lanka
[2] University of Vocational Technology, Sri Lanka
Corresponding author: darshikasrihani@gmail.com

Can Documentaries Be Used to Enhance Attitudes and Practices of G.C.E. (A/L) Students Towards Environmental Conservation in Batticaloa, Sri Lanka

Prashanth M.[1] ✉, **Gunaratne A. M. T. A.**[2]

Abstract

Environmental documentaries have the ability to dramatize environmental issues by enhancing students' attitudes and practices to find solutions for environmental crises. The present study investigated the effectiveness of documentaries to teach Environmental Biology for G.C.E (A/L) Biological science students in Batticaloa Educational zone, Sri Lanka. The objectives of the study are, to identify the level of environmental attitudes and practices; investigate the effectiveness of documentaries to develop positive environmental attitudes and good practices in students. The sample consisted of 80 students from Grade 13 in three selected schools in Batticaloa Educational Zone. The data were gathered using reliability tested structured questionnaires to test attitudes and practices in pre and post-tests. Documentaries were prepared to aid teaching for an experimental group for two lessons in Unit-Eight. The control group was taught using the lecture method. Data were analyzed using descriptive statistics, Mann-Whitney and Wilcoxon signed rank tests, and Pearson correlation in SPSS. This study identified that the mean percentage of attitudes (57.90±1.76), and practices (58.26±1.84) of students were moderate in the pre-test. The mean percentage marks of attitudes ($Z=5.581$, $p=0.000$) and practices ($Z=-5.585$, $p=0.000$) of the experimental group were significantly higher in post-test than pre-test. Positive attitudes and environmentally friendly practices in the experimental groups were significantly higher than the control groups in post-test. The mean gain of positive attitudes ($U=141.0$, $p=0.000$) and mean gain of environmental practices ($U=157.0$, $p=0.000$) of experimental groups were significantly higher than control groups. Environmental attitudes and practices showed high positive correlation in pre and post-tests. The study concluded that usage of documentaries to teach environmental-related lessons at G.C.E. Advanced Level developed positive attitudes and environmentally friendly practices in Grade-13 biological science students in Batticaloa educational zone, Sri Lanka.

Keywords: *Attitudes, documentaries, environmental biology, practices*

[1] Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

[2] Department of Botany, Faculty of Science, University of Peradeniya, Sri Lanka

✉ Corresponding author: mirun.muthu@gmail.com

Satisfaction of Hostel Facilities and Perceived Impact of Hostel Life; A Study Conducted among Hostel Accommodated Nursing Students in a Government Nursing School, in Sri Lanka

Wijayasundara W. M. S. K.[1] ✉, Rathnayaka R. M. S. I.[1], Rathnayaka M. T. N. M.[1], Panditharathna P. M. Y. P.[1], Rathnayaka R. N. P.[1]

Abstract

Hostel life is remarkable for a student who comes to live far away from their home leaving their families. Hostel from the viewpoint of a support facility in the learning environment increases the regularity, safety, efficacy and effectiveness of the students. Satisfaction for a hostel must be the focal point because it enhances the image of the institution and makes it an attractive choice for prospective students. Moreover, it is an obvious inquiry whether the hostel life makes an impact on the students' academic and personal life. No study has investigated before the satisfaction of hostel life and impact of hostel life among nursing students in Sri Lanka. Affiliation of the hostel and preparing to be a nursing professional is significant therefore there is a need to yield students' satisfaction with hostel facilities in a timely manner. This study was to investigate the satisfaction of hostel facilities and the perceived impact of hostel life among the first, second and third-year female nursing students living in a hostel at the college of nursing Anuradhapura. A descriptive cross-sectional study with a total of 99 pre-tested questionnaires was distributed to the respondents based on the total study population sampling method. The level of satisfaction was measured on categorized 10 areas of hostel facilities while the impact of hostel life was assessed on the areas of impact on behaviour and personality and academics. The data were analyzed with descriptive statistics in terms of mean score and inferential statistics; ANOVA, t-test and Pearson correlation tests. Significance was set as $p<0.05$. Ethical approval was obtained from the Rajarata University of Sri Lanka. It was revealed by the study that most of the students prefer college hostels to private accommodation because of the security of the college hostel environment (72.9%). The participants were mostly satisfied with room facilities (M=3.83, SD 0.62)) followed by a security system (M=3.58, SD 0.58)). The respondents were least satisfied with communication and internet facilities (M=2.97, SD 0.41). The perceived impact of hostel life found that living in a hostel makes them orderly (M=3.35, SD 0.54) and gains academic progress (M=3.47, SD 0.61) There is a statistically significant association between satisfaction on hostel facilities and academic year (p=0.036). A significant positive correlation was found between academic year and satisfaction on hostel facilities (r=0.193, p=0.05) and perceived impact on academic activities (r=193, p=0.05). These findings can be useful in terms of continuous improvement of hostel conditions in Sri Lanka which may increase students' hostel life satisfaction.

Keywords: *Nursing students, satisfaction, hostel facilities, perceived impact of hostel life*

[1] College of Nursing, Anuradhapura, Sri Lanka
✉ Corresponding author: srimathiwijayasundara@gmail.com

Impacts of the 13 Years of Guaranteed Education Stream: A Survey of the Students in Kandy District

Jayarathne P. M. G. N. M.[1], Prabodanie R. A. R.[2]

Abstract

The Ministry of Education in Sri Lanka introduced the "13 Years of Guaranteed Education" programme (13YGEP) to the Grade 12/13 curriculum in 2017 targeting the GCE O/L dropouts. The programme aims to provide opportunities for the students who fail in GCE O/L to qualify for GCE A/L to continue school education based on vocational subjects. This study aimed to evaluate the impacts of the programme, particularly on the employment prospects and income of the students who followed the programme compared to those who left school education after O/L. The study is based on a sample of 200 students from the Kandy district in the 19-21 years' age group including 100 students who followed the programme. Graphical data analysis and Chi-Square tests of independence were used to analyse the data. The results suggest that there is no statistically significant association between the 13YGEP and employability at present and that the students who followed the programme and those who didn't follow the programme are equally employable. However, a significant percentage (15%) of youngsters who followed the programme pursued self-employment which is an encouraging trend. The monthly income was found to be higher among those who didn't follow the programme possibly due to their early employment. Out of the 26 vocational subjects available under the programme, Automobile Studies is the most popular subject followed by Tourism & Hospitality Management and Graphics Design. The results indicate that the students who followed the programme are generally satisfied with the content and outcomes while the majority of those who did not follow the programme have no regret. The small sample size, limited geographical coverage and short-term experience with the programme are the key limitations of this study. Such surveys should be carried out continuously to monitor the impacts and outcomes of the programme.

Keywords: *Employment, higher education, income, school dropouts, vocational education*

[1] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
[2] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
✉ Corresponding author: ranga@wyb.ac.lk

Subliminal Isolation of the ESL Learner: Mapping the (Un) Conscious Pedagogical Error of Teaching Grammar in Isolation in the ESL Classroom

Kulathunga H. M. C. S.[1], Hapuarachchi S. S.[2]

Abstract

Ira Shor in her work "Empowering Education" raises the question "Can education develop students as critical thinkers, skilled workers, and active citizens" reminding that the purpose of education is not to merely "stock the memory" but to "form the intelligence" (Piaget). However, current pedagogical practices have reduced the complex and intricate process of learning a language into a simplified formula of grammatical structures. Therefore, the notion that teaching a language is teaching grammar in isolation, a colonial method that has been practised for years, which is still in practice in the ESL classroom, should be problematized. Methodologically the study takes an autoethnographic approach. Data were collected from the two ESL teacher-participants from the Department of English Language Teaching of Faculty of Arts and Faculty of Allied Health Sciences. Findings show two critical instances where the structural approach of teaching the English language fails the ESL learner: when teaching/learning grammar rules, and the limitations in vocabulary. Reducing the English language to a fixed entity focusing only on grammatical rules is a way of disregarding the complex intricacies of language learning. For example, even though students can easily explain the role and function of tenses in isolation, they fail to contextualize these tenses in other instances both in and out of the ESL classroom. Additionally, since students are constricted within this teaching/learning practice, the moment the student is expected to step out and critically analyze socio-political, economic and cultural surroundings, there is a visible struggle. The purpose of learning a language is not merely to communicate, but to form a critical dialogue with one another, which is not accomplished through the current ESL teaching method. Therefore, this study attempts to map out this (un)conscious pedagogical error in the ESL classroom where the English language is treated as an abstract notion rather than a living breathing organism.

Keywords: *Critical thinker, ESL learner, isolation, literature, structure*

[1] Department of English Language Teaching, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka

[2] Department of English Language Teaching, Faculty of Arts, University of Peradeniya, Sri Lanka

✉ Corresponding author: chamalistar@gmailcom.

Producing Passive Sentences-a Common Issue of Undergraduates

Attanayake A. M. N. R.[1], Dissanayake K. M.[1]

Abstract

Knowledge of passive constructions which is a part of formal writing is an essential requirement for academic writing. Undergraduates who pursue their content subjects in the English medium frequently complain about their inability to produce passive sentences. The purpose of this study is to investigate the reasons that lead to the learners' claim that passive voice constructions are more difficult and hence they score low marks in academic writing activities. This study which uses convenient sampling is an experimental research design consisting of a sample of sixty-first-year students who follow their three months Intensive English Course meant for the new entrants to a Sri Lankan state university. The relevant data was generated through a pre and post-test conducted for both control and experimental groups after and before the language treatment. The treatment included teaching the logical structure of passive voice, different forms of 'be' verbs, how to identify transitive verbs, past participle and the spelling rules of the past participle. Further, the students were given time to memorize the past participle of irregular verbs and the spellings. Gathered quantitative data were analyzed using the SPSS statistical package. It was found that given language remedial treatment is significant. Students in both the controlled group and experiential group scored much lower marks than expected. The controlled group and the experiential group scored, which was evident that students in both groups were equally weak in knowledge in passive voice. After conducting lectures following the conventional method to the control group and introducing the newly designed passive structure to the experimental group, a post-evaluation test was conducted to evaluate the effectiveness of the new teaching methods compared to the conventional method. According to the results students in the experimental group scored 57.7 marks on average, recording an increase of 30.5% on this average mark. Whereas students in the control group showed only an increase of 8.4% on their average marks which is 36.7 on average. This study suggests designing similar remedial courses to treat weaker students who stay behind their counterparts due to a lack of knowledge in the use of passive voice appropriately.

Keywords: *Undergraduates, academic writing, passive voice, logical structure, remedial course*

[1] Wayamba University of Sri Lanka, Sri Lanka

Corresponding author: nuwanrohith@yahoo.com

Understanding Constructive Discrimination between Language Learning Strategies by the Students at Tertiary Level in Sri Lanka

Ekanayake G. B.[1], Pathmasiri S. R. I.[2], Lecamwasam D. R.[3] ✉

Abstract

Strategic learning is a problem-solving approach to the learning material. It subsumes behaviours, techniques and mechanisms that contend with reasons, demands and the content of the task. Attributed to its perennial significance, language education has sought to encapsulate language learning strategies at the tapering end of the umbrella theme of learning strategies. In the L2 context, strategies are effective, specific means that can improve the language learning activity in order to help develop an autonomous, self-directed learner. The strategies, though intrinsically linked with learning styles, are rather overt, controllable factors. The users may unconsciously follow them owing to habit or ease of application. When deployed knowingly, they serve flexible manipulation of the language at hand while corresponding to individual preferences or styles. Adequate research into language learning strategies in the global literature is appropriately complemented by this study on the Sri Lankan student body as the research of that character is still growing proportionately. The local students apply language learning strategies in their L2 learner endeavour only unconsciously as they do not possess an explicitly standard repertoire of learned strategies. It aims to analyse the size of the user base while explaining the procedural aspects of the application. The target sample included students at the Institute of Technology, University of Moratuwa, Sri Lanka. Based on a mixed-method approach, an online survey depicting language learning strategies inventory representing all the four skills and an in-depth interview to cross-check the findings of the survey, involving 9 participants, were conducted. Quantitative data were measured for the percentage, mean and standard deviation whereas qualitative data were evaluated by Thematic Analysis. It was established that many local students apply strategies unconsciously even though they have not learnt them distinctively. They also exhibit contextual awareness while being selective about strategies and the related steps.

***Keywords**: Autonomous, procedure, strategic learning, unconsciously*

[1] CP/TEL Medamahanuwara Secondary School, Kandy, Sri Lanka
[2] Institute of Technology, University of Moratuwa, Sri Lanka
[3]Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding author: geethekanayake@gmail.com

Effectiveness of conducting Online Objective Structured Practical Examination (OSPE) in Anatomy among 1st Year Medical Undergraduates of University of Peradeniya

Madhushani H. A. U.[1], Dayarathna H. M. N.[1], Fahd M.[1], Dahanayaka S. Y. W.[1], Kaluarachchi K. K. N. T.[1], Herath H. M. G. S.[1], Pahalawattage N. J.[1], Marapana M. D. W. A. B.[1], Kosgallana E. W.[1] ✉, Amaratunga H. A.[1]

Abstract

With the Covid 19 pandemic, along with the world, the Faculty of Medicine, University of Peradeniya transferred to online methods of teaching Anatomy. As the next challenge was conducting online examinations, experimentally, 222 first-year medical undergraduates who had undergone exclusively online learning for one semester where foundation to human anatomy and anatomy of limbs were taught, were subjected to an online OSPE (Objective Structured Practical Examination). This was conducted as a cross-sectional study with descriptive and analytical components. Following a 2-week prior notice, an OSPE prepared by the academic staff members was conducted via a conferencing platform. Subsequently, student feedback was obtained via a google form regarding accessibility, preparedness, content, questions, images, and exam experience. SPSS Version 25 was used for descriptive analysis and one-sample T-test was used to compare the results with a previous batch that underwent onsite face-to-face teaching and examinations. Most students used laptop computers and personal Wi-Fi connections. More than half (63.1%) were comfortable taking the test via their personal devices. Satisfaction with images of gross anatomy specimens, radiographs, and histology slides were 48.2%, 90.5%, and 76.6% respectively. A majority agreed that the OSPE helped them to improve their knowledge (92.8%) and intrigued interest in the subject, motivating them to study (83.8%). Compared to a previous batch that underwent onsite teaching and examination, the performance of the students in this group was significantly lower ($p<0.001$). This may be due to learning anatomy only using online platforms hindering the three-dimensional understanding of Anatomy, short preparation time, and inexperience at facing online examinations. Even though technology-based learning and examination techniques have developed with the recent COVID 19 pandemic, it cannot yet replace the traditional methods in teaching and examination in Anatomy which agrees with recent studies in other countries (Sadeesh et al., 2021, Hanafy et al., 2021). However, this study shows that conducting online examinations is feasible with only 34.7% of students reporting minor technical difficulties. To our knowledge, this experiment is the first to evaluate online anatomy OSPE examinations in Sri Lanka and was a success since it helped us motivate students and identify the drawbacks and problems in conducting online examinations.

Keywords: *Anatomy learning, online examinations, medical education*

[1] Department of Anatomy, Faculty of Medicine, University of Peradeniya, Sri Lanka
✉ Corresponding author: waruni.kosgallana@med.pdn.ac.lk

Students' Acceptance of E-Learning during COVID-19 Pandemic: A Case Study

Dayananda K. S. N.[1], Jayaweera A.[2]

Abstract

During the COVID-19 pandemic, schools were forced to shut down, causing immense disruption of the education system. E-learning is the best alternative way to replace the conventional classroom setting. Although the severity of the pandemic has forced students to learn using this mode, drop-out rates and absenteeism are high. This qualitative study was carried out to investigate the learners' characteristics, technology, and infrastructure-related characteristics and social support on the level of acceptance of e-learning and suggest recommendations to accept e-learning. Data were collected from 80 students and using an online questionnaire during the school closure and analyzed using descriptive statistics and logistic regression. The results showed that the gender (female), high performing students, parents' support, and teachers' support affect the level of acceptance of e-learning ($p<0.05$). Female students are more likely to accept e-learning than males. High-performing students are more likely to accept e-learning than the rest. Students are more likely to accept e-learning when they have a supportive environment at home and parents' support. Students are more likely to accept e-learning when teachers provide support by making the e-learning process attractive. The infrastructure characteristics, peer support, and interest in ICT do not contribute to the acceptance of e-learning ($p>0.05$). The findings of the study will facilitate educational institutions and policymakers to take this e-learning process to the next level in a better way.

Keywords: *Covid-19, education, e-Learning, online learning*

[1] Department of Agricultural Extension, Post Graduate Institute of Agriculture, University of Peradeniya, Sri Lanka
[2] Department of Agricultural Extension, Faculty of Agriculture, University of Peradeniya, Sri Lanka
Corresponding author: ksachnimansha@gmail.com

Attitude of Sri Lankan Performing Arts Undergraduates toward Their University Learning Management System: Implications for Upgrading the System and Its Use for English Language Development

Embogama R. M. S. N[1]

Abstract

The use of Learning Management Systems (LMS) in educational institutions has become imperative since the unprecedented onset of the COVID-19 pandemic. A well-designed learning management system is known to enrich instruction, and its acceptance by learners is crucial for it to be accepted as a successful learning tool. This study was conducted; firstly, to investigate a group of students' attitude toward the use of their university LMS in terms of its perceived usefulness (PU), perceived ease of use (PEOU) and their acknowledgement of its use in general. Secondly, this research attempted to discover the target population's perceptions of learning English as a Second Language (ESL) through this system. Using the Technology Acceptance Model (TAM) as its basis for investigation, the study employed the case study method to consider the attitudes of a group of performing arts undergraduates with regard to their use of the university LMS for pedagogical intent. Through purposive sampling, 158 volunteer student respondents completed an online questionnaire that was designed to gather qualitative data to measure learners' perspectives in terms of perceived usefulness, perceived ease of use, and user satisfaction. The collected data were analysed using descriptive statistics whereby mean scores and standard deviations were calculated. The study findings demonstrate that the respondents had a highly positive attitude regarding the benefits that this system has to offer for learning purposes. Moreover, it became evident that the study participants were proficient users of the University's Learning Management System which was considered as user-friendly, easy to navigate, visually appealing and efficient. Regarding the use of the LMS for developing English as a Second Language, the target group expressed significantly high levels of satisfaction in terms of the usefulness of the learning content shared through the system. They also seem to appreciate the supplementary ESL material shared and the access to a custom-designed grammar course embeded into the system. Based on the study findings, it can be recommended that the university continues using its LMS even after the fully online teaching/learning period is over since, based on the results of this study, its capacity to promote autonomous learning and the flexibility it offers in delivering content through multimode methods appear to indicate acceptance of it as a fully-fledged pedagogical tool.

Keywords: *Learner-attitude, e-Learning, learning management system, University of the visual and performing arts*

[1] Department of English Language Teaching, Faculty of Dance & Drama, University of the Visual and Performing Arts, Sri Lanka
Corresponding author: sumudu.e@vpa.ac.lk

Teachers' Perspective about Delivering Lectures for a Large Group of Foreign Language Learners through Online

Cooray B. M. S.[1]

Abstract

Teaching to a large group of students in an online space is different from teaching the same course unit in a physical classroom in a traditional classroom setting. Yet online classrooms without boundaries and walls, have created opportunities for teachers to accommodate a large group of students anywhere at any time. The Department of Modern Languages, University of Kelaniya, offers six foreign languages French, German, Japanese, Chinese and Korean for Bachelor of Arts General Degree and Honors Degree programs. The student enrollments for the first year General degree program exceed the number of hundred for Chinese, German and Korean languages due to the popularity and demand for these languages in the local and foreign job market. The department has implemented its own set of methods to manage a large number of students physically by dividing the class into groups and by monitoring the classroom sessions with the assistance of several teachers. Yet the sudden transition of teaching from physical to online has posed controversial opinions among teachers, as it was uncertain how managing a large group of students online would affect the performance level of the learners. Therefore, the objective of this research was to examine teachers' perspectives of delivering lectures to a large group of foreign language learners online. Data was collected using a survey, where 15 lecturers teaching Chinese, German and Korean were selected as the research sample using the purposeful sampling method. According to the findings of the research, it was evident that the teachers are having a positive aspect about delivering lectures to a large group of foreign language learners online, as video conferencing software has allowed the teachers to distribute learning materials, maintain the motivation and enthusiasm among learners, do interactive activities and conduct assessment and evaluation process successfully.

Keywords: *Foreign language, delivering lectures, large group, online, teachers' perspective*

[1] Department of Modern Languages, Faculty of Humanities, University of Kelaniya, Sri Lanka
Corresponding author: madhusugandhi@yahoo.com

Innovative Strategies to Teach German Novels in a Foreign Language Classroom- A Focus on the Novel "Perfume: The Story of a Murderer"

Wijethilake S. P.[1]✉

Abstract

Literature is used for advanced language purposes in a foreign language classroom. It enriches vocabulary, helps learn complex grammatical structures, adds cultural/ social elements, develops critical/analytical thinking and motivates the language learner through visualization while reading. In spite of its advantages, the usage of traditional methods in literature teaching has caused demotivation and inefficiency among the students to handle literary texts with interest. The following study introduces strategies to promote the efficiency of the students of German as a foreign language in learning the novel "Perfume: The Story of a murderer". Further, it measures the efficiency of the strategies to improve the literary as well as language skills of the students. The sample group consisted of 32 undergraduates of German as a foreign language at the University of Kelaniya, who follow the four-year honours degree program in German for their Bachelor of Arts degree. The Qualitative data were collected through classroom observations and questionnaires, whereas the quantitative data were collected by evaluating the presentation and class test marks of the students. The results show that the innovative methods: introducing background and author details through audiovisual media, involving the students in the interpretation of the novel through speaking activities, relating the incidents in the novel to real-life situations/ experiences, involving students in group discussions, practising analytical skills by using the symbols in the novel, asking to create different ends to the story, usage of spaced repetition method to enhance the vocabulary skills, showing the film, and usage of role play resulted in better performance of the students of German as a foreign language in the literature classroom. Therefore, it has been concluded that the introduced student-centred and interactive learning methods promoted the performance of the students and further these methods are recommended to teach any novel or a short story to learners of a foreign language.

Keywords: *Literature teaching strategies, teaching German as a foreign language, teaching novels*

[1] Department of Modern Languages, University of Kelaniya, Sri Lanka
✉ Corresponding author: wpeumica@gmail.com

Translanguaging and Its Impact on Second Language Learners of English in Sri Lankan Universities

Gamagedara T. G. S. D.[1]

Abstract

The medium of study of most degrees offered in Sri Lanka is English, and mastering English at least to a certain extent is vital for any undergraduate studying in Sri Lankan universities. To facilitate learning English, undergraduates are allowed to improve and master the English Language in English as a Second Language (ESL) classes conducted for them in Sri Lankan universities. In such classes English Instructors or Lecturers may resort to Translanguaging when they attempt in making sure that what they teach is clear to the students, to ice break, to reinforce and reiterate what is taught etc. This practice of Translanguaging has been practised by teachers of languages for a long while. However, Linguists, Teachers and also learners of English as a second language perceive this use of First Language (L1) when teaching a Second Language (L2) in diverse ways. This controversy has been there for a long time, yet, it is unresolved. This study focuses on the attitudes of teachers and learners of English as a second language in Sri Lankan universities on Translanguaging in the English classroom. Data were collected via questionnaires and semi-structured interviews conducted for both undergraduates and English Instructors and English Lecturers in several Sri Lankan Universities. Randomly selected 500 answered questionnaires shared with undergraduates and 200 Instructors and Lecturers of English were taken into consideration when arriving at the conclusions. Out of 200 questionnaires of the Language Teachers, more than 96 percent agree that Translanguaging helps second language learners of English master the target language whereas nearly 90 percent of the undergraduates agree with the same idea. It was also perceived that the undergraduates' competency level plays a role in their perception of Translanguaging in the classroom. Hence, it was evident that Translanguaging does play a huge role in improving, motivating and assisting undergraduates who learn English as a second language in Universities in Sri Lanka even though very few disagree with the point. Consequently, the majority of the second language teachers and undergraduates agree that Translanguaging does have a positive impact on learning English as a second language.

Keywords: *English as a second language, first language, translanguaging, undergrad*

[1] English Language Teaching Unit, Faculty of Management, University of Peradeniya, Peradeniya, Sri Lanka
Corresponding author: shashinigamagedara1993@gmail.com

Impact of Covid – 19 on Online English Language Teaching in Dahanekgedara Region

Kumari S. H. M. D. N[1]

Abstract

COVID – 19 is a global pandemic. Therefore, the ministry of education in Sri Lanka issued a policy of closing all the schools and continue the teaching and learning procedure online. As a remedy for that most of the teachers, lecturers, and students adopted to used modern trends such as zoom, whatsapp, google meet, google classroom, LMS, e-mails and blog spots. This study aimed at assessing the current state of online English language teaching methods and identifying the strengths and weaknesses within this methodology. This research method used the descriptive qualitative method. As the research sample, the data will be collected from fifty people in the region including 10 teachers and 40 students through a google form due to this pandemic situation and information from another 20 people were taken via interview method. Meanwhile the opinions of the respondents were 84%were students and 16 % were teachers. Among them, the highest number of them respond that online teaching procedure is good and the least number of them respond that this method is poor due to some reasons. As an average, all the responses depict that this online teaching procedure is good for some extent. In this pandemic, most of the teachers used online learning systems, and some used two or more modern trends for this procedure. According to the results the most number of the respondents 72% used zoom, the least number of them used google meet and the 6 % lowest number of respondents used WhatsApp groups and other new trends**.** Therefore, this online teaching and learning process has the potential to help the teachers, students, and some strengths and weaknesses occur when assessing the current state of this procedure. In general, the researcher's aim is successful throughout the results and it is clear that the new modern trends are useful for the teachers and students to conduct learning and teaching procedures in this Pandemic by avoiding the various kinds of difficulties in these modern trends and the technology.

Keywords*: COVID -19 pandemic, online learning system, online teaching system, teaching English, rural areas, new trends.*

[1] An undergraduate, Department of languages, Faculty of Social sciences and Humanities, Rajarata University of Sri Lanka, Sri Lanka
Corresponding author: dilshaninipunika96@gmail.com

Causes of Poor Academic Performance in English at O/L in Anuradhapura District

Karunarathne W. N.[1]

Abstract

The research focused on the factors affecting the poor performance in English at O/L in the government schools in Anuradhapura district. According to the Sri Lankan school curriculum, the students in grade 3 through 13 are supposed to take English as a compulsory subject. The study mainly focused on the level of English performance and the reasons for the poor performance. The primary data were collected through questionnaires, interviews and case study methods, and the secondary data were collected through result sheets and annual statistical reports. The identified causes were lack of interest, poor attitudes and beliefs, poor teaching methodology, social context, contribution of the family, habits, teachers' qualifications, teaching materials, and learning period at homes, and economic condition as the reasons for this problem. At the end of the study, the researcher will recommend a few suggestions to mitigate the poor performance of O/L students in English in government schools in Anuradhapura district by improving teaching methodologies and materials, students' knowledge, vocabulary, basic language skills, increasing activities given by the teachers, removing the differences in the location of the schools, and arouse their interest in learning English language. Through these recommendations, the researcher hopes to reduce this poor performance of O/L students in English in Anuradhapura district.

Keywords: *O/L students, poor performance, English, schools, Anuradhapura*

[1] An undergraduate, Department of languages, Faculty of Social sciences and Humanities, Rajarata University of Sri Lanka, Sri Lanka

Corresponding author: wijayanthi.1997@gmail.com

Role of Educational Technology in the Teaching and Learning with the Special Reference on Teaching of Agriculture Science in Secondary schools in Jaffna District

Raveendran Y.[1] ✉, **Rasanayagam J.**[2]

Abstract

In the 21st century, all fields are technologically advanced and education is no exception. Incorporating technology into teaching is a great way to teach young people. Method of teaching influencing the students' subject selection. Despite being an agricultural country, there is a low tendency of the students who select agriculture science as a subject in their senior secondary level education especially in the Jaffna district. The aim of this study was to identify the strategies needed to enhance the teachers' effectiveness for the use of proper educational technology in teaching agriculture science. The objectives were to: (A) identify the current status of educational technology in teaching agriculture science, (B) identify the factors that influence the use of modern educational technology in teaching agriculture science, and (C) identify the barriers to modern technology integration in teaching agriculture science. The study population was teachers who teach agriculture science in senior secondary classes in the Jaffna district. Due to the low population, the whole population of this study was conceded as a research sample. Google form was used as the main instrument to collect the data. The link to the Google form was sent to the teachers through the 'Viber' community. Additional data were collected from additional directors of zonal education offices via structured interviews. Analysis of data includes mean, frequencies, and Pearson correlations. The study found that the experience in handling modern teaching aids, resource availability at the school, and proper training to the teacher to use technological aids in the classroom influences the method of agriculture science teaching. Proper training and seminars for the agriculture teachers and internet facilities available for classroom teaching would increase the usage of educational technology in practical activities and students assignments. According to the results, proper training of the teachers on the usage of modern teaching aids in the classroom and use of technologically advanced teaching aids in the classroom would enhance the integration of novel teaching technologies into the agriculture learning process and students' involvement in the course.

Keywords: *Educational technology, teaching, teaching methods, agriculture science, secondary schools*

[1] J/ Vembadi Girls' High school, Jaffna, Sri Lanka
[2] Department of Education, Faculty of Arts, University of Jaffna, Sri Lanka
✉ Corresponding author: t_yalline@yahoo.co.uk

Educational Reformations of Sir Syed Ahamad Khan in 19th Century

Gorden T.[1]

Abstract

Sir Syed Ahamad Khan's educational thoughts and activities in modern India have influenced the success of the present generation of Indians and are the basis for moving on with modern life. Indian society is a pluralistic society. It is a multi-religious, multi-ethnic and multilingual community, especially including Hindus, Muslims, and Christians. It is in this context that many challenges naturally arise when pursuing modern thinking and educational reformations. This study is structured on the basis that Ahamad Khan's educational reformation thoughts form the basis for the modernization of Indian society. The corruption, malice, and superstitions found in traditional India are still followed in some places. Scientific change is fundamental when proposing solutions to these. The objective of this study was to clarify the educational reformation thoughts of Sir Syed Ahamad Khan and assess the impact of Sir Syed Ahamad Khan's educational reformation thoughts on modernizing India. This research was purely theoretical based. Historical methodology, analytical methodology, comparative methodology, and descriptive methodology are used as research methodologies. The data required for this study are collected as primary and secondary data and analyzed qualitatively. To study the biography of Sir Syed Ahamad Khan as the only primary source of data collection and as a secondary source, the data were collected from different books, research articles, journals, and e-papers written by scholars about Sir Syed Ahamad Khan's educational reformations. The results of the study emphasize the need for English education and science education mainly in the educational reformations of the country and form the basis for the modernization of Indian society not only educationally but also socially, religiously, and economically. The Educational thoughts and activities of Sir Syed Ahamad Khan are seen as activities aimed at creating a rational society. It is noteworthy that the influence of these thoughts on the present day is seen as a necessity and a practice, beyond the extent to which his thoughts and activities have been successful. The main objective of the education reformation was to emphasize the need for Muslims to build their future and solve their problems and for the benefit of all Indians.

Keywords: *English Education, educational reformation, Muslims, modern India, scientific education*

[1] Department of Philosophy, Faculty of Arts, University of Jaffna, Sri Lanka
Corresponding author: gtharsiga@univ.jfn.ac.lk

An Investigation of the Impact of Undergraduates' Perception of Online Learning among Distance Learners: An Empirical Study

Nisansala K. K. H. P.[1], Ranwella K. B. I. S. [2], Jayasinghe W. A. L. P.[2]

Abstract

The educational system across the world has been immensely affected due to the outbreak of COVID-19 as it forced the shutdown of educational institutions, which adversely affected student fraternities across the globe. Due to its contagious nature, COVID-19 demanded containment and enforced isolation, which tremendously affected the personal interaction of teachers and students. The best alternatives for distance learning were strengthened. Therefore, the study investigated the impact of an undergraduate's perception on online learning among distance learners during the global disaster. The factors of social interactions, administrative issues, technical problems, technical skills, learner motivation, and academic skills were selected for the study. Primary data were collected using a structured questionnaire. A random sample of 65 undergraduates who are currently studying in their third year at the University of Colombo was taken, and the data were analyzed using SPSS Software. Reliability was tested with a Paired Two-Sample Test. Descriptive statistics, correlation analysis, and regression analysis were used to analyze the data. The finding reveals a positive and significant impact of undergraduates' perceptions of online learning among distance learners. The R2 value is 0.769. Out of 65 undergraduates, 54% of respondents were from the Department of Geography, 28% from the Economics course, 12% from the IT, and the remaining 6% were from international relations subjects. Therefore, fairly various groups of students have been included in the study to express their views. Undergraduates actively joined online education, achieving a 71% participation rate. More than half of the students participated in online education every day and around 29% of respondents attended online learning only once a week. Results revealed that administrative issues, instructor issues, financial problems, technical issues, and skills are the most influential and high-impact aspects of online learning for university students. Most students still had concerns over the affordability and stability of internet access. Furthermore, social interactions and academic skills have less impact on online learning. In contrary, previous findings, undergraduates were generally satisfied with online learning. Nevertheless, combining face-to-face learning with e-learning models may help distance learners cope better with their studies.

Keywords: *Financial issues, e-Learning, technical problems, undergraduates*

[1] Department of Geography, Faculty of Arts, University of Colombo, Sri Lanka
[2] Department of Geography, Faculty of Arts, Kelaniya, Sri Lanka. [3]Department of Geography, Faculty of Arts, University of Colombo, Sri Lanka
Corresponding author: hansipiyuminisansala@gmail.com

The Relationship between Self-Efficacy Beliefs in Learning English as a Second Language and Achievement of Sri Lankan Undergraduates

Gamage G. D. U. P. K.[1], Gamage G. P.[2]

Abstract

Self-efficacy (SE) is the belief that an individual holds his/her own ability to carry out a function or a goal. This adds to the conventional linguistic pedagogical difficulties learners face when learning English as a Second Language (ESL). Therefore, it has been identified as a significant factor that influences an individual when they learn ESL. Hence, the present study investigated the relationship between ESL learners' SE beliefs in learning ESL and achievement. The Questionnaire of English Self-Efficacy (QESE) which has four subscales measuring reading, writing, listening and speaking SEs was administered to collect data and a Researcher Developed Questionnaire (RDQ) was employed in order to gather details about the participants' linguistic background, personal, environmental, and behavioural factors that affect the SE, and their listening and speaking preferences, which gathered demographic information of the participants. Moreover, achievement was measured using the Grade Point Average on ESL of the end semester examination, which assessed students' four skills. Data were collected from 306 second-year basic and intermediate level ESL learners studying at the Faculty of Arts, University of Peradeniya. The questionnaire was distributed in Sinhala and Tamil medium as the sample included both Sinhala and Tamil native speakers. Data were analyzed using Statistical Package for Social Sciences (SPSS.17). Results showed a significant positive correlation between English speaking, listening, reading, and writing SEs and achievement in learning ESL. Furthermore, total English SE (the combination of all four self-efficacies) was positively and strongly correlated with achievement in English language learning. In addition, the results also indicated a significant difference between SE for students who had previous exposure to English speaking environments and those who did not have such an opportunity. Moreover, the present study indicated lower SE in understanding English spoken by native English speakers than local speakers. Thus, Sri Lankan ESL teachers could achieve more from facilitating the ESL learner accordingly by ensuring socio-cultural familiarity or Sri-Lankanization of ESL material while maintaining a conducive environment.

Keywords: *Self-efficacy, English as a second language, achievement, ESL learne*

[1] Department of English Language Teaching, Faculty of Arts, University of Peradeniya, Sri Lanka
[2] Department of Psychology & Counselling, The Open University of Sri Lanka, Nugegoda, Sri Lanka

Corresponding author: dhammikaupk@gmail.com

ISymRU 2021

Engineering and Technology

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

Assessment of RANS Turbulence Models for Prediction of Adiabatic Film Cooling Effectiveness for Shaped Film Holes

Sanjeeva K. P. P.1 ✉, Ranasinghe R. A. C. P.2

Abstract

Film cooling is one of the superior cooling technologies utilized in high-performance gas turbines. Accurate numerical simulations play an important role in designing and analyzing film cooling systems. Comparison of results from existing mathematical models with experimental results is essential to validate models and select suitable models for applications. In order to perform the comparison, three selected RANS turbulence models of Standard k-ω, SST k-ω and realizable k-ε were used to predict the adiabatic film cooling effectiveness without any modification. An experimental case of shaped cooling hole was set up in ANSYS Fluent with the blowing ratio of 3 and density ratio of 1.5 while free stream turbulence was 0.5%. The injection angle of the hole was set to 30^0 while the laidback angle and lateral angle were 7^0. The computational domain consists of a single hole with symmetry boundary conditions while the pitch to diameter ratio was maintained at 6. ANSYS Mesh was used to generate the required mesh for the domain. Mesh sensitivity analysis was performed to identify the mesh independent solution. The Y+ value near the adiabatic hot surface was set to 1.

The numerical results from a realizable k-ε model with enhanced wall treatment have shown good agreement in laterally averaged film cooling effectiveness compared to the other two models. The same model has presented a similar effectiveness pattern in the lateral direction while the other two have shown a bimodal pattern as well as jet skewness. The increase in lateral spreading of the effectiveness in the downstream direction has been captured by a realizable k-e model better than the other two models. The centerline film cooling effectiveness has been over-predicted by the three turbulence models. The over-prediction of centerline effectiveness can be found in the past studies, which has been estimated due to the inability to model the anisotropy of two equation turbulence models. The predictions of realizable k-ε at the downstream location of X/D = 5 have been closer to the experimental results than that of X/D = 30. Thus it can be concluded that the lateral spreading of film cooling effectiveness is not predicted well far downstream.

Keywords: *Adiabatic effectiveness, film cooling, shaped hole, turbulence modeling*

[1] Department of Mechanical and Manufacturing Technology, Faculty of Technology, Wayamba University of Sri Lanka, Sri Lanka
[2] Department of Mechanical Engineering, Faculty of Engineering, University of Moratuwa, Sri Lanka
✉ Corresponding Author: pasan@wyb.ac.lk

Process Simulation-based Life Cycle Mass Flow Analysis for Fuel-grade Bioethanol Production from Water Hyacinth

Abeysuriya D. I.[1], De Silva K. I.[1], Wijesekara N. H. S.[1], Sethunga G. S. M. D. P.[1], Rathnayake M.[1]

Abstract

Water hyacinth is an invasive aquatic weed that rapidly grows and spreads on eutrophic surface water bodies. The significant cellulose and hemicellulose contents along with the low lignin content in water hyacinth make it a potential feedstock for bioethanol production. In particular, the life cycle of bioethanol production from water hyacinth has no cultivation stage, thus free from agricultural operations with harmful environmental emissions as compared to other bioethanol feedstocks. To-date, laboratory-scale studies have been conducted to evaluate the performance of bioethanol production using water hyacinth. Still, comprehensive studies on scaled-up plants are required to assess the feasibility of commercial-scale implementations and the sustainability of bioethanol production using water hyacinth as the feedstock. Hence, this study focuses on evaluating the cradle-to-gate life cycle mass flows of a scaled-up bioethanol production plant using water hyacinth as the feedstock and analysing the mass flows in each process stage. The scaled-up bioethanol production plant was simulated using the Aspen Plus V10 process simulator based on experimental process parameters in the published literature. The mass flow analysis results show that water hyacinth contains 19.2% cellulose, 40.0% hemicellulose, and 4.8% lignin in dry basis after feedstock preparation and drying operations. During the alkali pre-treatment operation, 88% of cellulose has been converted to glucose, whereas 43% of hemicellulose has been converted to xylose and glucose. The yield of simultaneous saccharification and fermentation was reported to be 82% and bioethanol up to 99.7 vol% purity could be obtained after dehydration operation. Further, an overall bioethanol yield of 11.32 L/tonne of water hyacinth which corresponds to 0.17 kg of bioethanol/kg of water hyacinth (in dry basis) was obtained through the mass flow analysis in this study. These findings would support future life cycle assessments and decision-making in implementations of fuel-grade bioethanol production utilizing water hyacinth as the feedstock.

Keywords: *Life cycle assessment* (*LCA*), *mass flow analysis, bioethanol production, water hyacinth, process simulation*

[1] Department of Chemical and Process Engineering, University of Moratuwa, Sri Lanka
Corresponding Author: mratnayake@uom.lk

A Preliminary Study on the pH Compensation Capacity of Encapsulated Calcium Hydroxide in the Simulated Concrete Pore Solution

Natkunarajah K.[1] ✉, Masilamani K.[1], Maheswaran S. [1]

Abstract

The reinforced steel bar is used in the concrete structure to improve its tensile and flexural strength. In a high alkaline environment, a passive protective iron oxide film forms around the steel bar. When the pH of a concrete structure drops below 10, the protective layer is destroyed and the steel bar begins to corrode. One of the most important substances that lowers the pH of a concrete structure is chloride ion. Various research revealed that when the Cl-/OH- ratio reduces from a critical threshold, the corrosion of the steel bar is initiated. The corrosion protection can be achieved by keeping the concrete environment at a higher pH level and maintaining the passive film for a long period of time. Distribution of alkali hydroxides like $Ca(OH)_2$ at later ages using a slow-release technique can be used to stabilize the pH at a higher level. In this work, encapsulated macro capsules were proposed to maintain the pH at a high level for a long period where calcium hydroxide ($Ca(OH)_2$) is used as the active core material of the macro capsule, and the polystyrene resin is used as the coating agent. The pH compensation capacity could be achieved by the slow release of the core material during this process. The macro capsule fabrication process was done by spray drying method using custom-made tools. A preliminary study on the pH compensation ability of the encapsulated macro capsules was tested in the simulated pore solution containing chloride ion (Saturated calcium hydroxide + 3.5% of NaCl) for 80 days. The thickness of the wall and the surrounding pH level affect the releasing rate of the core material. The initial pH value of the simulated pore solution was 12.3. The preliminary analysis reveals that the addition of 3 wt% of macro capsule to the simulated pore solution can maintain the pH level of the solution at high (More than pH 10) up to 60 days in the open air. If the dosage of the macro capsules is increased, it can maintain the pore solution at a higher pH level for more than 60 days. Furthermore, this technique can be used in the concrete industry to increase the durability of the concrete.

Keywords: *pH value, concrete, macro capsules, coating, pore solution*

[1] Department of Chemistry, Faculty of Science, Eastern University, Sri Lanka, Vantharumoolai, Chenkalady 30350, Sri Lanka

✉ Corresponding Author: nkapil27@gmail.com

Vibration Attenuation of Farm Tractor Tiller Units for Enhanced Overall Performance

Patirana S. D.[1] ✉, Perera M.[2], Jayasundara J. W. K. S.[3], Wijerathna U. H. G. S. S.[4]

Abstract

The process of agriculture is being improved with the application of new machinery and technology. In the beginning, the traditional method of ploughing the field with buffaloes was replaced with two-wheel tractors and now with heavy four-wheel tractors. Tilling the soil with rotary blade assembly attached to a four-wheel tractor is the popular method among the farmers due to its high productivity. If the dynamic balance of the assembly is not properly done during the manufacture, farmers will have to experience mechanical efficiency related issues due to the excessive vibrations that builds up beyond the recommended levels. Intense vibrations can cause operator fatigue, high fuel consumption, and excessive component wear shortening the life-time of the equipment. Experiments which were carried out during this study have shown that the imported tillers are not acceptably vibration free as they should be. Due to the lack of facilities and expertise in rotor balancing, farmers doesn't have a choice but to use these tillers. Using machinery with excessive vibrations for a long period of time can cause both financial losses and health issues. This study aims to examine the problem holistically and minimize the vibrations through a method affordable to the local farming community. The results of the study can assist manufacturers to consider making tillers with good dynamic balance to reduce vibrations and associated problems. Secondly, local manufactures are encouraged to produce replaceable blades that do not significantly affect the dynamic balancing. Thirdly, the findings of this study can help to develop a method to check the dynamic balancing of the tiller unit economically and effectively. This study explains the initial steps that has been taken to identify the problem of tiller vibrations and the degree of effectiveness of the in situ dynamic balancing. The balancing trials had reduced the entire vibration level by two folds indicating the initial imbalance. The needed sequence of steps and further measurements are also planned to assure enhanced overall performance of the machine.

Keywords: *Vibration, tractor tiller, rotary blades, dynamic balance, imbalance*

[1] Department of Manufacturing & Industrial Engineering, Faculty of Engineering, University of Peradeniya, Sri Lanka
[2] Department of Mechanical Engineering, Sri Lanka Institute of Information Technology, Sri Lanka
[3] Department of Materials Technology, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka
[4] Skytech Engineering (pvt) ltd, Dehiwala, Sri Lanka
✉ Corresponding author: malika.p@sliit.lk

Investigate the Suitability of Pre-Chlorination with Rapid Sand Filtration as the Treatment Method to Remove Selected Physical and Chemical Parameters from Groundwater – A Pilot Study

Sutharsan M. E.[1] ✉, Meegahakumbura S. P. S.[1]

Abstract

Groundwater sources are very vital in the global drinking water supply as it holds around thirty percentage (30%) of the freshwater quantity of earth. The Murunkan aquifer is one of the most utilized aquifer systems in the Northern Province that catering approximately forty percentage (40%) of potable water demand of the Mannar district. Groundwater intakes of Murunkan have very high yields and daily average extraction is around 10,000 cubic meter per day from several deep wells for drinking water supply. A few physical and chemical properties from the individual wells have occasionally deviate the maximum permissible limit stipulated based on the Sri Lankan Standards for potable water SLS 614:2013. The scope of the pilot study is to investigate the suitability of pre-chlorination with rapid sand filtration as the treatment method to remove selected physical and chemical parameters such as colour, turbidity, pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness, total alkalinity, fluoride, nitrate, nitrite, total phosphate and sulphate from groundwater. A rapid sand filter model was erected at the water intake site and raw water was conveyed through the filter model with pre-chlorination. The pilot filter consists of particle sizes of 25mm, 16mm, 10mm, 2-5mm with layer thickness of 75 mm, 50mm, 30mm, 50mm, respectively, and a filter media with 700 mm layer thickness. Sieved ordinary silica sand was used as filter media and Effective size (D10) and uniformity coefficient (Cu) was found to be 0.425 mm and 2.77 respectively. The chlorine solution is conveyed by a small feeder mechanism, into the water at the inlet point of the rapid sand filter model. A retention time, is maintained between 20-25 minutes to allow oxidation to take place above the sand bed within the rapid sand filter model. The effluent from the filter model was tested for selected parameters based on APHA and SLS standards for 15 trials. Colour removal was observed in 67% of samples while the colour parameter of 93% of treated water samples were within the SLS 614:2013 standards. Turbidity parameter of all treated water samples were within the SLS 614:2013 standards while turbidity removal was observed as 60% of samples. The findings suggest that there is no considerable reduction in pH, EC, TDS, total hardness, total alkalinity, fluoride, total phosphate and sulphate in the treated water by using this treatment method.

Keywords: *Oxidation, chlorination, potable water, rapid sand filtration (RSF), water treatment*

[1] Regional Support Centre (North), National Water Supply and Drainage Board, Sri Lanka.
✉ Corresponding author: edsutharsan@yahoo.com

Prevalence of Unsafe Practices in Air Conditioning and Refrigeration Maintenance Industry in Sri Lanka

Rifan L. M.[1], Attanayake A. M. R. N.[2], Wickramasinghe I. P. M.[1]

Abstract

Refrigerant emissions are one of the major threats to the environment as well as to the humans. The unsafe emissions of refrigerant directly or indirectly have been identified to cause ozone layer depletion and global warming which is detrimental to life on earth. Therefore, identification of the underlying causes of such emissions may help avoiding environmental disasters. The authors hypothesize that the knowledge and attitudes of personnel in refrigeration and air conditioning (RAC) maintenance industry towards the associated environmental effects play a significant role in causing such inadvertent emissions to the environment. The RAC maintenance industries are not uniformly regulated globally. In Sri Lanka, use of air conditioners and refrigerators are steadily increasing. However, there is little or no regulation in place to make sure the environmental safety in relation to the unsafe refrigerant emissions. Data was gathered from 105 technicians and 35 managerial level employees in the RAC sector through structured questionnaires from all over the Sri Lanka. The study provides an insight into the knowledge base and current malpractices in the RAC maintenance industry in Sri Lanka. Besides, it facilitates the identification of each employees' contribution towards the emission of refrigerants and further evaluate the scale of self-realization of the social responsibilities in this regard. From the study, it was found that, 91.4% of maintenance industries does not have any training program for new recruits. Also, the unavailability of refrigerant recycling or recovery systems was seen in 94.3% of the cases. Furthermore, 88.6% of RAC maintenance industries were found to instruct their employees to emit the refrigerants directly into the environment before refilling new refrigerants. Consequently, 92.4% of technicians directly emit the refrigerants to the environment. In addition, 79% of technicians were not familiar with the use of recovery machines to remove refrigerants from cooling appliances. According to the key results and significant outcomes, it is concluded that improper refrigerant handling, poor training programs, insufficient awareness on effects of refrigerant emissions and lack of knowledge on recovery machine are key factors affecting unsafe refrigerant emissions in Sri Lanka.

Keywords: *Environmental and health effects, knowledge and attitude, refrigerants*

[1] Department of Mechanical and Manufacturing Technology, Faculty of Technology, Wayamba University of Sri Lanka, Sri Lanka
[2] Mechanical Technology Division, University College of Kuliyapitiya, Kuliyapitiya, Sri Lanka
Corresponding Author: rifanmhmd214@gmail.com

Modeling Predictive Assessments of Landslide Vulnerability Based on Rainfall Patterns: A Case Study of Badulla District

Dissanayaka D. M. D. S. K.[1] ✉, Malkanthi A. M. C.[1]

Abstract

Having a complex physical landscape with mountain ranges, divided plateaus, and narrow valleys, landslides have become a major type of natural disaster in Badulla District. Extreme rainfall, slope, unplanned agriculture activities and irrigation activities are identified as the major causes for this phenomenon. Thus, the present study aims to identify a relationship between rainfall and landslides to predict landslide vulnerability in selected regions of Badulla district based on seasonal rainfall analysis. Monthly rainfall data and monthly landslide data from 1999 to 2019, collected from the department of National Building Research Organization (NBRO), were used in the study. Python was used to develop the prediction in anaconda platform and Arc GIS was used to select the areas based on Haputhale, Dambethenna and Bandarawela divisional secretariat divisions. Considering the main rainfall stations in the study the Grama Niladari divisions were extracted and based on the GN divisions, landslide data were extracted from the data set to identify the relationship between rainfall and landslide. Seasonal Autoregressive Integrated Moving Average (SARIMA) model was used to predict the seasonal variation and monthly rainfall in the rainfall stations. Based on the lowest Akanke's Information Criterion (AIC) with standard error of 301 and 311, SARIMA model fitted as the best statistical model. The highest rainfall was recorded in 2006 and the lowest rainfall in 2016. In the developed model, the relationship between monthly rainfall and monthly landslide shows a statistically significant correlation with the p value greater than 0.089. A warning is issued for the months that exceed the threshold value of 1.698 for a possible landslide in the selected region. This system can be used for disaster management by notifying the people in vulnerable areas in advance as well as for planning agriculture-based activities to reduce the possible losses.

Keywords: *Landslide vulnerability, python, rainfall, SARIMA model*

[1] Department of Physical Sciences and Technology, Faculty of Applied Science, Sabaragamuwa University of Sri Lanka, Sri Lanka
✉ Corresponding author: dilinidissanayaka18@gmail.com

ISymRU 2021

Interdisciplinary Studies

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

Screen Time and Level of Perceived Stress Among Students of University of Peradeniya During Covid19 Pandemic

Muthukumarana P. C. K.[1] ✉ , Jayasinghe H. C. B. [1], Nusky M. P. M.[1], Pavithra T.[1], Roshan M. J. M.[1], Senadheera V. V.[1], Prasanna A. L. I.[1]

Abstract

In this digital age, the use of screens has become an essential part of life. The COVID19 pandemic has increased the use of screens for various purposes, especially among students. This study was aimed at finding the association between screen time and the level of perceived stress among students of the University of Peradeniya during the COVID19 pandemic. In this cross-sectional study, a pretested questionnaire consisting of the 18 item Screen Time Questionnaire and Perceived Stress Scale questionnaire was distributed via email, and a representative sample (N = 387, mean age = 22.964 ± 1.818) was randomly selected from the responses received. Mean screen time was found to be 13 h 27± 4h 52 min and the most used screen type among males was laptop/computer, and among females, smartphone. 99.74% of the respondents' screen time was found to be higher than the 2 h per day screen time recommendation. The mean perceived stress of the sample was 20.499 ± 5.393. This value is higher than the established norm for the mean PSS-10 score of the 18-29 years age group, which is 14.2 ± 6.2. Spearman correlation for screen time and perceived stress showed an insignificant positive correlation (Spearman rho = 0.132, p = 0.009) between screen time and perceived stress. Mean perceived stress of heavy, moderate, and light screen time categories were 21.371 ± 5.728, 20.744 ± 5.301 and, 19.333 ± 4.949, and mean screen time of high, moderate and, low-stress levels are 14 h 33 min ± 5 h 14 min, 13 h 33 min ± 4 h 42 min and, 10 h 41 min ± 5 h 8min, respectively. Neither screen time nor perceived stress was associated with gender [F (1, 385) = 1.05, p = 0.307]. It was observed that perceived stress had not significantly deviated from pre-pandemic values in comparison to the studies conducted in similar populations in Sri Lanka. In conclusion, the majority of students have moderate perceived stress and the study shows an insignificant positive correlation between screen time and perceived stress during the COVID19 pandemic. Longitudinal studies of assessment of PSS are necessary to find a cause-effect relationship.

Keywords: *COVID19, screen time, perceived stress, University of Peradeniya*

[1] Department of Physiotherapy, Faculty of Allied Health Sciences, University of Peradeniya
✉ Corresponding Author: chammi12b2@gmail.com

Ecological Models to Explain the Distributions of Words in Texts

Punchi-Manage R.[1], Mapa C.[2], Madhushani M.[3], Dilhara M.[1], Karunathilaka P.[4], Amiyangoda L.[2], Ekenayake U.[2]

Abstract

Genesis 1:1 says "*In the beginning was the Word, and the Word was with God, and the Word was God"*. It is found that less than 20% of the words can describe more than 80% of the contents of the word of a text. Pareto's 80:20 rule, power laws, and zip's laws are often used to explain the distribution of the words. However, we think that the ecological models can be also used to describe the distribution of the words. Species abundances of ecological communities are governed by a few dominant species followed by the majority of the rare and the singletons. This caused the species rank-abundance curves to show highly skewed distributions with long right tails; the patterns resemble the word distributions of texts. Ecologists often used three ecological models to explain species rank-abundance curves (*i.e.* Mac-Arthur's' Broken-Stick model, Fisher's log-series model, and Preston's Octave curves). The first step of our research is to use those three ecological models to see whether they could explain the word distributions of texts. For this purpose, we examined the relative frequencies of words in 10 renowned scientific literatures. We found that the relative frequency of word distributions of all the books was characterized each by a few dominant words preceded by a large number of rarely (infrequently) used words, hence causing long-tail distributions. We found Mac-Arthur's Broken-Stick model and Fisher's Log series model poorly explained the word distributions of texts. Also, the observed rank-abundances curves are outside the simulation envelopes of the Broken-Stick models. Further, Fisher's log series models with different alpha values (parameters) could not explain the full pattern (high values explain only the tail distribution and low values explain only the dominant word frequencies). Interestingly, only Preston's Octave curves are closely matched with observed relative word frequencies. Hence, our research emphasizes that the ecological model (*i.e.* Preston's Octave curve) can be applied for statistical linguistics.

Keywords: *Log-series model, broken-stick model, octave curves, relative word distribution*

[1] Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya
[2] Department of Physical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka
[3] Department of Mathematics, Faculty of Engineering, University of Moratuwa
[4] Axiata Digital Labs Pvt. Ltd Level 11, Parkland Building, 33, Park Street, Colombo 02
✉ Corresponding Author: sarangaamila@gmail.com

Accounting for Deaths: Calculative Practices for COVID 19 in Sri Lanka

Senevirathne K. M. S.[1] ✉, Samarasiri N. C.[2]

Abstract

The COVID 19 is a global pandemic that drastically affects the entire system of the world. The pandemic started in China in 2019 and spread worldwide very fast, resulting in around 4.4 million deaths globally. The purpose of this study is to identify the calculative practices by the government for the deaths of COVID 19 in Sri Lanka and contribute to the accounting literature on how accounting interpreted the casualties of a global pandemic. This study provides a novel theoretical structure to understand the role accounting played in reporting and interpreting deaths of COVID 19. The theoretical framework includes biopolitics and governmental management leading to politics introduced by Michel Foucault and Giorgio Agamben. Thanatopolitics helps to understand the role of accounting influenced by the politics of deaths during the COVID 19 pandemic in Sri Lanka. Biopolitics explains how the population is controlled with death rates in Sri Lanka, and how the government manages the situation with power and knowledge relations which is vital under governmental management from a Foucauldian perspective. The study is based on the ontological assumption that subjective reality is socially constructed and interpreted. The study adopts a qualitative interpretivist approach, and research methods include analysis of documents and records available verbally and non-verbally. This research explores traces of accounting used by government authorities in Sri Lanka to report the deaths of COVID 19. The data analysis focuses on the phenomenological perspective under interpretivism. According to the data analysis, the new category named 'COVID 19 deaths' for mortality rates in government reporting reflects the governmental management over citizenry within the country through the healthcare system. The 'counts' of deaths have been reported based on gender and religious requirements. The death rate of COVID was considered a critical factor in making political decisions to protect the country's entire population. The government is vested with the power to change the way of reporting COVID deaths within the biopolitical regime, and it is evident that politics exists in reporting deaths in Sovereign states. The study's main contribution is to the accounting literature by interpreting the role accounting played in reporting the deaths of COVID 19 in Sri Lanka. Further, this research contributes to theory exploring a resilient theoretical structure to identify how power relations within governmental management report deaths in a pandemic situation of COVID 19 and control the population through the information of deaths.

Keywords: *Accounting, biopolitics, COVID 19, deaths, thanatopolitics*

[1] Department of Management of Technology, Faculty of Business, University of Moratuwa, Sri Lanka.
[2] Department of Industrial Management, Faculty of Business, University of Moratuwa, Sri Lanka
✉ Corresponding Author: manulas@uom.lk

The Complexity of Research, and Researching Complexity: A Review of the Options

Pradeep R. M. M.[1] ✉, Morris M.[2]

Abstract

The search for understanding of the complex nature of the world has spawned deeper specialisation and greater diversification in scientific research, together with greater collaboration. A review of the literature suggests that where research is undertaken by different disciplines, misalignment between the respective understandings of the ontology, epistemology and axiology (o-e-a) underpinning the research is not uncommon. To explore this anomaly a mind-map was developed representing how research methodologies were underpinned by o-e-a, drawing on explanations from 35 prominent sources. This initial mind-map was then shared online (DOI: 10.13140/RG.2.2.13395.50721) and discussion was invited. A dozen experienced, international researchers, representing business administration/economics, logistic, operational research, sociology, environmental science, medicine, education, architecture and computing, critiqued the mind-map, and these contributions and supporting references were used to further chart the challenges of such collaborative working. The prevailing research approach to technical/scientific challenges continues to build on the conventional 'Newtonian' research paradigm, premised on physical entities being controllable, measurable, predictable and with a linear logic to equilibrium. The nature of collaboration appears to be in transition from multidisciplinarity to interdisciplinarity categorised by more integrative collegiate relations between disciplines. Such approaches have not however proven sufficiently robust to address the challenges of the complexity characterising socio-ecological systems. Such systems typically involve multiple diverse stakeholders, multiple uncertainties – unknown unknowns rather than missing data – and widespread disagreement and weak capacity amongst decision-makers. Collaboration in such circumstances needs to take the form of integrative research between scientific and non-scientific communities allowing for new and iterative forms of learning and problem-solving to emerge. This requires researchers to step outside their comfort zone (i.e. 'research as usual') to understand scientific questions through the blend of different perspectives thrown up by complexity, and is termed 'trans-disciplinarity'. Examples of such framing are provided by case studies on water security and catchment governance in Southern Africa. The challenge to academia where research extends beyond scientific disciplines to address issues of real-world complexity, is establishing whose o-e-a counts – that of the researchers, or the knowledge users? The paper argues for greater awareness of these broader contextual dimensions amongst the research community. Bound to epistemological, ontological, and axiological orthodoxies, research struggles with growing socio-ecological complexity. Academia generally, but research students, in particular, need to be facilitated in understanding the implications of complexity, in recognizing diverse worldviews and in respecting the plurality of knowledge, in their efforts to create a deeper, more effective understanding of reality.

Keywords: *Complexity, Discipline Collaboration, Research Methodologies, Ontology Epistemology Axiology*

[1] Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Rathmalana, Sri Lanka
[2] World Wildlife Fund -UK & Natural Resources Institute, University of Greenwich, London, United Kingdom
✉ Corresponding Author: pradeep@kdu.ac.lk

Job Satisfaction among Public Sector Extension Personnel in the Smallholder Rubber Sector: Special Focus on the *Moneragala* District of Sri Lanka

Gunarathne P. K. K. S.[1] ✉, Tennakoon T. M. S. P. K.[2], Edirisinghe J. C.[3], Jayasundara K. K. I.[1]

Abstract

The development and dissemination of new technologies on rubber farming are essential for the development of the smallholder rubber sector in *Moneragala* by the public extension services. Rubber Extension Officers (REOs) and Rubber Development Officers (RDOs) are the key public sector Extension Personal (EP) attached to the Advisory Services Department which is the extension arm of the Rubber Research Institute of Sri Lanka and Rubber Development Department, respectively at the grass-root level in *Moneragala*. Both REOs and RDOs coordinate and conduct extension activities to achieve national rubber production targets according to the rubber master plan. This study aims to assess the Job Satisfaction (JS) of EP. Data were collected from 35 EP in 2020, using a structured questionnaire. JS and its features were measured using a five-point attitude scale. The respondents were separated into three groups of JS *viz.* low, medium and high based on their JS by using the confidence interval method and the EP were categorized as follows; Low JS Group (LJSG), Medium JS Group (MJSG) and High JS Group (HJSG). Descriptive statistics and Spearman's correlation analysis were employed in the methodology. A greater proportion (50%) of the EP was found in LJSG whilst 20% were found in HJSG. MJSG consists of 30% of the EP. The study sample represented 95% male EP. The age of extension personnel ranged from 25 to 53 years and the majority (38%) were in the 46-55 years category. Opportunities for growth and promotion (r=0.6463), work experience (r=0.5652), mode of travelling (motor bicycles) (r=0.3671), compensation (salary and incentives) (r= 0.8852) and working hours (r=0.6854) were positively correlated with the JS, while age (r=-0.1562), work environment/safety (r=-0.1462) and target achievements (r=-0.1468) were negatively correlated with the JS. These findings will help the policymakers for the boosting of JS of EP and it will improve the performance of the rubber sector in *Moneragala*.

Keywords: *Extension personnel, job satisfaction, rubber*

[1] Rubber Research Institute of Sri Lanka, Sri Lanka
[2] University of Sri Jayewardenepura, Sri Lanka
[3] Wayamba University of Sri Lanka, Sri Lanka
✉ Corresponding Author: kapila.s.gunarathne@gmail.com

Spatial and Temporal Variation of Surface Chlorophyll-A and Sea Surface Temperature Over Coral Growing Territorial Water of Sri Lanka

Thilakarathne E. P. D. N.[1] ✉, Liyanage N. P. P.[1], Jayamanne S. C.[1], Sandamali G. A. J.[1]

Abstract

Environmental drivers on coral reef ecosystems vary spatially and temporally with natural or anthropogenic induces. Reef structure, function, extent, growth rate, quantity, diversity, and species, are influenced by such environmental variabilities. Understanding the dynamics of abiotic–biotic interactions requires accurate characterization of environmental drivers on reef ecosystems. Hence, this study reports the chlorophyll-a concentrations and Sea Surface Temperature (SST) demarcated by remote sensing techniques in territorial waters (12 nm zone) where the majority of coral reefs are situating around Sri Lanka, in periods of different monsoon patterns (First inter-monsoon, Southwest monsoon, second inter-monsoon, and Northeast monsoon) are occurring from 2005 to 2020. Hence, Moderate Resolution Imaging Spectroradiometer (MODIS) aqua images of Chlorophyll-a and SST which were taken as three per month were analyzed by SeaDAS 7.5.3, and then ArcGIS 10.8 was used to clip reprojected raster layer into 12 nm zone from the baseline of the country. Those were further clipped into different study regions as Eastern, Northern, Southeast, Southwest, and Northwest regions concerning climatic patterns. Significantly different ($p<0.05$) mean chlorophyll-a concentrations and SST resulted for the above different study regions during the 2005-2020 period. The mean chlorophyll-a concentrations and SST also differed significantly ($p<0.05$) to different monsoon patterns affected throughout the study period. The highest mean chlorophyll-a value (3.75 mg/m^3) was recorded during the southwest monsoon period in the Southwestern territorial water while the lowest value (0.40 mg/m^3) was in the Southeastern territorial water during the first inter monsoon. The highest mean SST value (29.51 ^0C) was recorded in the Northern region during the first inter monsoon while the lowest SST (18.96 ^0C) was in the Southwestern region during the Southwest monsoon. Observed irregularities of chlorophyll-a could be due to nutrients drained from terrestrial water runoff with activated monsoon patterns. Sometimes, the upwelling of nutrient-rich cool water into the upper layers could occur with the activated monsoon. Weather conditions, changes of current patterns, activation or deactivation of upwelling systems, and extreme conditions might have caused those variations of SST in different regions and monsoon patterns. Therefore, corals in these 12 nm zones must be sustained with those highly dynamic conditions in different monsoon periods of the year, and therefore, coral conservation strategies are better to be adjusted accordingly.

Keywords: *Coral reefs, ocean color, threats to corals, phytoplankton density, ocean climate*

[1]Department of Animal Science, Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka, Sri Lanka

✉ Corresponding Author: epdarshananuwan@gmail.com

n-Allopathic Covid-19 Self-Management Practices Adopted by Rural Communities in Sri Lanka: Preliminary Findings from A Qualitative Study

Kaludewa H. N.[1] ✉, Agampodi T. C.[1], Weerakoon K. G.[1], Liyanage C.[2] , Dikomitis L.[3], Agampodi S. B.[1]

Abstract

COVID -19 pandemic is one of the biggest health crises the world has faced in recent years. During the ongoing COVID-19 pandemic communities had to rely mostly on public health preventive practices in order to safeguard themselves against the disease, particularly in the initial stages of the disease with limited therapeutic options. While the health authorities of Sri Lanka exercised evidence-based public health measures, we observed a tendency of the public to go beyond allopathic medicine. They adopted traditional knowledge, ayurvedic, and religious practices as preventative measures against COVID-19. The objective of this study was to explore non-allopathic self-management practices adopted by rural communities to safeguard physical and mental and social wellbeing during the COVID-19 pandemic. Thirty purposefully selected community members from Padaviya, Thalawa, and Nachchaduwa medical officer of health (MOH) areas of Anuradhapura District, Sri Lanka were invited to document their daily activities in a diary for a month, from May 2021 to June 2021 as a part of a larger ethnographic study (ECLIPSE). We received twenty-seven diaries from twelve male and fifteen female participants. We conducted a thematic analysis with a special focus on COVID-19 related content. Religious and health practices adopted by the participants were identified in the analysis. Health practices included traditional knowledge and ayurvedic practices. A total of eleven non-allopathic preventative self-management practices were recognized and categorized under these themes and subthemes. Numerous religious, traditional and ayurvedic practices for mental, physical and social wellbeing are adopted in rural communities in Anuradhapura. Generating scientific evidence on the physical and psychological impact of these practices will be beneficial.

***Keywords**: COVID-19, public health, qualitative research, non-allopathic medicine, diary study*

[1] Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
[2] Faculty of Arts, University of Colombo
[3] Keele University
✉ Corresponding Author: hasaranuwangi@gmail.com

ISymRU 2021

Management and Economics

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

Corporate Governance and Corporate Social Responsibility Disclosures: Australian and Sri Lankan Market

Pratheepkanth P. [1]

Abstract

This study intends to investigate the effect of corporate governance (CG) on corporate social responsibility (CSR) disclosures of Australian and Sri Lankan listed firms for the period of 2020 to 2016. This study's comparison data comes from 100 Australian (ASX200-listed) firms and 100 Sri Lankan firms (Colombo-stock-exchange-listed firms). A quantitative research strategy employing secondary data is used to answer the study questions. Prior CSR literature was used to develop the checklist. Multiple regression analysis is used in this study to look into the relationship between various governance variables such as board size, board independence, CEO duality and the proportion of female directors, and the extent of CSR disclosures. It was found that the size of the board, board independence, and the number of female directors of the Australian firms have significant effects on the amount of CSR disclosures made than the Sri Lankan firms. CEO duality, on the other hand, appears to be insignificantly related with the degree of CSR disclosures in Australian and Sri Lankan firms, according to the results. This study addresses a gap in the literature by providing comparative study on the influence of CG on CSR disclosures. It also warns regulators, and practitioners in the emerging countries to pay more attention to CG reforms and enforcement, as well as enhance institutional constraints on CSR adaptation.

Keywords: *Corporate governance, board size, board independence, corporate social responsibility disclosures*

[1] Department of Accounting, University of Jaffna, Sri Lanka
Corresponding Author: ppratheepkanth84@yahoo.com

Determinants of Board and Audit Committee Meeting Frequency: Evidence from Sri Lanka

Pratheepkanth P.[1] ✉

Abstract

This study aims to look at the factors that influence the frequency of board and audit committee meetings in Sri Lankan listed firms. The factors investigated are connected to the board attributes and ownership structure. Using a sample of 100 Sri Lankan listed firms from 2016 to 2020, this study uses a multiple linear regression model. The frequency of board and audit committee meetings is unrelated to ownership concentration. Both the frequency of board meetings and the frequency of audit committee meetings are negatively correlated with insider ownership. The board and the audit committee activity are positively associated with the proportion of independent directors on the board. The size of the board, as well as the audit committee, is not a significant factor of meeting frequency. There is no significant link between CEO duality and the dependent variables. The size of the audit committee has a positive relationship with the frequency of board or audit committee meetings. This study addresses a gap in the literature by providing a study on the determinants of board and audit committee meeting frequency. It also warns regulators, and practitioners in the emerging countries to pay more attention to CG reforms and enforcement.

Keywords: *Board meetings, audit committee meetings, corporate governance, Sri Lanka*

[1] Department of Accounting, University of Jaffna Sri Lanka, Sri Lanka
✉ Corresponding Author: ppratheepkanth84@yahoo.com

Chief Executive Officer's Turnover Announcements and Stock Return: A Case of Sri Lankan Stock Market

Nimalathasan[1] ✉, Ramesh S.[1]

Abstract

This study investigates Chief Executive Officer's Turnover Announcements and Stock Return, employing a sample of 89 CEO turnover events from the Colombo Stock Exchange (CSE) that represent various industrial sectors from 2015 to 2019. The results are obtained using standard event research methods. The results show the biggest impressive negative AARs of -0.14% and a strong negative significant (t=-3.9) at the 1% level obtained on the event date. This result demonstrates that the CEO's change announcements include considerable negative information for the CSE. The market, on average, reacts negatively to a firm's unique informative event. Furthermore, throughout the 21-day window period, negative cumulative average abnormal returns (CAARs) of -0.26 percent were discovered. According to these negative CAARs, investors anticipate that this incident will result in incrementally negative future cash flows for the CSE. In addition to these findings, the rapid market reaction lends credence to the efficient market theory and the efficient information transmission mechanism to investors, since stock prices adapt extremely fast to changes in CEO information. Furthermore, participants in the stock market cannot gain abnormal profits by trading in the stock on and after the event day. Despite the fact that the event day is unprofitable, the market is informationally efficient as a result of the companies' connected informational events.

Keywords: A*bnormal returns, CEO turnover, market efficiency,*

[1] Department of Accounting, Faculty of Management Studies and Commerce, University of Jaffna, Sri Lanka
✉Corresponding Author: nimal@univ.jfn,ac.lk

Exploring the Nexus between Teleworking and Job Satisfaction with Mediating Role of Work Family Conflict during COVID-19 Pandemic

Jayasekara A. J.[1], **Weeraman A. P.**[2]

Abstract

Sri Lanka Government has introduced health guidelines related to the COVID-19 pandemic and all business bodies had to follow them while fulfilling the daily needs and the targets of their entities. To continue the business operations smoothly the concept of teleworking was introduced to government and private sector institutions. However, the deviation of labour environment and substituting with twin roles in similar time slots will be caused to the reason of the variation in job satisfaction of the employee. Identifying the bond between the experiences of teleworking and job satisfaction was the core objective of the study. To understand the nature of the influence of work-family conflict on the association between teleworking experience and job satisfaction as a role of mediator was the secondary objective. Forty three workers were used as the respondents of the study who were gained virtual office experience for the first time of the selected company in the COVID-19 pandemic period. A standard questionnaire was used to gather primary data through an email survey. The engagement period of teleworking was measured by the degree of teleworking and it was identified as a predictor variable. The Minnesota Satisfaction Questionnaire was used to measure job satisfaction in the reference period as the outcome variable. Work-Family conflict was measured through a standard multidimensional scale. To identify the bond between teleworking experience and job satisfaction, the Chi-Square test of independence and to identify the impact, the Kruskal-Wallis H test was used as inferential techniques. The Cronbach's Alpha was used to verify the reliability and the coefficient was 0.798. That was verified the questionnaire is reliable. Outcomes were disclosed that there is positively affecting the job satisfaction in teleworking, especially the working period six to eight hours and more than that. The hypothesis is proved that there is an influence on the observed mediating role on the linkage of teleworking experience and job satisfaction during the pandemic. Dependence on the results of the study may help the decision-makers of the business entities to decide on investment of virtual working programs within their working schedules.

Keywords: *COVID-19 pandemic, job satisfaction, virtual office, work family conflict*

[1] Department of Economics, University of Ruhuna, Matara, Sri Lanka
[2] ATG Hand Care (Pvt) Ltd, Koggala, Sri Lanka
Corresponding Author: anne@econ.ruh.ac.lk

The Linkage between Organizational Commitment and Employee Turnover Intention with Special Reference to Generation Y of ABC Holdings (Pvt) Ltd.

Weerarathna R. S.[1] ✉, Somawardana W. S. D.[2], Weerasinghe W. A. P. D.[3]

Abstract

A committed workforce is the greatest asset that drives organizations to success while preventing them from failures. The generation Y workers are the future generation employees and most of them are the least committed to retaining with the same organization during their career when compared to those preceding generations. The aim of this paper focuses on the general problem that addresses turnover intention of agency staff and the gap of organizational commitment of this company which keeps employees from performance and productivity. The main purpose of this study is to investigate the relationship between organizational commitment and turnover intention with a special reference to generation Y workforce in ABC Holdings (Pvt) Ltd. This research approach was quantitative, with a cross-sectional survey design. A systematic questionnaire was used to collect data. The questionnaire was shared with all three agency departments in ABC Holdings (Pvt) Ltd. No sampling was considered as the researcher had approached a complete enumeration with 100 employees. With the aid of SPSS, primary data was analyzed employing the data tool, correlation. As a result, the researcher claimed that there is a strong negative relationship between the turnover intention and organizational commitment with agency staff. According to the results, the generation Y workforce have no committed intention to remain in this organization and they feel that 'job hopping' is a trend these days and seek external job opportunities. The study findings indicate that top management attention is essential to create a strong organizational commitment. In this strategy, employee engagement as well as employee wellbeing and productivity are concerns to minimize possibilities for employee turnover intention.

Keywords: *Employee turnover intention, organizational commitment, generation y*

[1] SLIIT Business School, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka
[2] Faculty of Management & Finance, University of Colombo, Colombo, Sri Lanka
[3] Cardiff Metropolitan University, United Kingdom
✉ Corresponding Author: ranitha.w@sliit.lk

Application of DMAIC Approach to Reduce On-Time Delivery Failures in a Fabric Printing Plant

Fernando H. A. S.[1] ✉, **Ranasinghe G. M.**[2]

Abstract

On-time delivery is one of the key indicators of any industry's performance, and the apparel industry is no exception. As one of the top apparel producers of the world and as a major contributor to the Sri Lankan economy, ensuring on-time delivery across the supply chain has become one of the critical requirements of the Sri Lankan apparel industry. Given that, we identify the importance of addressing on-time delivery failures and apply the six-sigma DMAIC (i.e., Define; Measure; Analyze: Improve; Control) approach to a selected fabric printing plant in Sri Lanka. The main objective of this study is to identify the root causes of on-time delivery failures and provide recommendations to address the identified causes. Among various reasons, we focus our analysis on the six most frequently occurring reasons (i.e., production drop, absenteeism, hanger delay, efficiency drop, quality issues and, first-day drop) using historical data. We also observe the delivery variation using the Outside-In Span metric and visualize the root causes for the on-time delivery failures using the fishbone diagram. The study also identifies the possible preventive actions to address each root cause of on-time delivery failures by conducting brainstorming sessions with industry personnel. The study suggests that conducting motion studies, implementing a proper performance appraisal system, assigning skill printers to get bulk approval, analyzing daily production downtime, creating effective line layouts, use of Kaizen and Yamazumi methods, conducting equipment audits, and enhancing production capability and infrastructure can help improve the on-time delivery performance. The results also suggested that with the implementation of these recommendations, the organization reduced its delivery variation from 14.05 days to 6.8 days. Thus, this study provides important implications to the industry while fulfilling the empirical gap in the relevant literature.

Keywords: *Delivery performance, DMAIC approach, fabric printing plant, on-time delivery*

[1] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
[2] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
✉ Corresponding Author: gayani.ranasinghe@wyb.ac.lk

The Effect of Job Rotation on Career Development of Administrative Staff in Sri Lankan Universities

Wijekoon A. S. K. [1], **Deegahawature M. M. D. R.**[2]

Abstract

Though organizations adopt career development (CD) as a strategy to motivate and retain employees, the administrative staff in Sri Lankan universities is stagnated in lower-level positions in the hierarchy thus, higher positions remain vacant due to the scant number of applicants. Drawing upon the employee learning theory and social learning theory of career counselling, this study investigates the possibility of using job rotation (JR) as a strategy to spur administrative staff for CD since lateral movement among administrative jobs is possible. Therefore, the main objective of the study is to find the impact of JR on CD. Since the Sri Lankan university system consists of old and new universities based on whether they were established before or after 1990, the study attempts to identify differences in JR and CD between the two groups. The study randomly selected three universities from each group where the population was 195 administrative staff. The sample consists of purposely selected 130 administrative staff that includes 80 from old universities. The response rate for the structured questionnaire was 53 percent. JR was assessed by two variables namely, interest in JR and JR rate while CD by promotional rate, adopting previously tested and validated measures. The study employed a 4-item scale for the interest in JR. The JR rate, the frequency of lateral transfers among jobs, was measured by dividing the number of rotations by the number of years of tenure in the universities. The promotional rate, the frequency of promotions, was measured by dividing the number of promotions by the number of years of tenure. Results of the t-test report no significant difference in focal variables between old and new universities. Results of multiple regression ($F=5.55$, $p<.01$; R-square $=.15$, $p<.05$) report that though interest in JR positively influences CD ($\beta=.33$, $p<.01$), there is no significant influence from JR rate ($\beta=-.04$, $p=.77$). Hence, the interest in JR is conducive to CD. However, the number of rotations does not influence CD. This may be due to the extemporary rotation or use of JR as a sanction, arousing negative perception among those who were frequently rotated. Accordingly, though the frequent job rotations will not be an appropriate strategy, the universities can encourage administrative staff for CD by influencing their interest in JR. Also, the interest in JR, policies and practices of JR, and CD are uniform across the old and new universities, demanding a common endeavour to address the prevailing issue

Keywords: *Career development, interest in job rotation, job rotation rate, university administrative staff in Sri Lanka*

[1] Non-Academic Establishment Division, Wayamba University of Sri Lanka, Sri Lanka
[2] Department of Industrial Management, Wayamba University of Sri Lanka, Sri Lanka
Corresponding Author: dharsana@wyb.ac.lk

E-Interns Job Satisfaction at Work from Home

Chandradasa I.[1] ✉, **Liynapathirana Y.**[2]

Abstract

Advancements in technology bring new forms to the world and working from home is one of evolving trends that allows employees to work in the home setting. During the COVID 19 epidemic, work from home became popular in Sri Lankan organizations. Work from home provides opportunities for undergraduates to complete their internships in both local and international organizations in their homes. When this work-from-home trend continues in the future it is important to know about the job satisfaction of interns because this is the continuing trend, and they are the future of the world of work. Moreover, the internship is the entry stage of interns to career life and ensuring the satisfaction of them is paramount important to individuals, organizations and finally to the country. Hence, this study was carried out to examine the job satisfaction of e-interns who work in work-from-home settings. The current study is a quantitative study and data collected from 117 management e-interns in three different state universities located in the Colombo district. A structured questionnaire was used to collect data from respondents and a convenience sample technique was employed. Gathered data analyzed by using SPSS. Study results indicated that job characteristics, supervisor support, flexible schedules, financial compensation, and learning opportunities, and feedback have a significant positive influence on e-interns job satisfaction in work from home setting. Further, this study found that the quality of mentoring has no significant influence on e-interns job satisfaction and lack of awareness about that might be a possible reason for that. This study identified the indicators that influence e-interns job satisfaction in work from home setting and finding beneficial to the universities and policymakers to prepare management graduates with skills and experiences appropriate to their field of study, while still adhering to work from home norms and adaptations. Further, organizations can rearrange and make strategies to their internship programs to ensure the job satisfaction of e-interns in their organization and it will be beneficial to interns, organization, and the future world of work. Finally, to guarantee that the internship program's learning goals are met, all interested parties must evaluate all satisfaction criteria that may create more complete insights into the dynamics. Due to the several constraints, the sample is limited to 117 and future studies can expand the study to a larger sample to make a valuable contribution to the field of study phenomena.

Keywords: *E-intern's job satisfaction, management undergraduates, work from home (WFH)*

[1] University of Ruhuna, Sri Lanka
[2] Gampaha Wickramarachchi University of Indigenous Medicine, Sri Lanka
✉Corresponding author: isuru@mgt.ruh.ac.lk

Nexus Between Communication Satisfaction, Organizational Commitment and Organizational Citizenship Behaviour: Case of the Advertising Industry in Kurunegala District, Sri Lanka

Tennakoon W. D. N. S. M.[1] ✉, Gunawardhana G. L. N. M.[1]

Abstract

The prevailing literature reported Organizational Citizenship Behaviour (OCB) as a fundamental requirement for superior performance. Again, Communication Satisfaction (CS) is a crucial determinant of OCB, which denotes the level of organizational positioning within the employees. Organizational Commitment (OC) is an individual-level job-related attitude that governs the performance of corporate members. Likewise, the role of OC appears to be mediating the above relationship that needs empirical support. Thus, this study aims to assert the empirical shreds of evidence for the impact of communication satisfaction on OCB with the mediating effect of the organizational commitment. The advertising industry based on Kurunegala District of Sri Lanka was the study site with inviolable demand for superior organizational performance due to intensive rivalry within the industry. The study equipped a quantitative inquiry with non-managerial level employees (N = 100) from three advertising agencies selected on a random basis. OCB (Civic virtue, Conscientious, Courtesy, Altruism, and Sportsmanship), CS (Interpersonal, Group, and Organizational), and OC (Affective, Normative, and Continuance) were the dimension of three variables. The standardized instruments with a response scale of five choices assessed the responses. The multiple regression and Sobel test evaluated the hypotheses. The study found a strong explanatory power of communication satisfaction to predict the OCB. Specifically, individual and group level satisfaction account for a more significant variation in OCB. The organizational commitment partially mediated the above relationship between communication satisfaction and OCB. The study implications confirm the influence of communication satisfaction on the OCB. Again, it established the mediating role of organizational commitment on the said association. Hence, practitioners should treat communication satisfaction and organizational commitment as sovereign sources.

Keywords: *advertising industry, communication satisfaction, organizational citizenship behaviour (OCB), organizational commitment*

[1] Department of Business Management, Faculty of Business Studies & Finance, Wayamba University of Sri Lanka, Sri Lanka
✉ Corresponding Author: tennakoon@wyb.ac.lk

Examine the Impact of Service Quality Dimensions on Customer Satisfaction at Fast Food Outlets in Ratnapura District, Sri Lanka

Jayarathna P. D. N. A. B.[1] ✉, Rathnayaka R. M. D. L.[2]

Abstract

There is a boundless and developing concern in the fast food industry concerning the quality of service, which has a more prominent effect for organizations' survival and continuity. The quality of service is the fundamental for customer satisfaction and practical upper hand in the cutthroat business environment. This study was conducted to examine the impact of service quality dimensions on customer satisfaction at fast food outlets in Ratnapura district, Sri Lanka. The researchers considered many researches in the field of service quality in other countries to identify which factors influence service quality. Few scholarly investigations address service quality and customer satisfaction in fast-food restaurants (Lee and Ulgado, 1997, Qin and Prybutok, 2008). Notwithstanding, there is no past concentrate on which looks at the effect of service quality dimensions on customer satisfaction of any fast-food restaurant in Sri Lankan setting. From these factors, this study evaluated seven dimensions in the domain of service quality in the fast food industry, which affect customer satisfaction. The research was conducted through a quantitative approach. Further, self-administered questionnaires have taken as the tool to collect primary data for the research. Total of 146 completed questionnaires were used in the analysis. The researchers found out that assurance, empathy, cleanliness, food quality, reliability, responsiveness and tangibles show a significant positive relationship with customer satisfaction at fast food outlets in Ratnapura district, Sri Lanka. Moreover, it was disclosed that assurance, cleanliness, reliability, responsiveness and tangibles have an impact on customer satisfaction at fast food outlets in Ratnapura district, Sri Lanka. The remaining dimensions named empathy and food quality are not statistically significant in the output of multiple regression. Besides, the study revealed that there are additional service quality factors that would make an effect on customer satisfaction at fast food outlets in Ratnapura district, Sri Lanka. Moreover, the researchers found that empathy and food quality have a positive relationship with customer satisfaction in fast food restaurants. While alluding to the literature, the researchers additionally observed that food quality is the prominent service quality aspect which sways consumer satisfaction in fast food outlets in Pakistan, Malaysia and China. The researchers would like to suggest future researchers conduct the same study by using different customer segments or expand to a larger sample size or geographical area; and might get advanced and more practical results with actual situations regarding customer satisfaction.

***Keywords**: Customer satisfaction, fast food industry, service quality*

[1] Department of Tourism and Hospitality, Faculty of Management, Management and Science Institute, Sri Lanka
[2] Department of Science, Faculty of Sciences, Uva Wellassa University of Sri Lanka, Sri Lanka
✉ Corresponding Author: amandajay.hr@gmail.com

Productivity Changes of Major Agricultural Crops in Sri Lanka: A Comparison Among Main Countries in The World

Hatharasinghe H. K. A. P.[1] ✉, Jayamanne D. N. T.[1], Athukorala W.[2]

Abstract

Main objective of this study is to identify the productivity changes of tea, rubber, coconuts and rice in Sri Lanka over the last 5 decades (1970-2019). It also compares the land productivity with the top 10 countries that cultivate mainly those selected crops. Secondary data extracted from Food and Agricultural Organization (FAO) on cultivated area and the annual production for selected crops are used in the analysis. The study estimated 10 years averages of the productivity for selected crops and then average productivity changes between 1970-1979 and 2010-2019 are compared between countries for each crop. The results show that average productivity differences for tea, rubber, coconuts and rice are 1.18, 0.63, 1.14 and 2.23(000MT/ha) respectively for all countries. Estimated productivity growth rates for the same crops were found as 123.01%, 108.48%, 30.47% and 77.4% during the study period. When considering the country specific productivity changes, a significant variation could be found. The highest productivity growth rates for tea, rubber, coconuts and rice are recorded in Iran, Philippine, Papua New Guinea,Vietnam while the lowest growth rates were recorded in Japan, Nigeria, Vanuatu and Japan. The productivity growth rate of paddy and tea in Sri Lanka is 84.18%, 74.42% while the growth rate of productivity for rubber and coconut are 72.31%, 51.15 % respectively. This study also compares the productivity difference between developed and developing countries and found that productivity growth of developed countries is relatively higher than developing countries. Sri Lankan tea productivity growth rate is greater than Japan, Bangladesh, Indonesia and India out of ten countries. Among the top ten rubber producing countries, Sri Lankan rubber productivity growth rate is greater than five other countries. The findings of this study will help policy makers to understand the relative position of Sri Lankan productivity growth and take necessary action to boost agricultural productivity of above crops in Sri Lanka.

***Keywords**: Agriculture, productivity, comparison, Sri Lanka*

[1] Post Graduate Institute of Humanities and Social Sciences, University of Peradeniya, Sri Lanka
[2] Department of Economics and Statistics, Faculty of Arts, University of Peradeniya, Sri Lanka
✉ Corresponding Author: ayesha.hatharasinghe@yahoo.com

Frugal Innovation and SMEs in Sri Lanka

Perera R. L.[1] ✉, **Perera R. S.**[2]

Abstract

Over the past years, in several developing economies, frugal innovation (FI) has gained its traction as a type of resource constrained innovation which originated from emerging economies like India and China targeting low and middle income customers who are neglected by the high priced products of mainstream innovations which originated from advanced economies. FI can be identified as a product or a service innovation which simultaneously meets significant cost reduction, concentration on core functionalities and optimal functionality level and it is generally sourced by both large scale firms and small and medium scale enterprises (SMEs). However, it seems that the term of FI is not popular in Sri Lanka as a developing country context. Hence, this research is posited in order to investigate the potential of FIs among the SMEs in Sri Lanka and the objective of this research is to identify the opportunities and the barriers with SMEs towards FI in Sri Lanka. This study applied a qualitative research approach and collected data through interviews with ten respondents including SMEs, academicians, government and non-government organization officers. After analysing the interview data using content analysis, this research revealed attitudes of customers and SMEs, weak marketing and lack of awareness of SMEs as barriers and sustainability orientation, business ecosystem and internationalization as opportunities towards FI of SMEs in Sri Lanka. As per prior research, FI has proved its benefits in several countries by ensuring sustainability. Therefore, encouraging FI among SMEs allows more sustainable businesses among SMEs. Hence, policy making and university-industry linkages should be in line with promotion of FIs among SMEs in Sri Lanka by utilizing the opportunities and minimizing the barriers. Finally, it is recommended to conduct surveys with a large number of customers and SMEs in order to confirm these findings with quantitative data and methods.

Keywords: *Frugal innovation, low cost innovation, SMEs, Sri Lanka*

[1] School of Management, Asian Institute of Technology, Thailand
[2] Faculty of Fisheries and Marine Sciences, University of Ruhuna, Sri Lanka
✉ Corresponding Author: ranjika.perera@gmail.com

The Impact of Mobile Banking on Customer Loyalty: Evidence from Commercial Banks in Sri Lanka

Karunarathne K. P. P.[1] ✉, **Madurangi R. K. M.**[1] ✉, **Walakumbura S. H. M. L.**[2] ✉

Abstract

Every organization needs to adhere with innovative strategies to be successful in the competitive environment. Marketing decisions get a prominent place and provide sustainable competitive advantage to the organizations. Hence the dramatical increment of mobile usage caused to implement the mobile marketing strategies even in the banking sector. This study covers the mobile banking concept which comes under mobile marketing. It is necessary to identify the impact of mobile marketing on customer loyalty because organizations design strategies to retain their customers for a long time. Hence the researcher has developed this study to find the impact of mobile marketing on customer loyalty with evidence of commercial banks in Sri Lanka. Customer attitude, customer trust and perceived usefulness were taken as independent variables and customer loyalty has been considered as a dependent variable of the study. Validated and reliable self-administrative, five-point likert scale rating structured questionnaire developed by the researcher with two sections. The questionnaire comprised two subsects as section one and section two. Section one concerned about the demographic characteristics of the respondents while section two gathered data about mobile marketing and customer loyalty. The structured questionnaire has been distributed among 150 respondents to gather primary data. Deductive research approach used for the study using survey strategy with convenient sampling method. The researcher has used descriptive statistics and inferential statistics such as multiple regression analysis and Pearson correlation analysis. The researcher has used Cronbach Alpha to find the reliability and KMO and Bartlett's Test to find out the validity. The Pearson correlation matrix used to identify the relationship between mobile marketing and customer loyalty and it revealed a positive relationship. Regression analysis employed to discover the impact of mobile marketing on customer loyalty, and results show that the significance impact. Customer trust, customer attitude and perceived usefulness have a significant positive impact on customer loyalty of commercial banks in Sri Lanka. Findings of the study can be used to enhance the customer experience with mobile marketing in order to increase customer loyalty for the banking industry. in Sri Lanka. Findings of the study will fulfil the existing literature gap in the developing context like Sri Lanka concerning mobile banking and customer loyalty.

Keywords: *Customer Loyalty, Marketing Strategy, Mobile Banking, Mobile Marketing*

[1] Department of Marketing Management, Faculty of management Studies, Sabaragamuwa University of Sri Lanka, Sri Lanka.
[2] Department of Accountancy and Finance Management, Faculty of management Studies, Sabaragamuwa University of Sri Lanka, Sri Lanka
✉ Corresponding Author: poppubudu@gmail.com, maleeshiya.rajapaksha@gmail.com, lakminiwalakumbura2@gmail.com

Systematic Literature Review on Social Entrepreneurship Concept

Amarawansha T. G. A. H. C.[1] ✉, Gamage P. G. M. S. K.[2], Jayawardhana K.[3], Fernando P. I. N.[4], Siyambalapitiya J.[5], Premadasa I. V. M. N.[6]

Abstract

The extant literature on social entrepreneurship has advanced over the last three decades. The core purpose of social entrepreneurship is to offer innovative solutions for the social problems first on top of the financial wealth accumulation. Rapidly, the literature has nurtured to develop the theory and concept in social entrepreneurship while exploring the applicability of the concepts in different contexts and phenomena. Although the social entrepreneurship concept has been widely deliberated in the research agenda, the current stock of knowledge in the field remains unorganized. Subsequently, the primary objective of this paper is the systematization and categorization of the extant knowledge on social entrepreneurship in the research context. The systematic literature survey was followed in this study and 140 published papers were used for the analysis by eliminating the repetitions. The published papers were downloaded from well-reputed databases such as Web of Science and Google Scholar. The analytical methods have been organized twofold; first, a citation analysis was conducted in order to evaluate the prominent research in the existing literature in social entrepreneurship literature. Second, a thematic analysis was used to analyse existing themes and patterns in the Social Entrepreneurship literature. The paper exposed four themes that the social entrepreneurship concept has been researched in the field such as theory and concept of social entrepreneurship, institutional perspective and organizational management of social entrepreneurship, social innovation and value creation, change impact of social entrepreneurship. There are significant differences noticed among the found themes. Subsequently, this paper sets the way for future research by suggesting the gap and disparities in the social entrepreneurship research context.

Keywords: *Social Entrepreneurship, Systematic Literature Review, Citation Analysis, Thematic Analysis*

[1] Department of Management Sciences, Faculty of Management, Uva Wellassa University of Sri Lanka, Sri Lanka
✉ Corresponding Author: hirusha@uwu.ac.lk

The Behavior of Tourism and COVID-19 Literature: evolving Themes, Methods & Glitches

Samarathunga W. H. M. S.[1]

Abstract

COVID-19 has imposed irreversible changes to the tourism and hospitality industry. This pandemic has opened up new areas of studies in tourism and hospitality studies. The researchers are increasingly analyzing the tourism concepts, phenomena, challenges, and other empirical glitches that are disputed by the new normal situation. Therefore, the main aim of this study is to analyze the research papers published with major indexed journals on tourism and COVID-19, thereby identifying the emerging themes, patterns, and trends in the tourism COVID-19 literature. The study primarily used the Web of Science and Scopus databases to identify 116 relevant research papers. The study is based on an integrative evaluation of the literature. Keyword search was mainly used to locate relevant articles published after 2020, when the COVID-19 pandemic broke out at the end of 2019. The study used content analysis with the N-Vivo (V.12) software to identify the major themes, topics, and disputes, replicating the processes used in comparable reviews. The study identified three main emerging themes in COVID-19 tourism literature: post-pandemic tourism; rules, regulations, and standards; and tourism resilience and recovery. The theoretical light in many research papers is inadequate although there is ample space for that. The Research papers that have employed qualitative methods have used interviews, observations, and focus group discussions in collecting data. The qualitative papers have mainly employed thematic analysis and content analysis to analyze the qualitative data. Similarly, the authors have employed different quantitative data analysis methods using accepted models and equations in analyzing the quantitative data. The main theories used in these studies involve neo-institutional theory, psychological reaction theory, evolutionary theory, theory of planned behavior, protecting motivation theory and stakeholder theory. In addition to that, the literature is not sufficient to generate a holistic understanding on how COVID-19 impacted on tourism destinations, stakeholders and tourists since the research studies are mainly cornered to developed destinations. Therefore, more investigations are deemed necessary from developing countries and emerging destinations. The identified research papers contribute significantly to the tourism literature by identifying the critical issues in the tourism and hospitality industry amid the COVID-19 pandemic and provide useful empirical and theoretical underpins to rejuvenate the tourism and hospitality industry.

Keywords: *COVID-19, content analysis, mental health, post-pandemic travel, tourism resilience, and recovery*

[1]Department of Tourism & Hospitality Management, Faculty of Management Studies, Rajarata University of Sri Lanka, Sri Lanka

Corresponding Author: manoj.susl@gmail.com

Factors Affecting Employee Job Stress and Job Performance in Classified Hotels

Ranatunga R. A. D. D. N.[1]

Abstract

Human resource has evolved as a crucial area to fulfill one's goals and objectives of the hospitality firms as most of the industries. At present, the hospitality sector has become tumultuous and dynamic which operates everyday and every hour in a year. As a consequence, several job characteristics such as irregular working hours and shift work might be observed in the sector. Moreover, it is a labor-intensive profession, and non-executive employees are the critical ones who generate the most productivity by directly involving guests. Therefore, it is critical to comprehend the nature of job stress to avoid the potential bad consequences and suitably cope with them. Although the literature does not provide enough empirical evidence on the factors affecting employee job stress and performance in classified hotels. Hence, the objective of this study was to find out the relationship between workload, role ambiguity and role conflict of job stress and job performance among employees in classified hotels. 150 non–executive employees were selected as the sample and used a convenience sampling method in the study. Moreover, the data were collected using a structured questionnaire. The reliability static Cronbach's alpha was used to measure the internal consistencies of the questionnaire. Frequencies, means, and standard deviations were used as univariate analysis, and Pearson's correlation and multiple regression analysis were used as multivariate analysis in the study. The results of the correlation coefficient showed that role conflict, role ambiguity and workload have a positive significant relationship with job performance and it emphasized that workload has a strong positive relationship with job performance. According to the multiple regression analysis, the model was strongly fitted to the data and 26.7% variance of job performance was explained by role conflict, role ambiguity and workload of job stress. Hence, it is suggested that the future researchers should consider the other factors which may also impact on job performance. Finally, it can be concluded that there is a significant positive relationship between selected factors of job stress and job performance of employees in Classified Hotels in the Kandy area. Based on the findings of the study, it is recommended for management to maintain a moderate level of job stress in the hotel industry to enrich the job performance of employees.

Keywords: *Job stress, Job performance, Role ambiguity, Role conflict, Workload, Star Hotels*

[1] Department of Tourism Studies, Faculty of Management, Uva Wellassa University of Sri Lanka, Sri Lanka
Corresponding Author: dinunawanji@gmail.com

ISymRU 2021

Mathematics, Statistics and Data Science

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

Study on Return Distribution of All Share Price Index and Stock Market Volatility at Colombo Stock Exchange

Rathnayaka R. M. P. S.[1], Samarasinghe N. R.[2]

Abstract

Stock market studies have been increasingly popular around the world, as the stock market is one of the most important aspects of economic progress in a country. While difficult, the volatility in financial markets gives an excellent opportunity for us to reconsider our assumptions. Market indices are used by many investors to manage their investment portfolios and keep tracking the financial markets. The use of a normal distribution to forecast the likely range of future returns on an investment is frequent in the investing sector, even the stock market returns are not normally distributed, and finding a better-fitting distribution for any stock market in the globe is crucial. Colombo Stock Exchange (CSE) provides a transparent and regulated environment for both investors and businesses to meet in Sri Lanka. Currently the broad market index of CSE is All Share Price Index (ASPI) and we identified that ASPI returns distribution is non-normal, using daily and monthly ASPI for a five year period from 1st of January 2017 to 31st of March 2021. This study examines which distribution is preferable to describe this non-normal behavior. Generalized logistic distribution was fitted first. Since the shape parameter was not significant, location scale t-distribution was fitted. That was applicable and the Q-Q plots were well fitted on the reference line. It concludes that the location scale t-distribution provides one of the better fits to returns of ASPI.

Keywords: *ASPI, CSE, generalized logistic distribution, location scale t distribution*

[1] Department of Mathematics and Statistics, Nawaloka College of Higher Studies, Sri Lanka
[2] Department of Information and Communication Technology, Faculty of Technology, University of Colombo, Sri Lanka
Corresponding Author: prashan.rathnayaka@nchs.edu.lk

The Definitions and Some Elementary Properties of Polygroup

Thushanthan R.[1] ✉, **Sangathan M.**[1]

Abstract

The polygroup concept has found applications in many branches of mathematics such as analysis, algebra, geometry and fuzzy sets. The notion of quasi-canonical hypergroup called polygroup, which is a generalization of the notion of a group. A hyper-structure admits more than one output under the operation, which is called a hyper-operation. We generalize the notion of polygroup structure induced by the double cosets, which is also a generalization of the group object. There are only a few studies that have developed polygroup under hyper-operation. In our previous work, some of its properties such as normal subpolygroups, maximal subpolygroups and chain conditions were proved. In this paper, we construct a new polygroup from a given polygroup. Also, we show that if G, KandH are polygroups, then G⁄H⁄K⁄H≅G⁄K which is induced by the double cosets of a group.

Keywords*: Double cosets, isomorphic, polygroup structure*

[1] Department of Interdisciplinary Studies, Faculty of Engineering, University of Jaffna, Sri Lanka
✉Corresponding Author: rajathusha01@gmail.com

The Modern Approaches Used by Judges in the Interpretation of the "Right to Life" under the Current Constitutional Framework of Sri Lanka

Rupasinghe R. A. D. S. T.[1] ✉, Udayajeewa T. J.[1]

Abstract

The Human Rights provisions found in the present Sri Lankan Constitution encompass a very large and fruitful area. They include various fundamental rights except most valuable right called "right to life". The 1978 Constitution of Sri Lanka does not expressly recognize right to life as a fundamental right. Irrespective of the fact that there was no direct provision to safeguard the right to life, the Supreme Court of Sri Lanka has interpreted mainly in Articles 11 (Freedom from torture or cruel, inhuman or degrading treatment) and 13(4) (Right not to be punished with death or imprisonment except by order of a competent court made in accordance with procedure established by law) in order to bring in the fundamental right to life. Without life in the sense of existence, it would not be possible to exercise rights or to be the bearer of them. The Court should certainly play an active role with use modern approaches in interpreting the fundamental rights enshrined in the Constitution not to change any of its provisions but to give it a more effective meaning in fundamental rights. The main objective of this research work has been to focus on the modern approaches used by judges in the interpretation of "Right to Life" under the current constitutional framework of Sri Lanka. Thus, this particular study cited in several judgments where our Supreme Court has examined the scope and application of the right to life in Sri Lanka. For this purpose, the main research question is how the modern approaches used by judges in the interpretation of "Right to Life" under the current constitutional framework of Sri Lanka. The research methodology mainly based on interpretivism and epistemological philosophy, this help to build subjective reality, exploratory understandings and interpretations of real-world contexts. In addition, used to the qualitative research study by collecting both primary and secondary data for content analysis. Finally, researcher concerned key findings used content analysis and provided recommendations for directly recognize right to life in Constitution by a constitutional amendment or be included into fundamental rights chapter of the proposed new Constitution as a justiciable fundamental human right.

Keywords: *Constitution, fundamental right, interpretation, right to life, Sri Lanka.*

[1] Department of International Relations, Faculty of Arts, University of Colombo, Sri Lanka
✉Corresponding Author: dedunurupasinghe7@gmail.com

Directly Defining the inverse Mapping Method for Solving a Delay Differential Equation of Fractional Order

Karunarathna W. H. D. T. [1], **Dewasurendra M. T. M.** [1]

Abstract

In recent years, fractional differential equations and their applications have gotten extensive attention. The main reason is due to the rapid development of the theory of fractional calculus which is widely used in mathematics, physics, and other various disciplines. In this study, we applied a semi-analytical method called the Method of Directly Defining the inverse Mapping (MDDiM) to obtain a series solution for a delay differential equation of fractional order. A delay differential equation is a differential equation where the time derivatives at the current time depend on the solution and possibly its derivatives at previous times. Also, delay differential equations (DDEs) are used to introduce concepts arising in studies of infinite-dimensional dynamical systems. Liao introduced the MDDiM for nonlinear single ordinary differential equations. Recently, we extended the MDDiM to obtain approximate-analytical solutions of nonlinear single partial differential equations and systems of partial differential equations. In this work, we applied the MDDiM for acquiring an approximate-analytical solution of a fractional-order delay differential equation. Here, we obtained MDDiM solutions by considering the first three terms of the series solution. The best values of the convergence control parameter were determined by minimizing the square residual error of the approximate series solutions for different fractional orders. Further, it is investigated that the three term approximate series solution was accurate up to five decimal places, and agreed very well with the exact solutions and the solutions obtained by the Homotopy Analysis Method.

Keywords: *Delay differential equation of fractional order, fractional order differential equations, method of directly defining inverse mapping, series solution*

[1] Department of Mathematics, Faculty of Science, University of Peradeniya, Sri Lanka

k-graceful Labeling for the Ladder Graph and the Roach Graph

Indunil W. K. M.[1] , Dissanayake D. M. T. B.[2] , Priyadarshani M. A. D. [2], Perera A. A. I.[1]

Abstract

The study of graph labeling is currently one of the most popular graph theory research topics. Many graph labeling types can be found in graph theory. Graceful labeling is one of the most popular types of graph labeling. A simple graph G is said to be a vertex k-graceful if there exists a vertex graceful labeling on the vertices of G. A *graceful labeling* of G is a vertex labeling f be an injective mapping from V(G) to [0,EG+k-1] such that the edge labeling f:E(G)→[k, EG+k-1] defined by fuv=fu-f(v) is also injective. When k=1, f is called ordinary graceful labeling, and G is called a graceful graph. There is a very famous conjecture in this area that every tree is graceful. Numerous studies have been conducted on this area over the past few decades, and several results have been obtained. In this research work, we prove that the ladder graph admits the k-graceful labeling. The ladder graph is a graph obtained from the Cartesian product of Pn and P2. Moreover, we studied the k-gracefulness of the roach graphs and could obtain some partial results. However, we strongly believe that every roach graph is k-graceful. Finally, we introduced that as an open problem for future work.

Keywords: k-*graceful labeling, ladder graph, roach graph*

[1] Department of Physical Science, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2] Department of Mathematics, Faculty of Sciences, University of Peradeniya, Sri Lanka
Corresponding Author: asp1617030@as.rjt.ac.lk

Mathematical Modelling and MDDiM Solutions for Fingering Phenomenon during the Nano Silica Flooding

Sahabandu C. W.[1,2], Dewasurendra M.[1]

Abstract

In the primary enhanced oil recovery process (EOR), oil pushes to the earth's surface using the natural pressure of the reservoir. In that process, up to 5% -10% of oil can be extracted. In the secondary oil recovery process, most commonly, water or gases are injected and it allows around 20% -30% of the oil to recover. Recently, researchers found that Nano/biomaterials injection with water (Nano flooding) leads to a maximum of 58% of the estimated oil recovery portion at the secondary stage. This study was carried out to build up a mathematical model to find the saturation of Nano-water (S_i) of the fingering phenomenon for an inclined oil layer. The fingering phenomenon (or protuberance) occurs during the secondary oil recovery process when the injection fluid shoots through the porous media at a relative speed. Here we considered silica (SiO_2 - Silicon dioxide) as the Nano particle. Since Silica is mixable with both oil and water it improves the mobility ratio and increases the injected and native fluids viscosity and recovers an important portion of oil within the secondary EOR process and it is higher than the carbonated-water flooding. We applied the Method of Directly Defining the inverse Mapping (MDDiM) which is a recent method to solve non-linear differential equations to solve this model. MDDiM was first discovered by Liao in 2016 and it was extended by Dewasurendra et al. to solve a system of coupled nonlinear ordinary differential equations. In 2021, Sahabandu et al. further extended this novel technique to solve nonlinear partial differential equations. We obtained second and third-order solutions for S_i for different incline angles and discussed the convergence of the solutions with the order when squared residual errors are minimum. When the order is higher, we can see that errors are decreasing while converging to a more accurate solution. When α=00, our MDDiM solutions of second-order for saturations of silica-water are higher than the fourth-order solutions of the variational iteration method of saturation of water. This proves that the Silica-water saturation is higher than the water saturation, and it leads to recovery of more oil by using SiO_2 together with water.

Keywords: *Fingering phenomenon, inclined oil layer, method of directly defining the inverse mapping, nano silica flooding, secondary oil recovery process*

[1] Department of Mathematics, University of Peradeniya, Peradeniya, Kandy, Sri Lanka
[2] Post Graduate Institute of Science, University of Peradeniya, Peradeniya, Kandy, Sri Lanka
Corresponding Author: chathuriws@sci.pdn.ac.lk

Using a Modified Ant Colony Algorithm Approach to Solve Assignment Problems

Ekanayake E. M. U. S. B. [1]

Abstract

An assignment problem (AP) is concerned with what happens to the effectiveness function when some origins are associated with the same number of destinations. Each resource should be associated with one and only one job, and the associations should be created in such a way that the total effect is minimized. The AP is a subset of transportation problems, and it is a subject that is frequently discussed in the real world. The literature demonstrates that different techniques have been developed in the past to solve the AP. In some techniques, concentrate on finding an initial basic, feasible solution, while the rest of the techniques focus on finding the optimal solution to the AP. The Hungarian method produces an effective response to the task. In this study, we apply the Modified Ant Colony Optimization (ACO) Algorithm to solve AP. This is based on the Ant Colony Algorithm (ACA) approach, which has been shown to provide near-optimal solutions to large-scale APs with a reasonable degree of satisfaction. The degree of satisfaction of the optimal solution has been improved in this unique technique by altering ACA with the incorporation of the Transition Rule and Pheromone Update Rule. This study's algorithmic method is less complicated than well-known meta-heuristic algorithms in the literature. Finally, we use the proposed method to demonstrate it.

Keywords: *Assignment problem, Hungarian method, optimization, ant colony algorithm, alternate method*

[1] Department of Physical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
Corresponding Author: uthpalekana@yahoo.com, uthpalekanayake@as.rjt.ac.lk

Medicine and Public Health

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

The Sinhalese Version of eHealth Literacy Scale (Si-eHEALS): Reliability and Validity Testing in Health Science Students

Rathnayake S.[1] ✉, Liyanage I. P.[2]

Abstract

An assessment tool measuring electronic health literacy is lacking for Sinhalese-speaking Sri Lankans, including health care professionals. This study aimed to develop a Sinhalese version of the eHealth literacy scale (Si-eHEALS) from its original English version. In the first stage, we translated and cross-cultural adapted the original version into Sinhalese. We used five stages proposed by Beaton et al. for questionnaire translation and cross-cultural adaptation, including forward translation, synthesis of the forward translation, backward translation, expert committee review, and pre-test. In the second stage, a cross-sectional online survey was conducted among a convenience sample of 268 health science students at the University of Peradeniya, Sri Lanka, to establish the psychometric properties of the eHEALS. We used the pre-final version of eHEALS developed in the first stage of this survey. A sub-sample of 72 health science students participated in the test-retest assessment. Content validity, construct validity (including concurrent and discriminant validity), internal consistency, test-retest reliability, and floor and ceiling effects were assessed in the second stage. This study was approved by the Ethics Review Committee, Faculty of Allied Health Sciences, University of Peradeniya. As part of the online survey, participants' consent was recorded. Si-eHEALS had a mean score of 28.51±4.87. The reported content validity index (.97), internal consistency (Cronbach's alpha = .91), and test-retest reliability (intraclass correlation coefficient - .776) were acceptable. Principal component analysis showed that the scale was unidimensional, accounting for 61.2% of the variance. No floor and ceiling effect was reported. Concurrent validity was supported by a significant positive association between Si-eHEALS score with the academic year (r_s = .146, p = .017), self-rated internet skills (r_s = .122, p = .046), the usefulness of the internet in health decision-making (r_s = .212, p < .001) and the importance of the ability to access health resources on the internet (r_s = .230, p < .001). Discriminant validity was supported, showing no significant difference in Si-eHEALS score based on gender (U = 5854, p = .550) and degree programme ($X^2(2)$ = 2.965, p = .564). Si-eHEALS showed adequate psychometric properties on a sample of health science students. Therefore, Si-eHEALS is a valid and reliable tool to assess eHealth Literacy skills among health science students in Sri Lanka. Further validation of Si-eHEALS will allow it to be applied to assess eHealth literacy levels of other Sinhalese speaking populations such as patients and caregivers.

Keywords: *eHealth literacy, eHEALS, reliability, Sinhala, validity*

[1]Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka
[2]Department of Physiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka
✉ Corresponding author: sarathr@pdn.ac.lk

Predictors of In-hospital Mortality in Stroke Patients

Ranasinghe V. S.[1] ✉, Gawarammana I. B.[2]

Abstract

In-hospital mortality is a good indicator to assess the efficacy of stroke care. Identifying the predictors of in-hospital mortality is important to advance the stroke outcome and plan the future strategies of stroke management. However, there is a lack of data on stroke mortality in Sri Lanka compared to other South Asian countries. Hence, this study was carried out to fill the existing knowledge gap in the Sri Lankan health care system. Two hundred and forty-six patients with confirmed stroke were prospectively observed throughout the hospital stay in Teaching Hospital Peradeniya to identify the possible predictors of in-hospital mortality. The diagnosis of stroke was established on the clinical history, examination, and neuroimaging. The differentiation of stroke into haemorrhagic and ischaemic types was based on computed tomography results. In all patients, demographic data, comorbidities (hypertension and diabetes mellitus), clinical signs (systolic blood pressure, diastolic blood pressure, on admission Glasgow Coma Scale (GCS) score), and imaging findings were recorded. Serum electrolyte test was performed in all stroke patients, and hyponatremia was defined if the serum Na^+ level is < 131mmol/L. All patients were followed up throughout their hospital course, and the in-hospital mortality was recorded. In-hospital mortality was defined as the deaths which occurred due to stroke after 24 hours of hospital admission. The incidence of in-hospital mortality was 11.7% (95% confidence interval 8-16.4). The mean day of in-hospital deaths to occur was 5.9 days (SD±3.8 Min 2 Max 20). According to multivariate logistic regression analysis on admission, GCS score (Odds Ratio (OR)-0.71) and haemorrhagic stroke subtype (OR 5.12) predicted the in-hospital mortality. In contrast, demographic characteristics, comorbidities, systolic blood pressure, diastolic blood pressure, development of hyponatremia, and development of aspiration pneumonia did not predict in-hospital mortality. The Area under the curve of Receiver operating curve drawn for the on-admission GCS was 0.78 with a sensitivity of 96.31% and specificity of 41.38% for a patient presented with the GCS score of <10. On admission, GCS and haemorrhagic stroke were independent predictors of in-hospital mortality. Patients with on admission GCS <10 had a moderate predictive ability in predicting the in-hospital mortality. Thus, special attention should be given to patients with low GCS and haemorrhagic strokes to reduce rates of in-hospital mortality.

Keywords: *Glasgow coma scale, haemorrhagic stroke, in-hospital mortality*

[1] Department of Basic Sciences, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, Sri Lanka
[2] Department of Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka
✉ Corresponding author: vindyas@ahs.pdn.ac.lk

Perspectives of Nursing Students towards Taking Care of Death and Dying Patients and their Families: A Qualitative Study

Bandara M. G. D. N.[1] ✉, Rathnayake S.[1]

Abstract

Nurses face different challenges and difficulties when caring for dying patients, and it has an impact on both the work environment and the outside environment of nurses. Hence, they need special preparation for caring for dying patients. Nursing students need to be prepared with adequate knowledge, skills, and attitudes to provide quality care for dying patients and their families as the future nursing workforce. The purpose of this study was to explore the experiences of nursing students at the University of Peradeniya, Sri Lanka, in terms of caring for dying patients and their families during their clinical placement. A qualitative phenomenological approach was used to describe and interpret the understanding and shared meanings nursing students had in caring for death and dying patients and their families. A purposive sample of undergraduate nursing students participated in an in-depth semi-structured interview. Colaizzi's seven steps method was used in thematic analysis. Fourteen nursing students were included in the study based on the principles of data saturation. Four themes emerged: (a) Learning death and dying care is challenging. (b) Motivation for learning and care. (c) Need for developing knowledge and skills concerning death and dying care. (d) Need for support and mentoring for nursing students. Nursing students face many challenges, including various negative physical and psychological influences, when caring for dying patients and their families during their first clinical placement. The inadequate knowledge, skills, and experiences were identified. Continuous mentoring and supporting are essential for nursing students to learn the role of the nurses in death and dying care. This study suggests the need for addressing the learning needs of students from the beginning of their degree programme. Modification of the curriculum is essential. The establishment of clinical mentorship is beneficial to provide support for students to learn required skills and attitudes and cope with negative experiences related to death and dying care.

Keywords: *Death, dying, experiences, nursing students*

[1] Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Kandy, Sri Lanka
✉ Corresponding author: damithnissanka995@gmail.com

Development of a Sinhalese Version of Dementia Knowledge Assessment Scale (Si-DKAS)

Jagoda T.[1] ✉, Rathnayake S.[2]

Abstract

Insufficient knowledge among nurses limits their ability to provide optimal dementia care. Therefore, the assessment of knowledge among nurses regarding dementia is essential. However, a culturally adapted dementia knowledge assessment scale (DKAS) is unavailable in Sri Lanka. This paper reports the findings of stage one of a study aimed to develop a Sinhalese version of DKAS (Si-DKAS) from its English version with nursing students. The first stage involved translation and cross-cultural adaptation, following World Health Organisation guidelines for cross-cultural validation. Ethical approval was obtained from the Ethical Review Committee of the Medical Research Institute, Borella, Sri Lanka. The original developers permitted the validation of the scale with 25 items. Forward translation of the English version into Sinhalese was performed by a nurse, an independent translator who is an expert in both languages. A panel of experts (n=5) analysed the forward translation for poor expressions and inconsistencies compared to the original version. The Sinhalese version was back-translated into English by a bilingual expert whose mother tongue was Sinhalese, fluent in English, and had no prior knowledge of the scale. The research team sought feedback from a panel of experts (n=5) to ensure conceptual, semantic, and idiomatic equivalence. The content validity index (CVI) was computed (n=12). The researchers discussed with the original developers to ensure that the concepts depicted in the Sinhalese and English versions were the same. Next, the Si-DKAS was pre-tested with 11 nursing students from the School of Nursing, Kadana, and face validity was established. A language expert in Sinhalese evaluated the scale for comprehensibility. The conceptual translation was assured rather than the literal translation. The Si-DKAS had an excellent conceptual and semantic equivalence with the English version. Item-CVI, Scale-CVI/Average, and Scale-CVI/Universal were 0.8 to 1, 0.9, and 0.36, respectively, showing acceptable content validity. The pre-final version of the Si-DKAS was developed that can be used in the next stage of this study: the establishment of the psychometric properties of the Si-DKAS.

Keywords*: Dementia, nursing student, psychometrics, Sinhala, validation study*

[1] Department of Nursing and Midwifery, Faculty of Allied Health Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka
[2] Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, Sri Lanka
✉ Corresponding author: thilanka@sjp.ac.lk

Enteric Fever in Sri Lanka since 1902 – A Narrative Review

Illapperuma S. C.[1] ✉, Gunathilaka M. G. R. S. S.[1]

Abstract

Enteric fever is a systemic illness endemic in Sri Lanka and composes of both typhoid and paratyphoid fevers caused by *Salmonella* Typhi (S.Typhi) and *Salmonella* Paratyphi A (*S*.Paratyphi A), respectively. The global estimated cases of typhoid fever in 2017 was approximately 10.9 million with 117,000 deaths and 3.40 million cases of paratyphoid cases with 19000 deaths. The clinical presentations range from mild to severe, which could even result in death. The gold standard for diagnosis is bone marrow or blood culture. The rise in the resistance to antibiotics is a major concern. Since enteric fever is endemic in Sri Lanka and is a notifiable disease, this narrative review on available papers on enteric fever in Sri Lanka from 1900 to 2021 was conducted. It was found that the first case of typhoid was reported in Boer prisoners of war brought to Diyatalawa in 1902. After that, many outbreaks were reported, which were linked to lack of sanitary facilities, lack of potable water, carriers in food establishments, and defecation in open fields. In the Western province, Kandy and Ratnapura, a shift in the causative organism from *S*.Typhi to *S*.Paratyphi A was seen. In Jaffna *S*.Typhi still dominates. Rare complications of enteric fever, namely Guillain – Barre syndrome, acute disseminated encephalomyelitis, cholestatic hepatitis, endocarditis, acute liver failure with encephalopathy, splenic infarction, and spontaneous rupture, microscopic haematurea, "Comma vigil" a neuro-psychiatric complication, and typhoid bowel perforation were reported. Resistance to chloramphenicol, ampicillin, unasyn, co-amoxiclav, mecillinam, ceftriaxone, cefotaxime, ceftazidime, sulphonamides, co-trimoxazole, chloramphenicol, nalidixic acid, ciprofloxacin, amikacin, and azithromycin was seen. In 2017, Extended Spectrum Beta-Lactamase producing *S*.Typhi had been isolated. The baseline cut-off values for Widal antibody titres were determined, with the most recent study giving a cut off of 80 for both O antibody and AH antibodies and 160 for H antibody level. Nested PCR methods have been developed to diagnose typhoid fever, and an indirect ELISA which detect salivary anti salmonella lipopolysaccharide IgA to S.Typhi was developed. Since 1902, typhoid fever has caused many outbreaks in the country. However, a decline in the number of cases is seen throughout time which could be as a result of improved hygiene practices and access to safe drinking water. The century-old Widal test is still being used to diagnose enteric fever. However, it's advisable to always perform blood culture for the diagnosis of enteric fever along with antibiotic sensitivity testing due to the rise in antibiotic resistance in Salmonella.

Keywords: *Enteric fever, paratyphoid, Sri Lanka, typhoid*

[1]Department of Microbiology, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka

✉ Corresponding author: scillapperuma@gmail.com

Sitting Posture, Computer Ergonomics, and Study-Related Health Problems among Undergraduate Medical Students

Malshani G. W. W.[1] ✉, Weerakoon H. T. W.[1], Weerakoon K. G. A. D.[2]

Abstract

Online teaching-learning activities and the use of electronic devices have become mandatory elements of modern-day higher education, particularly during the COVID-19 pandemic. Prolonged sitting and working in front of electronic apparatus can cause musculoskeletal problems if the correct posture is not maintained. This study aimed to assess the sitting posture and computer ergonomic practices among undergraduate medical students to identify study-related health problems. In this descriptive cross-sectional survey, the practice of correct sitting posture and computer ergonomics and the study-related musculoskeletal health problems among medical students of Rajarata University of Sri Lanka were assessed using a self-administered online questionnaire. Of the total of 394 participants, the majority were females (n=285,72.34%) with a mean age of 23±1.3 years. Sitting is the commonest posture used by most of the participants (n=365,92.64%), while majority used laptops (n=284,72.08%) and smartphones (n=342,86.80%) for study activities. A chair with back support and no armrests or wheels was the most used chair type (n=214,54.31%). However, only 63 (16%) participants practiced correct posture when sitting. Though the recommended frequency of taking regular breaks during prolonged sitting should be every 20-30 minutes, most of the participants (n=236,59.9%) took breaks after 30 minutes of sitting. With regards to computer ergonomic practices, most of the students correctly kept their electronic devices on the study table (n=331,84.01%) and at the correct eye level (n=259,65.74%), while ~50% (n=196) of the participants kept the device at the recommended distance from eyes. Of the participants, 59.39% (n=234) had experienced pain/discomfort while studying. Though the association ($\chi 2$=1.633, p=0.201) between sitting posture and pain/discomfort was not statistically significant, 86.75% (n=203) of those who experienced pain/discomfort were practicing incorrect sitting posture. Lower back (n=137,58.55%), neck (n=118,50.43%), eye (n=102,43.59%) and shoulder (n=94,40.17%) pain were the most common discomforts reported. The higher amount of study-related health issues reported among the participants practicing incorrect sitting posture denotes the need of improved awareness of correct posture and computer ergonomics among students to reduce the risk of study-related health problems.

Keywords: *Computer ergonomics, sitting posture, study-related health problems*

[1] Department of Biochemistry, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2]Department of Parasitology, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka

✉ Corresponding author: wishmila94@gmail.com

Demographic and Clinical Characteristics of Patients Diagnosed with COVID-19 who Admitted to Provincial General Hospital, Kurunegala: A Retrospective Analysis

Herath C. M.[1], Rathnayake S.[2], Kendangamuwa C.[3], Welivita T.[3]

Abstract

Coronavirus disease 2019 (COVID-19) is a global pandemic. Its clinical manifestations can vary from asymptomatic to severe symptoms. Therefore, identifying the clinical characteristics of the disease is essential. A retrospective analysis was carried out to identify epidemiological and clinical factors and nursing documentation of patients diagnosed with COVID-19 admitted to the Provincial General Hospital Kurunegala (PGHK). This study included assessment of 780 bed head tickets, available at the medical record department of PGHK, of COVID-19 positive patients from 01st December 2020 to 31st May 2021. Socio-demographic data, clinical characteristics, and nursing chart documents were recorded. In data analysis, descriptive statistics were used. The results of the study revealed that the average time from admission to discharge was 1.4 days. The mean age of the patients was 45.92 (SD ± 19.34). The majority were males (64.2%), Sinhalese (90%), and had a contact history with a positive patient (32.8%). From the sample,12.3% were asymptomatic. The common symptoms presented were fever (53.3%), sore throat (30.1 %), cough (29.4%), shortness of breathing (23.8%), body ache (14.7%), cold (12.7%), headache (12.6%), myalgia (8.3%) and diarrhoea (2.8%). From the sample, 40.2% of participants reported co-morbidities such as diabetes mellitus (37.6%), hypertension (25.16%), ischemic heart disease (7.32%), bronchial asthma (8.92%), chronic kidney disease (10.19%), and dyslipidemia (11.15%). Patients have been transferred to 13 institutions, and the main institution was the District Hospital, Ambanpola (25.6%). From the sample, 2.43% were discharged, while 10% have died. The main reasons for death were pneumonia (49.8 %), infections (17.5%), and other reasons (33.8%). Temperature charts (78.8%), Observation charts (13.1%), and fluid balance charts (12.6%) were the main nursing charts maintained. In conclusion, one out of eight patients is asymptomatic. The most typical symptoms of COVID-19 patients reported are fever, sore throat, and cough. Pneumonia is the main reason for COVID-19 related deaths. There is a need to reduce the time for diagnosis from admission. Limited nurses' documentation was identified: therefore, nursing documentation needs to be improved.

Keywords: *COVID-19, clinical characteristics, demography, patients, Sri Lanka*

[1] Department of Clinical Nursing, Faculty of Nursing, University of Colombo, Sri Lanka
[2] Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka
[3] Provincial General Hospital, Kurunegala, Sri Lanka
✉Corresponding author: chandraniherath@dcn.cmb.ac.lk

A Study on the Impact of Social Media Addiction Towards the Decision Making Ability of State University Students in Sri Lanka

Senarath T. U. S.[1] ✉, Padmasiri U. G. M.[2]

Abstract

4.02 billion people use social media sites throughout the world. Regardless of their level of development, people behave similarly in social media, and many people see social media as an important aspect of their unique personality. The majority of empirical studies indicated that social media addiction is increasing year by year in tandem with rising levels of social media site usage and that social media addiction causes attention to be lured away as a negative result. The latest social media trend is for people to base their daily decisions on social media input. Social media is unwittingly training individuals to be like robots. The focus is drawn away from human existence, and a slew of task-unrelated ideas fill in the gaps. As a result, people must exercise control over it or risk being cast out of society. The overall goal of this research was to assess the impact of social media addiction on the decision-making abilities of Sri Lankan state university students. The population of this quantitative study was all the students enrolled in Sri Lankan state universities. Two hundred fifty students were chosen as the sample, and data were collected using an online survey. Using SPSS 21.0, the final result was produced by analysing the collected data and calculating regression and correlation. According to the conclusions of the study, if students spend more time on social media, they will develop a high level of social media addiction, and if they fail to control it, they will suffer damage to their decision-making ability.

Keywords: *Social media, addiction, decision making ability*

[1] Department of Information Systems, Faculty of Management Studies, Rajarata University of Sri Lanka, Sri Lanka
[2] Faculty of Medicine, University of Kelaniya, Sri Lanka
✉ Corresponding author: udesh.senarath@mgt.rjt.ac.lk

Intake of Major Dietary Constituents in Patients with Newly Diagnosed Type 2 Diabetes Mellitus in Southern, Sri Lanka

Wasana K. G. P.[1], Attanayake A. P.[1], Weerarathna T. P.[2], Jayatilaka K. A. P. W.[1]

Abstract

Unhealthy dietary practices contribute to the development of type 2 diabetes mellitus (T2DM), a major health burden worldwide. The present study aimed to assess the usual dietary intake in patients with newly diagnosed T2DM to appraise the intake of major dietary constituents. Information on dietary intake was collected using a 24-hour dietary recall from 158 patients with newly diagnosed T2DM referred to the University Medical Clinic, Teaching Hospital, Galle, Sri Lanka. Dietary intake records were assessed using the Sri Lanka food composition table, the Indian food composition table, and the United States Department of Agriculture nutrient database and were compared with the dietary recommendations of the American Diabetes Association. Of all the patients (mean age 48.6 ± 7.0 years), 96 were females. The average daily intake of energy, carbohydrate, protein, fat, and fiber of the enrolled patients were 2720.7 (1283.3 – 3859.1) kcal, 565.5 ± 92.7 g, 85.1 ± 18.3 g, 28.5 (9.1 – 104.8) g and 3.4 (1.6 – 34.0) g, respectively. The percentages of carbohydrate, protein, fat, and fiber that comprise the total energy intake were 82.9%, 12.4%, 9.1%, and 3.4 %, respectively. Almost all patients (99.4%) had consumed more carbohydrates than the recommended amount. Lower than the recommended intake of carbohydrates, protein, fat, and fiber was noted in 0.6%, 86.7%, 92.4%, and 98.7 % of participants, respectively. Out of the total sample, only 12.0%, 5.7%, and 1.3 % met the daily recommendations of protein, fat, and fiber, respectively. In conclusion, the diet of newly diagnosed patients with T2DM consisted of a notable high carbohydrate intake and very low protein and fiber content. Public health approaches to prevent T2DM in Sri Lanka should focus on reducing carbohydrates and improving the protein and fiber content in their diet.

Keywords: *Dietary intake, dietary recommendations, newly diagnosed patients with T2DM*

[1] Department of Biochemistry, Faculty of Medicine, University of Ruhuna, Sri Lanka
[2] Department of Medicine, Faculty of Medicine, University of Ruhuna, Sri Lanka
✉ Corresponding author: piyumi089@gmail.com

Clinical Signs and Symptoms for Detecting Early Pregnancy Anemia in Anuradhapura, Sri Lanka; Findings from the Baseline Assessment of a Large Pregnancy Cohort

Amarasinghe G. S.[1]✉, Agampodi T.C.[1], Mendis V.[2], Agampodi S.B.[1]

Abstract

It is important to identify and treat early pregnancy anemia which will otherwise worsen due to hemodilution and exhaustion of nutrient stores with the progression of pregnancy, leading to adverse outcomes. Clinical features and their validity to determine anemia are important for clinical decision making. But these may differ with the stage of pregnancy, socio-demographic and cultural context. Therefore, we report the prevalence of commonly used clinical signs and symptoms and the validity of them to screen for anemia among first trimester pregnant women in Anuradhapura. All first trimester pregnant women in Anuradhapura district registering for field antenatal care programme during the third quarter of 2019 were invited to participate in a maternal cohort. At the baseline, a clinical interview and examination by a trained MBBS-qualified doctor and a full blood count was performed in each participant. Hemoglobin level less than 11 g/dl was used as the reference value for anemia. Of the 3137 participants, 14.5% (95% CI13.2–15.7, n=451) had anemia. About 3/4th of the anemic women had mild while the rest (n-125,27.4%) had moderate anemia. None had severe anemia. Of the participants, 99 (3.2%) had difficulty in breathing at rest or with mild exertion, 58(1.9%) had palpitations, 302(9.7%) had conjunctival pallor and 147(4.7%) had cardiac murmur. Difficulty in breathing (χ2-6.3, p-0.01), palpitations (χ2-8.1,p-0.004), pallor (χ2-36.8,p-0.001) and murmur (χ2-12.4,p-0.001) were present in significantly higher percentages among the anemic compared to non-anemic women. A quarter of (n-32) the moderate anemic, 14.3%(n-47) of mild anemic and 8.7%(n-198) of non-anemic women were pale. Sensitivity of difficulty in breathing, palpitations, pallor and cardiac murmurs to detect anemia were 5.1% (95%CI3.5- 7.6), 3.6% (95%CI2.2-5.72), 17.5% (95%CI 14.3 - 21.3), and 8.0% (95%CI5.8-10.8) respectively. Positive predictive value for pallor was 26.2%(95%CI21.5-31.4). Mann-Whitney U test indicated a statistically significant difference (p-0.008) between the hemoglobin distribution of anemic women with pallor (Median-10.2g/dl, IQR-1.1) and without pallor (Median-10.3g/dl, IQR-0.7). In conclusion, majority of anemic pregnant women are asymptomatic in early pregnancy. Even the commonly used signs such as conjunctival pallor has poor sensitivity and cannot effectively be used for anemia screening in Sri Lankan pregnant women. Importance of relying on universal screening with a standardized hemoglobin assessment to identify anemia in early pregnancy is further highlighted with these findings. Universal teachings and utilization of clinical signs and symptoms should be carefully evaluated according to the context

Keywords: *Anemia, pregnancy, clinical signs, pallor, sensitivity*

[1]Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2]Department of Pathology, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
✉Corresponding Author: gayanishashikala@gmail.com

CKDu Patients' Perception and Expectations on Supportive Services

Senarathna L.[1], Dissanayake D.[2], De Silva K. T.[3]

Abstract

In response to the high prevalence of Chronic Kidney Disease of Unknown Etiology (CKDu), Sri Lankan government has introduced welfare mechanism to support patients and their families. This mechanism is mainly financial. But there are concerns whether the benefits of such mechanisms actually reach needed groups and whether the available support mechanism actually addresses the needs of effected families. This study aimed to explore perception of CKDu patients and their families on available support services and the type of support they really need. A qualitative study was conducted with the participation of CKDu patients and family members in Anuradhapura district of Sri Lanka. Participants were purposely selected and in-depth interviews were conducted with the patients and family members. Recordings from interviews were transcribed and used for thematic analysis together with the notes taken during home visits. Twenty patients were included in this study representing moderate to severe disease status. Four main themes were identified from the analysis; (01) Lack of trust on health care system, (02) receiving support to survive (the situation), (03) suffering of patients & families, CKDu and (04) poverty: losing capability. The theme; receiving support to survive (the situation); highlights the perception of patients on available support mechanism, and their expectations. Some individuals in need seemed missed out from receiving monthly government allowance to support treatment costs as one member of their families work in the government sector. Other than this main organized support mechanism, some have access to ad-hoc support from community groups, but not all. Participants valued support to establish regular income than allowances. Although there was no organized psychological or emotional support available, participants highlighted that they need psychological support. Such a need is mostly felt ; just after the diagnosis with CKDu, when they have to decide on starting dialysis (Kidney functions has become in-significant, and when they have to decide whether to stop dialysis (no hope of survival). But this has not being considered for any supportive services currently available. This study reveals that current financial support systems fails to reach needy individuals. Lack of organized programs on emotional and psychological support for patients and families was highlighted. Empowering CKDu effected families to establish regular income and providing them with essential psychological support would prevent them falling in to extreme poverty and minimize the impact of children.

Keywords: *CKDu, CKDu patients' perception, support services*

[1]Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2]Department of Pathology, Faculty of Medicine, University of Peradeniya, Sri Lanka
[3] Emeritus Professor, Department of Sociology, Faculty of Arts, University of Peradeniya, Sri Lanka
Corresponding author: gayanishashikala@gmail.com

Impact of Covid-19 Pandemic on the Social Wellbeing and Resilience Mechanisms of Three Rural Communities in Anuradhapura District, Sri Lanka

Gunasekara S. D.[1] ✉, **Wickramasinghe N. D.** [1], **Fernando W. M. S.**[2], **Dikomitis L.**[3], **Agampodi T. C.**[1], **Liyanage C.**[4], **Agampodi S. B.**[1]

Abstract

COVID-19 pandemic has led to strict social distancing measures around the world, which, in turn, led to a massive impact on the social wellbeing of people. This study aims to explore the impact of the COVID-19 pandemic on the social wellbeing of three selected rural communities in Anuradhapura district, Sri Lanka. An exploratory qualitative study was conducted, using solicited participant diaries to reflect on the day-to-day activities of community members in three purposively selected rural communities in Anuradhapura district. Twenty-seven diaries completed by community members were returned, and diary entries were typed and subjected to thematic analysis. Five themes were identified from the analysis; relationship with (1) family (2) friends (3) neighbours (4) other community members, and (5) social contribution. Both positive and negative impact on the identified dimensions had been reflected. Positive impact on family relationships, including family support and desire for protecting the family from COVID-19, were reflected. Relationships with neighbours and friends residing in the village were not negatively affected by the COVID-19 pandemic as they could maintain regular in-person contacts with each other. Sense of belonging to the community and supporting community members were also notable. Changes in the facet of 'social contribution' was identified during the analysis, as the community itself had adjusted the social activities, events, and activities of community-based organizations (CBOs) while adhering to COVID-19 precautions. Workload due to work from home regulations, increased social threats, reduced friendly conversations, quarrels among children in the house, reduced participation in CBOs/events, not being able to visit relatives/friends who live far from the village had led to a negative impact on social wellbeing. Our study findings reveal the potential for avoiding severe impact on the social wellbeing of rural communities during crisis situations, and it is important to understand the extent of the impact of COVID-19 on the social wellbeing of rural communities in Sri Lanka.

Keywords: *COVID-19, social wellbeing, rural, Sri Lanka*

[1] Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2] Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[3] School of Medicine, Keele University, United Kingdom
[4] Department of Sociology, Faculty of Arts, University of Colombo, Colombo, Sri Lanka
✉ Corresponding author: sonali.hp@as.rjt.ac.lk

Public Health of Ancient Sri Lankans in The Face of Epidemics

Panapitiya S.[1], Samarakoon K.[2]

Abstract

Today, the covid-19 epidemic is disabling all countries, creating various problems and challenging people's rights to life. It must be remembered that all countries worldwide have faced similar experiences in the past. This research is expected to show how the people of Sri Lanka in the past faced such epidemics and successfully solved them by providing solutions to them. The methodology used for this study is to analyze the facts obtained from the interviews with the senior community of Sri Lanka. Modern media attempts to portrait the methods used to deal with these epidemic diseases as modern. However, this research aims to describe these methods as commonly used tactics by ancient peoples of Sri Lanka. Isolation of the house and village was used for this purpose, restriction of travel, restriction of interpersonal relations, hand washing, and wearing face masks were identified as popular methods used in the past. The *Paadiya Baduna* was used for hand and foot washing. The house is isolated by hanging *kohomba* (*Azadirachta indica*) branches in front of the entrance to the house. Prohibition of entering the village by hanging medicinal leaves and *gokkola*. Taking action to increase immunity by giving medicinal porridges and drinks to the infected. Communicating one's own needs to others by producing different sounds using voice was a great process that was used. This research has shown that doing old things in a new way is not a modern finding or a modern concept. In the past, people believed that plagues spread with intense sunshine. They identified diseases such as measles and chickenpox as epidemics. These were called “God's diseases”. They called them Pattini diseases. In fact, the research concludes that the ancients successfully adapted to nature and maintained mental concentration for these diseases.

Keywords: *Isolated, pandemic, rituals, mental wellbeing, adapting*

[1] Department of Ethnomusicology, Faculty of Music, University of The Visual and Performing Arts, Sri Lanka
[2] Department of Western Music, Faculty of Music, University of The Visual and Performing Arts, Sri Lanka

Corresponding author. saman.p@vpa.ac.lk

Period Poverty in Rural Sri Lanka; Understanding Menstruation Hygiene and Related Health Issues to Empower Women

Hettiarachchi A.[1] ✉, **Agampodi T.**[1], **Agampodi S.**[1]

Abstract

Menstruation is a common bodily function for every reproductive age female. However, the methods used to manage their menstrual periods is highly influenced by social, cultural, economic, and educational backgrounds. Several studies conducted in Sri Lanka show that menstrual problems has been one of the commonest health issues as perceived by adolescent and young girls. Despite high literacy rates, exceptionally good maternal and child health care services and having one of the most appraised public health systems, menstrual problems are still mostly under-explored and considered a "taboo" even in most affluent settings in Sri Lanka. The "period poverty" - not having enough financial resources to manage bleeding and pain during menstruation - often attached with cultural shame is prevailing in Sri Lanka. This descriptive cross-sectional study was conducted in Anuradhapura district using modified WHO 30 cluster sampling technique. 539 participants with a mean age of 26.8 years a median age at menarche of 13 years were included. Regular menstruation was reported by 476(88.3%) participants. Median duration of bleeding was four days. Passing clots during menstruation was reported by 157(29.1%) females with majority (n=90,57.3%) passing clots only on a single day and another 53(33.8%) on two days. Only 79 has reported that they are passing clots in every cycle. Flooding was reported by 31(5.8%) participants. 137(25.4%) reported that they had perceived severe menstrual issues in the past. 68(12.6%) women sought medical care for menstrual issues, while others who has perceived that they had severe problem(s) didn't seek medical care. Estimated menstrual blood loss was more than 80 mL among 139(25.7%) women: less than one fourth of them perceived it as a problem. For 98(18.2%) women, the available sanitary product during their lifetime was "old clothes" showing a very high level of period poverty. Age, ethnicity, education, employment and income were significantly associated with not having access to proper sanitary methods. Use of clothes was significantly higher among participants with an older age, from remote MOH areas, of moor ethnicity, having a low level of education and low monthly income. Poor health seeking for menstrual issues is consistent with several studies conducted around the globe. Period poverty and inability of management of their period often subordinate women in their life with many aspects. Proper reproductive health education to the adolescent girls/reproductive age women and reducing the economic burden on sanitary products is needed as the two main steps for overcoming this issue in Sri Lanka.

Keywords: *Menstruation, health seeking, Sri Lanka, period poverty, women empowerment*

[1] Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka

✉ Corresponding author: ayeshhettiarachchi@yahoo.com

Traveling Cost for Health Service Utilization in Early Pregnancy: Evidence from the Rajarata Pregnancy Cohort

Gunarathne S. P.[1] ✉, **Agampodi T. C.**[1], **Wickramasinghe N. D.**[1]

Abstract

Traveling cost for health service utilization (TC) is considered an unavoidable cost type categorized under the direct non-medical out-of-pocket expenditure. We aim to assess the magnitude and the associated factors of TC in early pregnancy among pregnant mothers in the Anuradhapura district, Sri Lanka. This study was conducted in all 22 MOH areas in the Anuradhapura district under the Rajarata Pregnancy Cohort (RaPCo). We used a pre-tested self-administered questionnaire to collect data on household income and expenditure during the pregnancy, and TC during the first trimester is presented in this study. Data analysis was conducted using SPSS V27, and non-parametric tests were used to assess the statistical significance. The sample consisted of 1573 pregnant mothers. The mean (SD) age was 28.3 (5.6) years. The mean (SD) and median (IQR) TC during the first trimester were LKR 744.01 (1,397.17) and LKR 300.00 (150.00-700.00), which was equivalent to 37.1% of the total direct non-medical expenditure. The mean (SD) and median (IQR) TC per visit were LKR 316.28 (529.28) and LKR 150.00 (75.00-316.67), and it was equivalent to 8.2% of the monthly household traveling cost. Mothers with maternal morbidities had higher TC during the early pregnancy than their counterparts ($p<0.01$). Further, there were positive correlations between the distance to the health care facility and TC ($p<0.1$), number of visits, and TC ($p<0.1$). Hence, the study concludes that pregnant women in this rural Sri Lankan setting spend approximately one-third of the direct non-medical expenditure on TC. Mothers with maternal morbidities have high TC. There is a positive association between the distance to the health care facility and TC and between the number of visits and TC.

Keywords: *Health service utilization, maternal morbidities, out-of-pocket expenditure, pregnancy, travelling cost*

[1] Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka

✉ Corresponding author: sajaanpraveen7@gmail.com

The First Isolation of *Leptospira weilii* in Sri Lanka and Comparative Genomic Analysis of RAST Subsystems

Senavirathna I.[1,3] ✉, Warnasekara J.[2,3], Kappagoda C.[3], Srimantha S.[3], De Silva N.[3], Jayasundara D.[3,4], Agampodi S.[2,3]

Abstract

Leptospirosis is caused by spirochetes and is considered a remerging infectious disease worldwide. Leptospira isolation and whole-genome sequencing are two key concepts that enable us to understand the poorly defined pathophysiology of this disease. *L. interrogans*, *L.borgpetersenii,* and *L.kirchneri* were isolated from Sri Lanka two to three decades back. Even though Agampodi *et al.* has reported that *L.weilii* was causing disease, it was not isolated from Sri Lanka. This study was planned to identify *L.weilii* as an etiological agent causing human leptospirosis. Culture isolation of *Leptospira* from febrile patients was done using EMJH media and log phase from the growing culture was used for DNA extraction. In 25 isolated Leptospira, whole genomic sequencing was done to define the species. Extracted DNA was used for Pac-Bio sequencing. Data generated from sequencing were assembled using Canu 2.1. The average guanine-cytosine (GC) content of *Leptospira* lies between 34 and 41%: the highest was observed in *L.weilii*. Subsystem analysis by RAST annotation revealed that proteins linked to amino acids and derivatives, protein metabolism, cofactors, vitamins, prosthetic groups, pigments, carbohydrates, motility and chemotaxis were found in all species in roughly equal numbers. There was a slight variation in genome features even within the same species. In-depth comparative genomic analysis is required for further understanding.

Keywords: *Leptospira weilii, leptospirosis, Sri Lanka, comparative genomics, RAST subsystems*

[1] Department of Biochemistry, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
[2] Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University

[3] Leptospirosis Research Laboratory, Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka

[4] Department of Microbiology, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
✉Corresponding author: irathnabahu@gmail.com

High and Low-Risk Pregnancies at the First Clinic Visit: Requirement of Shared Care and Special Care in Pregnancy

Hettiarachchi A.[1] ✉, **Agampodi S.**[1]

Abstract

Despite the fact that Sri Lanka carries the lowest maternal mortality ratio (MMR) in the South Asian region, with 33.8 maternal deaths per 100,000 live births in the year 2016, Sri Lankan maternal mortality ratio is at a static state, with over 30 MMR for the past decade. The maternal risk assessment is conducted at the first clinic visit for all pregnant women registered with the system. While this service has been in practice for a long period, there are no published data on the low and high-risk pregnancies and the burden of shared care to the system. This study was conducted as a cross-sectional analysis of an ongoing cohort of pregnant females in Anuradhapura district, the Rajarata Pregnancy Cohort Study, covering all 22 MOH areas. A total number of 3374 mothers were recruited for the study. The mean age of the sample was 27.9. 85.8%(n=2896) participants attended their first clinic visit on or before 12 weeks of period of amenorrhoea (POA). Teenagers accounted for 7.5%(n=254) and 13.3%(n=449) were at the age of 35 or more. Primigravida women accounted for 30.9% (n=1041). Considering the primigravida women also as high risk, at least a single risk factor was detected in 90.6% (n=3058) of participants. The number of participants categorized as at risk due to complicated past obstetric history was 37%(n=1247). Categorized as risk due to conditions in present pregnancy was 79.3%(n=2675). Due to other disease conditions, 9.9%(n=333) were categorised as risk pregnancies. 2%(n=68) of pregnant females were categorized as high risk due to social factors such as unmarried or widowed. Of the 2329 multigravida women, 2015(86.5%) had at least one of the risk factors listed. Among 1041 primigravida women, 732(70.3%) had risk factors. Without considering the gravidity as a risk factor, 2749(81.5%) were categorised as risk pregnancies. The observation of more than 90% of women either being a primigravida or having a risk factor at the time of first clinic visit raises several queries about the current practice. While the pregnancy is classified as "low" and "high" based on the risk profile, our comprehensive analysis shows that more than 90% of pregnancies are actually having "high risk" for complications and require special attention. Health system adaptations and policy changes may be required, focusing on risk factors that actually require shared care and those with high complication rates. Prospective evaluation of pregnancy outcomes needs to be conducted to generate evidence for this proposed practice.

Keywords: *Antenatal care, maternal care, pregnancy, risk categorisation, Sri Lanka*

[1] Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
✉ Corresponding author: ayeshhettiarachchi@yahoo.com

Association between Non-Alcoholic Fatty Liver Disease in Pregnancy (NAFLD) and Maternal Weight Gain during Pregnancy; A Retrospective Study

Sewwandi M. M. S. [1] , Senarathne H. M. A. M. [1], Senarath P. G. D. D. W. [1], Senarathne M. K. U. D. [1], Sandaruwan J. K. [1], Sampath G. L. P. [1], Warnasekara Y. P. J. N [2], Koralegedara K. I. S. [3]

Abstract

Non-alcoholic fatty liver disease (NAFLD) is one of the most widespread metabolic conditions worldwide. Evidence suggests that NAFLD in pregnancy is associated with several pregnancy outcomes, including changing maternal weight gain. However, the prevalence and association between adverse maternal outcomes following NAFLD are lacking in Sri Lanka. Therefore we conducted a study to determine the association between NAFLD and weight gain during pregnancy. We used secondary data obtained from a large population-based prospective cohort study (RaPCo). This was conducted in the Anuradhapura district among a random sample of pregnant mothers registered in the national antenatal care program from July to August 2019. The weight of the mother at the first visit was recorded. All mothers were offered an ultrasound scan to diagnose fatty liver, and mothers were categorized according to ultrasound scan (USS) criteria into fatty liver grade 0, I, II and, III (FLG 0–III). All mothers were followed-up until delivery, and weight at the delivery was taken from the antenatal record. For the final analysis, 482 mothers were included. The mean age was 29.0 years (SD 5.6). Among them, 180 (37.3%) were diagnosed with FLG I, 67 (13.9%) had FLG II, while non-of pregnant women had FLG III. The total proportion of fatty liver was 51.2%. The mean weight gain of women who are in NAFLD grade 0 was 10.3 (SD- 4.2), fatty liver grade I was 9.9 (SD- 4.9), grade II was 8.8 (SD- 4.8). FLG II showed statistically significant lower weight gain ($p<0.05$) in comparison to FLG 0. After adjusting for the confounding factors, the significance of FLG II disappeared, and body mass index (BMI) and period of gestation (POG) at delivery remained the independent predictors of pregnancy weight gain. The reason behind the disappearance of significance in the multivariable analysis could be collinearity existing between FLG and BMI, as mothers with higher BMI are getting lower weight during pregnancy. Also, weight gain is known to be high with a higher pregnancy duration. As a result, this study concludes that there is no independent association between pregnancy weight gain.

Keywords: *NAFLD, pregnancy weight gain, Sri Lanka*

[1] Department of Information and Communication Technology, Faculty of Technology, Rajarata University of Sri Lanka, Sri Lanka

Association of Non-alcoholic Fatty Liver Disease and Large for Gestational Age Neonates: A Prospective Cohort Study

Koralegedara K. I. S.[1] ✉, Warnasekara Y. P. J. N.[2], Dayaratne K. G.[3], Premadasa A. J. K.[3], Agampodi S. B.[2]

Abstract

Non-alcoholic fatty liver disease (NAFLD) is a well-recognized hepatic manifestation of metabolic diseases worldwide. NAFLD in pregnancy is associated with the development of adverse neonatal outcomes, including pre-term birth, large birth weight babies, neonatal hyperglycaemia. Though several studies are conducted worldwide to assess the association between maternal fatty liver (FL) and neonatal birth weight, it has not been evaluated in Sri Lanka. This study aimed to evaluate the association between NAFLD and the subsequent risk of large for gestational age neonates (LGA). This prospective cohort study was conducted among a random sample of pregnant mothers registered in the national pregnancy care programme of Anuradhapura district from July to August 2019. After taking informed written consent, all mothers were given an interviewer-administered questionnaire. A well-experienced health care personnel took serum blood to perform an oral glucose tolerance test. Pregnant mothers who were diagnosed with chronic diabetes were excluded from the study. An ultrasound scan (USS) was performed under the supervision of a consultant radiologist to diagnose Fatty liver (FL) during the first trimester. FL was categorized into grades 0-III (FLG-0, I, II, III). All mothers who underwent USS were followed up till delivery. POA at delivery was documented. LGA was defined as birth weight equal to or more than the 90th percentile for a given gestational age. SGA was defined as birth weight equal to or less than the 10th percentile for a given gestational age. A total of 522 mothers were taken for the final analysis after excluding chronic diabetes, missing data, miscarriages with lost to follow-up. The mean age of the sample was 29.1 years (SD-5.6), and most of them (54.6%) were in the age category of 21-30 years. Of the total 522, 255 (48.9%), 195 (37.4%), and 72 (13.8%) were in the FLG-0, I, and II categories, respectively. They were followed up till delivery. The median gestational age at delivery was 39 weeks (IQR-38-40). The mean birth weight of FLG-0, I, and II were 2921 g (SD-442), 2958 g (SD-430), and 3025 g (452), respectively. The incidence of SGA in FLG-0, I, and II were 208, 164, and 139 per 1000 pregnancies, respectively. The incidence of LGA in FLG-0, I, and II were 43, 62, and 167 per 1000 pregnancies, respectively. FLG II remained a significant predictor with more than five times the risk of LGA even after adjusting for blood sugar values. (Ad.OR=5.4,95%CI=1.9-15.3). Therefore, early screening for FL, suggestively with a dating scan, could improve neonatal mortality and morbidity.

***Keywords**: NAFLD, large for gestational age, fatty liver, cohort, Sri Lanka*

[2] Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
✉ Corresponding author: shashikalasewwandi1995@gmail.com
[1] Department of Anatomy, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
[2] Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
[3] Teaching Hospital Anuradhapura, Sri Lanka
✉ Corresponding author: kis.koralegedara@gmail.com

Level of Knowledge on Sexual and Reproductive Health among Undergraduate Students in Sri Lanka

Dissanayake N. [1], Senavirathna C.[1], Senarathna L.[1]

Abstract

Sexual and Reproductive Health (SRH) problems in young groups are a common public health concern that can be a social and economic burden. University undergraduates represent a unique group of the young population, and their level of knowledge on SRH can contribute to improving the wellbeing of themselves and also their peers. The study aimed to assess the level of knowledge on SRH among undergraduates of state universities of Sri Lanka. A descriptive cross-sectional study was conducted among undergraduate students from 12 state universities of Sri Lanka during August 2018. A structured questionnaire was developed, pre-tested, and delivered as an online questionnaire using Google Forms as the platform. Information on socio-demographic characteristics, knowledge on SRH, information sources of reproductive health, contraception, and Sexually Transmitted Infections (STI) among participants were collected. Necessary precautions had been taken to enhance the confidentiality of the information collected. Descriptive statistics were used to describe the frequency, proportion, and distribution variables using SPSS as the tool. A total of 700 students responded to the questionnaire, from which 645 (92%) responses were included in the analysis. Nearly 25% of undergraduates mentioned that they never received any kind of formal sexual education. Overall knowledge on SRH in relation to reproductive physiology and contraception was significantly higher among male participants than females. The commonly accepted contraceptive was condoms (80.3%), while the knowledge on other methods varied across the faculties. They were poorly aware of natural contraceptive methods, including withdrawal and safe period, by 48.9% and 53.1%, respectively. Undergraduates from management faculties and arts faculties indicated a comparatively low level of knowledge regarding contraceptive methods. The intention of using contraception was preventing pregnancy, and nearly 10% recognized the use of particular contraception for preventing STIs. The awareness of the participants about the mode of transmission of STIs is high across all faculties, and there is no significant difference between faculties. However, a significant number of participants (83%) identified saliva as a transmission medium of STIs. Overall knowledge on SRH varies among study participants based on their gender, attended school type, faculty, and academic year. Findings affirmed the requirement of comprehensive interventions to enhance knowledge towards sexual health among undergraduates in Sri Lanka.

Keywords: *Knowledge, reproductive health, undergraduates, contraception*

[1] Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Sri Lanka
Corresponding author: nayo.dissanayake@gmail.com

Children with Conduct Disorder (CD) Make Life Harder for Teachers

Elapatha G. E. S. T.[1]✉, Premawansha I. J.[1], Nanayakkara N. B. N. A. K.[1], Kumarasinghe D. D. S. D.[1], Madushani S. A. P.[1], Prathapan S.[2], Wickremasinghe D. R.[3], Vidanage U. A.[4]

Abstract

Conduct disorder is one of the most common psychiatric disorders among children and adolescents globally. Therefore, teachers need to have a balanced attitude towards these children. This study aimed to describe the socio-demographic and teaching experience related factors associated with the attitude of school teachers on conduct disorder. A descriptive cross-sectional study comprising of 188 participants was conducted to describe the socio-demographic and teaching experience related factors associated with the attitude of school teachers on children with conduct disorder in selected schools in the Nugegoda MOH area. The attitude was assessed and categorized using a validated scoring system into favorable and unfavorable categories. Exclusion criteria included foreign teachers who worked at selected international schools and school teachers who were not conversant in Sinhalese and/or English. Snowball sampling technique was used. Data was collected using a self-administered questionnaire, administered as a google form. Data were analysed using SPSS software 26th version. Tables were presented with Chi-squared and Fisher's statistical tests. Favorable attitudes were defined as more than 50% of the total score. The significance level was set at 5%. Most teachers were female (n=176, 93.6%), and 87 (46.3%) were in the 21-30 years age group. 168 (89.4%) teachers were Sinhalese, and most of them (84%) were Buddhists. 78.7% had nuclear families. About half of the population (50.5%) was unmarried, and 113 (60.1%) teachers had no children. The majority of teachers (68.1%, n=128) had unfavorable attitudes, and only 60 (31.9%) had favorable attitudes. As sociodemographic factors, age group, and the number of children teacher had and among teaching experience related factors, the total period of service and grades they taught showed a statistically significant association with favorable attitudes ($p<0.05$). Therefore, the majority of teachers had unfavorable attitudes. Thus, continuous professional education should be introduced to enhance practices among school teachers.

***Keywords**: Conduct disorders, teachers reactions/ emotional expression, intervention programs, inclusion of CD students, teaching experience*

[1] Faculty of Medical Sciences University of Sri Jayewardenepura, Sri Lanka
[2] Department of community medicine, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka
[3] Department of parasitology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka
[4] Ministry of Health, Sri Lanka
✉Corresponding author: Sanjayalakmal10@gmail.com

Serum Amylase Enzyme Level and Body Mass Index: Is there any Correlation?

Weerasinghe W. C. A.[1], Risla M. B. F.[1], Dias P.[2], Priyadarshani A. M. B.[1]

Abstract

Amylase enzyme is important in carbohydrate digestion. However, abnormal levels of serum amylase are associated with disease conditions. Usually, a serum amylase test is recommended for patients who are already diagnosed with clinical complications such as acute and chronic pancreatitis, at its severe stage. So, it has great importance on screening serum levels of amylase enzyme in early stages as there are no published data in Sri Lanka. Therefore, the objective of this study was to investigate whether there is a relationship between serum amylase level and Body Mass Index (BMI) in healthy individuals in Sri Lanka. A descriptive cross-sectional study was conducted using altogether 120 individuals belonging to 22-35 years. An equal number of individuals (n=30) was recruited in each BMI category to compare the effect of BMI on serum amylase level. BMI was calculated according to the standard protocol. The serum amylase level was measured by MISPA VIVA semi-automated Clinical Chemistry Analyzer. An independent sample t-test was used to compare the statistical significance of differences in mean serum amylase levels between males and females whereas a One-way ANOVA test was used to compare the mean values of serum amylase enzyme level across categories of BMI in females and male study populations. Pearson's correlation coefficient (r) was used to evaluate the correlation between serum amylase enzyme level and BMI. The minimum and maximum serum amylase levels reported from the study population were 15.6 and 132.19 U/L, respectively. The mean serum amylase level of females was 72.35 U/L and in males, 63.28 U/L. In the study population, the mean serum amylase enzyme levels of underweight, normal, overweight, and obese groups were 69.32, 69.30, 70.25, and 70.28 U/L, respectively. In males, the mean serum amylase enzyme levels of underweight, normal, overweight, and obese groups were 63.30, 48.82, 51.32, and 80.06 U/L, respectively and in females, 70.24, 74.42, 81.20, and 62.79 o U/L, respectively. Results showed that in males, a statistically significant difference of serum amylase enzyme levels only between normal weight and obese (p=0.006) and overweight and obese (p=0.002) groups. In females, there was no statistically significantly different in serum amylase level between any of the BMI groups. Serum amylase enzyme level was significantly higher in females than males (p=0.042). There was no significant linear correlation between serum amylase enzyme level and BMI in both males (r=0.204, p=0.248) and females (r=-0.046, p=0.671).

Keywords: *BMI, gender, serum amylase*

[1] Department of Medical Laboratory Sciences, Faculty of Allied Health Sciences, University of Sri Jayewardenepura, Sri Lanka
[2] Department of Statistics, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka
Corresponding author. priyadarshani@sjp.ac.lk

Experiences and Barriers of Medication Adherence in Older People with Uncontrolled Type 2 Diabetes Mellitus: A Qualitative Study

Upamali R. A. S.[1] ✉, **Rathnayake S.**[2]

Abstract

Diabetes mellitus is one of the most prevalent non-communicable diseases worldwide. The presence of diabetes among the older population is increasing and is associated with a higher risk of diabetes-related complications. Medication non-adherence is an essential clinical and resource-intensive concern and older people are at an increased risk. This study aimed to explore the experiences and barriers of medication adherence among older patients with uncontrolled type 2 diabetes mellitus attending government healthcare centres in Sri Lanka. A qualitative, descriptive, exploratory study was conducted through in-depth telephone interviews with a purposive sample of 14 older people with uncontrolled type 2 diabetes mellitus. A semi-structured interview guide was used for data collection. The study included patients from the Diabetes Clinic at Teaching Hospital, Peradeniya, as well as community members through snowball sampling. Interviews were audiotaped with the participants' consent and transcribed verbatim. The thematic analysis method was used in data analysis. In reporting results, the consolidated criteria for reporting qualitative research guidelines were followed. Six themes were emerged: (a) Impact of knowledge, practices, and attitudes on medication adherence, (b) Treatment-related barriers for medication adherence, (c) Impact of age-related changes on medication adherence, (d) Person-related barriers for medication adherence, (e) Impact of COVID-19 on medication adherence and, (f) Role of support system in medication adherence. In addition to the barriers common for the general population, age-related physical and psychological changes interfere in medication adherence of older people with diabetes mellitus. Furthermore, complementary and alternative medicine is used increasingly by older people, giving it a priority, which consequently leads to poor adherence when taking western medicines. Implementing individualized patient teaching and provision and strengthening of additional support systems, especially during the COVID-19 pandemic, are essential to improve medication adherence levels among older people with diabetes mellitus.

Keywords: *Medication adherence, older people, type 2 diabetes mellitus*

[1]Department of Pharmacy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, Sri Lanka
[2]Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, Sri Lanka
✉ Corresponding author: sathmaupamali@gmail.com

Experiences of Chemotherapy as a Treatment Modality Among the Patients with Cancer Attending Chemotherapy

Nanayakkara N. W. W. G. S. K.[1], Jayaratna Y. G. S. W.[2]

Abstract

Chemotherapy is one of the major treatment modalities for treating patients with cancer. The present study aimed to explore the experiences of chemotherapy among patients with cancer. A descriptive qualitative study was carried out with fifteen patients attending chemotherapy at the National Hospital Kandy in Sri Lanka. A pre-tested interview guide was used as the data collection tool. Ethical clearance was obtained from the ethical committee of the Faculty of Allied Health Science, University of Peradeniya. Both male & female patients aged 18 years or older, those who have completed three or more chemotherapy cycles were interviewed. Data collection was stopped once data saturation occurred. Hence 15 in-depth interviews were conducted. Thematic analysis was performed to analyze and interpret the meaning of the gathered qualitative data. Investigator triangulation was performed to enhance the credibility of the study. Three themes emerged. The first theme 'Experiencing chemotherapy negatively' comprised four subthemes: chemotherapy negatively affected the body, chemotherapy negatively affected the mind, needed time to return from chemotherapy discomforts, and experiencing different chemotherapy regimens in different ways. Three sub-themes formed the second theme 'Experiencing chemotherapy positively' those subthemes experiencing a significant improvement of the disease, absence of common chemotherapy side effects, and emotional well-being during chemotherapy. The theme 'Living with chemotherapy' emerged from three sub-themes lifestyle modifications due to chemotherapy, perceiving and experiencing coping strategies positively, and supportive measures to deal with chemotherapy discomforts. Cancer patients experienced multiple physical and emotional disturbances during chemotherapy. It was clear from the findings that further interventions need to improve the emotional well-being of patients undergoing chemotherapy. Moreover, further studies are required to explore the different experiences of chemotherapy-related to the different chemotherapy regimens.

Keywords: *Chemotherapy, qualitative study, experiences, cancer patients*

[1] Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka
[2] Medical Education unit, Faculty of Medicine and Allied sciences, Rajarata University, Sri Lanka
Corresponding author: sandaninanayakkara04@gmail.com

Views and Experiences of Lifestyles of Overweight and Obese People: A Qualitative Study in a Selected Group of Sri Lankans

Bookoladeniya D. R.[1], Perera R. H.[1], Senevirathne K. A.[1], Silva S. M.[1], Gunawardana H. A. K. S.[2]

Abstract

Overweight & obese people have different perspectives on weight management. Stigma and discrimination toward obese persons are pervasive and pose numerous consequences for their psychological and physical health. This qualitative study has been conducted to explore the views and experiences of lifestyles of overweight and obese people. Ethical approval was obtained from the Ethics Review Committee of CINEC Campus, Malabe. A purposive sample of 30 (17 overweight and 13 obese) from selected walking paths in Colombo District was taken and semi-structured interviews were conducted to collect the data. Data analysis was done by using thematic analysis. 03 major themes emerged; living with increased body weight is challenging, unrealistic expectations, social pressures. Difficulty in performing normal daily activities, difficulty in finding clothes as per preference where the sub-themes derived under life with increased body weight is challenging. Under the major theme of unrealistic expectations, the majority of the participants expect to lose weight, most of them stated that they find it difficult to control the food intake & do weight monitoring regularly. Under the major theme of social pressures, respondents were being criticized, humiliated by the closed people, and making them feel negative were the subthemes. Weight loss is a difficult task with physical, social, behavioral & environmental elements that appear to assist and inhibit weight-loss efforts concurrently. The findings suggested the critical role of support in the obesity self-management process. Awareness of the perception of the people who have excess body weight is needed for society to minimize the psycho-social impact on them. Society can play a major role to increase the quality of life of people with increased body weight.

Keywords *- Overweight, obese, views, experience, lifestyle*

[1] Department of Biomedical Sciences, Faculty of Health Sciences, CINEC Campus, Malabe, Sri Lanka
[2] Department of Health & Medical Sciences, Faculty of Health Sciences, CINEC Campus, Malabe, Sri Lanka
✉ Corresponding author: demiduravinda@gmail.com

Respiratory Effects of Exhausted Vehicle Fume Exposure Among Traffic Police Officers in Kandy Police Division, Sri Lanka

Rajapaksha R. M. D. K.[1], Pathirathna M. L.[2]

Abstract

Air pollution has become one of the significant public health problems in Sri Lanka over the last few decades. Exhausted automobile smoke from the increasing number of vehicles and unplanned urbanization directly contribute to air pollution. Daily exposure to exhausted vehicle smoke is frequently associated with increased morbidity from cardiovascular diseases, lung cancer, and respiratory diseases, such as bronchitis and respiratory tract infections. Traffic police officers working on roads, especially in urban environments, are occupationally exposed to exhausting vehicle fumes generated by motor traffic vehicles. Hence, the traffic police officers are at a greater risk of developing respiratory illnesses due to this occupational exposure. The present study aimed to investigate the prevalence of respiratory symptoms and their relationship with some selected variables among the traffic police officers in the Kandy Police Division, Sri Lanka, as Kandy city is identified as one of the most air-polluted cities in Sri Lanka. The study was performed as a descriptive cross-sectional study in the police stations located in the Kandy police division, Central province, Sri Lanka. One hundred sixty-three traffic police officers who were attached to the traffic units of the Kandy police division and who were active on road traffic duties were included in the study. Data was collected through telephone conversations using a structured interviewer-administered questionnaire that consisted of socio-demographic, occupational-related, and respiratory symptoms-related questions. The collected data were analyzed using Minitab 19 statistical software. The mean age of the participant was 47.8±7.2 years. The reported prevalence of respiratory symptoms among traffic police officers were: coughing 22.7%, bringing up phlegm 27%, wheezing 11%, shortness of breath while walking 4.9%, pain or tightness in the chest 4.3%, and getting very tired in a short time 12.3%. The traffic police officers who were exposed to active or passive tobacco smoke had a higher risk of having cough ((OR: 1.14; $p = 0.009$), bringing up phlegm (OR: 1.12; $p = 0.005$) and attacks of wheezing (OR: 1.568; $p = 0.022$) compared to those who were not exposed to tobacco smoke. The current study results suggest that being exposed to active or passive tobacco smoke adds a higher risk of having respiratory symptoms like cough, bringing-up phlegm, and wheezing to the traffic police officers who are active on road traffic duties.

Keywords: *Air pollution, traffic police, vehicle fumes, Sri Lanka*

[1]Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka
[2]Department of Health & Medical Sciences, Faculty of Health Sciences, CINEC Campus, Malabe, Sri Lanka
Corresponding author: kushanhotline@gmail.com

Sociodemographic Factors Affecting Early Pregnancy Metabolic Syndrome Among Pregnant Women in Anuradhapura District

Jayasinghe H. M. I. U.[1] Dissanayake A. K.[2], Agampodi S. B.[1]

Abstract

Research on early pregnancy metabolic syndrome (MetS) is scarce in the local context. Recent scientific evidence shows that MetS in pregnant women has adverse implications on pregnancy outcomes. Therefore, exploring the epidemiology of MetS in different parts of the world is crucial in understanding its effect on pregnancy and its outcomes in specific obstetric populations. On this background, our study aimed to evaluate the sociodemographic characteristics among pregnant women with MetS in their early pregnancy, in rural Sri Lanka. We analyzed the baseline sociodemographic data collected from participants of the Rajarata Pregnancy Cohort to achieve this objective. Pregnant women registered before the completion of 12 gestational weeks and those below 18 completed years were included for the analysis. Women with a history of myocardial infarction, stroke, hypothyroidism, autoimmune disease, asthma, and who are on long-term steroid therapy were also excluded. Diagnosis of MetS was made by International Diabetes Federation (IDF) criteria. 2639 participants were included in this analysis. Their mean age was 28.1 years (SD-5.4) and the median period of amenorrhea was 8.0 weeks (IQR-3). Of them, 143 pregnant women were identified as having MetS according to IDF criteria (5.4%, 95%CI-4.6-6.4). A higher prevalence of MetS was reported among ethnic Tamils (18.5%, CI-8.2-36.7) and women with second or more gravida (6.2%, CI-5.2-7.4). Kahatagasdigiliya, Kekirawa, Galenbindunuwewa, and Ipalogama MOH areas had MetS prevalence of 8.8%, 8.6%, 8.3%, and 8.2%, respectively, while Thalawa had the least prevalence (1.2%). In the bivariate analysis, the prevalence of MetS was significantly associated with age ($p<0.001$), ethnicity ($p<0.001$), gravidity ($p=0.01$), and the area of residence ($p=0.04$). However, the multivariable analysis shows that only ethnicity and age at conception are the predictors of having MetS at the first visit of this obstetric population. The observed differences in geography and gravidity were due to the confounding effect of ethnic distribution and age at conception. In conclusion, the significant prevalence of MetS among this rural Sri Lankan obstetric population and the associated predictors of age and ethnicity warrants further extensive evaluation for MetS in this population to uplift the health of females.

Keywords: *Antenatal, metabolic syndrome, pregnancy, socio-demographic predictors*

[1]Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2]Department of Gynecology and Obstetrics, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
Corresponding author: hmiujayasinghe@gmail.com

An Evaluation of "Self -introduction" in the Community Engagement and Involvement (CEI); A Preliminary Study Based on Participant Observation

Lalani J. M. G. [1] , Wickramasinghe N. D.[1], Liyanage C.[2], Agampodi T. C.[1], Agampodi S.B. [1]

Abstract

Community Engagement and Involvement (CEI) increases the value of research and has been promoted as a strategy for improving recognition and societal value for the community. Evaluation of CEI has been identified as a key component of research, especially in social science and health. The project, "Empowering people with Cutaneous Leishmaniasis: Intervention Programme to improve the patient journey and reduce Stigma via community Education" (ECLIPSE) is large-scale health and social intervention in rural Sri Lanka. It uses the approach of evaluation of CEI by establishing "Community Advisory Groups" (CAGs) at village settings. CAG members were purposefully selected from the relevant communities and included people with Cutaneous Leishmaniasis as well as key informants who could provide feedback on the implementation of the project work at the community level. The aim of the study was to describe and evaluate the process of "self-introduction" made by members of CAGs at initial meetings as a part of the CEI evaluation of the project. To accomplish this objective, an independent member of the research team carried out participant observation of the CAG meetings conducted at Katuyaya and Puwakwewa field sites in Anuradhapura district, Sri Lanka. The field notes of participant observation were analyzed using a framework approach based on UNICEF Minimum Quality Core Standards of CE. Study results suggested that people reflect their introduction by using the name, educational background, occupation, positions and roles in volunteer social organizations, family role, and willingness to contribute to the project. We observed that giving an opportunity to introduce themselves without a structured format creates power hierarchies within the group impeding "participation", "inclusion" and "empowerment" which are core standards of CEI. The research team changed the approach of self-introduction at subsequent CAG meetings by asking to elaborate on current work engagement. The approach was successful and enhanced meaningful participation, minimized exclusion, and empowered members on collective action. It also revealed information on social organizations, social roles, and the social cohesion of communities. Thus, self-introduction in CAGs serves as a strong foundation for CEI. However, it should be carefully used by researchers so that undue power differences would not breach the core standards of CE.

Keywords: *Community advisory groups, community engagement and involvement, evaluation, participant observation, self-introduction*

[1]Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Sri Lanka
[2] Department of Sociology, Faculty of Arts, University of Colombo, Sri Lanka
Corresponding author: lalani.mihin@yahoo.co.uk

Proceedings of the ISymRU 2021
Medicine and Public Health: Poster Presentation

Visualization of Doubling times and Comparison of Control measures for COVID-19 in Sri Lanka and China

Gunarathne M. V. H. S.[1], Dilakshana K.[1], Jayathilake R. M. S. D. L.[2]

Abstract

Coronavirus disease 2019 (COVID-19) is an emerging infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Epidemic doubling time is a measure of disease transmissibility and characterizes the sequence of intervals at which the cumulative incidence doubles. These metrics could be used to integrate real-time information regarding the epidemic's spread over time. This study aims to analyze the effect of control measures on the COVID-19 pandemic in Sri Lanka evaluating the fluctuation of calculated doubling times (td, in days) of cases and deaths with time by comparing the corresponding epidemic data with China in hope of benefiting from fighting against the pandemic. This was a descriptive study. The data of cumulative incidence of cases and deaths related to COVID-19 in Sri Lanka and China were extracted, doubling times were calculated and compared about key events during the corresponding period and the control measures implemented in the two countries. The calculated doubling times for the total number of cases in Sri Lanka were *td1=60, td2=19, td3=12, td4=13, td5=23, td6=105, td7=40, td8=14, td9=27, td10=43, td11=102, td12=40* and *td13=81* whereas the doubling times for China were *td1=1, td2=2, td3=2, td4=2, td5=4, td6=3, td7=4, td8=7* and *td9=397*. Doubling times for the total number of deaths in Sri Lanka were *td1=2, td2=3, td3=31, td4=175, td5=13, td6=10, td7=106, td8=44, td9=53, td10=70, td11=23, td12=44* and *td13=33* while for the China; doubling times for deaths were obtained as *td1=5, td2=3, td3=2, td4=0, td5=3, td6=2, td7=1, td8=4, td9=4, td10=6, td11=9* and *td12=59*. After the first case in Sri Lanka, the government imposed stringent public health measures and social distancing leading to a drastic drop in the transmission rate at the beginning showing a high doubling time. The second wave was largely due to local transmissions and their contacts and the government-controlled the spread of the pandemic by imposing an island-wide quarantine curfew. With the spread of the Delta variant, the previously controlled pandemic became more virulent, thus leading to an aggressive third wave. Doubling timelines for both cases and deaths in China indicate a gradual increase in doubling times which in turn confirms an efficient national COVID-19 control policy and economic strategies implemented in China. The findings of the study show that China's COVID-19 control measures are more effective since their doubling time in both cases and deaths are getting higher remarkably with time. Although Sri Lanka has shown successful disease management at the beginning of the pandemic, the implementation of strict control measures would be more beneficial.

Keywords: *China, control measures, COVID-19, doubling time, Sri Lanka*

[1] Department of Pharmacy, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka
[2] Department of Nursing, Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka
✉ Corresponding author: hansinigunarathne111@gmail.com

Immunogenicity and Vaccine Efficacy of Covid-19 Vaccines in Sri Lanka

De Silva S. S[1], Eugene E. J[1]

Abstract

The widespread morbidity and mortality associated with the coronavirus disease 2019 (COVID-19) pandemic precipitated the most extensive and rapid global vaccine development programme in history. This literature review is focused on the vaccine efficacy (VE) and immunogenicity of COVID-19 vaccines administered in Sri Lanka such as Sinopharm (BBIBP-CorV), AstraZeneca (AZD1222/chAdOx1), Pfizer (BNT162b2), Moderna (mRNA-1273) and Sputnik V (Gam-COVID-Vac). The descending order of the vaccines based on the resultant ratios of neutralising antibody is as follows - mRNA-1273, BNT162b2, AZD1222, Sputnik V, BBIBP-CorV. The efficacies of currently used vaccines) range from 50.38% to 95%. VE of Sinopharm, AstraZeneca, Moderna, Pfizer and Sputnik V were 79.34%, 90%, 94.1%, 95% and 91.6% respectively. In response to COVID-19 global vaccine development 102 candidate vaccines were developed on seven different platforms (viral vectored vaccine, recombinant protein vaccine, activated vaccine and live attenuated vaccine, DNA, RNA, virus inactivated) out of which 15 vaccines have already been approved for emergency use. According to WHO five vaccines are used among the Sri Lankan population. Namely, Sinopharm (BBIBP-CorV), AstraZeneca (AZD1222/chAdOx1), Pfizer (BNT162b2), Moderna (mRNA-1273) and sputnik V (Gam-COVID-Vac). This literature review mainly focuses on the immunogenicity, safety and efficacy of the above-mentioned vaccines administered in Sri Lanka. The VE of Sinopharm, AstraZeneca, Moderna, Pfizer and Sputnik V were 79.34%, 90%, 94.1%, 95% and 91.6% respectively. The importance of neutralizing antibodies in imparting protection against COVID-19 has been supported by prior investigations on monoclonal antibodies and convalescent sera. Multiple studies have found that antibody responses established by natural infection with coronaviruses (e.g., SARS CoV-2) may decline significantly over time. However, reinfection in these patients has been rare, implying that immunological memory may play a key role in preventing re-infections. As a result, the formation of a recallable specific immune response to SARS-CoV-2, rather than the antibody level, may be the key to an effective COVID-19 vaccine. This literature review shows immunogenicity and vaccine efficacy plays vital role determining the safety and effectiveness of the vaccine but immunogenicity is determined by ethnicity, cellular immunity and neutral antibodies.

Keywords: *COVID-19 vaccines, vaccine efficacy, immunogenicity, neutralising antibody*

[1] Department of Biomedical Science, Faculty of Information Technology and Sciences, International College of Business and Technology, Colombo 04, Sri Lanka

Corresponding author: sherikadesilvaa@gmail.com, mcjeugene@yahoo.com

Capacity of Midwives to Screen for Post-Partum Depression, A Descriptive Study in Matara District, Sri Lanka

Vidanage U. A.[1] ✉, Elapatha G. E. S. T.[2] , Thirimanna H. D. G. S.[2]

Abstract

Postpartum Depression (PPD) occurs in 10-20% of post-partum women but less than half of the cases are detected. PPD can have significant consequences for the well-being of mother and infant. Screening for PPD is done as part of the maternity care program in Sri Lanka. Public health midwives (PHMs) are the main category of health staff involved in this screening program. Hence, assessing their capacity of performance will justifiably be important for evaluating this screening program. A community-based descriptive cross-sectional study was carried out in the Matara district, from March 2016 to August 2017 with the participation of all (260) PHMs attached to 17 MOH offices who were enrolled after obtaining informed written consent. A pretested self-administered questionnaire was used to assess five specific objectives. Socio-demographic and work-related factors, organization-related factors, knowledge, attitude, and associated factors of these two were assessed. Statistical package for social science (SPSS) version 21 was used to analyze data. Good knowledge-score: at or above 50% Poor knowledge-score: less than 50%. Cross tabbing was done with some independent variables and statistically analyzed. Ethical clearance was obtained from PGIM Colombo. Out of the study population, 55.7% (136) were satisfied with the service of the medical officer of mental health (MOMH). 65.6% (160) of PHMs were not satisfied with the facilities available for screening a mental disease in clinics. 201PHMs (82.4%) had knowledge of (PPD) and treatment of PPD. Only 50% of respondents had good knowledge of the Edinburg Postpartum Depression scale (EPDS). Further, 64.8% (158) had a strong attitude towards the importance of in-service training and inclusion of mental health into their basic training. There were statistically significant associations between their good level of knowledge and the number of training programs attended and their family support ($p<0.05$). Furthermore, statistically significant associations between good attitude and time were taken to arrive at the working station and field experience were found ($p<0.05$). There are gaps in knowledge and attitude, therefore giving up-to-date information, improvement of clinic facilities for maternal health care and periodical in-service training especially aiming at PPD will help to fill these gaps.

Keywords: Post-partum depression, public health midwives, medical officer mental health, Edinburgh postpartum depression scale

[1] Ministry of Health, Sri Lanka
[2] Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka
✉ Corresponding author: Udula.vidanage@gmail.com

ISymRU 2021

Social Sciences and Humanities

Research and Innovation Towards Global Sustainability Through Rural Empowerment 22-21 December

The Modern Approaches Used by Judges in the Interpretation of the "Right to Life" under the Current Constitutional Framework of Sri Lanka

Rupasinghe R. A. D. S. T.[1] ✉, Udayajeewa T. J.[1]

Abstract

The Human Rights provisions found in the present Sri Lankan Constitution encompass a very large and fruitful area. They include various fundamental rights except the most valuable right called the "right to life". The 1978 Constitution of Sri Lanka does not expressly recognize the right to life as a fundamental right. Irrespective of the fact that there was no direct provision to safeguard the right to life, the Supreme Court of Sri Lanka has interpreted mainly in Articles 11 (Freedom from torture or cruel, inhuman or degrading treatment) and 13(4) (Right not to be punished with death or imprisonment except by order of a competent court made in accordance with the procedure established by law) in order to bring in the fundamental right to life. Without life in the sense of existence, it would not be possible to exercise rights or to be the bearer of them. The Court should certainly play an active role with modern approaches in interpreting the fundamental rights enshrined in the Constitution not to change any of its provisions but to give it a more effective meaning in fundamental rights. The main objective of this research work has been to focus on the modern approaches used by judges in the interpretation of "Right to Life" under the current constitutional framework of Sri Lanka. Thus, this particular study is cited in several judgments where our Supreme Court has examined the scope and application of the right to life in Sri Lanka. For this purpose, the main research question is how the modern approaches used by judges in the interpretation of "Right to Life" under the current constitutional framework of Sri Lanka. The research methodology is mainly based on interpretivism and epistemological philosophy, this helps to build subjective reality, exploratory understandings and interpretations of real-world contexts. In addition, used for the qualitative research study by collecting both primary and secondary data for content analysis. Finally, researchers concerned key findings used content analysis and provided recommendations to directly recognize the right to live in the constitution by a constitutional amendment or be included in the fundamental rights chapter of the proposed new Constitution as a justiciable fundamental human right.

Keywords: *Constitution, fundamental right, interpretation, right to life, Sri Lanka.*

[1] Department of International Relations, Faculty of Arts, University of Colombo, Sri Lanka
✉ Corresponding author: dedunurupasinghe7@gmail.com

Aging and Retirement: Identifying the Negative Experiences of Post-Retirement

Siriwardhana W. S. N.1✉

Abstract

Aging is a biological process associated with human life, and it is a very natural process. Over time, the person ages, and a person cannot avoid adapting to that stage of life. That is, everyone has to accept the various opportunities and challenges they face in relation to old age. The study focuses on understanding the relationship between the negative experiences of post – retirement life and post retirement planning. Identifying the negative aspects of post-retirement experience and recognizing the importance of managing post-retirement life were the main objective of this study. Since this study is primarily aimed at examining the negative consequences of the retirement transition in the Sri Lankan context, the literature is based on research findings in the field of post-retirement life. To collect primary data, Forty (n = 40) respondents were selected under non-random, purposive sampling, and the study used twenty similar respondents, each based on gender. Data was collected using Semi structured interviews. Negative impacts on post-retirement life predominate. For example, major negative effects of retirement transition include job loss, declining income and having to reorganize life activities, social isolation and changes in an individual's social acceptance. Dissatisfaction in retirement is due to factors such as low income, low self-esteem and poor planning or lack of pre-planning are the main causes of these negative consequences. The gender impact towards post – retirement planning was identified in the findings reveals that post – retirement planning is much advance among women, than men. The study emphasize that the main reason for the difficulty in adapting to retirement life is not planning adequately for post-retirement life before retirement. In conclusion, it is revealed that there is a direct relationship between the negative conditions associated with post-retirement life and the lack of pre-retirement management.

Keywords: *Aging, dissatisfaction, planning, post-retirement life, retirement*

[1]Department of Sociology, Faculty of Arts, University of Colombo, Sri Lanka
✉ Corresponding author: wsnsusi@gmail.com

Lives in the Street – Challenges, Abuse, and Protection of Street Elders in Sri Lanka

Herath U. [1]

Abstract

Aging is marked by remarkable changes in peoples' lives since it is encountered with a huge number of issues such as loneliness, lack of income, medical issues, with the decline of their physical strength. From the world perspective Zoyza, T.D (2014) states that: one out of every ten people in the world today belongs to the category of older people. In another perspective, the rapidly growing aging population badly created social, economic, and cultural issues. This study has attempted to focus on the challenges, abuse, and protection of the lives of elders who are begging in the streets. The main research problem of this study was "Being economically inactive pushes elders to street life? Three main research objectives were formulated in line with the main research problem of this study. To identify the purposes for begging in the streets, to identify the main challenges street elders are facing in the present. Identifying the ways that they abuse in the street lives were major research objectives. The study, within an exploratory background Case studies, were descriptively analyzed in a qualitative research design. The study population were purposely selected as street elders above 60 years 15 males and 35 females respectively around in Nugegoda, Kelaniya and Bellanwila geographical area. Observations and interviews were used as primary data collecting techniques while collecting secondary data through paper articles, annual reports and scholarly articles. Lack of access to fulfil basic needs –Shelter, Foods, Medicine, water, clothes, safety, Ignorance – based on their out appearance (bad smell, with wound), Less attention, Lack of sanitary facilities, Lack of affection, not legal guardians and domestic violence as they age, failing to meet proper guidance were identified as challenges they face in their day-to-day life. Most street elders were detached from their families as they age because: economically they are inactive, failed a caregiver to fulfil their caregiving responsibilities, their family members also could not meet with good economic stability. The study identified that the street elders are encountered with physical, sexual, emotional and financial abuses in their street lives. The study recommends that the close relative's attention must be paid to protect their physical and mental strength. Requests of majorities were to have a safe place with sanitary facilities until they die.

Keywords: *Street elders, challenges, poverty, caregiving, aging*

[1] Department of Social Studies, The Open University of Sri Lanka, Sri Lanka
Corresponding author: hmuhe@ou.ac.lk

Determinants of Work-Family Balance of ICT Professionals in Sri Lanka

Athapaththu A. M. C. S.[1], Deegahawature M. M. D. R.[1]

Abstract

Maintaining work-family balance (WFB) has become a challenge for the majority of employees due to the pressure of the external environment. An imbalance between work and family lives leads to numerous adverse effects including work-family conflicts, poor health, and quality of life. Factors that can affect the work-family balance of the ICT industry can be different from others due to the unique working culture. Especially, they have flexible working practices such as working from home, compressed workweek, job sharing, and flex time. Therefore, their WFB can be influenced by those practices. This research, therefore, attempts to identify the factors affecting the work-family balance of the ICT industry in Sri Lanka. Particularly, this study strives to identify the effect of work flexibility, job autonomy, and job satisfaction on work-family balance. The data were collected from 137 respondents through a structured questionnaire distributed via Google forms. Previously tested measures were used to measure the variables and responses were collected over a 5-point Likert scale. SPSS software was used for the regression analysis. The sample profile shows that 75 percent of the sample is below 29 years of age while only 7.5 percent is above 35 years of age. 83 percent of employees possess less than 5 years of experience and 6.5 percent have over 10 years of experience. The results of the ANOVA test indicate that the regression model statistically and significantly predicts the outcome ($F = 147{,}788$, $p < .05$). The model summary statistics show that R-square is 0.69 ($p < .05$). The regression results indicate that job satisfaction ($\beta = 0.64$, $p < .05$), and work flexibility ($\beta = 0.28$, $p < .05$) have a significant positive effect on WFB. However, job autonomy has no statistically significant effect on WFB ($\beta = -0.09$, $p > .05$). Job autonomy is the freedom, independence, and discretion enjoyed by employees in their work, and this may be required by experienced and senior employees. Thus, a possible reason for this contrary result is that 83 percent of the respondents have less than 5 years of experience, and they may not expect autonomy since they are in the early stage of the learning curve. This study suggests policymakers of ICT companies in Sri Lanka take actions to improve job satisfaction and work flexibility of their employees to improve their WFB and that will help them achieve organizational goals.

Keywords: *ICT employees in Sri Lanka, job autonomy, job satisfaction, work-family balance, work flexibility*

[1] Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Sri Lanka
✉ Corresponding author: chamlishehan123@gmail.com

A Sociological Study of the Relationship Between Mental Health Illness and Family Conflict. (Western Province, Kaluthara District, Horana Divisional Secretariat Area)

Kethumali G. H.[1] ✉, **Rangana K. K. K. C.**[2]

Abstract

This article reviews the sociological factors that lead to family conflicts. Research problem of the study was how to intervene in the social work profession to minimize family conflicts in families caused by people with mental illness? The main objective of this study was to determine whether there is a relationship between family conflicts and mental health illness. The sub-objective of this study was to study how the social work profession can be used to reduce family conflict. The family is the basic unit of society. But today, many changes can be identified in the family related to the family background. But if one of the family members suffers from mental health illness, the family would suffer a great setback and stressful environment. In Sri Lanka, it is estimated that out of a total population of nearly 20 million approximately 600,000 persons experience different types of mental illnesses (WHO). According to the WHO (2006), almost 400,000 Sri Lankans experience serious mental disorders due to family conflicts. Therefore, many family conflicts can be identified due to mental health disorders. This study used a purposive sampling method based on the severity of the problems and the nature of the needs. The primary and the secondary method used in the research to collect information were in-depth interviews carried out via case studies. These case studies were taken from selected unique people, who are experiencing family conflicts and suffering from mental health illnesses. This study used thematic analysis as the data analysis method. Research has exposed that people, regardless of gender or age, are more likely to be mentally ill. As a result, people have to live with stress economically, socially and psychologically. Therefore, people have been labeled in society. It is a very stressful situation for their mentality. The stress that this creates in individuals is a major factor in the breakdown of relationships between family members. This pressure creates more conflict in such families. Accordingly, social work is a multidisciplinary approach and it has appropriate social work intervention to help to understand the reality of human life and to build a strong man as well as a strong family free from conflict. The social worker identifies the real problems and takes the necessary treatment, preventive and developmental approaches to reduce them. This situation, which is created in a family, affects the existence of the whole society. Therefore, a strong family properly protects the social order.

Keywords: *Mental health illness, family, relationship*

[1] National Dangerous Drug Control Board, Rajagiriya, Sri Lanka
[2] District Secretariat office, Colombo, Sri Lanka
✉ Corresponding author :hansikakethumali@gmail.com

Smokeless Tobacco Use in Sri Lanka (An sociological Analysis)

Kethumali G. H.1

Abstract

Smokeless tobacco use is one of the leading social health problems in Sri Lanka. The trend of using and addiction to smokeless tobacco has gone up and created new social-cultural issues and health challenges. The research problem was how does smokeless tobacco use affect socio-cultural, health and political conditions? The main objective of this study was to analyze the socio-cultural, health and political factors that influence smokeless tobacco use in Sri Lanka. The qualitative data was collected through in-depth interviews and quantitative data was collected through the questioners. Secondary tools were used by collecting information. Responders were selected using the purposive sampling method and snowball sampling method. In this research, a sample of 50 was selected for data collection. These case studies were taken from selected unique people, who are consuming smokeless tobacco. This study qualitative data was analyzed by thematic analysis method. Quantitative data were analyzed by the SPSS method. This study reveals that smokeless tobacco has been well-integrated into Sri Lankan culture and smokeless tobacco is being positively socialized through the religiously organized social institutes. Smokeless tobacco locally known as school and malware are more popular and spread all over the country. The youth sub-culture in association with sports and fashion lay the foundation for smokeless tobacco. Therefore, it has developed as a silent subculture among the livelihood groups such as transport workers, fishermen factory workers and construction workers and plantation community. The family background, social neighborhood, youth fashion or deviant behaviour, the nature of livelihood and psychological conditions are the major determiners that influence the practice of using smokeless tobacco. According to the field data, adolescents are more prone to lip and oral cancers and heart disease because of the smokeless commercial tobacco products. But the study shows that very few people are referred for treatment. The percentage of people who received treatment was 18% and those who did not receive treatment were 82%. This study revealed; there is a strong tendency for smokeless tobacco use to spread in society as a silent sub-culture. There is an urgent need to develop a strong prevention mechanism for this problem. It helps to protect the social status and develop human well-being.

Keywords: *Smokeless tobacco, thool, sub-culture*

[1] National Dangerous Drug Control Board, Rajagirirya, Sri Lanka
Corresponding author: hansikakethumali@gmail.com

A Sociological Analysis of Cannabis addicted three-wheel Driver. (Western Province, Gampaha District, Nittabuwa Divisional Secretariat Area)

Kethumali G. H.[1], Rangana K. K. K. C.[2]

Abstract

This article reviews the sociological analysis of cannabis addicted three-wheel drivers. The research problem of the study was what are the impacts of cannabis use by three-wheeler drivers on their families? The family is the basic unit of society, yet many changes can be identified in the family background. Based on drug arrests in 2019, the highest numbers of cases were reported for cannabis (45,923) (Handbook, 2019). According to (2004) traffic police reports, three-wheeler drivers have committed offences related to road accidents, such as driving after consuming the drug and distracting drivers with smoking. The main objective of this study was the impact of cannabis use by three-wheeler drivers on their families and the sub-objective of this study was the subculture of three-wheel drivers addicted to cannabis. The qualitative data was collected through in-depth interviews via case studies and 10 case studies were used. The purposive sample technique was used for selecting interviewees. This study used thematic analysis as the data analysis method. According to the field data, the highest age groups among the interviewees were 34-38. The majority of the three Wheel drivers are in the active working-age group. When considering Three Wheeler drivers' education level, the majority of them have studied up to Grade 8 or O/L. Based on this information the monthly income level of the three wheel drivers was not enough to get a profit from their job. Therefore, some of the money earned by three-wheel drivers was used for their drug needs and a small amount of money was used to fulfil the needs of the family. In that situation, they were economically, sociologically and psychologically vulnerable groups in the society. According to this study, the three-wheeler drivers who are using cannabis revealed that they have a unique language and style. Their behaviour, language, style and clothing take on a different face. Young drivers are mostly dressed in shorts, denim and sleeveless shirts, t-shirts or colourful shirts. Also, drivers tend to have long hair, pierced ears and body tattoos. It could be concluded that these behaviours of the cannabis addicted three-wheel divers have a negative impact on their families and they show sub-cultural characteristics that are different from the main culture in the society. The preventive of cannabis use and their job done right is a timely necessity for the family as well as society.

Keywords: *Cannabis, sub-culture, three-wheel drivers*

[1] National Dangerous Drug Control Board, Rajagiriya, Sri Lanka
[2] District Secretariat Office, Colombo, Sri Lanka
✉ Corresponding author: hansikakethumali@gmail.com

Impact of Prison Rehabilitation on Recidivism in Sri Lanka

Bandaranayake P.[1] , De Silva P.[2]

Abstract

The incarcerated prison population in Sri Lanka has been on the increase in recent years reaching over 24,000 in 2018, where the majority of them are functionally illiterate. As in many jurisdictions, rates of criminal recidivism in Sri Lanka are reported to be as high as 50 per cent. It has been revealed that the majority of inmates do not possess the basic social and educational skills that they need to function in society as literates and law-abiding rational citizens. The responsibility of prison authorities in making these prisoners law-abiding citizens is significant. However, with the high rate of recidivism, it is argued that whether prison rehabilitation is effective enough. The main purpose of this study is to get a deeper insight into the perception of prison rehabilitation programmes by prisoners, ex-prisoners and prison officials. This study is mainly a qualitative approach particularly applying an inductive grounded theory approach as it requires a deep understanding of the effect of rehabilitation programmes on inmates' skills and attitudes and how inmates view rehabilitation programmes. Focus group discussions with recidivists at 4 closed prisons: Welikada, Mahara, Bogambara (Kandy) and Angunakolapelessa, life histories with ex-prisoners and semi-structured interviews with prison rehabilitation officers paved the way for collecting qualitative data. Obtrusive and unobtrusive observations were also useful in better understanding this issue. Even though prisoners and ex-prisoners see that prison rehabilitation helped them to overcome boredom, acquire self-esteem and get basic literacy skills, issues such as overcrowding, lack of funding, lack of trained staff affected the quality of programmes conducted. The majority of prisoners believe that education will serve them well when they are released. It was observed that all sorts of rehabilitation are carried out in an ad hoc manner without proper planning. However, a minority of prisoners and ex-prisoners believed that nothing works for them as they tend to continue criminal behaviours while prison officials believed that no substantial impact can be observed despite how much they struggled to rehabilitate certain offenders. Structural conditions of prisons such as current policies, funding, program availability and program quality are shown to be factors that negatively affected prisoner participation. In conclusion, this paper focuses on the urgent need for introducing a more humanizing approach to the penal administration of the Sri Lankan prison system through proper planning of prison rehabilitation programmes.

Keywords: *Rehabilitation, prison education, qualitative study, prisons in Sri Lanka*

[1] PhD Candidate, Faculty of Graduate Studies, University of Colombo, Sri Lanka
[2] Senior Professor of Sociology, Faculty of Arts, University of Colombo, Sri Lanka
Corresponding author: pbandaranayake@gmail.com

Use of Kinesics: Family-Centered Ethical Identities of Personal Communication in an Urban and a Semi-Urban Context

Jayarathna R. N. H. M. D.[1], Angammana B. H.[1]

Abstract

Belonging to one of the initiatives of human communication, kinesics represents the messages sent by the body including gestures, facial expressions, body movements, postures, gaze and gait. Since the family influence is one of the prominent phenomena on an individual's social behaviour, one's communication is highly shaped by related family; kinesics is also in it. All types of ethical considerations which stand toward the process of communication are immensely applicable for the use of kinesics due to their qualified contribution to quality communication. Under this circumstance, considering the process of communication in the family, the present study was done to achieve two objectives. One was to identify a common code of ethics in the use of kinesics and the other was to identify attributed values of the use of kinesics. The mixed research methodology was applied and qualitative data were collected by conducting interviews as the major tool while observation was also done. Following a simple socio-economic criterion, the families were categorized into five groups; by names, the families represent ancient folk, rural elite's ancestry, modern middle class, modern rural folk, and modern town folk. A sample of fifty families with a total number of ten families per group was randomly selected from the Kurunegala district covering urban and semi-urban settings. Three components of kinesics; namely 'frown', 'gait' and 'posture of worship' were considered. In the interviews, the family members' recognition, attitude, and practice of the particular kinesics were separately explored by deep questioning. Though the intensity of the frown is personalized, its impact seems more similar within the family with corresponding contexts than with outsiders. The frown is more controversial when dealing with aliens since it can convey both positive and negative indexes. An unintentional frown can occur for a variety of reasons, followed by guilt within and outside the family. Although there are obvious differences in the gait and posture of worship according to the family group, they are limited to usage as many of their attitudes toward those practices are very similar. By analyzing data on this non-verbal code of signals, concluded that many attributed values of kinesics are equal as a recognition than a practice to all kinds of families and the use of kinesics in any social context is openly or secretly controlled by family-centred ethics, which owe similar identities enabling to see a common code of ethics.

Keywords: *Ethics, non-verbal signals, gait, kinesics, postures*

[1] Department of Social Studies, Faculty of Humanities and Social Sciences, The Open University of Sri Lanka, Sri Lanka
✉ Corresponding author: deejayarathna@gmail.com

Renting The Womb: The Legal Analysis of the Act of Surrogacy and Right to Be a Parent in Sri Lanka in Comparison to India and United States of America

Indrakumara W. D. M[1], Gunathilake M. D. M. U[1], Wataliyadda H. M. A. P[1]

Abstract

As a country where the cultural constraints are profound in shaping the society, at times more so than the laws, Sri Lanka holds a prominent destination for the surrogacy for various nationals, amidst the cultural taboo of renting out the womb and the complete blind eye of the legislations governing the matter. The main reasoning behind this floodgate is the lack of regulations and restraints from the Sri Lanka government on the matter of surrogacy. The wealthy western intended parents are reaching for the poverty felt women fulfil their desire of having a child. It is a common notion that when money is involved that exploitation begins. Another side of this argument is the intended parents in Sri Lanka, who may have biological impediments preventing them from becoming parents who have limited options as to the right to be parents, in Sri Lanka, confined to the adoption of a child, mostly a child with no biological connection to the adopting parents. Surrogacy can provide a solution for this inability. However, in Sri Lanka, the legislature holds a deaf ear to this matter. The protection to the surrogate mother is confined to a contract, a mere agreement. To make the matters worse, Sri Lanka considers abortions an illegal act, hence in case of a default in the said contract, the woman will be left in the country with a child. In comparison the USA practices various laws state-wise without a consensus, while states such as Michigan had criminalized surrogacy contracts, California through various judicial pronouncements had taken a more favourable stance on such contracts. This paper seeks to address and analyze these issues using the black letter approach and comparative research methodology with the United States of America and India. Further, this paper uses qualitative analysis of legislative enactments and case law as primary data and books and journal articles as secondary data. The research concludes with the view that in Sri Lanka legislative enactment is insufficient to address the issues arising out of surrogacy, which warrants amendments to the penal law and legislations to cater to the requirements of the growing amount of surrogacy contracts.

Keywords: *Surrogacy, law in Sri Lanka, right to be a parent*

[1] Sri Lanka Law College, Colombo 12, Sri Lanka
Corresponding author: Indrakumara.madushan@gmail.com, madara.gunatilaka@gmail.com, anjaliewataliyadda@yahoo.com

Contributory Factors for the Passion Play Genre *'Nurthi'* to Transcend *'Nadagam'*

Batuwatta S.[1]

Abstract

'Nadagam' and *'Nurthi'* are two outstanding drama styles in the Sri Lankan passion play tradition. Nonetheless, *"nadagam"* of Dravidian origin and *'nurthi'* of North Indian have no antecedence among Sri Lankan theatres. The arrival of *'nurthi'* at the declining period of *'nadagam'* has made a definite change in society. Being in a modern time where these passion plays are dissolving away from society, this study discusses different aspects of the two plays to answer the question, what caused *'nurthi'* to surpass the *'nadagam'* tradition, and what were the outcomes after this process. This study is mainly based on literature and interviews with resource personnel. The collected data were thematically analyzed and made a comparative study. Moreover, the findings show that the whole creation of *'nurthi,*' mainly the dramatic elements and its features, has caused popularity over *'nadagam.*' Specially *'nurthi'* has brought the novel experience of watching the plays sitting inside a playhouse in a setting improved with dramatic techniques. Further, the *'nurthi'* plays were mostly based on Indian story plots and had used North Indian classical music and musical instruments. Dialogues were in spoken form, and both males and females had performed while singing themselves. Advanced technology on stage management decorated with attractive backdrops, lighting systems, colourful costumes, and makeup are the highlighted factors in *'nurthi.*' Further, the convenience due to short duration was one reason for more popularity. In conclusion, following almost contrasting features, *'nurthi'* has created a new tradition in Sri Lankan living art genre, transcending *'nadagam*.' Later, with the popularity and the patronage of the jet class of those days, *'nurthi'* has influenced the local music industry related to light songs, gramophone records, and film songs. Thus, *'nurthi'* has also influenced the emergence of another novel passion play tradition called *'Nava Naatya'* in Sri Lankan drama culture

Keywords: *Nurthi, passion play, transcendence*

[1] Department of English Language Teaching, Faculty of Humanities and Social Sciences, University of Ruhuna, Sri Lanka
Corresponding author: saumya@eltu.ruh.ac.lk

Comparison of Individual Carbon Footprint in Semi-Urban areas. A Case Study of two Grama Niladari Divisions in Galewela Divisional Secretariat in Matale District of Sri Lanka

Disanayaka D. M. M. G. J .M[1], Rajapakshe P. S. K

Abstract

Individual carbon footprint (CFp) is a measure of the total amount of carbon dioxide emitted to the atmosphere from our daily activities. Mainly, household energy consumption, transportation, dietary pattern, and secondary consumption of the individuals. Therefore, this study aimed to compare the individual CFp in Pathkolagolla and Pattiwela Grama Niladhari Division in the Galewela Divisional Secretariat in Matale District of Sri Lanka. The specific objectives of this study are to measure the individual CFp, measure the per capita CFp, and identify the respondent's knowledge and attitude about CFp and its adverse impacts. To achieve these objectives, data were collected from 60 respondents in both Pathkolagolla and Pattiwela GN Division by using a Convenience sampling method. The primary data were collected from the questionnaire survey and secondary data was collected from journal articles, reports, and websites. https://www.carbonfootprint.com standard online carbon footprint calculator was utilized to calculate the individual CFp in this study area. Data were analyzed by using SPSS 10.1 software. Descriptive statistics analysis (mean, percentage, frequencies) were employed for the data analyzed. According to the study findings, the total individual CFp of the Pathkolagolla GN Division is 7.2 tons and Pattiwela GN Division produces 5.93 tons per month. Further, the total per capita CFp of the Pathkolagolla GN Division is 0.12 tons and Pattiwela GN Division produces 0.09 tons per month. The highest amount of CFp is produced by the respondent's secondary consumptions in both areas. Male respondents produced 4.72 tons of CFp and female respondents produced 2.57 tons of CFp in Pathkolagolla GN Division. And also, male respondents in Pattiwela GN Division produce 3.6 tons of CFp, and female respondents are responsible for 2.3 tons of CFp. The majority of the respondents weren't aware of the CFp and its adverse impacts in both study areas. Similarly, most of the respondents are moderately educated of climate change in both study areas, However, the total individual CFp of the Pathkolagolla GN Division is higher than the Pattiwela GN Division. According to the online CFp calculator, per capita, CFp in Sri Lanka is 0.89. Therefore, the individual per CFp in both study areas is lower than Sri Lanka designated target level.

Keywords: *Carbon footprint, consumption, household, individual, per capita*

[1]Department of Environmental Management, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka, Sri Lanka
Corresponding author: janakimanjula1994@gmail.com

An Investigative Study of the Impact of British Plantation on the Traditional Society of Sri Lanka

Kanthi J. K. A.[1]

Abstract

The caste system based on different technical grades was a major factor in considering man's status in the local social system. This system was more of a traditional formal social system than a caste system. Accordingly, each caste had its due role to play, and the role assigned to each caste in maintaining a self-sufficient system of coexistence was imperative. There were some differences in the caste system, the role of each caste was equally important for the survival of the society, so there was a reciprocal relationship between the castes and mutual respect. Local land tenure and caste service were also intertwined, and the intermediate factor that connected it was the compulsory service duty system. Accordingly, compulsory service was a service of devotion and love with mutual duties and responsibilities. The research problem here was what the Sri Lankan society looked like before expanding British plantations. This research aimed to study how the local society was self-sufficient and the social changes caused by plantations. This study was based on a qualitative research methodology. It used library observation for primary and secondary data sources such as Dispatches, Administration Reports, Blue Books, Hansard, Land Ordinances, Census Reports, Fergusons Directories, Kachchary Records etc**.** Secondary data in the study was extracted from several publications by local and international authors. The data were analyzed qualitatively. The British rulers ignored the traditional social system. They determined social value by considering economic status rather than caste. The Land Acts introduced in 1840 created a new dimension of personal value based on the increase or decrease of the amount of land held by an individual. However, the study found that the caste system in Sri Lanka did not change completely with the expansion of plantations. Many changes took place in urban society. But there is evidence that many elements of traditional society in rural areas continued to function.

Keywords: *Craft grades, mandatory duty system, plantation, caste system, traditional society*

[1] Department of History and Archaeology, Faculty of Humanities and Social Sciences, University of Ruhuna, Sri Lanka
✉ Corresponding author: jkajayasinghe@yahoo.com

A Systematic Review on the Theories of Life Satisfaction

Sellahewa W. N.[1], Samarasinghe T. D.[2], Chandanamali D. M. M.[2]

Abstract

Every human being is entitled to only one life to live and therefore, he or she needs to manage that life very carefully without wasting the valuable life on unnecessary arguments, problems and irrelevant stuff. However, when carefully observing the nature and the behaviours of people, it is visible that the majority of people are wasting their only life on suffering. They forget to live but they have to sacrifice more suffering. In such a context, the current research intends to conduct a review on the concept of life satisfaction and related theories. Researchers believe that the pool of knowledge accumulated through this study will contribute to making human lives blessed with happiness and peace. Any of the individuals can benefit from the current review for their real-life to live within their life. It was carefully reviewed around 30 pieces of literature extracted from reliable and rich sources. However, to add value to the existing knowledge on life satisfaction, the researchers conducted two focus group discussions via zoom platform representing five members for each focus group discussion. Bottom-up theories and Top-down theories on life satisfaction are the main concerns of this study. All the data were analyzed qualitatively and presented descriptively. By conducting this study, it was an attempt to emphasize that the revealed knowledge on the 'bottom-up' perspective and the 'top-down' perspective can be used by the general public to make their lives happy. In conclusion, the details consolidated by this study is vital for the betterment of any individual to be satisfied with life. Further, as a recommendation, it is suggested that the need of developing a platform that can be reached by the general public to understand the research findings rather than sharing the research findings only with the research community via the available platforms. By conducting this study, it is expected to remind people to live their life.

Keywords: *Life satisfaction, theories on life satisfaction, bottom-up theories, top-down theories*

[1]Uva Wellassa University of Sri Lanka, Sri Lanka
[2]Faculty of Graduate Studies, Sabaragamuwa University of Sri Lanka, Sri Lanka
Corresponding author: researchassistwns@gmail.com

Library and Information Science Students' perception on Library Automation: A survey

Palukandewe S.[1], Ransara P. W. A. S. D.[1]

Abstract

We all know that as the information era progressed, so did the usage of ICT. The housekeeping activities of libraries are becoming atomized. The purpose of this study is to show how users feel about library automation. It excludes topics such as how to automate, what software is used to automate, and so on. The study's goal is to determine how knowledgeable users are about library automation. The impact of automating library cleaning chores on library utilization and user academic work. Discover the benefits and drawbacks of library automation, as well as user recommendations for future improvements. Students of the Department of Library and Information Sciences, University of Kelaniya were used as the population. With the aid of a web-based questionnaire, data were collected from 50 users of the Library and information science students. The sample was selected by a simple random sampling method. 90% responded. 10% did not respond. Using the aid of a web-based survey. Tables and graphs were used to analyze the data. Users are aware of a library's automated system, and they are happy with the library's rapid service following automation, according to data research. Users are used to automated library sources and services such as web- OPAC and due book reminders, according to the findings. They are familiar with various library automation tools. They claimed that automation would enhance their working capacity and allow them to finish their tasks in less time.

Keywords: *Library automation, LIS students, ICT, automation technology*

[1]Department of Library and Information Science, University of Kelaniya, Sri Lanka
Corresponding author: siwaliuok@gmail.com

Engaging in a Newspaper News Thematic Analysis to Understand the Socioeconomic, Health, Political Impact of Covid 19 in Sri Lanka (From Sinhala Newspapers Published from May 24 to June 14, 2021)

Mallawaarachchi A. P.[1], Agampodi S.[2], Weerasinghe M.[2]

Abstract

The situation with the ongoing epidemic of coronavirus disease 2019 (COVID-19) that was probably first reported in Wuhan, China, has spread rapidly around the world. As of 12 October 2021, Sri Lanka had confirmed 528,064 cases of COVID-19, 480,499 of these cases were recovered and there had been 13,354 deaths. Some citizens do not comply with health regulations established to prevent COVID-19 due to the lack of knowledge about the disease. Newspaper news is an effective means of communicating important social concerns and has been used at length to do so during the pandemic. An exploratory content analysis of newspaper news was conducted between May 24th and June 14th of 2021 at the beginning of the COVID-19 outbreak in Sri Lanka. A sample of first-page news from four daily and weekend free online newspapers was included and was selected using the following keywords: "corona", "COVID-19" and "Covid". Thematic analysis was used to identify the different perspectives of the News. Based on the keywords considered, 94 news out of 788 were selected. 694 news outlets were excluded because they did not contain keywords related to COVID-19. From the identification of COVID-19 as an epidemic, 21 common themes were identified, ranging from symptoms, distribution, and control, to highlighting changes in socio-cultural practices associated with epidemics and to discussing possible alternatives, and to economic and political impact of an epidemic. News has been used as an important medium to convey information on COVID-19, including prevention strategies guided by the WHO, and the social, health, economic, and political effects of the pandemic on Sri Lanka. But basically, exploratory reporting is not found in media reporting. The only way to find out is to quote the report from the webpage of the relevant institution or department. There is a lack of information reporting, chasing down major sources. Public health workers and authorities can collaborate with reporters and media to present the news that can provide effective health messages. It also discusses the spread of the disease, the number of patients, and the number of deaths, but does not discuss in detail the issues facing health staff, future challenges, and the socio-economic impact. And it was also concluded that in some cases fake news were given higher values in connection with politicians.

Keywords: *COVID-19, newspaper, news thematic analysis, health message, socio-cultural practices*

[1] Department of humanities, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka, Sri Lanka
[2] Department of Community Medicine, Faculty of Medicine and allied science, Rajarata University of Sri Lanka, Sri Lanka
Corresponding author: asithaprabhath@gmail.com

Impact of the Main Family for being Pregnant in Teenage in a Selected Semi Urban Village in Sri Lanka

Priyadarshani. A. A. N.[1], Angammana. B. H. [1], Abeysinghe. H. M. P. P. K.[2]

Abstract

Teenage pregnancy is an issue considered globally. The teenage girl is becoming pregnancy within the age between 13-19 years can be defined as the teenage pregnancy. It has identified as a problem in both developed and developing countries. It caused to raise various human right issues as depriving her right to education and denying her right to health. There are many reasons associated with teenage pregnancy as poverty, ignorance, alcohol and drug abuse, mothers working overseas, risky sexual behaviour, poor parent-child relationship and poor teacher-pupil relationship. Accordingly, the major objective of the present research was to identify the impact of the main family for being pregnant in teenage and the specific objectives were to identify the social, economic and emotional factors associated with the teenage pregnancy and to identify necessary suggestions to minimize the teenage pregnancy. As methodology case study was applied and data were collected via open interviews with the pregnant teenagers in vide array and their family members based on five case studies. Further the '*grama niladaree'* (GN), class teacher and family health midwife (PHM) were interviewed as a mechanism to protect the validity and the reliability of data. Necessary steps have been taken to protect the confidentiality of data; the names of the participants and also the name of the village were not mentioned in the report. Date was analyzed through data through thematic analysis technique. As an economic factor all the respondents presented poverty as the major cause for teenage pregnancy. Similarly, negative parenting, lack of the understanding of sexual education, education level of the parents, income of the family, alcohol addiction, drug abuse and peer teacher-student relationships were identified as causing factors to the teenage pregnancy and by providing the services of all the public officers who are already attached to the villages and properly supervising and regulating that service, the incidence of girls in such situations can be minimized.

Key words: *Parenting, semi urban, sexual behaviour, teenage pregnancy*

[1]Department of Social Studies, Faculty of Humanities and Social Sciences, The Open University of Sri Lanka, Sri Lanka
[2]Library.The Open University of Sri Lanka, Sri Lanka

A Study on Available Library Services for Differently- Able Users in North Western Province (NWP) Public Libraries, Sri Lanka

Abeysinghe H. M. P. P. K.[1] ✉, Angammana B. H.[2]

Abstract

Reading is considered a major tool in searching and acquiring knowledge. This paper discusses the available library services for differently-able users in North Western Province (NWP) Public Libraries. The general objective of the study was to study the current status of the library services, facilities and resources for differently-able users in North Western Province (NWP) public libraries in Sri Lanka. The other objectives were to identify the available library services and facilities for differently-able users in NWP, Public libraries and to identify the barriers faced by public librarians when providing the services for differently able users in NWP, public libraries. A semi-structured questionnaire was used to gather quantitative data. The convenient sampling method was used and the response rate was 80% out of 100 questionnaires. Excel (2013) version was used to analyze the data. Most physically disabled (48%) differently-abled users are coming to their public libraries to get the library services. Most respondents stated that they provided as the service for differently- able users support to get photocopy service and it was 35% and the next highest percentage indicated that they provided as a service, special books distribution services for differently-able users and it was 27%. They faced several barriers related to library services such as limited space, lack of technology, lack of funds, lack of professional guidance and training. It is recommended to arrange some activities such as workshops, seminars to develop the professional knowledge and the training to provide library services for differently-abled users. Necessary steps should be taken by the authority to introduce new technology to facilitate differently-able users.

Keywords: *Differently-able users, public library Services, North Western province, public libraries*

[1] Library, Kurunegala Regional Centre, The Open University of Sri Lanka, Sri Lanka
[2] Department of Social Studies, Faculty of Humanities and Social Sciences, The Open University of Sri Lanka, Sri Lanka
✉ Corresponding author: hmkar@ou.ac.lk

Panel of Reviewers

Prof. H. M. V. G. Herath
Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Sri Lanka

Prof. R. Attanayake
Department of Plant and Molecular Biology, Faculty of Science, University of Kelaniya

Prof. N. Wijayawardene
College of Biological Resource and Food Engineering, Qujing Normal University, China

Prof. (Ms.) N. Ranathunge
Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna

Prof. Siril Guruge
Department of Agricultural Biology, Faculty of Agriculture,University of Peradeniya

Prof. H. M. A. M. C. Herath
Department of Chemistry, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Prof. D. Wickramasinghe
Faculty of Science, University of Colombo

Prof. C.V. Hettiarachchi
Department of Chemistry, University of Peradeniya

Prof. A. Wickramasinghe
Department of Chemistry, University of Peradeniya

Prof. B.A. Karunaratne
Department of Materials Technology, Faculty of Technology, Rajarata University of Sri Lanka

Prof. M. M. D. R Deegahawature
Department of Industrial Management, Faculty of Applied Science, Wayamba University of Sri Lanka

Prof. P. L. N.L. Liyanage
Department of Food Science and Technology, Faculty of Agriculture, University of Ruhuna

Prof. R. Weerasooriya
National Institute of Fundamental Studies, Kandy, Sri Lanka

Prof. E. D. N. S. Abeyrathne
Department of Animal Science, Faculty of Animal Science and Export Agriculture, Uva Wellassa University

Prof. W. P. Wijewardena
Department of Accountancy and Finance, Faculty of Management Studies, Rajarata University of Sri Lanka

Prof. A. M. Perera
Department of Accountancy, Faculty of Business studies and Finance, Wayamba University of Sri Lanka

Prof. P. M. B. Jayathilake
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Prof. N. K. A. Silva
Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka

Prof. W. Abeyewickreme
Department of Paraclinical Sciences, Faculty of Medicine, General Sir John Kotelawala Defence University

Prof. D. M. W. K. Dissanayake
Department of Languages, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Prof. Ven. Waradiwela Wijayasumana Thero
Bhiksu University of Sri Lanka

Prof. S. Nanayakkara
Department of Humanities, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Prof. P.A.D.H.N. Gunathilaka
Department of Parasitology, Faculty of Medicine, University of Kelaniya

Prof. R. M. Mahinda
Department of Environmental Management, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Prof. D. S. W. Gunawardane
Department of Social Sciences, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Prof. W. Abeyewickreme
Department of Parasitology & Molecular Medicine Unit, Faculty of Medicine, University of Kelaniya

Prof. R. Wickremasinghe
Department of Parasitology, Faculty of Medical Sciences, University of Sri Jayewardenepura

Dr. Aruna Wickramarathna
Okanagan Specialty Fruits Inc Canada

Dr. R.M.A.I. Rathnayake
Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka

Dr. D. Perera
Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka

Dr. J. Wewalwela
Department of Agricultural Technology, Faculty of Technology, University of Colombo

Dr. M.S. Yapa
John Keells Holdings, Colombo, Sri Lanka

Dr. C. Egodawatta
Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka

Dr. Y. Mahagamage
Centre for Environmental Studies and Sustainable Development, Open University of Sri Lanka

Dr. P. Waidyarathne
Physiology Division, Coconut Research Institute

Dr. N. Molagoda
Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka

Dr. R. G. P. T. Jayasooriya
Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka

Dr. E. Pathiraja
Institute of Policy Studies of Sri Lanka

Dr. S. Dissanayake
Department of Agricultural Systems, Faculty of Agriculture, Rajarata University of Sri Lanka

Dr. K. H. I. N. M. Herath
Department of Biosystem Engineering, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Dr. P. Abeyrathna
A.T. Still University of Health Sciences, Department of Anatomy, USA

Dr. S. D. N. K. Bathige
Ceylon Nano Diagnostics (pvt) LTD, Nanotechnology and Science Park, Homagama

Dr. L. Senarathna
Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Dr. K. S. S. Atapaththu
Department of Limnology and Water Technology, Faculty of Fisheries and Marine Sciences and Technology. University of Ruhuna

Dr. H. Rajapaksha
Solutions Architect, JAPAC, Oracle for Research, Australia

Dr. S. Rathnayake
University of Missouri -Saint Louis

Dr. U. Ekanayake
Department of Physical sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Dr. R. D. S. S. Ranatunaga
Industrial Technology Institute of Sri Lanka, Colombo.

Dr. W. Wijesekara
Product Lead- Medical Apparel PPE, MAS Holdings

Dr. E.Y. Fernando
Department of Biological Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Dr. M. Fernando
Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Dr. W. M. M. D. Bandara
Department of Food Technology, Faculty of Technology, Rajarata University of Sri Lanka

Dr. Y. M. A. L. W. Yapa
Department of Chemistry, Faculty of Science, University of Ruhuna

Dr. A. Abeykoon
Department of Mass Communication, Faculty of Social Sciences, University of Kelaniya

Dr. M. M. M. G. P. G. Mantilaka
Postgraduate Institute of Science, University of Peradeniya. Sri Lanka

Dr. P. Kumarage
Department of Electrical and Electronic Technology, Faculty of Technology, Rajarata University of Sri Lanka

Dr. S. Prabagar
Environmental Technology Section, Industrial Technology section, Colombo 07

Dr. G. A. Udayantha
Ministry of Health, Colombo

Dr. L. Jayarathne
Environmental Science Research Program, National Institute of Fundamental Studies

Dr. D. Uduwela
Department of Chemistry, Faculty of Science, University of Peradeniya

Dr. E. M. M.S Ekanayake
Faculty of Technology, Department of Bioprocess Technology, Rajarata University

Dr. K. B. Jayasundara
Department of Chemistry, Faculty of Science, University of Ruhuna

Dr. V. Waisundara
Australian College of Business & Technology (ACBT), Kandy
Dr. K. A. S. Kodikara-Arachchi
Department of Botany, Faculty of Science, University of Ruhuna

Dr. A. Sanjeewa
Department of Biosystem Technology, Faculty of Technology, University of Sri Jayewardenepura

Dr. S.M. Hewage
Department of Physiology and Pathophysiology, University of Manitoba, Canada

Dr. R. Niloofa
Department of Zoology & Environment Sciences, Faculty of Science, University of Colombo

Dr. D. N. Vidana Gamage
Department of Soil Science Faculty of Agriculture, University of Peradeniya

Dr. C. Jayasundara
Department of Chemistry, Faculty of Science, University of Peradeniya

Dr. G. Y. Liyanage
Faculty of Urban and Aquatic bioresources, University of Sri Jayewardenepura

Dr. D. Jayasekara
Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura

Dr. L. Udayanga
Department of Biosystems Engineering, Faculty of Agriculture & Plantation Management, Wayamba University of Sri Lanka

Dr. H. M. B. P. Ranaweera
Department of Information Systems, Faculty of Management Studies

Dr. H. A. N. Dharmagunawardhane
Department of Materials Technology, Faculty of Technology, Rajarata University of Sri Lanka

Dr. S. Thenabadu
Department of the English Language Teaching Unit (DELT), University of Colombo

Dr. S. Embogama
Department of English Language Teaching, University of the Visual & Performing Arts

Dr. Ven. Olaganwatte Chandrasiri
Department of Languages, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Dr. J. M. S. B. Jayasundara
Department of Environmental Management, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Dr. W. K. D. Keerthirathne
Department of Humanities, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Dr. S. K. Illangarathne
Senior Assistant Librarian, Faculty of Technology, Rajarata University of Sri Lanka

Dr. K. Kodikara
Department of Medical Education, Faculty of Medicine, University of Kelaniya

Dr. Thissa Karunarathna
Department of Biosystems Technology, Faculty of Technology, University of Ruhuna

Dr. R. Weerathunga
Department of Accounting and Finance, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. S. Perera
Faculty of Technology, Rajarata University of Sri Lanka

Dr. R. Palamakumbura
Department of Engineering Mathematics, Faculty of Engineering, University of Peradeniya

Dr. R. De Silva
Department of Mathematics, Faculty of Science, University of Peradeniya

Dr. K. De Silva
Department of Mathematics, Faculty of Science, University of Colombo

Dr. U. W. M. R. S. Kappagoda
Department of Human Resource Management, Faculty of Management Studies

Dr N. A. A. D. Wickramarathna
Rubber Research or University of Alberta

Dr. W. M. R. B. Weerasooriya
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. J. D. T. Madhusanka
Department of Marketing Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. Y. M. W. G. P. Udurawana
Department of Marketing Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. J. K. Mallika
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. D. M. C. Dassanayaka
Department of Tourism and Hospitality Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. R. M. N. C Swarnapali
Department of Accountancy and Finance, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. J. D. T. Madhushanka
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. W. H. M. S. Samarathunga
Department of Tourism and Hospitality Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. C. M. Y. S. S. Bandara
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Dr. A. Upekshika
Paraclinical Department, Faculty of Medicine, General Sir John Kotelawala Defence University

Dr. N. Ubhayawardana
Department of Basic Science & Social Science, Faculty of Nursing, University of Colombo

Dr. D. Seneviratne
Consultant Transfusion Physician, Head of the Cluster Blood Bank Anuradhapura, Regional Blood center, Teaching Hospital Anuradhapura

Dr. T. Wickramasinghe
Department of Biochemistry & Clinical Chemistry, Faculty of Medicine, University of Kelaniya

Dr. Y. S. Wijayasinghe
Department of Biochemistry & Clinical Chemistry, Faculty of Medicine, University of Kelaniya

Dr. S.S. Gunawardhana
Director/CEO, Gunawardhana Ayurveda Holdings (PVT) LTD, Anuradhapura

Dr. T. Wijerathna
Department of Parasitology, Faculty of Medicine, University of Kelaniya

Dr. N. Perera
Department of Surgery, School of Medicine, Moores cancer center at UCSD

Dr. T.T. Piyathilake
Department of Pathology and Laboratory Medicine, School of Medicine and Public Health, University of Wisconsin-Madison, USA

Lt Col (Dr) Prasad Premaratne
Department of Paraclinical Sciences, Faculty of Medicine, General Sir John Kotelawala Defence University

Dr. S. Tennakoon
Genetics and Molecular Biology Unit, Faculty of Applied Sciences, University of Sri Jayewardenepura

Dr. K. Liyanage
Genetics & Plant Breeding Department, Rubber Research Institute of Sri Lanka

Dr. P. K. G. S. S. Bandara
Department of Biosystems Technology, Faculty of Technology, Sabaragamuwa University of Sri Lanka

Dr. S.N. Dissanayake
Department of Agricultural Systems, Faculty of Agriculture, Rajarata University of Sri Lanka

Dr. D. Guruge
Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Dr. N. Millagala
Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Dr. M.P.S. Mudalige
Department of Medical Laboratory Science, Faculty of Allied Health Sciences, University of Peradeniya

Dr. R. Withanachchi
Department of Anthropology, University of Sri Jayewardenepura

Dr. V. Kumara
Department of Buddhist Studies, Faculty of Arts, University of Colombo

Ms. R. Warnasooriya
Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka

Ms. G.Y. Liyanage
Faculty of Applied Science, University of Sri Jayewardenapura

Mr. W.V.V.R. Weerasingha
Department of Animal and Food Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka

Ms. P. N. Yapa
Department of Biological Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Mr. H. K. S de Zoysa
Department of Bioprocess and Technology, Department of Technology, Rajarata University of Sri Lanka

Ms. P. D. B. J. Palihakkara
Department of Soil Science, Faculty of Agriculture, University of Peradeniya

Ms. T. Irugalbandara
Department of Computing, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Mr. H. Kulathilake
Department of Computing, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Ms. A. Gunathilaka
Department of Computing, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Ms. L. D. M. Premasiri
Department of Information and Communication Technology, Faculty of Technology, Rajarata University of Sri Lanka

Mr. H. K. G. M. N. Karunarathne
Department of Information Systems, Faculty of Management Studies, University of Sri Jayewardenepura

Ms. H. M. P. Preethimali
Department of Information and Communication Technology, Faculty of Technology, Rajarata University of Sri Lanka

Mr. H. M. H. T. Hikkaduwa
Department of Information and Communication Technology, Faculty of Technology, Rajarata University of Sri Lanka

Mr. W. A. H. M. Karunarathne
Department of Biosystems Technology, Faculty of Technology, University of Ruhuna

Mr. D. A. Wehella
Department of English Language Teaching, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Ms. R. A. N. N. Ranasinghe
Department of Social Sciences, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Ms. A. Vidanapathirana
English Language Teaching Unit, Faculty of Science, University of Peradeniya

Ms. S. K. Jayasena
Department of Accountancy and Finance, Faculty of Management Studies, Rajarata University of Sri Lanka

Mr. P. R. Weerathunga
Department of Accountancy and Finance, Faculty of Management Studies, Rajarata University of Sri Lanka

Mr. I. M. S. Weerasinghe
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Ms. N.D. Peiris
Library, University of Peradeniya

Mr. W. W. A. N. Sujeewa
Department of Human Resource Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Ms. D. M. M. I. Dissanayake
Department of Tourism and Hospitality Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Ms. S. N. S. Dahanayake
Department of Tourism and Hospitality Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Mr. N. M. K. C. Premarathne
Department of Agricultural Systems, Faculty of Agriculture, Rajarata University of Sri Lanka

Mr. P. G. Munasinghe
Department of Information System, Faculty of Management Studies, Rajarata University of Sri Lanka

Ms. K. G. P. Senani
Department of Accountancy and Finance, Faculty of Management Studies, Rajarata University of Sri Lanka

Ms. N. H. K. Cooray
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Ms. M. G. S. Pathmini
Department of Marketing Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Mr. R. K. D. Randeni
Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Ms. K. T. N. P. Abeywickrama
Department of Tourism and Hospitality Management, Faculty of Management Studies, Rajarata University of Sri Lanka

Mr. P.G. Munasinghe
Department of Information Systems, Faculty of Management Studies, Rajarata University of Sri Lanka

Mr. S. M. S. P. Kumara
Department of Agricultural Extension, Faculty of Agriculture, University of Peradeniya

Mr. W. N. K. Wehalle
Regional Manager, Coconut Cultivation Board, Vavuniya, Sri Lanka

Mr. C.P. Senvirathna
Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Ms. K. G. P. H. Kandegedara
Department of Health Promotion, Faculty of Applied Sciences, Rajarata University of Sri Lanka

Mr. R. M. Dhanapala
Department of English Language Teaching, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Mr. M. D. S. S. Kumara
Department of English Language Teaching, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

Ms. T.S. Abeynayake
Department of English Language Teaching, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka

ISymRU 2021

ISSN-2235-9710

symposium.rusl@rjt.ac.lk