



The Open University of Sri Lanka

OUSL JOURNAL

Volume 14, No. 2 - December, 2019

Published by The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka.

The OUSL Journal is a peer-reviewed journal, published biannually by The Open University of Sri Lanka (OUSL).

Peer Review Policy

All research articles in this journal have undergone peer review, based on initial editor screening and anonymized refereeing by at least two anonymous referees.

Permission

It is a condition of publication that manuscripts submitted to this journal should not have been published elsewhere. *By submitting a manuscript, the author agrees that the copyright for the article is transferred to the publishers, if and when the article is accepted for publication.* The copyright covers the exclusive right to publishing, reproductions, microforms or any other reproductions of similar nature and translations.

The views expressed by the authors are their own and do not necessarily reflect the policies of The Open University of Sri Lanka.

Editorial/Correspondence

All correspondence including manuscripts for submission should be addressed to:

Editor-in-Chief/OUSL Journal
The Open University of Sri Lanka
P.O. Box 21, Nawala, Nugegoda, Sri Lanka
Email: ouslj@ou.ac.lk

Subscription Rates

Local: Rs. 200.00; Foreign: US \$ 20.00 (Inclusive of postage)

Local cheque should be crossed and made payable to the "The Open University of Sri Lanka" and should be addressed to the Librarian/OUSL.

Copyright © 2019, The Open University of Sri Lanka

Printed at The Open University Press

ISSN 1800-3621

E-ISSN 2550-2816

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted or disseminated, in any form, or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise without prior written permission from the copyright holder.



The Open University of
Sri Lanka

OUSL Journal

Volume 14 No. 2
December, 2019

OUSL Journal

Volume 14, No. 2 – December, 2019



Published Biannually by The Open University of Sri Lanka (OUSL)

Editor in Chief

Shyama R. Weerakoon

Professor of Botany, Dept. of Botany,
Faculty of Natural Sciences, The Open University of Sri Lanka

Editorial Board

G. D. Lekamge

Professor of Secondary & Tertiary Education,
Department of Secondary & Tertiary Education,
Faculty of Education, The Open University of Sri Lanka

C. N. Herath

Professor in Textile & Apparel Technology, Dept. of Textile &
Apparel Technology, Faculty of Engineering Technology,
The Open University of Sri Lanka

Harini Amarasuriya

Senior Lecturer in Social Studies, Department of Social Studies,
Faculty of Humanities and Social Sciences,
The Open University of Sri Lanka

Sreemali Herath

Senior Lecturer, Post-Graduate Institute of English
The Open University of Sri Lanka

B. Gayathri Jayatilleke

Senior Lecturer in Educational Technology, Centre for Educational Technology and Media, The Open University of Sri Lanka

N. Karthikeyan

Senior Lecturer in Physics, Department of Physics
Faculty of Natural Sciences, The Open University of Sri Lanka

K. A. Sriyani

Senior Lecturer in Nursing, Department of Nursing
Faculty of Health Sciences, The Open University of Sri Lanka

Ramani Amarasekara

Librarian, The Open University of Sri Lanka

OUSL Journal

Volume 14 No. 2 – December, 2019



Published Biannually by The Open University of Sri Lanka (OUSL)

Advisory Board:

Patricia B. Arinto

Professor and Dean, Faculty of Education,
University of the Philippines – Open University, Philippines

Chandra Gunawardena

Emeritus Professor in Education, The Open University of Sri
Lanka

Charlotte Nirmalani Gunawardena

Distinguished Professor of Distance Education and Instructional
Technology, University of New Mexico, USA

Janet Hemingway

Professor of Insect Molecular Biology,
Director/Liverpool School of Tropical Medicine, Liverpool, UK

Rasika Jayasekara

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

Nihal Kularatna

Associate Professor in Electronic Engineering, School of
Engineering, The University of Waikato, Hamilton, New Zealand

Sanjaya Mishra

Education Specialist - e-learning, Commonwealth of Learning,
British Columbia, Canada

K. Sarath D. Perera

Senior Professor in Chemistry, Faculty of Natural Sciences,
The Open University of Sri Lanka

Ryhana Raheem

Emeritus Professor in English, The Open University of Sri Lanka

Nishanta Rajakaruna

Associate Professor in Plant Biology, Biological Sciences
Department, California Polytechnic State University, USA

Language Editing

Lal Medawattegedara

Technical Assistance

Priyantha Nawarathne

Contents	Page
<i>Editorial</i>	1
The Efficacy of Different Mulching Materials in Influencing Growth, Yield, Soil and Quality Parameters of Ginger Cultivated in Low Country Intermediate Zone (IL1) of Sri Lanka	7
<i>R. P. D. N. Kumara and C. S. De Silva</i>	
Quality of Life Among Patients With Chronic Kidney Disease Who are Undergoing Haemodialysis at Two Selected Teaching Hospitals in Sri Lanka	31
<i>M. A. S. S. Premadasa, H. G. I. M. Hulangamuwa, W. A. D. H. Wijesooriya and T. D. Amarasekara</i>	
“Your Majesty, your son is unable to learn?": A Study of the Notions of ‘Learning’ and ‘Teaching’ Inscribed in a Sample of Southern Folk Tales from Ancient Lanka	57
<i>Lal Medawattegedara</i>	
Use of Selected Essential Oils for Controlling Stem-end Rot Disease in Mango (cv. Karuthacolomban)	75
<i>Anjali A. Kulasinghe, K. O. L. Chathurika Karunanayake and S. Somaratne</i>	
Commuter Travel Pattern to OUSL Nawala: A Case Study	91
<i>L. M. Prathapasinghe, D. B. Maddumaarachchi, G. N. Damayanthi, and K. S. Weerasekera</i>	
Perceptions of Buddhism among Professionals in Nepal	123
<i>Mahendra Kumar Shakya</i>	

Editorial

This is the Volume 14, Number 2 of the OUSL Journal, the Journal of The Open University of Sri Lanka which is published biannually. The articles published in this Volume include, research based on Agriculture, Health Sciences, Folklore, Postharvest Pathology, Transportation and Buddhist Education.

Mulching is a well-known process among cultivators, but they are seemingly unaware of its contribution to growth and yield of Ginger and its ability to cope with temperature and water stress. A field experiment was conducted at the Intercropping and Betel Research Station, Narammala to investigate the effects of different mulching materials on growth, yield, quality parameters of Ginger and the soil parameters in the Low Country intermediate zone (IL1) of Sri Lanka. The findings given in the paper titled “The Efficacy of Different Mulching Materials in Influencing Growth, Yield, Soil and Quality Parameters of Ginger Cultivated in Low Country Intermediate Zone (IL1) of Sri Lanka” are expected to contribute to eliminate the uncertainty faced by farmers when selecting suitable mulch for Ginger. The mulches tested were straw, gliricidia leaves, coconut leaves, coir dust and polythene. Plant and soil parameters were measured at monthly intervals. Mulch significantly affected soil chemical properties, growth and yield parameters of Ginger as it increased soil moisture contents, soil total nitrogen, available phosphorous, available potassium, plant height, number of pseudo stems per clump, number of rhizome fingers, fresh and dry weight of rhizomes and decreased soil pH and pungency levels. The best significant performances in plant and yield parameters were observed in the gliricidia mulch treatment. Polythene mulch had a good ability to conserve moisture than the other treatments. With the increase in temperature and decrease in rainfall due to global warming, farmers need to follow adaptation measures to maintain the potential yield of Ginger. Average yield of Ginger was estimated as 6000 kg/acre by the Department of Agriculture (DEA). Application of gliricidia mulch positively affected the increasing yield of Ginger at 43.6% per hectare more than average yield denoted by DEA. Therefore, it is advisable to use freely available gliricidia mulch to reach a good yield in Ginger cultivation.

Chronic Kidney Disease (CKD) is a worldwide public health problem which leads to social, physical, economic and psychological issues. CKD has shown a rising trend in Sri Lanka. Haemodialysis (HD) is a method of managing patients with CKD. Improving and maintaining

Quality of Life (QOL) is an essential goal of nursing care for patients with CKD. However, there is a lack of data on QOL among patients with CKD who are undergoing HD in Sri Lanka. Finding of the study published in this journal may help to understand the views of patients with HD about their health, performance capacities, sense of welfare and the benefits of the treatment procedure. Understanding the factors that influence the wellbeing of these patients may allow nurses to focus on specific interventions to enhance the quality of life of their patients. Therefore, the study on “Quality of life among patients with chronic kidney disease who are undergoing haemodialysis at two selected teaching hospitals in Sri Lanka” is aimed at assessing QOL among patients with CKD who are undergoing HD at haemodialysis units in selected teaching hospitals in Sri Lanka. A descriptive cross-sectional study was conducted with purposively selected participants (n=250) at haemodialysis units (DU) of National Hospital Sri Lanka (NHSL) and Teaching Hospital Anuradhapura. Data was obtained through two pre-tested questionnaires aimed at gathering relevant information on patients QOL of physical, psychological, social and environmental health. Participants were approached in DU while on HD. Findings revealed that, majority of participants were male 184 (73.6%), and belonged to the 30-64 age group. Nearly half of them (48.4%) have undergone HD treatment for periods ranging from three months to one year duration, and 54% of them have been admitted three times per week for HD. Data revealed that the environmental domain has the highest mean value (59.2±16.6), and social relationship domain has the least (49.5±22.5). Physical health and psychological domains were 51.9 (15.6), and 52.3 (19.9) mean values, respectively. Most of the participants (69.2%) were observed having poor overall QOL. The majority of the patients with CKD undergoing HD in two teaching hospitals in Sri Lanka experienced poor QOL. Understanding of QOL in haemodialysis patients is useful for nurses when developing individualized interventions based on their personal needs and delivering holistic care to this population. Health education programs should be organised to enhance QOL among patients with CKD and undergoing HD. This study was conducted only in two teaching hospitals, and therefore, results cannot be generalized to the whole country.

Folktales are the traditional speech acts usually attributed to common folks, and yet research suggests that they have the capability of carrying cultural rudiments across time and space. It is these cultural axioms that become the focus of the research paper titled “Your Majesty, your son is unable to learn?": A Study of the

Notions of 'Learning' and 'Teaching' Inscribed in a Sample of Southern Folk Tales from Ancient Lanka." The paper attempts to locate how Lankan folktales from the south situate the notion of 'learning' and 'teaching.' The study uses Ceylon's oldest folktales, which were collected and compiled under the title *Village Folk Tales of Ceylon* by the colonial (British) irrigation officer Henry Parker. Using a folkloristic standpoint which views folk speech acts as being carriers of not only cultural embellishments but cultural predispositions, this study attempts to locate what the notions of 'learning' and 'teaching' present in stories told by southern Lankans tell us about their deep-seated attitudes to understandings of education.

In Sri Lanka, stem-end rot (SER) caused by *Lasiodiplodia* sp. is the most common and serious disease to affect the mango cultivar 'Karuthacolomban' which is the most popular among the local cultivars. The disease originates in the field and thus is difficult to control. At present, disease control is achieved with chemical fungicides which are hazardous to human health and the environment. As such, the research paper titled "Use of Selected Essential Oils for the Control of Stem-end Rot Disease in Mango (cv. karuthacolomban)" investigated the possibility of using essential oils as biological fungicides. Six essential oils were selected based on literature and tested for effectiveness against the target pathogen by a poisoned food bioassay. The most effective EOs under *in vitro* conditions were used in *in vivo* studies. The effect of the treatment on reducing disease development, organoleptic properties and the edibility of fruits after *in vivo* application was assessed. Results of the present study revealed that basil, cardamom and citronella oils are effective in reducing the growth of the fungus. Out of these EOs the most suitable was cardamom oil and further studies were carried out only with cardamom. Cardamom ($700 \mu\text{l l}^{-1}$) in warm water dip treatment, reduced disease development but did not affect quality parameters such as sugar content, acidity and more importantly, the treatment had no negative effects on the taste of the fruit. Therefore, plant EOs can serve as safe, eco-friendly and effective alternatives to synthetic fungicides. However, the external appearance of the peel was negatively affected by the dip treatment in EO. Therefore, the method of application can be altered, such as spray treatment or incorporation of EO to a fruit coating can be used for optimum benefit.

A study on "Commuter Travel Pattern to OUSL Nawala: A Case Study" has analyzed the commuter inflow travel pattern to OUSL Nawala. The commuter travel origins with their travel mode patterns

and travel nature were identified in the study. Pilot studies were conducted during midweek and the weekend to obtain an awareness of the size of survey teams for interviews and how to locate survey teams during the main surveys. Origin inflow pattern surveys were carried out via roadside interviews on a Saturday (weekend) and a Wednesday (midweek), from 8:00 to 18:00 hours covering a 10-hour duration. According to the questionnaire surveys the walkers and motorists coming to OUSL through all four gates were contacted and more than 1,000 respondents were interviewed. This survey captured around 58% of the total arrivals during the weekend and 56% during midweek. It was observed that a total of 51% of the university community came through Nugegoda. Most of them come from the Kotte DS division. Around 74% of community coming to OUSL used buses, while 9% come by trains. As an outcome of this study a shuttle service of buses is proposed to provide a better service to OUSL users during the rush hours (i.e. 8:00 am to 10:00 am). Shuttle services are proposed from Kotte, Kaduwela, Maharagama, Kottawa, Kesbewa, Gampaha and Dehiwala during the weekends, and also from Kotte, Maharagama, Kaduwela, Kottawa, Kesbewa, Gampaha, Horana and Thimbirigasyaya during midweek.

The paper on “Perceptions of Buddhism among Professionals in Nepal” discusses the existing knowledge and perceptions of Buddhism among the professionals. Prince Siddhartha, who later became the Buddha, was born in the city of Lumbini in Nepal circa 623 BC. The teachings of the Buddha, who throughout his life preached about integrity and morality, could be valuable in promoting ethics and integrity and could also play an influencing role in the current drive of the Nepalese government to create a prosperous nation. Thus, understanding the perceptions of the development of professionals and the intellectuals of Nepal towards this system of philosophy would be critical to understand not only the current status of Buddhist teachings in Nepal, but also how this system of thought could be diverted for the purposes of nation building. Therefore, an exploratory survey was carried out in 2018 with questionnaires developed using Google Forms. The link was shared among 250 professionals and the first 100 responses received online were tabulated and analyzed. The study found that more than two-thirds of the respondents do not have even a basic knowledge about the Buddha's teachings and practices, which would comprise

the teaching disseminated through the texts such as *The Dhammapada*, *The Jataka Stories*, and the philosophical foundations of the Four Noble Truths, the Noble Eightfold Path, and Meditation. Some of these professionals illustrated the importance of including the teachings of the Buddha in the school curriculum and offering meditation as an extracurricular activity and further suggested that the best way for Nepal inheriting the legacy of the Buddha is to treasure and practice his teachings.

Professor Shyama R. Weerakoon

Editor in Chief/OUSL Journal

Email: ouslj@ou.ac.lk

 <https://orcid.org/0000-0003-0975-2738>



This article is published under the Creative Commons Attribution-Share Alike 4.0 International License (CC-BY-SA). This license permits use, distribution and reproduction in any medium; provided it is licensed under the same terms and the original work is properly cited.

How to Cite: Weerakoon, S.R., 2019. Editorial. *OUSL Journal*, 14(2), pp.1–5.

The Efficacy of Different Mulching Materials in Influencing Growth, Yield, Soil and Quality Parameters of Ginger Cultivated in Low Country Intermediate Zone (IL1) of Sri Lanka

R. P. D. N. Kumara* and C. S. De Silva

Department of Agricultural and Plantation Engineering, The Open University of Sri Lanka, Sri Lanka

Abstract

Even though mulching is a well-known fact among cultivators they are seemingly unaware of its contribution to growth and yield of Ginger and its ability to cope with temperature and water stress. Therefore, a field experiment was conducted at the Intercropping and Betel Research Station, Narammala to investigate the effect of different mulching materials on growth, yield, quality parameters of Ginger and the soil parameters in the Low country intermediate zone (IL1) of Sri Lanka. The study was

*Corresponding should be addressed to **Mr. R. P. D. N. Kumara**, Department of Agricultural and Plantation Engineering, The Open University of Sri Lanka, Sri Lanka

Email: nuwand45@gmail.com

 <https://orcid.org/0000-0002-5749-9469>

(Received 10th January 2019; Revised 6th June 2019; Accepted 6th October 2019) © OUSL)



This article is published under the Creative Commons Attribution-Share Alike 4.0 International License (CC-BY-SA). This license permits use, distribution and reproduction in any medium; provided it is licensed under the same terms and the original work is properly cited.

How to Cite: Kumara, R.P.D.N. and De Silva, C.S., 2019. The Efficacy of Different Mulching Materials in Influencing Growth, Yield, Soil and Quality Parameters of Ginger Cultivated in Low Country Intermediate Zone (IL1) of Sri Lanka. *OUSL Journal*, 14(2), pp.7-29.

also extended to find out the best mulching material for Ginger under certain field conditions. The findings are expected to contribute to eliminate the uncertainty faced by farmers when selecting suitable mulch for Ginger. The mulches tested were straw, gliricidia leaves, coconut leaves, coir dust and polythene. A control treatment was used without the use of mulch. Experiment was carried out as a Randomized Complete Block Design (RCBD) with three replications. Plant and soil parameters were measured at monthly intervals. All the treatments showed better performances than the control treatment which did not use mulch. The maximum number of sprouted plants was obtained in plots mulched with gliricidia. Further, the significantly highest plant height and number of pseudostems per clump were observed in gliricidia mulched plants. Fresh weight and dry weight of rhizomes too followed the similar pattern of measured growth parameters. Plots that did not used mulch recorded the lowest growth rate and yield of Ginger. Soil moisture conservation was significantly higher in the treatments with mulch than the control treatment. Polythene mulch was more effective for conserving of soil moisture than other mulches. However, all the soil parameters significantly contributed to the highest yield of Ginger in Gliricidia mulch treatment. The pungency level of Ginger was significantly higher in the control treatment. In this study gliricidia mulch positively contributed to increase the yield of Ginger (43.66% per hectare) more than the average yield denoted by DEA. Keeping the above facts in view, gliricidia proved to be the best mulch for Ginger cultivation in the low country intermediate zone (IL1) of Sri Lanka. Therefore, the results of this study will help the farmers to use the correct mulch to get significantly higher yield.

Key words: Ginger, Mulches, Pungency, Growth, Yield, Moisture

Introduction

Ginger (*Zingiber officinale* Roscoe) belongs to the family Zingiberaceae and is one of the economically-important crops in Sri Lanka. Rhizome of the plant is used as a delicacy, medicine

and spices. Ginger is widely propagated by planting rhizome pieces. Ginger is used to prepare value-added products such as Ginger bread, cookies, crackers, cakes, Ginger-ale and Ginger beer. Ginger is grown in all over the country but wet and intermediate zones are the major growing areas. Total cultivated extent and production in 2017 were 1,883 ha and 16,326 Mt (DEA 2018). In Sri Lanka farmers cultivate three main types of Ginger: local, Chinese and Rangoon. Mulching in Ginger is a common cultivation practice. Mulching is the process or practice of covering the soil/ground to make favorable condition for plant growth, development and efficient crop production. Mulching controls weed infestation, reduces run off and soil loss, improves physical, chemical and biological properties of soil which leads to better yield of crop (Singh et al., 1976, Aggarwal et al., 2002 and Subrahmaniyan et al., 2011) And also mulching provides multiple benefits such as enhancing soil temperature and moisture retention, accelerating crop growth with increased yield (Tiwari et al., 2003; Ghosh et al., 2006; Kasirajan and Ngouajio, 2012). Mulching also improves crop-water use efficiency, minimizes salt build-up in the crop root zone and reduces fertilizer leaching during rainy periods (Dong et al., 2009; Yuan et al., 2009; Almeida et al., 2015). Mulching has been found to increase the yield of Ginger (Aclan, 1976 and Mohanty and Sharma, 1978). Hanada (1991) and Salau et al., (2002) reported that the mulching stimulates the microbial activity in soil through improvement of soil agro-physical properties. Mulching also minimizes the use of Nitrogen fertilizer (Jones et al., 1977). Organic mulch can be defined as application of a layer of some suitable plant or animal residue such as straw, leaves, manure, or sawdust to the soil surface to protect the soil surface and provide a more favorable environment for plant growth. Organic mulches are also available, which are environmentally friendly and are also available at low cost. Apart from that synthetic mulches like transparent polythene and colored polythene can be used to increase the yield (Thankamani et al., in 2016).

Problem statement and justification the research

Normally Ginger cultivation is carried out in the *Yala* season from March or May under rain-fed conditions. However, rain-fed cultivation is unreliable due to the increase in atmospheric

temperature and unpredictable and or low rainfall due to the impact of climate change in future (De Silva, 2006). Frequently, Ginger cultivators face severe drought condition during the plants' vegetative stage and maturity stage which adversely affects the growth and yield of Ginger. Kushwah *et al.*, in 2012 reported that moisture is one of the major biotic factors which affects the production of the crop. And also, Kushwah *et al.*, in 2012 reported that covering of soil with mulch prevents the extreme changes in soil temperature and creates a micro environment in which moisture loss through evaporation comes down. And also, heavy rainfall is a factor that leads to the reduction of a yield, because it causes soil erosion as well as leaching loss of nutrients (Issaka *et al.*, 2017). Apart from these problems excessive water also increases the incidences of diseases to the crop. Due to high weed population in the field, plants unable to get enough water and nutrient from the soil (Lee *et al.*, 1981). It is also one reason which can could cause the reduction of a Ginger yield. Microorganisms are very important to increase the physical, chemical and biological properties of soil and their presence is also vital to enhance the stability of soil aggregation and improve soil properties which could provide favorable environmental condition for better growth of the plant. Singh *et al.*, (1976), Aggarwal *et al.*, (2002) and Subrahmanian *et al.*, (2011) reported that mulching controls weed infestation, reduces run off and soil loss, improves physical, chemical and biological properties of soil which leads to better yield of crop. They further predicted that the increase in temperature due to climate change will pose serious threats to soil temperature (De Silva *et al.*, 2007). Montague *et al.*, (2004) reported that mulching is important to reduce surface temperature of the soil.

Even though mulching is a well-established fact among the scientific community, farmers are not convinced and remain uncertain about selecting suitable mulch for different crop species. Kader *et al.*, 2017 reported that the different mulch materials have different effects on soil environment and crop yield. In this study Ginger was taken as an example as it provides income for small farmer communities who produce the crop for the export market.

The objective of this research was to examine the efficacy of different mulching materials to affect the growth, yield, soil and quality parameters of Ginger cultivated in the Low country intermediate zone (IL1) of Sri Lanka and then find out the best mulching material for local Ginger under the field conditions

Methodology

Location and Variety selection

The study was carried out in a field at the Intercropping and Betel Research Station, Department of Export Agriculture, Narammala, (IL1) during the period from January to December 2017. The Soil type of the plot was sandy loam with a pH ranging from 5.74 to 6.58, having total nitrogen 0.13%, available phosphorus 320 ppm and available potash 0.017%. Local type of Ginger was selected for this experiment.

Land preparation

The site was mechanically prepared with the aid of a tractor. Land preparation was done by clearing, ploughing, harrowing and making of beds. Eighteen beds of 130cm in length and 105cm in width were prepared.

Preparation of planting material and planting

The test crop was Ginger (local type) obtained from the Intercropping and Betel Research Station, Narammala. The rhizome was cut into plant-able sett size of 30-40 g (DEA) and care was taken to ensure that each set contained at least two buds. Seed treatment involved dipping the rhizomes 50°C hot water and solution of recommended fungicides Captan (N-trichloromethylthio-4-cyclohexene-1) for about two minutes in the evening of the day preceding the act of planting. Then seed Ginger were planted in shallow holes of 4cm deep at a spacing of 30cm X 70cm. Basal fertilizer was applied after planting and before mulching according to the recommendation of Department of Export Agriculture.

Experiment design

Six treatments consisting of mulching with straw (T2) at the rate of 1.5 kg per plot (fresh weight), gliricidia (T3) at the rate of 5 kg

per plot (fresh weight) , 25 microns polythene sheet (T4), coconut leaves (T5) at the rate of two coconut branch per plot , coir dust (T6) at the rate of 5 kg per plot (dry basis), and control (T1) (without mulch) were laid in Randomized Complete Block Design (RCBD) with three replications.

Application of mulching

Different types of mulching materials were applied according to the recommendation of DEA. Straw was collected from a paddy field near the research station and kept under shade condition. 1.5kg of straw (fresh weight) was measured and it was applied to one plot once per 12 weeks. Five kilo grams (5 kg) of Gliricidia (fresh weight) were applied to another plot once per six weeks. Two coconut branches were added to one plot. 5 kg of coir dust (fresh weight) was applied per plot once per 7 weeks. 25 microns polythene sheet was applied to the other plots according to the experimental design. The control preparation was without mulch.

Field Layout

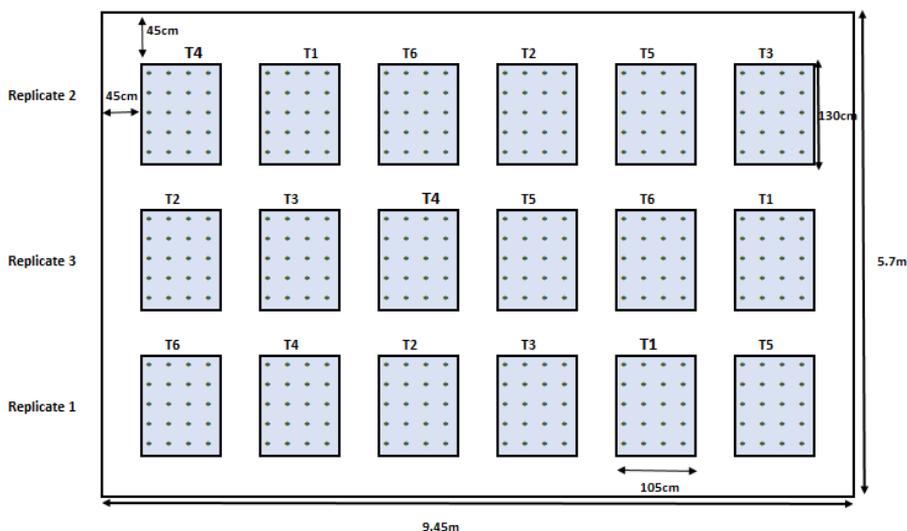


Figure 1: Field Layout

Intercultural practices

Plants were watered sufficiently in the propagation period except on rainy days. After that, watering was done once a week. Every morning plants were examined for investigation of diseases,

disorders and data collection. All the soil-related cultural practices were kept at minimal level not to disturb the soil fauna.

Irrigation

Watering was done manually. On rainy days watering was disregarded and 35 L amount of water (1/5 amount of field capacity) was applied to each plot once per week. This irrigation interval and the amount were selected to minimize water usage with mulching. The field capacity of soil was measured using volume basis method and pressure plate apparatus (Cresswell *et al.*, 2008). Soil moisture was measured by gravimetric method (Jalota *et al.*, 1998).

Collection of Data

Observations were recorded on growth parameters such as the number of sprouting plants, number of pseudo stem per clump, plant height, and yield parameters such as number of rhizome fingers, fresh and dry weight of rhizomes and soil parameters such as soil moisture, total nitrogen, available phosphorous and available potassium. Soil pH and soil EC were recorded once per month and the quality parameters such as pungency of Ginger was recorded at the age of about 6 months. All of the measured data (Table 01, 02) were subjected to Analysis of Variance (ANOVA) using SAS software package. Mean separation was done by Least Significant Difference Test (LSDT) at 0.05 level of probability.

Observation on plant growth and yield parameters

Table 1. Plant Parameters

Plant Trait	Method of trait measurement
Plant height (cm)	Plant height was taken from the ground level to the tip of the longest shoot. Data was recorded from randomly selected two plants from each replicate.
Number of emerged plants from the soil	Number of emerged plants was counted in each replicate.

Fresh and dry weight of the rhizome (kg/ha)	After harvest, rhizomes were cleaned and fresh weight was taken by electronic balancer. Dry weight was taken by drying the rhizome in the oven in 70 °C temperature to obtain constant weight. After that weight was taken by using an electronic balancer.
Weed biomass (g)	Weed was taken from each replicate and fresh weights were taken and then dried in the oven in 70 °C temperature until constant weight and dry weights were recorded.
Number of rhizome fingers	Count rhizome fingers of rhizome. Two plants were taken from each replicate.
Total biomass (g)	Total biomass weight was taken from two plants from each replicate.
Pseudo stems per clump	Pseudo stems per clump were counted from two plants from each replicate.

Observation of soil parameters

Table 2. Soil Parameters

Soil Trait	Method of trait measurement
Soil pH	Soil pH was measured by pH meter (McLean, 1982)
Soil EC (mS)	Soil EC was measured by EC meter (Rhoades, 1982).
Soil moisture content (%)	Soil moisture was measured by Gravimetric method (Jalota <i>et al.</i> , 1998) before irrigation.
Soil total nitrogen content (%)	Soil nitrogen content was measured using Kjeldahl method (Nelson <i>et al.</i> , 1980).
Soil available phosphorus content (ppm)	Soil phosphorus was measured colorimetrically using ammonium molybdate procedure by Spectrophotometer according to Chapman and Pratt (1961) and Jackson (1973).

Soil available Potassium content (%)	K content was measured by using Ammonium acetate extraction method. (Helmke and Sparks, 1996).
---	--

Observation of quality parameters

Pungency of rhizome

Sensory evaluation was done to test pungency level of Ginger using Friedman Rank Sum Test with five-point hedonic scale. Tea was prepared to test the pungency of rhizome. 25ml of water was used to prepare one sample of tea with 10g of rhizome piece according to the treatments. Six tea samples were prepared for six treatments and one additional tea was prepared without Ginger as a control and were given to thirty persons to taste and were asked them to give marks according to the pungency level of rhizome. Marks were given according to the five-point hedonic scale as follows and data were analyzed by SPSS package.

Pungency level	Mark
Extremely low pungency	1
Slight pungency	2
Moderate pungency	3
Very much pungency	4
Extremely high pungency	5

Results and Discussion

Growth Parameters

Number of sprouting plants

Treatments T3 (gliricidia) and T2 (straw) showed significantly ($p < 0.05$) the highest number of emerged plants in the 2nd month and treatment T6 (coir dust) showed the lowest number of sprouted plants (Table 3). All the treatments have totally completed their germination (100%) at the moment of the third-month data collection and because of that there was no significant difference in the number of emerged plants in the third month.

Plant height

The results presented in Table 3 indicated that different mulching materials significantly ($P < 0.05$) influenced the plant height. Maximum plant height was recorded in mulching with leaves of gliricidia (T3), which was significantly superior over the treatments of T1, T4 and T6. However, it was not significantly ($P > 0.05$) different from the treatments of T2 (straw mulch) and T5 (coconut leaf). The minimum plant height was recorded in the case where mulch (T1) was not used and it might be due to the expose of seed Ginger to the direct sun light. Therefore, the plant became weak when compared to other treatments. Mohanty *et al.*, (1999) reported that the plant height was low in treatment without mulch. Gliricidia mulch (T3) was the effective agent that influenced the plant height, and that might be due to the release of organic ions to the soil because of its high decomposition rate when compared to other organic mulch treatments. Montague *et al.*, (2004) reported that the mulches which decomposed faster, released nutrients into the soil that can be used by plants and microbes.

Number of Pseudostem per clump

The number of pseudostems per clump responded significantly to different mulching materials. Pseudo stem per clump showed an increasing trend pattern during the study period. The highest number of pseudostem was obtained in gliricidia mulch (T3) which was significantly different ($P < 0.05$) from the control as well as other treatments (Table 3). Treatment T2 (straw) and T5 (coconut leaf) were at par with each other and showed better results than treatments of T1, T4, and T6. The lowest number of pseudostem per clump was recorded in treatment (T1) control and it was significantly different ($P < 0.05$) from all other treatments.

Table 3. Growth Parameters of Ginger

Treatments	Number of Sprouted plants (%)	Plant height	Number of pseudostems per clump
T1	45 ^{cd}	80.67 ^d	15.83 ^e
T2	80 ^a	99 ^a	22.5 ^b
T3	81.67 ^a	102.167 ^a	28 ^a

T4	55b ^c	93b ^c	20.83 ^c
T5	65a ^b	96.83 ^{ab}	22b ^c
T6	31.67 ^d	87.67 ^c	18.83 ^d
Treatment	P<0.05	P<0.05	P<0.05
CV (%)	4.45	3.39	4.97

Treatments are significantly different if they do not share a letter (s) in common adjusted P value < 0.05.

Yield Parameters

Fresh weight and dry weight of rhizome

The results presented in Figures 2 and 3, clearly revealed that the yield (kg/ha) of Ginger was significantly (P<0.05) influenced by the use of different mulching materials. Fresh and dry weight of rhizome showed an increasing trend pattern during the study period. These findings are in line with those of Senguptha in 2009. Gliricidia mulch produced a pronounced effect (P<0.05) with regard to plant yield against the other treatments. Gliricidia mulch readily decomposes compared to other examined mulches, and it is a constant and quick supplier of available nutrients for plants. Use of coir dust was less effective towards increasing the yield of the crop. However, the maximum and minimum dry weight of rhizome were recorded from gliricidia (T3) and control (T1), respectively. Minakshi (1959) reported that mulching is vital for increasing the growth rate of rhizome. Therefore, fresh weight of rhizome has increased in a similar pattern, as T3 (Gliricidia) > T2 (straw) > T5 (coconut leave) > T4 (polythene) > T6 (coir dust) > T1 (control). Kumar *et al.*, (2018) reported that the higher rhizome yield with organic mulches was due to the improved growth attributes, reduced competition by weeds and improved soil conditions.

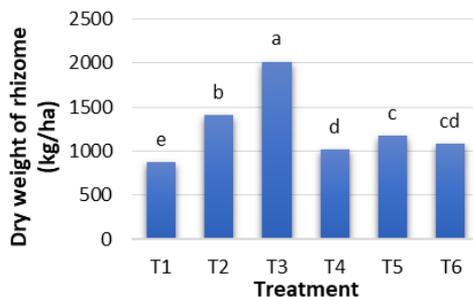
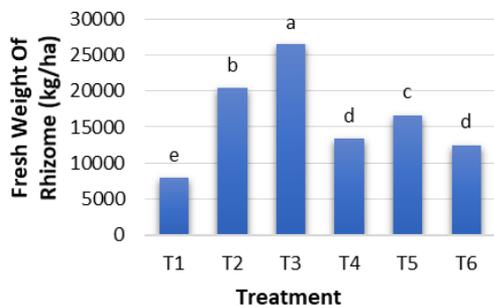


Figure 2: Fresh Weight of Rhizomes (kg/ha)

Figure 3: Dry Weight of Rhizomes (kg/ha)

(Treatments are significantly different if they do not share a letter (s) in common adjusted P Value < 0.05)

Number of rhizome fingers

The number of rhizome fingers per clump was significantly (P<0.05) influenced by the use of different mulching materials. The highest number of rhizome fingers was obtained in gliricidia mulch (T3) which was significantly different (P<0.05) from all other treatments. Mulching with straw (T2) secured second place. The minimum number of rhizome fingers was recorded in the case where mulch (T1) was not used and it might be due to the direct exposure to the sun light and poor moisture conservation due to higher evaporation than other treatments. Similar results were reported by Ram Chandra and Govind (2000). The number of rhizome fingers has increased in a similar pattern, as T3 (Gliricidia) >T2 (straw) > T4 (polythene)>T5 (coconut leave) >T6 (coir dust) >T1 (Control).

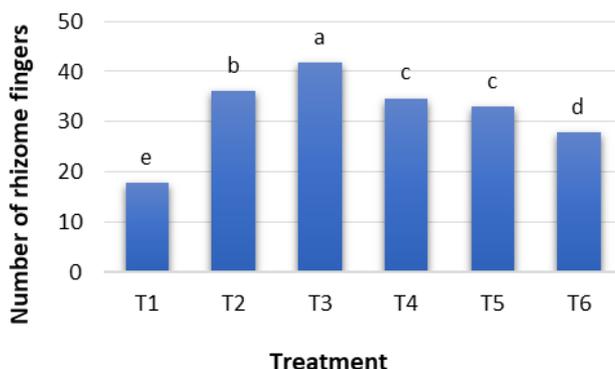


Figure 4. Number of Rhizome Finger, Six Months after Planting

Treatments are significantly different if they do not share a letter (s) in common adjusted P value < 0.05

Soil parameters

Soil pH

The lowest pH was obtained in gliricidia mulch (T3) (Table 4) and it was significantly different ($P < 0.05$) from control (T1), polythene (T4) and Coir dust (T6) treatments. Lowest pH value in Gliricidia mulching treatment might be due to the release of organic acids to the soil when it decomposed. Earlier studies have shown that soil pH decreases when organic mulches are used (Tukey and Schoff, 1963; Billeaud and Zajicek, 1989 and Duryea *et al.*, 1999). Treatments with organic mulch showed lower pH value than the control treatment. The same results were reported by Himelick and Watson in 1990, they observed that mulch induced pH reduction results from the addition or retention of organic matter, with organic acids produced from decomposition of plant-derived materials accumulating or leaching into the soil. The effect of mulch appears to depend on the relative difference between the soil pH and that of the mulch. pH showed a decreasing trend pattern during the study period. When plants grow, plants absorb more ions from the soil as nutrient. As a result of the absorption of nutrient by the plant, H^+ ions were released to the soil. And also, application of urea in 45 days and 90 days after planting resulted in the decrease of soil pH due to acidification resulting from dissociation of urea to produce H^+ ions.

Soil Electrical conductivity (EC)

The highest EC was shown in gliricidia mulch (T3) and it was significantly different from the other treatments. The lowest EC was shown in polythene mulch (T4) and it might be due to high moisture conservation in T4 treatment. Higher moisture content increased the solubility of ions. As a result of that soil EC decreased. Iles and Dosmann (1999) reported that due to high moisture conservation and high solubility of ions, soil EC decreased.

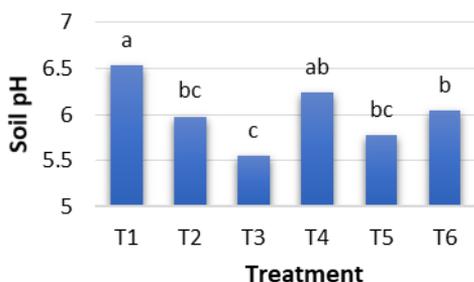


Figure 5. Soil pH

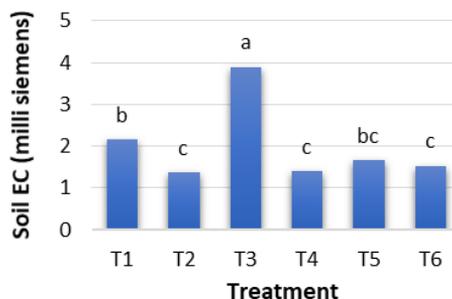


Figure 6. Soil EC

Treatments are significantly different if they do not share a letter (s) in common adjusted P value < 0.05

Soil moisture content (%)

Ni *et al.*, in 2016 reported that different mulches have variable effects on the soil moisture content. The highest percentage of moisture was obtained in plots mulched with polythene mulch (T4) and it was significantly different (P<0.05) from other treatments. Jones *et al.*, (1977) reported that the highest moisture conservation was observed under the polythene mulch mostly due to prevention of evaporation from the soil surface. Plots mulched with gliricidia (T3) also showed high moisture percentage. Treatment T1 (control) showed significantly the lowest percentage of moisture and it might be due to higher soil evaporation than the other treatments. Therefore, moisture conservation ability of each mulch can be shown as T4 (polythene) >T3 (gliricidia) >T2 (straw) >T6 (coir dust) =T5 (coconut leave) >T1 (control). All the treatments which consisted of mulch showed better performances

than the treatment of control. Khurshid *et al.*, (2006) found similar results: mulching improves the ecological environment of the soil and increases soil water contents.

Soil total nitrogen

The highest percentage was shown in gliricidia mulch (T3) and it was significantly different ($P < 0.05$) from all the other treatments (Figure 11). Gliricidia leaves produce a high quantity of biomass that contains a low concentration of lignin and active polyphenol that makes it decompose rapidly (Vanlauwe, 1996; Kwesiga *et al.*, 2003; Subramanian *et al.*, 2005). Subsequently this highest soil nitrogen percentage under Gliricidia mulch has significantly contributed to the growth and yield parameters of Ginger. The lowest percentage of soil nitrogen was obtained in the control treatment (T1). All the treatments which consisted of mulch showed higher soil nitrogen percentage than the control treatment. Alharbi in 2017 reported that the total N in surface layer in mulch treatment was higher than treatment that did not use mulch. Ginger plant is more sensitive to N fertilizers (DEA, 2011). Therefore, the plant growth rate was high in all the treatments which consisted of mulch than the control treatment—that may be due to positive correlation of soil total nitrogen percentage and vegetative growth of the plant.

Soil available phosphorous

There is tendency towards a higher amount of available phosphorus in the soil in plots that did not use mulch. Coir dust (T6) mulch on available phosphorus had the most influence but it was not significantly different from treatment T3 (gliricidia). The lowest available phosphorous content was shown in Treatment T1 (control). Similar results were obtained by Green lee and Rakow (1995) who mentioned that phosphorus availability under mulch treatment increased in comparison with no mulched treatment.

Soil available potassium

The positive effect of gliricidia (T3) mulch on available potassium in the soil was estimated and it was significantly different ($P < 0.05$) from the other treatments. The lowest ($P < 0.05$) amount of soil available potassium was obtained in control (T1). Alharbi in 2017 reported that the soil K was significantly affected by the mulching

process ($p < 0.05$). Furthermore, he recorded that the available K in the soil for treatment with mulch was higher than treatments with zero mulch.

Table 4. Soil Properties

Treatments	Soil moisture content (%)	Soil total nitrogen (%)	Soil available phosphorous (ppm)	Soil available potassium (%)
T1	4.858 ^d	0.116 ^c	314.5 ^d	0.0187 ^e
T2	8.894 ^{bc}	0.188 ^b	362 ^c	0.0311 ^b
T3	9.698 ^b	0.262 ^a	384.16 ^{ab}	0.0389 ^a
T4	12.363 ^a	0.187 ^b	378.76 ^b	0.0251 ^{cd}
T5	7.865 ^c	0.182 ^b	360.33 ^c	0.0200 ^{de}
T6	8.739 ^{bc}	0.146 ^{bc}	395 ^a	0.0294 ^{bc}
Treatment	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$
CV (%)	11.33	18.47	1.79	10.88

Treatments are significantly different if they do not share a letter (s) in common adjusted P value < 0.05

Keeping the above facts in view, all the soil parameters significantly contributed to the highest yield of Ginger in Gliricidia mulch treatment.

Quality parameters

Pungency of rhizome

Pungency is mainly varied according to type of Ginger but environmental conditions also slightly affected the pungency level of Ginger (DEA, 2011). According to Figure 7, the highest pungency level was obtained in control (T1) and it was significantly different ($P < 0.05$) from all other treatments. Lower soil moisture content might have resulted in the higher concentration of chemical constitution of the Ginger in the control (T1) treatment. Therefore, it might be the reason for the high pungency level in the control (T1) treatment. The lowest pungency level was obtained in T4 (polythene sheet) and it might be due to

highest moisture content contributed to the dilution of chemical constituents. However, the type of mulching materials had no significant impact on the pungency level of Ginger.

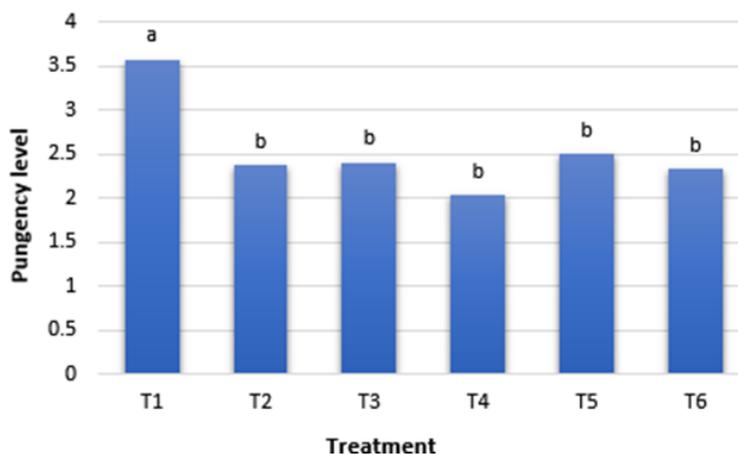


Figure 7. Pungency of Ginger in Treatments Six Months after Planting.

Treatments are significantly different if they do not share a letter (s) in common adjusted P value < 0.05

Conclusions and Recommendations

Mulch significantly affected the soil chemical properties, growth and yield parameters of Ginger as it increased soil moisture contents, soil total nitrogen, available phosphorous, available potassium, plant height, number of pseudo stems per clump, number of rhizome fingers, fresh and dry weight of rhizomes and decreased soil pH and pungency levels. The best significant performances in plant and yield parameters were observed in gliricidia mulch treatment (T3). Treatment performances on growth and yield parameters can be shown as gliricidia (T3) > straw (T2) > coconut leave (T5) > Polythene (T4) > coir dust (T6) > control (T1). Treatment T1 (control) showed the lowest growth rate, yield and soil improvements. Poor plant performances of T1 treatment might be due to exposure to sunlight, evaporation, high

weed growth and runoff. Polythene mulch had a good ability to conserve moisture than the other treatments.

With the increase in temperature and decrease in rainfall due to global warming, farmers need to follow adaptation measures to maintain the potential yield of Ginger. Average yield of Ginger was estimated as 6000 kg/acre by DEA. According to this study, application of gliricidia mulch positively affected the increasing yield of Ginger at 43.6% per hectare more than average yield denoted by DEA. Therefore, farmers are advised to use gliricidia mulch, which is freely available, to achieve a good yield in Ginger cultivation.

This study has been conducted in intermediate zone (IL1) of Sri Lanka and the results of this experiment might be different for the other climatic conditions. Therefore, further investigation is needed and is suggested for different agro-ecological region of Sri Lanka in order to confirm the present findings.

Acknowledgements

Authors gratefully acknowledge the assistance provided by Mrs. S. I. C. Silva, Research Officer in charge of Intercropping and Betel Research Station, Damplelessa.

References

- Aclan, F. and Quisumbing, E. C. (1976). Fertilizer requirement, mulch and light attenuation on the yield and quality of Ginger, *Philippine Agriculturist*, 60 : 183-91.
- Aggarwal. S., Korla, B. N., Sharma. V., (2002). Effect of dates of planting and mulch materials on growth and yield of Ginger (*Zingiber officinale* Rosc.) *Haryana J Hort Sci* 31(1&2):108-110.
- Aggarwal, S., Korla, B. N., Sharma. V. (2002). Effect of dates of planting and mulch materials on growth and yield of Ginger (*Zingiber officinale* Rosc.) *Haryana. J Hort Sci*, 31(1&2):108110.

- Aiyadurai. S. G., (1996). A review of Research on spices and cashew in India, *Indian council of Agricultural Research, New Delhi*, p. p. 85-103.
- Alharbi, A. (2017). Effect of mulch on soil properties under organic farming conditions in center of Saudi arabia, *scientific proceedings international scientific-technical conference "agricultural machinery"* volume 2, p. p. 230-236.
- Almedida, W. F. D., Lima, L. A., Pereira, G. M., (2015). Drip pulses and soil mulching effect on American crisphead lettuce yield, *Engenharia Agrcola* 35,1009-1018,
<https://doi.org/10.1590/1809-4430Eng.Agric.v35n6p10091018/2015>
- Billeaud, L. A., Zajicek, J. M. (1989). Influence of mulches on weed control, soil pH, soil nitrogen content, and growth of *Ligustrum japonicum*. *J. Environ. Hort.* 7:155–157
- Broschat, T. K. (2007). Effects of mulch treatment and fertilizer placement on weed growth and soil pH and nutrient content. *Hort Technology* 17:174–177.
<https://doi.org/10.21273/HORTTECH.17.2.174>
- Chapman, H. d. and Pratt, P. F. (1961). *Methods of Analysis for Soils, Plants and Waters. Univ. California Div. Agr. Sci., Riverside, CA*
- Cresswell, H. P., Green, T. W., MsKenzie, N. J. (2008). The adequacy of pressure plate apparatus for determining soil water retention, *Soil science society of America Journal*, Vol. 72, issue 1, pp. 41.
<https://doi.org/10.2136/sssaj2006.0182>
- De Silva, C. S. (2006). Impacts of climate change on potential soil moisture deficits and its use as a climate indicator to forecast irrigation need in Sri Lanka. *Water Resources Research in Sri Lanka, Postgraduate Institute of Agriculture, University of Peradeniya.*, p8p79-90, ISBN 955-1308-05-0
- De Silva, C. S., E. K. Weatherhead, J. W. Knox., J. A. Rodrihuez-Diaz (2007). Predicting the impacts of climate change-A case study of paddy irrigation water requirements in Sri Lanka. *Journal of Agricultural Water Management* 93(2007)19-29. Elsevier Publishers, Amsterdam, Netherlands. <https://doi.org/10.1016/j.agwat.2007.06.003>

- Department of Export Agriculture (2011). Performance and Accounts report, PP: 47
- Dong, H., Li, W., Tang, Wei., Zhang, D., (2009). Early plastic mulching increases stand establishment and lint yield of cotton in saline fields. *Field Crops Research*. 111. 269-275. <https://doi.org/10.1016/j.fcr.2009.01.001>
- Duryea, M. L., English, J., Hermansen, L. A. (1999) A comparison of landscape mulches: Chemical allelopathic, and decomposition properties. *J. Arboriculture* 25:88–97
- Gill, B. S., Randhawa. R. S., Randhawa., G. S., Singh, J., (1999). Response of turmeric (*Curcuma longa* L.) to nitrogen in relation to application of farm yard manure and straw mulch. *Journal of Spices and Aromatic Crops* 8: 211-214.
- Green, Lee K. M., Rakow, D. A. (1995). The effect of wood mulch type and depth on weed and tree growth and certain soil parameters. *J. Arboricult.*, 21(5): 225-232.
- Hanada. T., (1991). The effect of mulching and row covers on vegetable production. Kyoto: Food and Fertilizer Technology Center.
- Helmke. P. A., Sparks, D. L. (1996). Lithium, sodium, potassium, rubidium, and cesium, p. 551-574. In: DL Sparks (ed.). *Methods of soil analysis. Part 3. Chemical methods*. Soil Sci. Soc. Amer, Madison, Wis.
- Himelick, E. B., Watson, G. W. (1990). Reduction of oak chlorosis with wood chip mulch treatments. *J. Arboriculture* 16:275–278
- Iles, J. K., and Dosmann, M. S. (1999). Effect of organic and mineral mulches on soil properties and growth of Fairview Flame red maple trees. *J. Arboriculture* 25:163–167
- Issaka, S., and Ashraf, M. A. (2017). Impact of soil erosion and degradation on water quality: a review. *Journal of Geology, ecology and landscapes*, 1, PP. 1-11. <https://doi.org/10.1080/24749508.2017.1301053>
- Jackson, M. L. (1973). *Soil Chemical Analysis*. pp. 178-182. Prentice-Hall of India Private Limited, New Delhi.
- Jalota, S. K., R. Khera, B. S., Ghuman, (1998). *Methods in Soil Physics*, pp: 65–67. Narosa Publishing House, New Delhi.

- Jha. R. C., Maurya, K. R., Pandey. R, P. (1986). Influence of mulches on the yield of Ginger in Bihar. *Indian Cocoa Arecanut and Spices J.* 9 (4): 87-90.
- Jones, T. L., Jones, U. S., Ezeli, D. O. (1977). Effect of irrigation and plastic mulch on properties of troup sand on yield of "water tomato". *J. Amer. Soc. Hort. Sci.*, 102, 27-35.
- Ghosh,K. P., Dayal, D., Bandyopadhyay, K. k., Mohanty, M. (2006). Evaluation of straw and polythene mulch for enhancing productivity of irrigated summer groundnut. *Field Crops Research.*, <https://doi.org/10.1016/j.fcr.2006.03.004>
- Kader, M. d., Senge., Masateru., Mojid, M. A., Ito, K., (2017). Recent advances in mulching materials and methods for modifying soil environment. *Soil and Tillage Research.* 168. 155-166. <https://doi.org/10.1016/j.still.2017.01.001>
- Kasirajan,S and Ngouajio, M., (2012). Polyethylene and biodegradable mulches for agricultural applications: a review, *Agronomy for sustainable Development*, vo:32, pp 501-529. <https://doi.org/10.1007/s13593-011-0068-3>
- Khurshid, K., Iqbal,M., Arif ,M. S., Nawaz,A., (2006). Effect of tillage and mulch on soil physical properties and growth of maize. *Int. J. Agric. Biol.*, 8: 593-596
- Kumara,M., Swapnil,D., Dwivedi, P. K., Yadav,A. K., Mohit, K. (2018). Influence of Different Mulch Materials on Vegetative Growth and Yield of Ginger (*Zingiber officinale* Rosc.) under Drip Irrigation System. *Int. J. Curr. Microbiol. App. Sci.* 7(02): 2546-2551. <https://doi.org/10.20546/ijcmas.2018.702.310>
- Kushwah, S. S., Dwivedi, Y. C., Jain. P. K. (2013). Effect of mulching materials on growth and yield attributes and enhancing farm income through Ginger cultivation under rained rice-based production system. *Vegetable science* (40) 1: 96-98
- Kwesiga, F., Akinnifesi, F. K., Mafongoya, P. L., McDermott, M. H., Agumya, A. (2003). Agroforestry research and development in southern Africa during the 1990s: review and challenges ahead. *Agroforest. Syst.* 59: 173-186. <https://doi.org/10.1023/B:AGFO.0000005222.68054.38>
- Lee, M. T., Asher, C. J., Whiley, A. W. (1981). Nitrogen nutrition of Ginger: II. Effect of nitrogen supply on growth and development.

- Field crops Res. 4, 55-68. [https://doi.org/10.1016/0378-4290\(81\)90054-X](https://doi.org/10.1016/0378-4290(81)90054-X)
- McLean, E. O. (1982). Soil pH and Lime Requirement, Methods of Soil Analysis, Part 2, Chemical and Microbiological Properties, 2nd edition, pp: 199–224. Agronomy Monograph No. 9, Madison, WI.
- Minakshi, S. (1959). Ginger earns good income for the West Coast. *Indian Fmg.* 9: 12-13
- Mohanty, D. C., Sarma, Y. N., Panda, B, S. (1991). Influence of mulch materials and cover crops on the yield of turmeric crop under rainfed condition in Orissa. *Indian Cocoa Arecanut and Spices J.* 14 (3): 97-99.
- Mohanty, D. C. and Sarma, Y. N. 1978. Performance of Ginger in tribal areas of Orissa, India, as influenced by method of planting, seed treatment, manuring and mulching. *J. Plantation Crops*, 6: 14-16.
- Montague, T., Kjelgren, R. (2004). Energy balance of six common landscape surfaces and the influence of surface properties on gas exchange of four containerized tree species. *Sci Hortic.* 100: 229–249. <https://doi.org/10.1016/j.scienta.2003.08.010>
- Nelson, D. W., Sommers, L. E. (1980) Total nitrogen analysis of soil and plant tissues. *J Assoc Off Anal Chem.*; 63: 770–778.
- Ni, X., Song, W., Zhang, H., Yang, X., Wang, L. (2016) Effects of Mulching on Soil Properties and Growth of Tea Olive (*Osmanthus fragrans*). *PLoS ONE* 11(8): e0158228. <https://doi.org/10.1371/journal.pone.0158228>
- Rhoades, J. D. (1982). Cation Exchange Capacity, Methods of Soil Analysis, Part 2, Chemical and Microbiological Properties, 2nd edition. Agronomy Monograph No. 12.
- Salau, O. A., Opara-Nadi, O. A. and Swennen, R. (2002). Response of plantain to mulch on a Tropical ultisol. Part 1. Effect of different mulching materials on soil physical and chemical properties. *International Agro physics.* 6: (12): 55-66.
- Sengupta, D. K., Maity, T. K., Dasgupta, B. D. (2009). Effect of mulching on Ginger (*Zingiber officinale* Rose) in the hilly region of Darjeeling district, *journal of Crop and Weed*, 5 (1): 203- 205

- Singh, K, Vashistha, R. N., Pandita, M. L., Batra, B. R., (1976). Effect of mulching on growth and yield of cucurbits under rainfed conditions. *Haryana J. Hort. Sci.* 5(1&2):87-91.
- Subrahmaniyan, K., Zhou, W., Veeramani, P., (2011). Weed control through degradable, herbicidal plastics and organic mulches and their effect on crop growth and yield of winter rapeseed (*Brassica napus*). *Indian Journal of Agricultural Sciences* 81 (4): 348-352.
- Subramanian, P., Dhanapal, R., Sanil P., Palaniswami, C., Sairam, C. V., Maheswarappa H. P. (2005). *Glyricidia sepium* as green manure in improving soil fertility and productivity of coconut under coastal littoral sandy soil. *Journal of Plantation Crops* 33(3): 179-183.
- Thankamani, C. K., Kandiannan, K., Hamza, S., Saji, K. V. (2016). Effect of mulches on weed suppression and yield of Ginger (*Zingiber officinale* Roscoe.). *Scientia Horticulturae*, 207, pp: 125-130. <https://doi.org/10.1016/j.scienta.2016.05.010>
- Tiwari, K. N & Singh, Ajai & Mal, P. K. (2003). Effect of drip irrigation on yield of cabbage (*Brassica oleracea* L. var. capitata) under mulch and non-mulch conditions. *Agricultural Water Management*. 58. 19-28. 10.1016/S0378-3774(02)00084-7. [https://doi.org/10.1016/S0378-3774\(02\)00084-7](https://doi.org/10.1016/S0378-3774(02)00084-7)
- Tukey, R. B., Schoff, E. L. (1963). Influence of different mulching materials upon the soil environment. *Proc. Amer. Soc. Hort. Sci.* 82:69-76
- Vanlauwe, B. (1996). Residue quality, decomposition and soil organic matter dynamics under sub-humid tropical conditions. KUL-Press. Katholic University of Leuven, Leuven, Belgium. Pp 203.
- Yuan, Cuiping & Lei, Tingwu & Mao, L & Liu, Han & Wu, Yang. (2009). Soil surface evaporation processes under mulches of different sized gravel. *CATENA*. 78. 117-121. <https://doi.org/10.1016/j.catena.2009.03.002>

Quality of Life Among Patients With Chronic Kidney Disease Who are Undergoing Haemodialysis at Two Selected Teaching Hospitals in Sri Lanka

**M. A. S. S. Premadasa^{1*}, H. G. I. M. Hulangamuwa²,
W. A. D. H. Wijesooriya¹ and T. D. Amarasekara³**

¹National Hospital of Sri Lanka, ²Teaching Hospital Anuradhapura, Sri Lanka

³Department of Nursing and Midwifery, University of Sri Jayawardenapura, Sri Lanka

Abstract

Chronic Kidney Disease (CKD) has shown a rising trend in Sri Lanka. Haemodialysis (HD) is a method of managing patients with CKD. Improving and maintaining Quality of Life (QOL) is an essential goal of nursing care for patients with CKD. However, there is a paucity of data on QOL among patients with CKD who are undergoing HD in Sri Lanka. Therefore, this study aimed at

*Corresponding should be addressed to **Ms. M. A. S. S. Premadasa**, National Hospital of Sri Lanka², Teaching Hospital Anuradhapura, Sri Lanka

Email: spremadasa9@gmail.com

 <https://orcid.org/0000-0002-7636-8034>

(Received 15th October 2018; Revised 25th August 2019; Accepted 10th September 2019) © OUSL)



This article is published under the Creative Commons Attribution-Share Alike 4.0 International License (CC-BY-SA). This license permits use, distribution and reproduction in any medium; provided it is licensed under the same terms and the original work is properly cited.

How to Cite: Premadasa, M.A.S.S., Hulangamuwa, H.G.I.M., Wijesooriya, W.A.D.H. and Amarasekara, T.D., 2019. Quality of Life Among Patients With Chronic Kidney Disease Who are Undergoing Haemodialysis at Two Selected Teaching Hospitals in Sri Lanka. *OUSL Journal*, 14(2), pp.31-55.

assessing the QOL among patients with CKD who are undergoing HD at haemodialysis units in selected teaching hospitals in Sri Lanka. A descriptive cross-sectional study was conducted with purposively selected participants (n=250) at haemodialysis units in the above settings. Data was obtained through two pre-tested questionnaires, Socio-demographic questionnaire and WHOQOL-BREF, and they were analysed using descriptive statistics. Ethical approval was obtained from the ethics review committee, KAATSU International University (KIU), Sri Lanka. Findings revealed that the majority of participants were male 184 (73.6%), and belonged to the 30-64 age group. Nearly half of them (48.4%) have undergone HD treatment for periods ranging from 3 months to 1 year duration, and 54% of them have been admitted three times per week for HD. Data revealed that the Environmental domain has the highest mean value (59.2±16.6), and social relationship domain has the least (49.5±22.5). Physical health and psychological domains were 51.9 (15.6), and 52.3 (19.9) mean values, respectively. Most of the participants (69.2%) were observed having poor overall QOL. Statistically, significant p values were as follows: Participants' education level (p=0.000), average monthly income (p=0.002) and the frequency of dialysis towards QOL (p=0.000). Health education programs should be organised to enhance QOL among patients with CKD and undergoing HD.

Key words: chronic kidney diseases, haemodialysis, quantitative research, Sri Lanka

Introduction

Background of the study

Chronic Kidney Disease (CKD) is a worldwide public health problem which leads to social, physical, economic and psychological issues. CKD prevalence is estimated to be 8- 16% worldwide (Jha et al., 2013). In 2015, there were approximately 58 million deaths, with 35 million attributed to CKD globally (Levay et al., 2007).

According to the 2010 Global Burden of Diseases study (Mills et al.), CKD was ranked 27th in the list of cause of a total number of deaths worldwide in 1999, but raised to 18th in 2010 (Jha et al., 2013). During 2011-2014 prevalence of CKD (stage 1- 5) in the United States (USA) was 14.8 % of adults, and the number has exceeded the prevalence of diabetic Mellitus (12.3 % - National

Health and Nutrition Examination Survey-NHANES, 2011-2014). Annually, more than 500,000 individuals develop the end-stage renal disease (or CKD stage 5) in Sub-Saharan Africa, and the vast majority of these patients suffer premature mortality (Ojo, 2014).

According to the World Health Organization's (WHO) health profile in Sri Lanka, kidney disease is the seventh leading cause of death, with figures of 2.5 % (WHO, Non-communicable country profile, 2014). Currently, in Sri Lanka, CKD prevalence can be seen in the North-Western, Eastern, Southern and Central provinces and parts of the Northern provinces. However, previously, it was limited to the North-central and Uva provinces (Sunil, 2014).

End-Stage Renal Disease (ESRD) is the last stage of CKD, which requires renal replacement therapy (RRT) (Long, Wilkinson, Baldwin, and Wallin., 2014). The ability of the kidney to filter and remove waste and extra fluid from the body gets decreased due to CKD and acute kidney injury. Therefore, RRT is needed to manage the lives of patients with CKD. There are two types of renal replacement therapies: haemodialysis and kidney transplantation. Haemodialysis (HD) is a treatment option available for patients experiencing renal insufficiency, in which a machine is used to act out the function of the kidney such as filtering the blood and excretion of by-products (Ivey and Lane., 2010). HD is one of the most common procedures performed in US hospitals, and it was listed as five of theth most common procedures for patient aged 45 – 65 years. It was identified that more than 6000 (approximately) people underwent HD in 2005. (Ranasinghe, Perera, Makarim, Wijesinghe and Wanigasuriya., 2011).

Son, Choi, Park, Bae and Lee In 2009 stated that when patients with ESRD start to receive HD, they may face a lot of chronic stress-related to restrictions on their time, the economic and vocational costs related to treatment, functional limitations, dietary constraints, and possible adverse effects of medications. Abdel-Kader, Unruh and Weisbord, (2009) stated that ESRD on maintenance dialysis and those with advanced CKD experience a similar overall burden of physical and emotional symptoms and depression and comparably low QOL. Patients with ESRD who are undergoing HD may experience stress, time restriction, dietary constraints, functional limitation, sexual dysfunction, medication effects, awareness of impending death and difficulties related to employment, social and family dynamics (Cukor, Scott, Peterson

and Kimmel., 2007). In general, patients with HD have significantly reduced self-assessed physical and mental health compared to the general population (Kittal et al., 2001).

Patients with renal failure face many challenges due to their condition, which may leave them feeling fatigued and depressed. On the other hand, haemodialysis can threaten their body image, finances, relationships and independence. Nurses are always concerned about the physical, mental, psychological and social well-being of their patients. Therefore, it is of relevance to assess and understand the QOL among patients with CKD and who are undergoing haemodialysis in two teaching hospitals in Sri Lanka.

The Nephrology, Dialysis and Transplant Unit of the National Hospital of Sri Lanka provides care for renal patients in the region. It consists of a dialysis unit with a dedicated healthcare team, and this is the first renal unit that has been established under the Ministry of Health and Nutrition. The number of dialysis sessions carried out in 2003 was little over 3000, and the numbers have dramatically increased to more than 11600 in 2013, and more than 6900 up to July 2014 (the average number of HD sessions per month are around 1000). The number of HD provided by NHSL in 2013 was 11669. (Nephrology statistics from NHSL, 2015). Dialysis is provided to patients with acute kidney injury and chronic renal failure, and to patients who are awaiting transplants.

Significance of the study

There is limited data regarding QOL among patients with CKD undergoing HD within the Sri Lankan context. Finding of this study may help to understand the views of patient's with HD about their health, performance capacities, sense of welfare and the benefits of the treatment procedure. Understanding the factors that influence the wellbeing of these patients may allow nurses to focus on specific interventions to enhance the quality of life of their patients. Furthermore, findings from this study may be more beneficial for nurses to plan better nursing care as they could have a better perception of physical and mental health status, abilities and limitation of these patients.

General objective

To assess the QOL of patients with CKD undergoing HD in two selected teaching hospitals, Sri Lanka.

Specific objectives

This study was conducted to identify the level of the physical, psychological, social and environmental health of patients with CKD undergoing HD.

Literature Review

Global burden of CKD

The Kidney Disease Outcomes Quality Initiative (KDOQI) of the National Kidney Foundation (NKF) established a definition and classification of CKD in 2002. According to that, CKD is defined as either kidney damage or a decreased glomerular filtration rate (GFR) of less than $60 \text{ mL/min/1.73 m}^2$ for at least three months (KDOQI, 2002). The numbers affected with CKD in low- and middle-income countries (LMICs) were 177.4 million men and 210.1 million women. Thus, CKD is a critical global-health challenge, especially in LMICs (Mils et al., 2010) Stanifer et al. (2016) stated that environmental toxins and urbanisation exposes a growing number of people to numerous infectious diseases and non-communicable diseases (NCD). This is a significant but poorly understood and rapidly growing health burden in LMICs, leading to significant morbidity and mortality due to treated cardiovascular disease and kidney diseases.

Furthermore, they noted that nearly 500 million people are estimated to have CKD, with the majority (80%) living in LMICs. Worldwide, cause of death due to CKD is now ranked as 19th, which represents an increase of 82% since 1990. Alebiosu and Ayodele (2005) stated that the prevalence of CKD is higher in developing countries than in developed countries.

A Presidential Task Force (2017) has been established for the prevention of CKD in Sri Lanka. It confirms, according to the available health statistics, that there are approximately 20,000 admissions/ re-admissions of patients with renal failure to government hospitals with nearly 2,000 annual deaths approximately in Sri Lanka. Approximately 70,000 patients with CKD has been identified in known high-risk areas of which majority are from the North Central Province (The official website of the Presidential Task Force of Sri Lanka). Community screening for CKD was started in 2008, and so far, 38,000 patients with CKD have been identified. Anuradhapura and Polonnaruwa Districts

had about 1,500 patients who have been identified with CKD annually during the past four years (Ministry of Health, 2015).

Jayasekara et al. (2015) conducted a cross-sectional study to identify the epidemiology of CKD of uncertain aetiology in Sri Lanka by analyzing health statistics. Three cohort studies were conducted ($n = 15,630$, 3996 , and 2809) to analyze the demographic information, age-specific prevalence, aetiology, and stage of presentation. Their results showed that the male-female ratio was 2.4:1, the mean age of patients was $54.7 \pm$ eight years, 92% of the patients were farmers, and 93% consumed water from shallow-dug wells. The familial occurrence was common (36%). The majority of patients were stage 4 (40%) at the first presentation, while 31.8% were stage 3, and 24.5% were at stage 5. Stage one and two presentations accounted for only 3.4%. Therefore, CKD is a devastating disease in Sri Lanka.

Management of CKD

The kidneys are responsible for filtering waste products from the blood in the human body. Dialysis is the procedure that substitutes for many of the normal functions of kidneys. Dialysis can allow individuals to live productive and useful lives, even though their kidneys can no longer work adequately. There are two main types of dialysis, namely haemodialysis (HD) and peritoneal dialysis (PD). Haemodialysis uses a particular kind of filter to remove excess waste products and water from the blood (Shiel, 2017).

Globally, 2.6 million patients with ESRD received HD in 2010. This number is projected to almost double to 5.4 million by 2030 (Vijaindren, 2017). Statistics from 2010 showed that approximately 414,000 patients were receiving dialysis in the United States. An additional number of patients of over 179,000 had a functioning kidney transplant for ESRD (National Kidney Foundation, 2002).

Quality Of Life among patients with CKD

According to WHO (2017) definition, Quality of Life (QOL) of a person is an individual perception about his/her culture and the value system in which he/she lives, and about standards and concerns. Furthermore, WHO also adds other factors such as a person's physical health, psychological state, level of independence social relationship, personal beliefs and relationships of their environment (WHOQOL measuring QOL, Division of mental health

and prevention of substance abuse, WHO, 1997).

John and Thomas (2013) explored the psychosocial experience of patients with ESRD and its impact on QOL (n=118) using semi-structured face-to-face interviews with the WHOQOL questionnaire. They found that there was a considerable psychological burden for those with renal issues and a considerable impact on QOL for those living with ESRD.

Another descriptive correlational study was conducted in Iran by Ahmadzadeh (2016) about the evaluation of individual QOL among 53 patients with HD using a structured interview method. The author identified that the majority of the subjects was unemployed or disabled, only five were engaged in jobs, and they were in the lower-income category. Tilaki, Heidari, and Tilaki. (2017), conducted a case-control study in Iran, with 154 patients on HD and 308 healthy participants using a standard short-form questionnaire. Their result indicated that poor QOL among patients with HD.

In Greece, a qualitative and quantitative study was conducted by Gerogianni, Gerogianni, and Panagiotou (2016), their sample also included 100 patients, all of whom were assessed by interviewer-administered questionnaire. Researchers concluded that specific variables, such as age, gender, frequency and duration of dialysis, education, marital, financial and professional status, social functioning and effects of the renal disease could affect QOL of patients either positively or negatively.

Theofilou (2011) studied QOL in patients undergoing HD or peritoneal dialysis treatment. They assessed 144 patients using several tools namely, WHOQOL- BREF, General Health Questionnaire (GHQ-28) of Goldberg, State-Trait Anxiety Inventory, centre for Epidemiologic Studies Depression Scale (CES-D), and Multidimensional Health Locus of Control (MHLC). The author identified that the patients in HD treatment, compared to patients with PD treatment, had a more compromised QOL in the domains of environment and social relationships.

Another cross-sectional study was conducted by Edalat-Nejad, and Qlich-Khani., (2013) about the quality of sleep and health-related quality of life (HRQOL) in patients with HD in Iran. Quality of sleep was measured using the Pittsburgh Sleep Quality Index (PSQI), and HRQOL was measured using the Medical Outcomes

Study 36-item Short Form (SF-36) in 115 patients with haemodialysis. The study concluded that poor sleep is common in dialysis patients and is associated with lower HRQO. Seckinger et al. (2016) conducted a prospective, longitudinal, nationwide, non-randomized study in Germany among 2507 patients to assess QOL and treatment parameters, adverse and intercurrent events, hospitalisations, morbidity and mortality in the age groups ≥ 75 and < 75 years. The study found that the social QOL in elderly patients was more stable than in the younger cohort. In 2015 Gerasimoula et al. studied the influence of socio-demographic and clinical characteristics on the QOL in 320 patients undergoing HD in a one-day dialysis centre by using Missoula- VITAS QOL Index (MVQOLI). Authors found that participants with higher education had a better quality of life, possibly because education allows a more profound understanding of the disease and compliance with the therapeutic regimen. Another alternative explanation was that higher education might reflect higher income and consequently ability to afford treatment.

A cross-sectional study conducted by Tannor et al. (2017) in South Africa involved both qualitative and quantitative methods using 106 patients. The study used the KDQOL SF 3.1 questionnaire, and 36 of them participated in the focus group interview. The researchers found that patients on PD were more symptomatic and experienced more treatment-related limitations than those on HD. There was no difference in the overall QOL between patients with HD and PD.

A quantitative study by Michel(2016) with a group of 286 Brazilian patients with CKD on being treated with haemodialysis used a demographic questionnaire, KDQOL SF-36 and analysis of the electronic medical record. Results indicated that people with CKD have considerable trouble in keeping or going back to their jobs on account of various physical, psychological, and legal obstacles. Females had lower QOL scores than males in practically all areas, particularly in the domains related to physical symptoms and emotional wellness.

Donciu et al. (2013) conducted a cross-sectional study on the impact of end-stage renal disease on quality of life using the Short Form Health Survey Questionnaire (SF-36) in Romania (n=102). The study concluded that HD patients experienced a more significant burden from physical and psychological symptoms of the disease, perceiving a considerable impairment in their QOL,

especially related to the physical component.

Bayoumi et al. (2013) in Saudi Arabia studied the predictors of quality of life in haemodialysis patients (n=100) using the SF-36 and KDQOL-SF forms covering six domains of QOL, namely, physical, emotional, social, illness impact, medical and financial satisfaction, and overall general health. The study concluded that QOL reduced in all the health domains of HD patients.

A cross-sectional study among 223 patients was conducted by Braga et al. (2011) to identify factors associated with health-related quality of life in elderly patients on haemodialysis in South-Eastern Brazil (n=223). QOL was measured with the Kidney Disease Quality of Life Short Form (KDQOL-SF) and the Medical Outcomes Study 36-Item Short-Form Health Survey (MOS SF-36). The study concluded that health-related QOL was consistently associated with chronic diseases points to the importance of the morbidity profile in elderly patients who are undergoing haemodialysis.

Briefly stated, several studies have been conducted in other countries regarding QOL among patient with CKD who are undergoing HD. However, in Sri Lanka, this area is not adequately studied. Therefore, the present study plans to assess the QOL with the focus on levels of physical, psychological and social health and the level of the environmental health of patients with CKD undergoing HD in two teaching hospitals, Sri Lanka. The findings of this may be useful for nurses to improve QOL among patients with CKD undergoing HD. Also, findings from this study may be more beneficial to nurses as they could have a perception about patients physical and mental health status and also their abilities and limitation which could influence them to plan and deliver better nursing care.

Methodology

Study Design

This study is a quantitative descriptive, cross-sectional study and was conducted at a Teaching hospital (TH) in Anuradhapura and the National Hospital of Sri Lanka (NHSL) as they are the two major hospitals in Sri Lanka which provide care for a large number of patients with CKD who are undergoing HD. The target population was patients with CKD, undergoing HD, and admitted to Dialysis Units (DU) of NHSL and TH Anuradhapura. Two hundred fifty

participants (150 from NHSL and 100 from TH Anuradhapura) were selected under the following inclusion and exclusion criteria.

Inclusion criteria

Individuals who were diagnosed with CKD; age above 18 years; who can understand, read and write Sinhala, Tamil or English; and patients who have undergone HD for more than 03 months.

The following participants were excluded from the study: individuals less than 18 years of age and who were unable to speak, write or understand Sinhala, Tamil or English; patients who have undergone HD for less than three (03) months; patients who were suffering from severe mental disorders.

Data collection

This study used two types of questionnaires as follows: Part a) demographic data; Part b) WHO-QOL BREF. Permission was obtained from WHO to use the WHO-QOL BREF (1997) tool. An agreement was signed and emailed to the WHO group. Permission was obtained from the WHO team after emailing the details of the proposal. According to the user agreement, the researcher is not permitted to translate the Questionnaire to any language. So English, Sinhala and Tamil language versions were requested and got down through email from WHO (WHOQOL-BREF Field Trial Version, 1996). There are 04 main domains of WHOQOL -BREF. They are physical, psychological, social and environmental health.

Each patient's QOL was assessed using interviewer-administered questionnaire after obtaining the ethical approval from the ethics review committee of KAATSU International University (KIU). The questionnaire aimed at gathering relevant information on patients QOL of physical, psychological, social and environmental health. Participants were approached in DU while on HD.

Data Analysis

Descriptive statistics were used, and the result was presented as the sample mean, mode, median. SPSS version 23 statistical software and MS Excel 2013 were used to analyze the data. The WHOQOL-BREF produces four domain scores. Two items were examined separately. The mean score of items within each domain was used to calculate the domain score.

According to the WHOQOL-BREF questionnaire, another 24 questions represent the physical, psychological, social and environmental domains. Each item was related to the 5 points

Likert scale. The responses were scaled in a positive direction. According to the WHOQOL-BREF user manual, the mean score of the item within each domain was used to calculate the row score. Row score was then transformed to a 4-20 scale and 0-100 scale using a transformation formula. A higher score reflects a better QOL.

Ethical considerations

Ethical approval was obtained from the ethics review committee of KIU (reference number – KIU/ERC/17/011) before the data collection. Further approval was obtained from the Deputy Director of NHSL and Director of TH Anuradhapura. Also, permission was obtained from the Consultant Nephrologists and the Nurse in charge of DU in NHSL and TH Anuradhapura.

Participation in this study was voluntary. Participants were fully informed of their rights to decline or withdraw from participation in the study as desired. The questionnaires were administered to the participants after obtaining the informed written consent.

Confidentiality and anonymity were maintained by using codes to identify each participant. All information was in a locked file cabinet.

Findings and Discussions

Results

A pilot study was conducted with the questionnaire using ten patients. They were not included in the main study. Statistical analyses was performed using SPSS 23 software and MS Excel 2013. The total number of participants (250) were included in this study. Participants respond rate 100%

Demographic characteristics of the participants

The median age was 30-49 yrs. According to the findings, most of the participants belonged to age groups 30-49 (39.6%) and 50-64 (39.6%). Majority of them were male 184 (73.6%). Female to male proportion was 1: 2.78. Most of the participants (79.6%) belonged to the Sinhala ethnic community (199 out of 250), and 185 of them (74%) were Buddhist. Two hundred twenty-four participants (89.6%) had achieved secondary education. All most all of them were married (83.6%). Out of 250 participants, 105 were

unemployed (42%), and few were farmers 10 (4%). Average monthly income of 58.8% participants (147) was less than Rs. 29,999/- .121 participants (48.4%) had undergone three months to one-year duration of HD. Among the sample, 134 participants (54%) were admitted three times per week for HD.

1. QOL of the participants

A simulation study was conducted using WHOQOL-BREF. It contains 26 questions. The first two questions evaluated the overall perception of QOL and satisfaction with their health. As shown in Table 1, 135 (54%) participants rated their QOL as neither poor nor good. Findings indicated that none of the participants was very satisfied with their health. An only a small amount of participants were satisfied (15.6) with their health.

Table 1. Overall perception of QOL and satisfaction with their health (n=250)

Characteristics	Frequency	Percentage
Overall perception of QOL		
Very poor	20	8.0
Poor	66	26.4
Neither poor nor good	135	54
Good	23	9.2
Very good	06	2.4
Health satisfaction		
Very dissatisfied	30	12
Dissatisfied	89	35.6
Neither satisfy nor dissatisfied	92	36.8
Satisfied	39	15.6
Very satisfied	00	00

According to the WHOQOL-BREF, other 24 questions represent physical, psychological, social and environmental domains. Each item is measured with 5-points Likert scale. The response was scaled in a positive direction. According to the WHOQOL BREF User Manual, the mean score of the item within each domain was used to calculate the row score. Row score was transformed to a 4-20 scale and 0-100 scale using a transformation formula. The higher score reflects a better QOL.

There are no cut-off points above or below which QOL could be evaluated as “poor” or “good” thus it was decided to consider QOL<60 as poor; QOL and QOL>60 as good QOL when compared to a Brazilian study. The Brazilian study stated that OQOL \geq 60 cut-off point was moderately sensitive for recognizing individuals with good/satisfactory QOL in Brazilian older adults. On the other hand, the sensitivity of the test with the OQOL < 60 cut-off point was optimum, as was poor/unsatisfactory (Silva, Soares, Santos, and Silva (2014).

2. QOL of the participants under the physical domain

Findings indicated that the patient had more concern about their pain. That physical pain prevents them from engaging in what they needed to do. There are 33 (13.2%) participants with an extreme amount of pain and 93 out of 250 participants (37.2%) who suffered from very much pain. It was difficult for 190 (76%) participants to balance daily life without medical treatment, and 76 felt that they needed the extreme amount of medical treatment, and 114 felt the intense need for medical treatment.

Findings revealed that 101 participants (40.4%) were neither satisfied nor dissatisfied with their ability to perform daily living activities. Most of the participants, 102 (40.8%), were dissatisfied about their capacity for work. They cannot balance daily life. 21 (8.4%) participants felt very satisfied with their sleep satisfaction.

0-100 scale of the physical domain was used to calculate the overall physical QOL. QOL<60 was considered as poor QOL, and QOL>60 as good QOL, as shown in Figure 1. All most all of the participants numbering 205 (82%) experienced poor QOL, and 45

(18%) participants experienced good QOL under the physical domain.

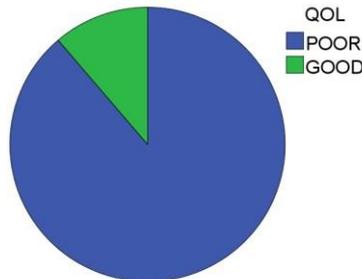


Figure 1. QOL of the participants under the physical domain (n=250)

3. QOL of the participants under the psychological domain

There are 06 questions included under the psychological domain (Q5, Q6, Q7, Q11, Q12, Q19, Q26). Data revealed that 2.3, or 116 (46.4%) of the participants were able to concentrate on things very much amount that in their daily living. Most of them, e 109 (43.6%) of the total sample, accepted their bodily appearance as a moderate amount. However, 76 participants (30.4%) enjoyed their life much, and 83 (33.2%) fell under a moderate amount.

0-100 scale of the psychological domain was used to calculate the overall psychological QOL. QOL<60 was considered as poor QOL, and QOL>60 as good QOL. Figure 2 indicated that the majority of participants, numbering 160 (64.8%) represented the poor QOL category, and 90 (35.2%) of them represented the good QOL category under a psychological domain.

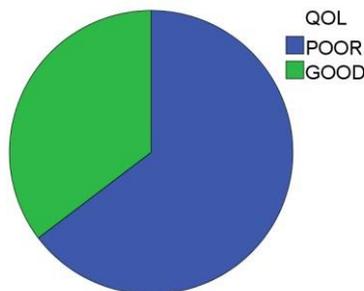


Figure 2. QOL of participants under the psychological domain (n=250)

4. QOL of participants under the social domain

There were 03 questions included in the social domain (Q20, Q21, Q22). Findings indicated that 95 individuals out of 250 (38%) were satisfied with their relationships. Some indicated that they were undecided the support they received from their friends. Only a small number of participants was very satisfied (4.4%) with their sex life.

0-100 scale of the social domain was used to calculate the overall social QOL. QOL<60 was considered as poor QOL, and QOL>60 as good QOL. As shown in Figure 3, 173 (69.2%) participants out of 250 were viewed as those experiencing poor QOL, and 77 (35.2%) of them were represented under the good QOL in the social domain.

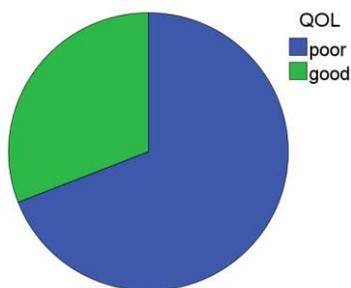


Figure 3. QOL of the participants under the social domain (n=250)

5. QOL of the participants under the environmental domain

08 questions represented the environmental domain (Q8, Q9, Q12, Q13, Q14, Q23, Q24 and Q25). Data indicated that 109 (43.6%) participants were satisfied with the conditions of their homes. More than 50% of the participants, 130 out of 250, cited their physical environment category as 'healthy'. However, 92 (36.8%) participants stated they had less money to meet their needs. There are 116 (46.4%) participants out of 250 who were satisfied, and 67 (26.8%) very satisfied with access to health services.

0-100 scale of the Environmental domain was used to calculate the overall Environmental QOL. QOL<60 was considered as poor QOL,

and $QOL > 60$ as good QOL. As shown in Figure 4, 132 participants (52.8%) experienced poor QOL and 118 (47.2%) participant experienced good QOL under the environmental domain.

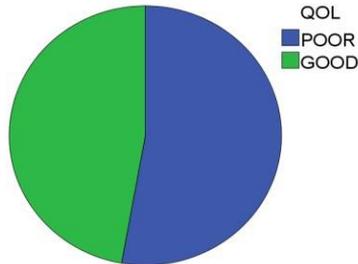


Figure 4. QOL of the participants under the environmental domain (n=250)

Above result indicated that participants experienced better QOL of the environmental domain than other domains.

6. Overall QOL of the participants

Overall QOL was calculated by the mean value of the above 04 domains. It included 24 questions. 0-100 scale of the overall QOL was used to calculate the overall QOL. $QOL < 60$ was considered as poor QOL, and $QOL > 60$ as good QOL. As shown in Figure 5, the majority of the participants 173 out of 250 (69.2%) represented poor QOL, and 77 (30.8%) of them good QOL. Therefore, the majority of patients with CKD having HD in two teaching hospitals, Sri Lanka experienced with poor QOL.

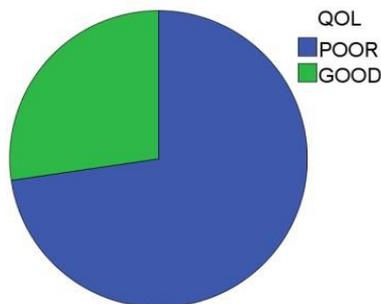


Figure 5. Overall QOL of the participants (n=250)

Comparison of overall QOL with demographic data

Two or more independent sample non-parametric test was performed to assess the difference between overall QOL and demographic data. As shown in Table 2, an education level ($p=0.000$), average monthly income ($p=0.002$) and the Frequency of dialysis ($p=0.000$) and QOL were statistically significant. Therefore there is a difference between education level, average monthly income and the frequency of dialysis and QOL. Gender, ethnicity, religion, marital status, occupation and HD duration vs QOL was not statistically significant ($p>0.05$).

Table 2. Comparison of overall QOL with demographic data (n=250)

Compare group	Significance level (p value)
QOL vs Gender	0.624
QOL vs Ethnicity	0.566
QOL vs Religion	0.939
QOL vs Education level	0.000*
QOL vs Marital status	0.747
QOL vs Occupation	0.346
QOL vs Average monthly income	0.002*
QOL vs HD Duration	0.246
QOL vs Frequency of Dialysis	0.000*

*significant level <0.05

Discussion

Majority of the participants of this study were Sinhala (79.6%), Buddhist (74%), Male (73.6%), married (83.6%), under 18-64 age group (90.4%), secondary level educated (89.6%) and under 3month-1yr HD (48.4%). Most of the participants were unemployed (42.2%) and came under the lower-income category (58.8% under <29999Rs). A similar study was done by Ahmadzadeh (2016), and they stated that all the participants had been treated for one year, and (86.8%) were married. In terms of educational status, the majority of the participants were illiterate (71.7%), and none had an academic degree. The majority was unemployed or disabled, and only five had jobs. All the patients indicated that they were in the lower-income category. Almost one-half earned 160 US dollars per month(Ahmadzadeh, 2016). Another study conducted in Malaysia revealed that the majority of the respondents were unemployed (Baizura et al., 2013). Another study was conducted in Chile, and they found that most participants were male (57.9%), married (53.7%), with a partner (68.6%). On average, patients had 7.84 years of education; the majority declared being religious (91%), professionally inactive (77.1%) and with monthly economic revenues less than 5,000 Chilean Pesos (53.1%), equivalent to less than 200 Dollars per month (Guerrero et al., 2012). Another study carried out in Greece stated that majority of the participants (69%) were between 50-59 years old, and 44% have been receiving HD for 01-03 year (Gerogianni et al., 2016). Contrasting findings were identified in terms of education (Ahmadzadeh, 2016; Guerrero et al., 2012) employment (Ahmadzadeh, 2016; Baizura et al., 2013; Guerrero et al., 2012).

In this study majority of the participants were reportedly experiencing poor physical (82%), psychological (64.8%), social (69.2%) and environmental QOL (52.8%). QOL under physical domain was lower than the other domain and QOL under environmental domain was higher than the other domains. Similarly, a study done in Nepal revealed that patients with CKD undergoing dialysis had overall low QOL scores in all four domains (Joshi et al., 2017).

The first two questions in this study evaluated that individuals' overall perception of QOL and satisfaction with their health. Around 54% of participants rated their QOL to be in neither poor nor good category, and 34.4% (cumulative) participants were under

the very poor and poor category. Around 15.6% of participants were satisfied with their health. In contrast, the Brazilian study stated that around 56.3% of the older adults perceived their quality of life to be good or very good, and 7.9% as poor or very poor; 52.4% were satisfied or very satisfied with their health, whereas 23.0% considered it to be dissatisfactory or very dissatisfactory (Silva et al., 2014).

In this study, 69.2% of participants were observed to be experiencing poor QOL, and 30.8% participant good QOL. Therefore the majority of the participants were experiencing poor QOL. Similarly, an Indian study found that the overall QOL of patients on HD was significantly impaired (Abraham et al., 2012).

In this study, the education level ($p=0.000$), average monthly income ($p=0.002$) and the frequency of dialysis ($p=0.000$) and QOL were statistically significant. Therefore, there is a connection between the education level and average monthly income in QOL. However, gender, ethnicity, religion, marital status, occupation and HD duration are not statistically significant towards QOL. Similar studied conducted previously stated that the relationships between the QOL scores and education, job and marital status were not statistically significant (Ahmadzadeh, 2016). Another study found that participants of higher education had a better quality of life, possibly because education allows an in-depth understanding of the disease and compliance with the therapeutic regimen. Another alternative explanation is that higher education may reflect higher income and consequently, the ability to afford treatment (Gerasimoula et al., 2015). A similar study conducted in Iran revealed that older age, female gender, and lower educational level were significantly associated with a lower score of all physical, psychological, and social domains of QOL (Tilaki et al., 2017).

Findings of this study provide healthcare providers with ways to identify the patients' quality of life as well as to plan and implement strategies to help enhance it. It can also educate the patients by increasing their awareness of conditions that may affect their quality of life.

Conclusions

The findings revealed that majority of participants were from the Sinhala ethnic community, Buddhist, male, married, under 18-

64 age group were exposed to secondary level education, were undergoing HD for three months to 1 year duration and participated in HD three times a week. Majority of the participants experienced poor QOL under each domain. However, QOL of the environmental domain was better than other domains and QOL of the physical domain lower than the other domain when compared to each other. Therefore, the majority of the patients with CKD undergoing HD in two teaching hospitals in Sri Lanka experienced poor QOL.

The education level ($p=0.000$), average monthly income ($p=0.002$) and the frequency of dialysis towards QOL are statistically significant. Therefore there is a difference between the education level, average monthly income and the frequency of dialysis and QOL.

Understanding of QOL in haemodialysis patients is useful for nurses when developing individualized interventions based on their personal needs and delivering holistic care to this population.

Limitations

This study was conducted only in two teaching hospitals. Therefore, the results cannot be generalized to the whole country.

Recommendations

There should be an awareness programme to improve the QOL of patients with CKD undergoing HD in Sri Lanka. There should be an educational programme to improve the nurses' further knowledge about a person's perception of QOL. Further study with a larger sample is recommended.

Acknowledgements

We want to thank all participants and staff of the Dialysis Unit 1,2 of the National Hospital of Sri Lanka and Teaching Hospital Anuradhapura.

References

- Abdel-Kader, K., Unruh, M. L., & Weisbord, S. D. (2009). Symptom Burden, Depression, and Quality of Life in Chronic and End-Stage Kidney Disease. *Clinical Journal of the American Society of Nephrology* 4(6),1057-1064
<http://doi.org/10.2215/CJN.00430109>.
- Abraham, S., Venu, A., Ramachandran, A., Chandran, P.M, Raman, S. (2012) Assessment of quality of life in patients on hemodialysis and the impact of counselling. *Saudi Journal of Kidney Disease Transplant*, 23(5):953-7.
<http://doi.org/10.4103/1319-2442.100875>.
- Ahmadzadeh, H.M.S. (2016). Evaluation of individual quality of life among hemodialysis patients, *Journal of Patient Preference and Adherence*, 1-9.
<https://dx.doi.org/10.2147/PPA.S117860>
- Alebiosu, C.O. & Ayodele, O.E. (2005). *Journal of Advance Chronic Kidney Disease*,5-13.
<http://doi.org/10.1053/j.ackd.2010.02.001>
- Anu, V. K., Pushpa, P., & Kumar, S. S. (2014). Quality of Life of Patients undergoing Haemodialysis at BP Koirala Institute of Health Sciences. *Journal of Manmohan Memorial Institute of Health Sciences*, 1(2), 19-2
DOI: <https://doi.org/10.3216/jmmihs.v1i2.9904>
- Bayoumi, M., Al Harbi, A., Al Suwaida, A., Al Ghonaim, M., Al Wakeel, J., & Mishkiry, A. (2013). Predictors of quality of life in hemodialysis patients. *Saudi Journal of Kidney Disease Transplant*, 24(2):254-9.
<http://doi.org/10.5144/0256-4947.2012.570>.
- Baizura, N., Yusop, Mun, C.Y., Shariff, Z.M., & Huat, C.B. (2013). Factors Associated with Quality of Life among Hemodialysis Patients in Malaysia, Volume 8 | Issue 12.
<http://doi.org/10.1371/journal.pone.0084152>.
- Braga, S.F., Peixoto, S.V., Gomes, I.C., Acúrcio, Fde, A., Andrade, E.I., & Cherchiglia, M.L. (2011). *Rev Saude Publica*, 45(6):1127-36. <https://doi.org/10.1590/s0034-89102011000600015>

- Cukor, D., Scott, D.C., Peterson, R.A., & Kimmel, P.L. (2007). Psychosocial Aspects of Chronic Disease: ESRD as a Paradigmatic Illness, *Journal of the American society nephrology*.<https://doi.org/10.1681/ASN.2007030345>
- Donciu, M.D., Tasmoc, A., Dumea, R., Hogas, S., Voroneanu, L., Siroopol, M.D. & Covic, A. (2013). The impact of end-stage renal disease on quality of life. *Rev Med Chir Soc Med Nat Iasi*,117(4):908-15.
- Edalat-Nejad, M., & Qlich-Khani, M. (2013). Quality of life and sleep in Hemodialysis patients. *Saudi Journal of Kidney Diseases and Transplantation*, 24(3), 514.
<https://doi.org/10.4103/1319-2442.111031>
- Finnegan-john, J., & Thomas, V. J. (2013). The Psychosocial Experience of Patients with End-Stage Renal Disease and Its Impact on Quality of Life , *Journal of ISRN Nephrology*, 3–6.
<https://doi.org/10.5402/2013/308986>.
- Gerasimoula, K., Lefkothea, L., Maria, L., Victoria, A., Paraskevi, T. & Maria, P. (2015). Quality of life of haemodialysis patients, *Journal of Mater Sociomed*; 27(5): 305-309.
<https://doi.org/10.2147/IJNRD.S136522>
- Gerogianni, S., Gerogianni, G., & Panagiotou, M. (2016). Social Life of Patients Undergoing Haemodialysis, *Journal of Caring Sciences*, Volume 9, Issue 1, Page123.
- Grove, S.K., Grey, J.R. & Burns, N.(2015). *Understanding Nursing Research*, Building and evidence-based practise 6th edition, p 33, 212-213.
- Guerrero, V.G., Alvarado, O.S., Espina, M.C. (2012). Quality of life in people with chronic hemodialysis: association with sociodemographic, medical-clinical and laboratory variables, 20(5):838-46
<https://doi.org/10.1590/s0104-11692012000500004>
- Heidari, B. (2017). A Comparison of Health-related Quality of Life in Patients with Renal Failure under Hemodialysis and HealthyParticipants, *Saudi Journal of Kidney Disease Transplant*; 28(1),133–140. <https://doi.org/10.4103/1319-2442.198165>

- Ivey, T., & Lane, B. (2011). Quality of Life in Patients with End-Stage Renal Disease on Hemodialysis.
- Jayasekara, K. B., Dissanayake, D. M., Sivakanesan, R., Ranasinghe, A., Karunarathna, R.H., & Priyantha Kumara, G. W. G. (2015). Epidemiology of Chronic Kidney Disease, With Special Emphasis on Chronic Kidney Disease of Uncertain Etiology, in the North Central Region of Sri Lanka. *Journal of Epidemiology*, 25(4), 275–280. <https://doi.org/10.1007/s13201-018-0792-9>
- John, J.F. & Thomas, V.J. (2013). The Psychosocial Experience of Patients with End-Stage Renal Disease and Its Impact on Quality of Life: Findings from a Needs Assessment to Shape a Service,” *ISRN Nephrology*, Article ID308986, 8 pages, <https://doi.org/10.5402/2013/308986>.
- Joshi, U., Subedi, R., Poudel, P., Ghimire, P.R., Panta, S., & Sigdel, M.R. (2017). Assessment of quality of life in patients undergoing hemodialysis using WHOQOL-BREF questionnaire: a multicenter study. *International Journal of Nephrology and Renovascular Disease*, Pages 195—203 <https://doi.org/10.2147/IJNRD.S136522>.
- Jha, V., Garcia-Garcia, G., Iseki, K., Li, Z., Naicker, S., Plattner, B., Saran, R., Wang, A.Y, & Yang, C.W. (2013). The effect of spirituality on quality of status of life patients with chronic kidney disease and its correlation with the mental health status and cognitive perception for their illness, *Open access library journal*, (2,8). [https://doi.org/10.1016/S0140-6736\(13\)60687-X](https://doi.org/10.1016/S0140-6736(13)60687-X).
- Levey, A.S., Jong, P.E.D., Coresh, J., Nahas, M.E.I., Astor, C.B., Matsushita, K., Gansevoort, R.T., Kasiske, B.L., & Eckardt, K.U. (2011). *Kidney International*, Volume80, Issue 1, 2011, pp. 17-28 <https://doi.org/10.4236/ijcm.2016.77053>
- Long, M., Wilkinson., Baldwin, A., & Wallin, E. (2014). Chronic kidney disease. *Oxfordhandofclinicalmedicine*. <https://doi.org/10.1093/med/9780199204854.003.2106>
- Michel, R. B. (2016). Quality of life in hemodialysis patients and the relationship with mortality, hospitalization and poor treatment adherence, *JournalofBrasNefrol*;38(4):411-420 <https://doi.org/10.5935/0101-2800.20160066>.
- Mills, K.T., Xu, Y., Zhang, W., Bundy, J.D., Chen, C.-S., Kelly, T.N., Chen, J., & He, J.A (2015). Systematic analysis of worldwide population-based data on the global burden of chronic kidney disease. *Journal of kidneyinternational*,88(5):950-7.

- <https://doi.org/10.1038/ki.2015.230>.
- National Hospital of Sri Lanka (2015). Retrieved from <http://www.nhsl.health.gov.lk/web> (Government of Sri Lanka Web Portal Retrieved Jan 18, 2018, Ministry of Health Web Portal National Kidney Foundation (NKF). (2002). The Kidney Disease Outcomes Quality Initiative (KDOQI) Retrieved from <https://www.kidney.org/atoz/content/about-chronic-kidney-disease#ckd>
- Ojo, A. (2014). Addressing the Global Burden of Chronic Kidney Disease Through Clinical and Translational Research. *Transactions of the American Clinical and Climatological Association*, 125, 229–29. Press, D. (2017). Evaluation of individual quality of life among hemodialysis patients, *Patient Preference and Adherence*: 11, Presidential Task Force of Sri Lanka (Official website) Retrieved from, <https://www.presidentialtaskforce.gov.lk/en/kidney.html#doi.org/10.1186/s12955-017-0697-6>
- Ranasinghe, P., Perera, Y. S., Makarim, M. F. M., Wij single, A., & Wanigasuriya, K. (2011). The costs in the provision of haemodialysis in a developing country: *Journal of BMC Nephrology*, 12:42 <https://doi.org/10.1186/1471-2369-12-42>
- Seckinger, J., Dschietzig, W., Leimenstoll, G., Rob, P. M., Kuhlmann, M. K., Pommer, W., Fraass, U., Ritz, E. & Schwenger, V. (2016). Morbidity, mortality and quality of life in the ageing haemodialysis population: *Clinical Kidney Journal*, vol.9,(6),839–84 <https://doi.org/10.1093/ckj/sfw087>
- Shiel, (eds.). (2017). The medical information website, MedicineNet.com. Retrieved On Jan15,2018. Retrieved from <https://www.medicinenet.com/dialysis/article.htm>
- Silva, P. A. B., Soares, S. M., Santos, J. F. G., & Silva, L. B. (2014). Cut-Off point for WHOQOL-bref as a measure of the quality of life of older adults. *Revista de Saúde Pública*, 48(3),390–397. Retrieved from <http://doi.org/10.1590/S0034-8910.2014048004912>
- Son, Y.J., Choi, K.S., Park, Y.R., Bae, J.S., & Lee J.B., (2009). Depression, symptoms and the quality of life in patients on hemodialysis for end-stage renal disease. *Am j Nephrol*, 29,36-42.
- Sunil. (2014). Chronic kidney disease spreads in rural Sri Lanka. Published by the International Committee of the Fourth

International (ICFI). *Worldsocialistwebsite*. Retrieved from <https://www.wsws.org/en/articles/2014/03/05/slfm-m05.html>.

- Stanifer, J. W., Muiru, A., Jafar, T. H., & Patel, U. D. (2016). Chronic kidney disease in low- and middle-income countries. *Nephrology Dialysis Transplantation*, 31(6), 868–874. doi: 10.1093/ndt/gfv466.
- Tannor, E. K., Archer, E., Kapembwa, K., Schalkwyk, S. C. Van, & Davids, M. R. (2017). Quality of life in patients on chronic dialysis in South Africa: *BMC Nephrology*, doi: 10.1186/s12882-016-0425-1.
- Theofilou, P (2011). Quality of Life in Patients Undergoing Hemodialysis or Peritoneal Dialysis Treatment. *Journal of Clinical Medicine Research*, 3(3), 132–138. doi: 10.4021/jocmr552w.
- The Presidential Task Force of Sri Lanka (Official website) Retrieved from <http://www.presidentialtaskforce.gov.lk/en/kidney.html#>
- Tilaki, K.H, B., Heidari.B., Tilaki, A.H. (2017). A Comparison of Health-related Quality of Life in Patients with Renal Failure under Hemodialysis and Healthy Participants. *Saudi J Kidney Dis Transpl* 2017;28(1):133-140
- Vijaindren, A. (2017). 22nd report of the Malaysian Dialysis and transplant Registry.
- Wang, L., & Chen, C. (2009). The Psychological Impact of Hemodialysis on Patients with Chronic Renal Failure. (www.intechopen.com).
- The WHOQOL Group. (1998). Development of the WHOQOL-BREF Quality of Life Assessment. *Psychological Medicine*.(WHOQOL measuring QOL, Division of mental health and prevention of Substance abuse, WHO, 1997). Retrieved from <http://www.who.int/healthinfo/survey/whoqol-qualityoflife/en/>
- World health organization (2014). Non-communicable disease (NCD) country profiles, SriLanka.

“Your Majesty, your son is unable to learn?”: A Study of the Notions of ‘Learning’ and ‘Teaching’ Incribed in a Sample of Southern Folk Tales from Ancient Lanka

Lal Medawattegedara*

*Department of Language Studies, The Open University of Sri Lanka,
Sri Lanka*

Abstract

Despite textual and other historical evidence pertaining to ‘learning’ and ‘teaching’ in ancient Lanka is sparse scholars have focused their attention on such notions. However, there is rich evidence for ‘learning’ and ‘teaching’ in ancient Lanka’s folktales which treat these concepts as ‘lived experiences’ of protagonists occupying imaginary worlds. Yet, there has been minimal scholarly attention paid to folktales. This paper focuses on those folktales with the objective of locating what such story-telling tells us about the way common folks perceived education. Using a folkloristic standpoint which views folk speech acts as being carriers of not only cultural embellishments but cultural predispositions, this

*Corresponding should be addressed to **Mr. Lal Medawattegedara**, Department of Language Studies, The Open University of Sri Lanka, Sri Lanka.

Email: lalmedawattegedara@gmail.com

 <https://orcid.org/0000-0003-3351-1889>

(Received 11th October 2019; Revised 22nd November 2019; Accepted 30th November 2019) © OUSL)



This article is published under the Creative Commons Attribution-Share Alike 4.0 International License (CC-BY-SA). This license permits use, distribution and reproduction in any medium; provided it is licensed under the same terms and the original work is properly cited.

How to Cite: Medawattegedara, L., 2019. “Your Majesty, your son is unable to learn?”: A Study of the Notions of ‘Learning’ and ‘Teaching’ Incribed in a Sample of Southern Folk Tales from Ancient Lanka. *OUSL Journal*, 14(2), pp.57–73.

study attempts to locate what the notions of ‘learning’ and ‘teaching’ present in stories told by southern Lankans tell us about their deep-seated attitudes to/understandings of education. The study uses Henry Parker’s Ceylonese folktales as its sample and attempts to locate the enabling conditions that uphold the ideas of ‘learning’ and ‘teaching’ to achieve its objectives.

Key words: Learning, Teaching, Folktales, Story-telling, Attitudes

Introduction

Though folkloric speech acts—folktales, folksongs, folk drama, myths and etc.—are largely told/heard/read for purposes of entertainment by ordinary ‘folk’ and might not readily invite in-depth scholarly attention, such narratives are not culturally unembellished and neutral. Folktales, the focus of this study, are not created in a vacuum and they reflect the socio-cultural conditions of their time of creation/narration and transmit them across time and space often, as a folklorist suggests, “unconsciously or selfunconsciously” (Dundes 1980). Take the case of Sinhala folktales: they disseminate “common cultural traditions” (Weeresequera 1997) and offer “subtle resistance” (Weeresequera 1997) to those in power—he does not elaborate on this important idea of resistance. Gencarella (2010), on the other hand, aligns folktales with those in power when he argues that people who are exposed to the traditional, insular worldviews disseminated by folklore would not be capable of organizing themselves politically. Roberts (2003) implicitly agrees with Gencarella given that his extensive study of oral modes of communication in the Kandyan period (1590-1815) views orally transmitted speech as participating in the “organization of life” and the “exercise of power” by the Kings in the historical period under focus (Roberts 2003). The point this writer wishes to make here is that folk narratives tend to be ‘political’ as well as ‘cultural’ and therefore, merit more serious attention from scholars.

The syllabus designers of the modern Lankan state have opted to include samples of folklore in the school syllabuses, possibly with the understanding that the narratives are purveyors of (positive attributes) of culture¹. Yet, folkloric narratives need not always be acceptable

¹ School curriculum for the Sinhala/English languages features folktales and folksongs

discourses for the culturally conservative masses in a social setting. Folklore also conveys “biases and prejudices” (Dundes, 2010) and one specific group that has been the target of such disparagement in the USA is teachers, according to Dundes (2010). Despite the brevity of his original discussion on this subject, he argues that American folklore disseminate “resentment” (Dundes, 2010) towards teachers and educational administrators. The present research too focuses on related motifs: ‘learning’ and ‘teaching.’ This paper attempts to undertake a close reading of a sample of southern Lankan folktales collected by a British colonial officer, Henry Parker, during the late 19th century to understand how ‘learning’ and ‘teaching’ may have been conceived by a community of rural Sinhala speakers in Ceylon’s South. Parker collected these tales from native Sinhala speakers of the South while he was engaged in irrigation work for the (British) colonial government. Through a close reading of Parker’s 266 tales, with the primary focus on the acts of ‘learning’ and ‘teaching’, this study attempts to understand how pedagogy and its (supposed) end product, erudition, could have been perceived by the ‘folk’ who either created/narrated/heard the fictional universes and plots in those tales to entertain themselves at intimate family gatherings, as noted by the British colonial official in Sri Lanka, John Davy (1983).

Parker’s 266-tale compilation is Lanka’s first major folktale collection published in any language. Those tales are largely devoid of Buddhist influences² and neither do they feature as cultural influences, let alone characters, of the European colonizers—the Portuguese, Dutch and British—whose presence has inevitably found its way into Lanka’s mainstream and folk culture.³ Parker’s tales largely feature fictional universes peopled by humans, anthropomorphic animals, and supernatural beings amidst social spaces shaped by caste, class, the paranormal and the patriarchal. Folklorist Crooke, who was one of the first scholars to review Parker’s folktales, asserts that these folktales are essentially pre-Buddhist.⁴ His argument is based on the absence of

² Three tales of Henry Parker feature Buddhist monks as characters. Buddhist ideas or morals are largely absent from the tales.

³ There are Sinhala folktales that feature the European invaders to Lanka. One specific example is: *Parangi Rajjuruwo Saha Thawath Katha* (The Portuguese King and Other Tales) by Mahanama Dunuwala. See References.

⁴ It is generally accepted that Buddhism was introduced to ancient Lanka approximately in 300 BCE by Arahant Mahinda who headed a team of Buddhist missionaries from neighboring India.

European colonial influence as well as Buddhist influences in the tales. At the same time, another aspect of the tales that had escaped the attention of Crooke—and Parker’s⁵—is the absence of local regional deities in the folktales. Ancient—and modern—Lanka is home to cults formed around regional deities of native and non-native origin with many folktales/poems/rituals woven around them. The deities found in Parker’s folktales—identified as *devata*—are generic, in the sense that they lack the idiosyncrasy and individuality granted to local regional gods by their believers through creation myths, birth stories and specific attributes of power. One way of reading the absences of Buddhist influences, European colonizers, and local regional gods in Parker’s folktales is that the tales he collected could be some of the oldest in the country. Their remoteness from the centers of power—Parker himself asserts that he had collected the tales from rural areas and taken specific care to ensure that the tales were devoid of what he called “European influences” (Parker 1910)—might have made them impervious to mainstream cultural influences. This particular reading of Parker’s tales as some of the oldest in Lanka informs this paper as it seeks to explore how common people of Lanka perceived ‘learning’ and ‘teaching’ in the fictional sphere and what such perceptions could tell us about ‘learning’ and ‘teaching’ in the material sphere.

Review of Literature

It would be pertinent at this point to understand how ‘learning’ and ‘teaching’ were understood in ancient Lanka in discourses other than folklore, though that knowledge might not have significant impact on the present study. Though historicity of education in ancient Lanka could offer a reader a representation of a (near) ‘authentic’ state of ‘learning’ and ‘teaching’ that existed in ancient Lanka—one could always argue against the ‘authenticity’ of the original sources from which such information is extracted. Folktales, on the other hand, are imaginative texts, and need not necessarily capture a ‘presence’ of the modes of teaching-learning prevalent at the time of their creation/telling/hearing.

There are scholarly disagreements on the dates and the mode of introduction of the religion and such arguments are beyond the scope of this paper.

⁵ Parker wrote an extensive *Introduction* to the folktales to familiarize the reader with the context that gave him the tales as well as to inform the reader of his mode of collection, compilation and translation of the tales

Yet, folkloric texts, as Gancerella (2010) argued, record and preserve the ‘modes of thinking’ associated with previous hegemonies. The objective of this paper is to locate and analyze these modes of ‘thinking’ specifically related to ‘learning’ and ‘teaching’ in ancient Lanka as they are preserved in a sample of folktales. This study therefore does not undertake to offer an ‘authentic’ state of education in ancient Lanka. Rather it offers a way a way of exploring how such notions might have been conceived by the people who created/believed in and subscribed to the tales under focus. Thus, what follows is a summary of the available scholarship on ancient Lanka’s education.

Education in pre-Buddhist Lanka, according to the scholar Jayasuriya (2018), was a two-tiered system: apprenticeships for ‘commoners’ (he does not offer detailed information of this category) and a system of schooling for the royal class. “The kings or chieftains had Brahamin teachers” (Jayasuriya 2018) and “(t)he craftsmen needed for the economy were turned out through apprenticeship...” (Jayasuriya 2018). Suraweera (2008) also echoes this notion in his work which uses Lanka’s ancient chronicles as sources to suggests that tutors of royal princes were Brahamins. Both these scholars surmise that education became the prerogative of the Sangha after the advent of Buddhism in Lanka with the Buddhist monk becoming the teacher and the temple being the site of education. Jayasuriya (2018) claims that this system, where religious edification became the priority, did not ignore “secular subjects” (Jayasuriya 2018) even though he does not identify these subjects nor does he elaborate. Furthermore, Suraweera argues that the Sangha-driven education process also involved ordinary masses because the monks also preached the finer points of religion to ordinary people. Folklorist Ratnapala (1991) adds an interesting point to this view when he argues that the basic tenants of Buddhism were disseminated among the laity using the Jataka Tales,⁶ which were imported from ancient India. Erudition in ancient Lanka was identified not as being “well-read” but as “those who have heard a great deal” (Jayasuriya 2018); thus “committing knowledge to memory” (Suraweera 2008) was the mode of learning in ancient Lanka. Coomarsawamy (2003) commenting on education in Lanka during a much later age—Kandyian period (1590-1815)—notes that children were initiated to education at the age of six (06) and they began with writing. Yet, Suraweera (2008) quoting ancient

⁶ Buddhist Jataka Tales are considered “the most reliable, the most complete and the most ancient collection of folklore now extant in any literature in the world” (Davids 1987)—see reference for full citation

texts, suggests that the age of initiation of a child to education was 12 years in the Polonnaruwa and Dambadeni periods. Though he does not commit to a time period, Jayasuriya (2018) lists the following classification criteria as “an early attempt” (Jayasuriya 2018) at an analysis of the learning process in ancient Lanka: acquisition of knowledge, comprehension, retention and disseminate knowledge to others. Despite the thinness of information in scholarship quoted above, it is possible to understand that ‘education’ in ancient Lanka as an idea motivated by social class/caste and Buddhist spirituality—in other words ‘education’ was not a singular notion acceptable to all, rather it was a notion that played into/upheld the social conditions of the day and could have been regulated by those selfsame social values. Folktale had a presence in this system of education as a tool of teaching—but they were for the masses and not the elite. So, how did the common masses—the ones who listened to Jataka Tales preached by early Buddhist monks—perceive ‘learning’ and ‘teaching’? Like the historian John Man, who turns to folklore when historical sources into the life of Genghis Khan runs into a vacuum,⁷ this paper too would resort to Parker’s folktales to understand the possible perceptions of common folk towards ‘learning’ and ‘teaching.’

Though Parker’s collection of folktales is not without certain scholarly issues—such as his translation of the tales from Sinhala into English, his own colonial (British) subjectivity—such issues are beyond the scope of this paper. Despite those short comings, Parker has left a large collection of folktales for posterity, and his tales are still in circulation in the modern nation state either as translations or retellings. It would be of interest to isolate, examine and understand how the notions of ‘learning’ and ‘teaching’ could have been understood by southern folk in the imaginative tales they recited/created/heard for entertainment. How did the common people of ancient Lanka view the ideas of ‘learning’ and

⁷ “In 1227 this valley might have been a huge glade of crops and pastures, a perfectly wonderful base to hide a nomadic army. I needed something to make sense of all this. Maybe folklore would help. Perhaps, there would be old people to talk to.” (*Genghis Khan—Life, Death and Resurrection*, John Man)

‘teaching’? How did a ‘teacher’ view the act of ‘teaching’? How did ‘learning’ and ‘teaching’ play into the lives of ordinary people? This paper attempts to answer these questions for purposes of cultural comprehension by undertaking a close reading of the tales.

This research will isolate the acts and motifs related to ‘learning’ and ‘teaching’ to understand the conditions that uphold their existence. All speech, according to Macherey “envelopes in the unspoken in order to reach utterance” (Macherey 1993), and this “silence” (Macherey 1993), informs us of the “precise conditions for the appearance of a utterance, its limits...real significance” (Macherey 1993). These silences that surrounds the ideas of ‘learning’ and ‘teaching’ of the tales will be put under scrutiny in this study to understand how common folks in Southern Lanka of an unspecified time period could have viewed education.

Findings and Discussion

The notions of ‘learning’ and ‘teaching’ as conceived by the story tellers/creators/listeners of ancient Lanka is presented under different thematics as follows:

‘Learning’

a) Only the privileged class/caste/gender were exposed to ‘learning’

‘Learning’ in Parker’s folktales is a privilege built around male characters from the royal class with an occasional royal female thrown in—males ‘go to school,’ ‘learn,’ ‘read’ and ‘write’. At the same time, notions of ‘learning’ are only present in the tales narrated by the cultivating caste—whose tales make up the majority in Parker’s collection⁸ and such ideas do not appear in the tales he collected from the ‘lower’ castes⁹. Thus,

⁸ Of the 266 tales of Parker, 210 were ascribed to raconteurs from the cultivating caste, the rest to the lower castes

⁹ In ancient Lanka’s casteism, the cultivators (*govi*) were considered the highest caste next to the rulers (*raja*)

only royal princes learned ‘the sciences,’ to quote a Brahmin father from one of Parker’s tales. By constructing ‘learning’ around privileged class/caste/gender the storytellers could have been attempting to justify the assumed ‘pre-eminence’ and even ‘dominance’ of a specific group of people over others and thus sustaining a preferred social hierarchy. This substantiates Gencarella’s (2010) theoretical assumption of folklore being a preserver of past hegemonies. But, inscribed in the tales Parker collected from Ceylon’s lower castes were traces of resistance offered by them to the higher castes where they ridiculed the high caste people by positioning them in their tales as dim-witted characters. Yet, why did those radical tales from the oppressed castes leave out the idea of ‘learning’ from their tales?¹⁰ After all, learning, as mentioned above, was associated with power in the tales of the higher castes. However, silences in texts are not to be overlooked. “To speak is to be known,” argues Wickramagama (2009), because it “enables the knower to claim possession”; yet, “to refuse speech...is to remain outside the orbits of representation and, by extension, to refuse appropriation by the knower.” The presumed ‘silence’ of the low-caste story creator/teller with respect to education could be because they perceived no value in the notion of formal ‘learning.’ In a society where one could easily learn their caste-based profession (eg. drumming, washing) at home lofty ideals of formal education could have been deemed impractical and redundant exercises. Yet, Suraweera (2008) offers an interesting argument about literacy in ancient Lanka: the presence of a large number of stone inscriptions in the nation, some of the oldest going back to the 3rd Century BCE, indicates a high rate of literacy among people. In other words, he insinuates that most people of ancient Lanka, regardless of their class/caste, knew how to read a text. If that is the case, then one could assume that ancient Lanka’s citizens were offered some kind of formal learning in the residence of a teacher or elsewhere making ‘learning’ an inevitable fact of life. Thus, for those from the oppressed castes, whose social mobility was thwarted by social conditions, learning only served a practical purpose (eg. reading an important inscription) whereas for the privileged castes, learning was a critical, social act in addition to its practical purposes. For the lower castes, learning was an option, something that they could achieve at their own pace and time—‘learning’ did not govern their lives. Therefore, there was no need for their

¹⁰ This will be further discussed in the author’s forthcoming paper: *Casteism in Henry Parker’s Village Folk Tales*

tales to offer undue significance to this act. The other question one could also ask is the reasons for the obvious gender bias towards males with respect to 'learning'. Parker's tales are products of a deeply patriarchal social setting¹¹ and these tales could have played a critical role in preserving the sites of power in those settings for males of the high caste/class. Thus, 'learning' was a motif that acted as a deterrent to females from pursuing formal education or being empowered, and by extension, occupying seats of power. Either way, the notion of 'learning' was a problematic event for Lanka's story tellers, functioning as a sluice gate at a water reservoir—it appears to have been opened for some and closed for others.

b) Learning happens in a specific space

Ceylonese folktales situate learning in a generic space (identified as 'school' though one need not imagine a 'school' in the modern sense)—and in one story this space is identified as the personal residence of a teacher¹². Students are frequently found 'going to school' in the morning. Take the tale *The Prince Who Did Not Go to School*. Here two princes “go to school,” (Parker1910) every morning, and as the title suggests, one deliberately avoids school. In the tale, *The Prince who Received the Turtle Shell*, a young prince is “sent to a teacher to learn,” (Parker1910) suggesting the teacher's residence as a separate space for learning. In *The Story of the Cobra's Bite*, a prince is “handed over” (Parker 2010) to the “Royal Preceptor” (Parker1910) to be educated. The implications are that the southern story tellers/creators/listeners imagined 'learning' as an activity that takes place—or should take place—in a separate space, managed by an educator where a student is required to be present. This location of the process of teaching/learning in a separate space implies that common people were familiar with 'learning' as a process that requires the removal of a learner from his/her familiar environs. At the same time, since Parker's tales only use the notion of 'learning' for the ruling class, a separate space for learning/teaching could have facilitated the act of learning by removing young princes from their immediate spheres of influence and power. At the same time, this space might have promoted the socializing of the young ruling elite with others

¹¹See Medawattegedara (2015): “*We Must Make Men*”: Construction of Masculinities and Femininities in Parker's Village Folk Tales of Ceylon. OUSL Journal, Volume 9, 2015.

¹² Studying at the teacher's residence is a well-known idea among the Buddhists: Prince Sidhartha, the founder of the religion, was educated at his teacher's residence.

of their class.

c) Learning and Punishment

Ceylonese folktales frequently promote the idea of harsh punishments for those who do not make the best of opportunities to learn. Thus, in the tale *Concerning the Prince and the Princess who was Sold*, a prince deliberately neglects his learning and is discovered when he is unable to read a letter at the request of his father, the king. The angry king immediately orders the beheading of his son. In the tale *The Prince who Received the Turtle Shell*, a prince who is not skilled in learning becomes the subject of humorous banter by the other princes. Unable to withstand these veiled insults, the victim leaves the palace. One could assume from the tales that for males of the royal class, learning was compulsory; their parents were observant of their educational progress—and they expected success. The presence of notions such as ‘observing and assessing learners,’ and ‘punishing those who failed to learn’ in the tales related to the royal princes (and few princesses) narrated by the high castes suggests that the Lankan story tellers/creators/listeners considered learning as a critical aspect for rulers and of ruling. The analysis of the functioning of a ruler in the tales also plays into this idea: rulers are frequently depicted settling legal disputes, intervening to settle serious social issues among their subjects, listening to poetry, appreciating aesthetic products and even conversing with highly intelligent persons. Thus, erudition was a common expectation of rulers.

In addition to harsh punishments, Lankan story creators/tellers also linked ‘learning’ to the institution of marriage—finding a suitable bride was predicated on ‘learning.’ Take the case of *The Nobleman and His Five Sons*. A royal wife chases her husband, a son of a nobleman, because he lacked education. “What do you know of the Sciences?” (Parker, 1910) she asks him, and he responds: “I don’t know a single one” (Parker, 1910). She drives him away saying, “If so, you cannot stay near me; go away” (Parker, 1910). When the humiliated young man goes home, his father takes the issue seriously and sends all his sons to learn ‘the sciences’ with the threat of expulsion from home if they did not succeed. A father rejects four marriage proposals for his daughter sent by four Brahmin youth who have not been exposed to learning in the tale *The Attempt of Four Brahmana Princes to Marry*. The opposite happens in the tale *The Wicked Princess*, where a prince who excels in learning is given the teacher’s daughter in marriage. Thus, ‘learning’ and

marrying were linked. The ‘untaught’ men were treated with derision by (ironically) the females who had no or minimum access to learning. In a social setting driven by deep-seated male bias facing and absorbing such serious insults from females might have been considered as an act of emasculation for males—warning enough, we presume, for a high caste/class male to take his education seriously.

d) Females who learned?

The stories so far only related how males of the royal class ‘learned.’ The presence of females who are exposed to ‘learning’ is sparse, though that notion is not completely absent. The king in the tale, *Holman Pissa* educates his attractive daughter. Her education stands her in good stead when she is called upon to preside over legal disputes—yet she appears in this role only in male disguise. The subtext of the tale underscores that learning is a useful tool for one’s life¹³. In the tale *The Prince and the Princess and Two Devatawas* one has reason to believe that the female protagonist, a royal princess, is learned since she (in male disguise) is hired by the king as a teacher (all teachers in Parker’s tales are erudite males) and an examiner of shipping cargo. This tale does not elaborate on the nature of her duties in the harbour, thus we cannot comment on its potential implications. Yet, these few tales with educated females do not support the gender neutralization of learning, rather they promote the masculine bias in education. The tales seem to say that: someone who is considered knowledgeable and learned in the public sphere is always a ‘male’ of the royal class. Parker’s tales explicitly deny females many social initiatives, and education is only one of them¹⁴.

e) What they ‘learned’

Some of Parker’s folktales pay attention to the subjects learned by their protagonists. In the tale *The Princess who Learnt the Sciences*, four princes who were unsuccessful in learning and expelled by their father learn the following skills: “soothsaying, theft, archery and carpentry” (Parker 1910). These skills are eventually demonstrated to the king as

¹³ This reminds one of the Sinhala adage, *Ugatha mana shilpaya mai mathu rekena*, or it is one’s erudition that could save one

¹⁴ For a detailed discussion of gender imbalances in Parker’s folktales see Medawattegedara (2015): “*We Must Make Men*”: *Construction of Masculinities and Femininities in Parker’s Village Folk Tales of Ceylon*. OUSL Journal, Volume 9, 2015.

proof of their learning. In *The Nobleman and His Five Sons*, five young men learn “soothsaying, theft, making rapid journeys, bringing dead to life and shooting accurately (Parker 1910).” Similarly, in *The Seven Princess*, seven princes who run away from their palace learn the following skills: “soothsaying, crow’s language, shooting, carpentry, ball-playing and thieving” (Parker 1910). In *The Attempt of Four Brahmana Princes to Marry*, the four young men become experts at: “reading omens; travelling through the sky; abating poison; giving new life to a dead person” (Parker 1910). In the tale *The Boy Who Went to Learn the Sciences* a boy is requested to learn ‘the sciences’ by his father – with the most significant and important science being the shrewd tactics (*mayam*) of females. As ‘strange’ and ‘removed from life’ as these subjects sound, they become relevant and useful in the universe of the folktales.

The subjects that were learned by these royal elite could be categorized as follows:

- a) Military: shooting, archery
- b) Medicine: abating poison
- c) Professional: carpentry
- d) Sports: ball-playing
- e) Astrology: soothsaying
- f) Supernatural: bringing dead to life, making rapid journeys¹⁵, crow’s language, reading omens
- g) Social skills: reading ‘mayam’ of females¹⁶
- h) Survival: theft¹⁷

Interestingly, the protagonists who were forced to learn the above subjects were pupils who have come out of the formal learning process (learning at a teacher’s residence) due to various reasons. In other words the skills listed above were learned outside the formal teaching system. Thus, there is a strong suggestion that there were locations of ‘learning’ other than the teacher’s residence, and that such locations taught skills that could be considered more practical, helpful and feasible for these

¹⁵ Ability to travel through air

¹⁶ Sinhala folklore suggests that females possess 64 ploys (*mayam*) which they could use to deceive males

¹⁷ For some royal protagonists in Parker’s tales’ theft under specific circumstances is considered natural and is also important as a skill of survival at some critical point in their lives; they do not commit theft as a habit/profession

fictitious (or non-fictitious) characters.

There is also a tendency among story creators/tellers to valorize supernatural skills, possibly owing to their entertaining appeal. At the same time, these stories offered some mode of 'learning' to its high caste/class protagonists even if they were outside the formal learning process, for example, a prince or a Brahmana young male, despite their lack of success in formal education, learnt supernatural skills and sustained their power. Thus, the stories only ended up perpetuating the existing power structures of their immediate social settings. At the same time, one could also interpret these supernatural skills as wishful thinking of the cultivating castes story tellers who were frequently forced to live with threats to their crops from nature and wild animals and fears of mortality posed by disease. Thus, they floated the 'possibility' of the existence of powers that defied nature as a response in their imaginative spheres.

f) Learning to Read and Write

Those who learned at a teacher's residence were taught reading and writing skills and the story creators/ tellers located them as critically important skills for royal princes/princess. Thus, in the tale *Concerning the Prince and the Princess who was Sold*, a prince who did not study is discovered by his father through a deliberate act of reading. The king asks him to read a letter, and the boy fails: "...there are a sort of strokes, and strokes, and a sort of drops..." (Parker 1910). The king orders the beheading of the prince. *The Prince and the Princess*, a young royal couple escapes from a difficult situation by communicating with each other through messages written on an orange. In *The Gamarala's Girl*, a king writes an enigmatic letter (the story does not offer details) to a female in order to find a pretext to execute her. The female reads the letter accurately and her ability impresses the king so much that he marries her. These tales, on one hand, reiterate that 'reading' and 'writing' are skills that are closely connected to 'power' and the absence of these skills was considered an absence of 'self'-- or death. None of the ordinary characters featured in Parker's tales face a crisis due to their incompetence in reading and writing. On the other hand, the tales serve to keep the lower class/castes in their specified social position by reinforcing the gap between the 'unlearned' ordinary people and the 'learned' royal class. Parker has unconsciously (or consciously?) participated in this power equation himself given that he has collected orally-transformed tales of common folk of Ceylon and translated (or written!) them for the reading pleasure of the educated class.

'Teaching'

a) 'Teaching' as a high caste/male prerogative

Teachers in Parker's Ceylonese folktales are males of the Brahamin caste—this might be an indication of Parker's tales being older because Lanka's 5th century chronicle, *The Mahavamsa*, also offers the same position to Brahamins. Only two female characters (of the royal class) became teachers and were forced to practice their craft disguised as males. In *The Prince and the Princess*, the main character, a princess, teaches while disguised as a male. In the tale *The Prince and the Princess and Two Devatawas*, a royal princess, works as a teacher and an examiner of shipping cargo—in male disguise. In the fictional universe of the Ceylonese Southern folktales the story creators/tellers opted to associate sites of power (kingship, teaching) with the male gender of the high castes. One could assume that the affairs in the material sphere were no different and even if things were different, these stories could have acted as a psychological barrier for people who did not meet these criteria from achieving—or usurping—those in power. Coomaraswamy (2003) referring to education in the Kandyan period says that children who did not attend a temple for learning, ended up learning from their 'fathers.' The absence of the 'mother' (and thereby female) from the formal teaching process is telling evidence of the gendered notions of education in ancient Lanka. At the same time, the location of the profession of teaching as a masculine prerogative—the privileged gender in ancient Lanka—might be an indication of the reputation with which this profession was upheld by the story creators/narrators/listeners.

b) Teachers' Response to Failures in 'learning'

The story tellers/creators/listeners treated students who failed to learn harshly—and their responses might be questionable for, if not shocking, to a modern-day practitioner. A teacher would send back a weak student to his parents—where terrible punishments awaited them like beheading or expulsion from the palace. In such instances, the 'teacher' or the act of 'teaching' was not questioned. Thus, in *The Prince who Received the Turtle Shell*, a teacher who assumes that "he could not teach" (Parker, 1912) a particular royal prince, complains to his father who takes the boy home. In the story *The Story of the Cobra's Bite*, a teacher complains to a king about his son: "Your Majesty, your son is unable to learn?" The king accepts the teacher's word without question. Learning was conceived by the story creators/tellers as the obligation of a learner—it

is a biological inheritance, something that is in a child’s ‘nature’ rather than something ‘nurtured’ through effective intervention. A teacher’s role was that of a facilitator and a nurturer of a pre-existing skill in a learner. What Lanka’s story creators/tellers might have wanted to tell their audiences was that ‘learning’ was closely connected to political power and those who failed to learn automatically relinquished this advantage. Therefore, ‘learning’ was a learner responsibility and not that of a teacher. It might be of interest here to note that Sri Lanka’s modern Sinhala fiction follows the same representational mode when it comes to learning. In Martin Wickramasinghe’s epic novel *Gam Peraliya* (Upheaval of the Village), Piyal outmaneuvers the feudal society of his village through his education; In *Karulwala Gedara* (The House in Darkness) by the same author, the main protagonist uses education as the pivotal pedal to achieve the same task, this time in Colombo. Similarly, in T.B. Illangaratne’s *Amba Yahaluwa* (Bosom Friends) the main character overcomes his poverty through education. All these novels focus on the learner’s ability to learn—not necessarily the teachers’ ability to teach.

a) Exploiting students

The tale *Holman Pissa* offers the rare incident of a teacher exploiting a female student. This teacher makes a marriage proposal to his student, a princess, who out of respect does not refuse him but stops going for lessons. The teacher takes revenge by giving a wrong prognosis of her astrological chart to her father, the king, thus influencing the king to expel her. Later, this princess extracts her revenge from this teacher. Exploitation of students by teachers occurs only once in the 266 tales, suggesting that such incidents were rare. This tale, while accepting the possibility of such events, offers a warning to those in teaching profession of the consequences of such action.

Conclusions

‘Learning’ and ‘Teaching’ as conceived by the story creators/tellers/listeners of ancient Lanka was part of the oppressive mechanism that sustained the power asymmetries of a social setting where caste and gender defined the sites of power. A person who combined these categories—high caste and male—was considered fit to learn—and ‘fit to govern,’ to quote a Shakespearean phrase. A ‘teacher’ was always a high caste male whose residence might have been the site of learning and was held in high esteem by those in power: More specifically, his word on the nature of the learning aptitude demonstrated by his student/s was accepted without question. Yet, the

notions of ‘teaching’ and ‘learning’ might not have meant the same to those who heard these stories in ancient Lanka. For upper class/caste males, these terms carried meanings associated with a threat as well as empowerment: a threat because one could not let one’s teacher down and afford to give away one’s own social privileges and empowerment because ‘learning’ was one of the mileposts they passed on their way to power. For the females of the same class/caste the terms carried notions of restrictions and social knowledge: restrictions because females were warned off from both ‘learning’ and ‘teaching’; social knowledge because a learned male was considered deserving of their love, respect and affection and a male who failed in ‘learning’ could be slighted and rejected by a female. As for the lower caste females and males, these stories might have created deep impressions of the power hierarchies that awaited them in the material sphere and also helped to re-establish their oppressed social positions. At the same time, these terms might not have carried meaning or significance for them because their lives and livelihood did not depend on formal access to learning. In that sense ‘teaching’ and ‘learning’ as conceived in the imaginary spheres of ancient Lanka were not acts only aimed at imparting/gaining knowledge for expanding of one’s worldviews. Instead, they were loaded terms that preserved and disseminated subtle notions of power and prejudice. The phrase “your majesty, your son is unable to learn,” just as much as it signifies that the teacher has nothing more to offer this student, also implies to the father and the king that he has no reliable successor to the throne. In other words, those words are not uttered for an individual, rather they are uttered for the entire ‘nation’ state—whatever the way people conceived their ‘nation’ to be as the story was created/read/heard—reminding people that a royal male who cannot learn spells doom for the nation state.

References

- Coomaraswamy, Ananda K. (2003). *Mediaeval Sinhalese Art*, Munshiram Manoharlal Publishers (Pvt) Ltd, New Delhi.
- Davids, Rhys. (1987). *Buddhist India*, Motilal Banarsidass, New Delhi.
- Dundes, Alan. (1980). *Interpreting Folklore*. Indiana University Press, Indiana.
- Dunwala Mahanama, (2015). *Prangi Rajjuruwo Saha Thawath Katha*. Godagae, Colombo.
- Gencarella Olbrys Stephen. “Gramsci, Good Sense, and Critical Folklore

Studies.” *Journal of Folklore Research* Vol. 47, No. 3 (September – December 2010).

DOI: 10.2979/jfolkrese.2010.47.3.221

Davy, John. (1983). *An Account of the Interior of Ceylon and of its Inhabitants with Travels in that Island*. Tissara Prakasakayo, Colombo.

Jayasuriya, J. E. (2018). The Buddhist Tradition in Education. In Dayantha Jayasuriya (Ed). *Education in Sri Lanka. Past Present and the Future*. Colombo:Nanila Publications.

Macherey, Pierre. (2016). *A Theory of Literary Production*. Routledge, London.

Man, John. (2011). *Genghis Khan. Life, Death and Resurrection*. Bantam Books, London.

Parker, H. (2010). *Village Folk Tales of Ceylon Volume I*. Tissara Prakasakayo, Colombo.

Parker, H. (2010). *Village Folk Tales of Ceylon Volume II*. Tissara Prakasakayo, Colombo.

Parker, H. (2010). *Village Folk Tales of Ceylon Volume III*. Tissara Prakasakayo, Colombo.

Parker, H. (1999). *Ancient Ceylon*. Asian Educational Service, New Delhi.

Ratnapala, N. (1991). *Folklore of Sri Lanka*. The State Printing Corporation, Colombo.

Ratnapala, N. (2000). *Jana Katha:1*. National Institute of Education, Colombo.

Roberts, Michael. (2003). *Sinhala Consciousness in the Kandyan Period 1590s to 1815*. Vijitha Yapa Publications, Colombo.

Suraweera, A.V. (2008). *Communication Modes in Sinhala Writing. A Retrospective Survey*. Godage International Publishers (Pvt) Limited, Colombo.

Wickramagamage, Carmen. (2009). *Where Have All the “Women” Gone? A Consideration of Gender and Literary Production in Sigiri Graffiti*. The Sri Lanka Journal of Humanities, XXV.

<http://dlib.pdn.ac.lk/handle/123456789/2754>

Use of Selected Essential Oils for Controlling Stem-end Rot Disease in Mango (cv. Karuthacolomban)

Anjali A. Kulasinghe, K. O. L. Chathurika Karunanayake* and S. Somaratne

Department of Botany, The Open University of Sri Lanka, Sri Lanka

Abstract

In Sri Lanka, stem-end rot (SER) caused by *Lasiodiplodia* sp. is the most common and serious disease that affects the mango cv. 'Karuthacolomban'. At present, disease control is achieved with chemical fungicides which are hazardous to human health and environment. As such, this research looked into the possibility of using essential oils (EOs) as biological fungicides against *Lasiodiplodia* sp. in mango (cv. Karuthacolomban). Pure-grade Basil oil (*Ocimum basilicum*), Cardamom oil (*Elettaria cardamomum*), Citronella oil (*Cymbopogon nardus* L.), Lemon oil (*Citrus limon*), Mustard oil (*Brassica juncea*) and

*Corresponding should be addressed to **Dr. K. O. L. C. Karunanayake**,
Department of Botany, The Open University of Sri Lanka, Sri Lanka

Email: kokar@ou.ac.lk

 <https://orcid.org/0000-0003-0657-9888>

(Received 21st October 2019; Revised 30th November 2019; Accepted 05th December 2019) © OUSL)



This article is published under the Creative Commons Attribution-Share Alike 4.0 International License (CC-BY-SA). This license permits use, distribution and reproduction in any medium; provided it is licensed under the same terms and the original work is properly cited.

How to Cite: Kulasinghe, A.A., karunanayake, K.O.L.C. and Somarathne, S., 2019. Use of Selected Essential Oils for Controlling Stem-end Rot Disease in Mango (cv. Karuthacolomban). *OUSL Journal*, 14(2), pp.75-90.

Orange oil (*Citrus sinensis*) were selected for the study. The most effective EOs against *Lasiodiplodia* sp. under *in vitro* conditions selected by a poisoned food bio-assay, were used in *in vivo* studies. The effect of the treatment on reducing disease development, organoleptic properties and the edibility of fruits after *in vivo* application was assessed. Twenty-four hours after artificial inoculation, fruits were dipped in the selected concentration of the EO solutions at room temperature or at 45°C for 3 minutes and then stored under ambient conditions. Disease development, percentage weight loss, titrable acidity and total soluble solids contents were measured and a sensory evaluation with a taste panel was also carried out for the treated fruits. Results revealed that basil, cardamom (700 $\mu\text{l l}^{-1}$) and citronella (400 $\mu\text{l l}^{-1}$) oils significantly reduced the growth of *Lasiodiplodia* sp. under *in vitro* conditions and cardamom oil (700 $\mu\text{l l}^{-1}$) in warm water effectively reduced the severity of SER under *in vivo* conditions with no effect on sensory properties or physico-chemical quality parameters. Thus, plant EOs can serve as safe, eco-friendly and effective alternatives to synthetic fungicides.

Key words: Mango, Essential Oil, Stem-End Rot, *Lasiodiplodia* sp., cardamom oil.

Introduction

In Sri Lanka, mango is a fruit that is in high demand in the domestic market and an important fruit for the export market (Jayasinghe and Fernando, 2009). However, commercial mango production is constrained by several diseases at all stages of its development. ‘Karuthacolomban’ (KC), a popular local mango cultivar, develops large stem–end rots caused predominantly by *Lasiodiplodia theobromae* and it is a major problem in the mango industry in Sri Lanka. (Karunanayake et al., 2013). Stem-end rot of mango is mainly caused by *Lasiodiplodia theobromae* (Pat.) Griff et Maubl. in tropical Asia (Johnson et al., 1993) and *Dothiorella* spp., *Phomopsis mangiferae*, *Pestalotiopsis* sp. and *Cytosphaera mangiferae* are also known as causal agents (Johnson et al., 1992) in this process. At present, post-harvest diseases of Mango are controlled by using fungicides (Nascimento et al., 2000). Long term use of agrochemicals has caused serious health hazards to humans and environment in addition to inducing non-target pest and fungicide

resistance (Fry, 1982). Thus, adoption of new disease preventive methodology which is safe for humans and environment is needed. Among the various alternatives, natural plant products, including essential oils (EOs) that are biodegradable and eco-friendly, are grabbing the attention of scientists worldwide (Macias *et al.*, 1997). Anthracnose of mango has been effectively controlled using EOs from basil (*Ocimum basilicum*), orange (*Citrus sinensis*), lemon (*Citrus medica*) and mustard (*Brassica juncea*) (Abd-alla and Haggag, 2013). In Sri Lanka, research has been carried out on the use of EOs for the control of post-harvest diseases of banana fruit (Anthony *et al.*, 2003; 2004). Disease control is achieved by the antifungal properties shown by these EOs. Although much research has been carried out regarding controlling anthracnose of mango fruit with EOs, application of EOs to control stem-end rot disease of mango fruit has not been reported in Sri Lanka and limited work (Tripathy and Shukla, 2009) is available internationally. Therefore, in this research, the effects of natural plant products, which are essential oils (EOs) were evaluated as alternatives to fungicides in controlling SER of Mango fruit cultivar 'Karuthacolomban'.

Materials and Methods

Essential oils

Pure-grade Essential oils of basil (*Ocimum basilicum*), cardamom (*Elettaria cardamomum*), citronella (*Cymbopogon nardus*), lemon (*Citrus limon*), mustard (*Brassica juncea*) and orange (*Citrus sinensis*) were obtained from Herbal Exotics, Pugoda, Sri Lanka.

Fruits used in the study

Healthy unripe mango fruits at the harvesting maturity stage were obtained from 'Thabuththegama' (8.15° N, 80.30° E) within 24 h of harvest. The fruits were transported to the Botany Research Lab in The Open University of Sri Lanka, washed in running tap water and allowed to dry under ambient conditions. Healthy, unripe fruits of equal size and maturity were used in experiments.

Isolation of the SER pathogen

The SER pathogen was isolated on to Potato Dextrose Agar (PDA) (Meron Bacteriological Agar, superfine grade) from stem-end rot lesion on ripe K.C. mango fruit following surface sterilization with 0.5% NaOCl for 30

seconds. Sub-culturing was performed on the isolated fungi to obtain a pure culture. Sub-culturing was done on to PDA at two weeks intervals and pure cultures of the isolated fungus were maintained. Fungi were identified using colony and conidial morphology. Koch's postulates were performed to confirm the pathogenicity.

***In vitro* poisoned food bio-assay**

The pure-grade essential oils in the selected concentrations ($\mu\text{l l}^{-1}$), were dispersed individually as an emulsion using Tween 80 (0.05%) and added to flasks containing sterile PDA (at a temperature of 40-45 °C) just before pouring to Petri dishes (Pitarokili *et al.*, 2003). Concentrations of EOs between 400 and 1000 $\mu\text{l l}^{-1}$ were tested and the controls included the same quantity of sterile distilled water. The amount of EO added was adjusted according to the volume of PDA in the flask to obtain the required final concentration. A 5 mm diameter disk of the test fungal culture was placed in the middle of each plate prepared as mentioned above and incubated at room temperature (RT) ($29\pm 2^\circ\text{C}$) (Pitarokili *et al.*, 2003). Linear growth of the fungus was taken by measuring the diameter of the growing culture along two axes (at right angles to each other). Mean growth rates were calculated from three replicate plates of fungi every 24 h until fungal growth in the control filled the Petri dishes completely. The percentage mycelial inhibition was calculated as described by Tripathi *et al.* (2008).

***In vivo* application of essential oil treatment**

A portion of one mm^2 mycelial plug from 14-day old *Lasiodiplodia* sp. culture was placed on top of the stem-end region of mango after making a slight cut on the peel of the fruit at the stem-end (Nisansala *et al.*, 2015). After 24 h incubation the mycelial plug was removed and fruits were dipped 2-3 min in the effective concentrations of EOs selected based on the *in vitro* study as a curative treatment. The treatments were: dipping mango fruits in the selected effective concentrations of EOs dissolved in distilled water at RT, or the same EOs and concentrations of EOs in warm water (45 °C) and the controls where mangoes were dipped in distilled water at RT or in warm water (45 °C).

Evaluation of disease development in EO treated fruits

The infection was identified on the basis of symptoms i.e., a brown, soft decay starting at the stem end and rapidly spreading to the whole fruit.

The extent of stem end rot was determined daily up to seven days by tracing the diseased area on to graph paper as described by Karunanayake *et al.* (2013).

Effect of the *in vivo* essential oil treatment on fruit quality parameters

Physiological Weight Loss (%)

Weight loss was determined by daily weighing of fruits for 7 days on digital balance (Radwag, PS6000.R2). The average weights of all fruits in each treatment were taken and at the end of the experiment % of the weight loss was calculated by the formula of Gerefa *et al.* (2015).

$$\text{Physiological weight loss} = \frac{\text{Initial weight of fruits} - \text{Final weight of fruits}}{\text{Initial weight of fruits}} \times 100$$

Titration Acidity (%)

To determine titrable acidity, ripe mango fruits (04) from each treatment were selected, peeled and juiced. From each fruit 10 ml of juice sample was taken (three replicates) and 3 drops of phenolphthalein was added as a pH indicator. Titration was carried out against 0.1 N NaOH until the endpoint turns to pink. Titrable acidity percent as malic acid was calculated by the following formula (Gerefa *et al.*, 2015).

$$\text{Titrable acidity (TA\%)} \text{ as malic acid} = \frac{0.0064 \times \text{ml of 0.1 N NaOH consumed}}{\text{Volume of juice}} \times 100$$

where 0.0064 is the malic acid conversion factor.

Total Soluble Solids (°Brix)

To determine total soluble solids (TSS) ripe mango fruits (04) from each treatment were selected and fruit pulp was made into juice without adding water. The Brix value of the pulp of each treatment was recorded using a portable refractometer (Brix/ATC 0 ~ 32%) of 0-30 Brix range at RT (25 ± 2 °C) and expresses as °Brix (Samane *et al.*, 2012). The readings were taken three times and analyzed.

Sensory evaluation of fruits treated with essential oils

A panel of untrained 26 adults (aged above 21 years), comprising both male and female, were randomly selected for sensory evaluation. A five point hedonic scale as described by Larmond (1977) was used, where 5 = very high, 4 = high, 3 = moderate, 2 = low and 1 = very low. The four samples were served in identical plates. The organoleptic evaluation of interest conditions were: color (both peel and flesh color) and appearance, texture, odor and taste (Umuhozariho *et al.*, 2013).

Statistical Analysis

In-vitro experiments were run in triplicate, and data were reported as the mean \pm standard deviation (SD). For the *in vivo* trials 8 fruits were used per treatment and the experiment was performed thrice. Data were analyzed using a statistical package, IBM SPSS version 20.0. One-way Analysis of variance (ANOVA) among means was performed using one way ANOVA. After applying the least significant Difference (LSD) test, differences of $P \leq 0.05$ were significant. For sensory evaluation data, Principal Component Analysis (PCA) and cluster analysis were used to identify the preferences of the panelists for the samples.

Results

Isolation of the SER pathogen

The mycelia grew uniformly in all directions and fully covered the surface of the media within 3 to 4 days. The colour of the colony changed gradually from light grey to dark gray after four to seven days of incubation and to greyish black after 2 weeks of incubation (Figure 1). Mature conidia were observed to have one septa, oval-shaped and brown in colour with the presence of irregular longitudinal striations (Figure 2). The identity of the fungus was confirmed as *Lasiodiplodia* sp. Based on colony and conidial morphology. Pathogenicity was confirmed by Koch's postulates.

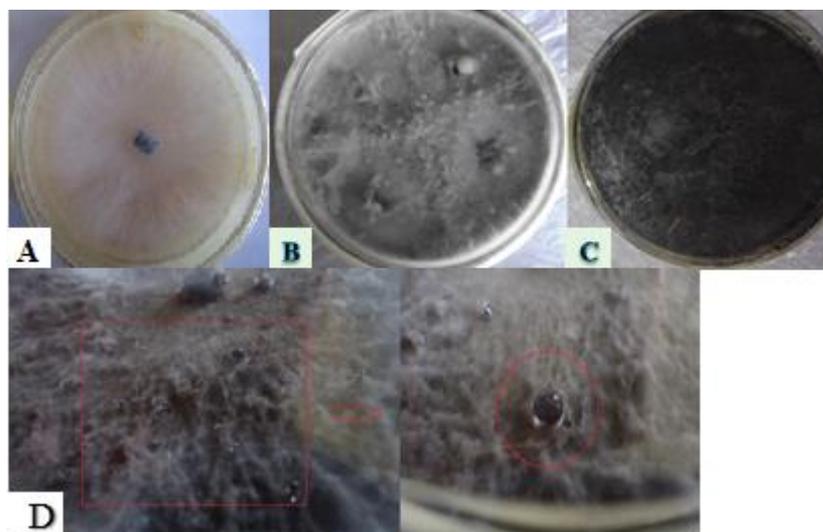


Figure 1: Colony characteristics of the fungus isolated from Mango (K.C.) fruit. (A). Top view (day 2); (B). Top view of colony (day 4); (C). Top view of colony (day 14); (D). Developing fruiting bodies (after 14 days).

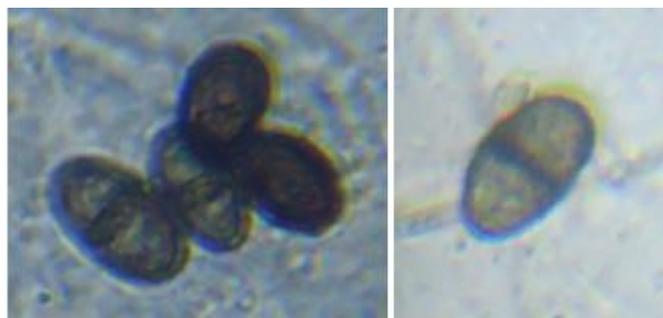


Figure 2. Conidial morphology of *Lasiodiplodia* sp. under light microscope (high power: 400x magnification).

***In vitro* poisoned food bio-assay**

Of the six selected EOs Lemon, orange and mustard were not effective in inhibiting growth of *Lasiodiplodia* sp. under *in vitro* conditions (LSD $p > 0.05$). Basil, cardamum and citronella oils showed a significant effect (LSD $p = 0.00$) on mycelial growth where cardamom oil was found to be the most effective (67.7% inhibition) at $700 \mu\text{l l}^{-1}$ (Table 1).

Table 1. Percentage mycelial inhibition of *Lasiodiplodia* sp. in PDA media treated with different concentrations of essential oils by the time control cultures reached maximum growth (90mm colony diameter).

Essential oil Treatment	Concentration ($\mu\text{l l}^{-1}$)	Inhibition (%)
Basil	600	46.50 \pm 14.9
	700	60.71 \pm 13.3
Cardamom	600	30.14 \pm 6.29
	700	67.69 \pm 13.9
Citronella	400	52.41 \pm 17.2
	500	57.31 \pm 14.53

Evaluation of disease development in fruits following in vivo application of Essential oils

In the *in vivo* treatment, the most effective is the cardamom in hot water treatment. Mean area of disease development was significantly lower in hot water dipped cardamom oil treated fruits, 72 hours after treatment (HAT), 96 HAT and 120 HAT when compared with the control. Disease development is high in basil-treated fruits than in control fruits at 72 HAT and 96 HAT (Figure 3).

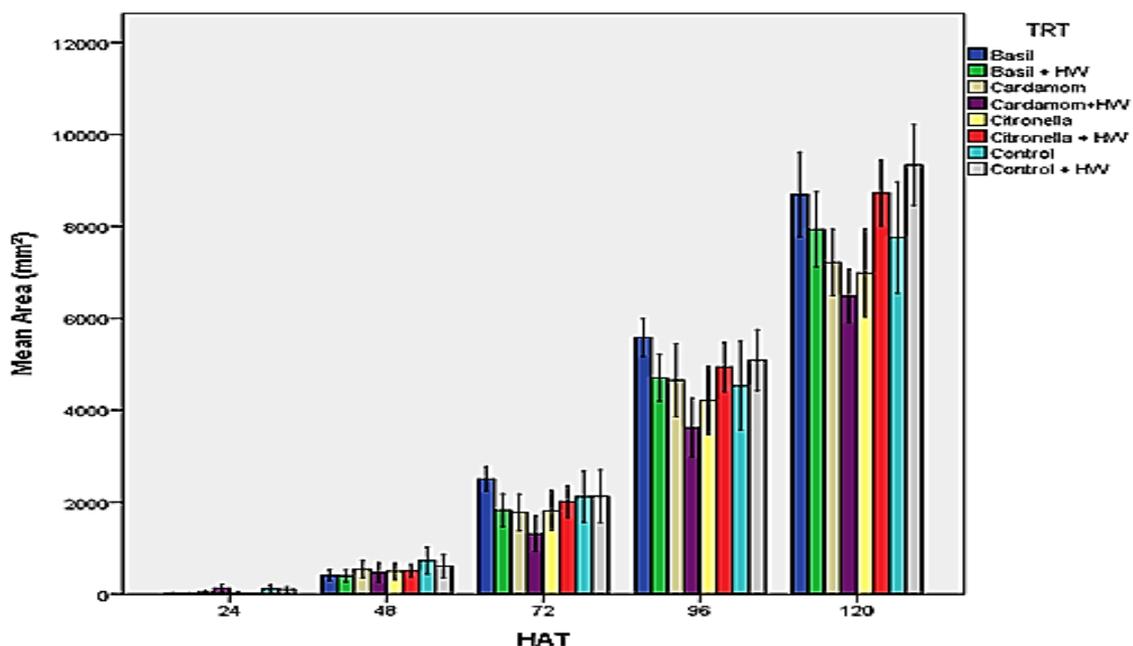


Figure 3. Mean disease area (mm²) of 14 replicates of 'K.C.' fruits inoculated with *L. theobromae* and then treated with 3 selected EOs. Error bars represent the standard error of the means.

Mean area = diseased development in 14 replicates, TRT = Treatment, HAT = Hours after treatment, HW = EOs in hot water at (45 °C).

Effect of the in vivo essential oil treatment on physico-chemical parameters: physiological weight loss, Titrable acidity and TSS

The lowest %weight loss was seen in cardamom + HW treatment (Day 6: 1.52g, Day 7: 2.00g) while the highest was in the control + HW (Day 6: 2.25 and Day 7:2.7g). There was no significant difference in °Brix value among the treatments. However, the value was slightly higher in the control (13.25) compared to the effective cardamom treatments (cardamom 12.05, cardamom + HW 12.81) and the control + HW 12.55. There was no significant difference between the %Titrable acidity among treatments.

Sensory evaluation of fruits treated with essential oils

The Principal Component Analysis (PCA) extracted three components explaining a total variance of 51.541% of the total data set. The result of the PCA revealed that the treatment did not affect the taste of the fruits. However, treatment negatively affected the appearance, peel color, hardness and freshness of treated fruits (LSD $p=0.00$) (Table 2).

The most effective oil for reducing the growth of *Lasiodiplodia* sp. under *in vivo* condition was cardamom oil. As a treatment, cardamom oil in hot water was more inhibitory on the SER pathogen and rendered lower physiological weight loss in fruits compared to all the other treatments. According Olivero-Verbel *et al.* (2010) and Utta-U´r *et al.* (2000) inhibitory effect of cardamom essential oil on fungi maybe due to 1,8-cineol (29.7%) and α -terpineol acetate (26.1%) the main components found in the volatile oil. Hot water treatment is known to be an effective and environmental-friendly method for controlling postharvest diseases of mango (Kumah *et al.*, 2011; Duamkhanmanee, 2008). Therefore, in the present study the EO with fungicidal components and the hot water treatment which can also control post-harvest diseases would have in combination brought about the significant reduction in SER in treated mango fruits.

Table 2. Summary of the Principal Component Analysis (PCA) carried out on the sensory data of treated fruits

	Component		
	1	2	3
Eigen value	1.889	1.379	1.370
% variance explained	20.994	15.325	15.222
Total variance explained	20.994	36.319	51.541
Appearance	0.697	-0.116	-0.062
Peel Color	0.652	0.212	0.155
Hard	0.620	0.080	-0.074
Fresh	0.537	-0.065	0.466
Soft	0.040	-0.685	0.221
Flesh Color	-0.017	0.664	0.285
Sweet	0.141	0.618	0.100
Dry/Wrinkled	-0.324	0.074	0.738
Fruity	0.423	0.116	0.660

Discussion

The most effective essential oils for reducing the growth of the SER pathogen *Lasiodiplodia* sp. under *in vitro* conditions were cardamom oil, basil oil and citronella oil. Although citronella oil was effective in controlling pathogen, it was not used in the *in-vivo* experiment due to its strong and unpalatable aroma. The antimicrobial activity of basil against various microbes has been reported in previous studies (Bozin et al., 2006; Sokovic and Griensven, 2006) and many scientists have linked basil antimicrobial effects to the presence of high content of linalool which is the main component of the oil (Juliani and Simon, 2002).

In the present study, the highest Brix value was seen in the control

fruits. However, all treatments demonstrated TSS over 10% Brix which is an acceptable sugar content for mango fruit (Harrill, 1998). Therefore, the treatment did not negatively affect the sugar content of the fruit. Though the taste of fruits under focus was not affected by the oil application, PCA data revealed that treatment did affect the appearance, peel color and hardness of the fruit all of which are important determinants of marketing the fruit. This is a negative aspect of EO treatment as the outer appearance is a major parameter for consumer acceptability.

Overall, these findings suggest that cardamom EO can be used to control the postharvest losses caused by *Lasiodyplodia* sp. in the mango cultivar 'Karuthacolomban' fruit. However, the method of application needs slight modifications to overcome the negative effects of EO on the outer appearance of the fruit. Incorporation of EOs into edible waxes and other fruit coatings may be a suitable alternative to hot-water-dip treatments.

Conclusions

Essential oils of cardamom (*Elettaria cardamomum*) are an effective and environmentally safe alternative to synthetic fungicides in controlling the stem-end rot caused by *Lasiodyplodia* sp. in mango fruit cultivar 'Karuthacolomban' with no detrimental effects on sensory quality.

Acknowledgments

Financial assistance from Faculty Research Grant, Faculty of Natural Sciences, OUSL -2016 is acknowledged

References

- Abd-alla, M. A. & Haggag, W. M. (2013). Use of some essential oils as Postharvest botanical fungicides in the management of anthracnose disease of mango fruits caused by *Colletotrichum gloeosporioides*. *International Journal of Agriculture and Forestry*, 3(1), 1-6. DOI: 10.5923/j.ijaf.20130301.01

- Anthony, S., Abeywickrama, K. & Wijeratnam, S.W. (2003). The effect of spraying essential oils of *Cymbopogon nardus*, *Cymbopogon flexuosus* and *Ocimum basilicum* on postharvest diseases and storage life of Embul banana. *Journal of Horticultural Science and Biotechnology*, 78 (6), 780-785.
<https://doi.org/10.1080/14620316.2003.11511699>
- Anthony, S., Abeywickrama, K., Dayananda, R., Wijeratnam, S.W. & Arambewela, L. (2004). Fungal pathogens associated with banana fruit in Sri Lanka and their treatment with essential oils. *Mycopathologia*, 157 (1), 91-97.
DOI:10.1023/b:myco.0000012226.95628.99
- Bozin, B., Mimica-Dukie, N., Simin, N. & Anackov, G. (2006). Characterization of the volatile composition of essential oils of some Lamiaceae spices and the antimicrobial and antioxidant activities of entire oils. *Journal of Agricultural and Food Chemistry*, 54, 1822-1828. DOI:10.1021/jf051922u
- Duamkhanmanee, R. (2008). Natural essential oils from lemon grass (*Cymbopogon citratus*) to control post-harvest anthracnose of mango fruit. *International Journal of Biotechnology*, 1, 104-108.
<https://doi.org/10.1504/IJBT.2008.017971>
- Fry, W. E. (1982). *Principals of plant disease management*, Academic press, New York, p.377.
- Gerefa, S., Satheesh, N. & Berecha, G. (2015). Effect of essential oils treatment on anthracnose (*Colletotrichum gloeosporioides*) disease development, quality and shelf life of mango fruits (*Mangifera indica* L). *American-Eurasian Journal of Agricultural & Environmental Science*, 15 (11), 2160-2169.
DOI: 10.5829/idosi.ajeaes.2015.15.11.96140
- Harill, R. (1998). *Using a refractometer to test the quality of fruits & vegetables.*(2nd ed.). Keedys Ville, Madagascar: Pink noll Publishing.
- Jayasinghe, C. K. & Fernando, T. H. P. S. (2009). First report of *Colletotrichum acutatum* on *Mangifera indica* in Sri Lanka. *Ceylon Journal of Science (Bio.Sci.)*, 38(1), 31-34.
<http://doi.org/10.4038/cjsbs.v38i1.1326>

- Juliani, H. R. & Simon, J. E. (2002). Antioxidant Activity of Basil. Trends in new crops and new uses. J. Janick and A. Whipkey (eds.). ASHS Press, Alexandria, VA., pp. 575-579. <https://www.hort.purdue.edu/newcrop/ncnu02/v5-575.html>
- Johnson, G.I., Mead, A.J., Cooke, A.W. & Dean, J.R. (1992). Mango stem-end rot pathogens-fruit infection by endophytic colonization of the inflorescence and pedicel. *Annals of Applied Biology*, 120, 225-234. <https://doi.org/10.1111/j.1744-7348.1992.tb03420.x>
- Johnson, G., Cook, T & Mead, A. (1993). Infection and quiescence of mango stem-end rot pathogens. Proceedings IV international Mango symposium in *Acta Horticulturae*, 341.
- Karunanayake, K. O. L. C., Sinniah, G. D., Adikaram, N. K. B. & Abayasekara, C. (2013). Cultivar differences in antifungal activity and the resistance to postharvest anthracnose and stem-end rot in mango (*Mangifera indica* L.). *Australasian Plant Pathology*, 43, 151-159. DOI 10.1007/s13313-013-0257-4
- Kumah, P., Applah, F. & Opoku-Debrah, J. K. (2011). Effect of hot water treatment on quality and shelf-life of Keitt mango. *Agriculture and Biological Journal of North America*, 2(5), 806-817. Doi:10.5251/abjna.2011.2.5.806.817
- Larmond, E., (1977). Laboratory methods for sensory Evaluation of food, Canada Department of Agriculture.
- Macias, F. A., Castellano, D., Oliva, R. M., Cross, P & Torres, A. (1997). Potential use of allelopathic agents as natural agrochemicals, Proceedings of Brighton Crop Protection Conference Weeds, pp.33-38 Brighton, UK.
- Nascimento, S. R. C., Araujo-Neto, S. E. & Hafle, G. M. (2000). Use of prochloraz, azoxystrobin and sodium bicarbonate for the postharvest control of *Colletotrichum gloeosporioides*. *Summa Phytopathologica*, 26(3),379-382.
- Nisansala, Y. M. C., Jayakody, L.K.R.R., Sarananada, H.A. & Somarathne, S. (2015). Effect of pre-harvest potassium treatment on stem-end rot disease development in mango (*Mangifera indica* L) cv. *Tom EJC* during fruit ripening. *Sabaragamuwa University Journal*, 14 (2), 119-132. DOI: <http://dx.doi.org/10.4038/suslj.v14i2.7700>

- Olivero-Verbel, J., González-Cervera, T., Güette-Fernandez, J., Jaramillo-Colorado, B. & Stashenko, E. (2010). Chemical composition and antioxidant activity of essential oils isolated from Colombian plants. *Brazilian Journal of Pharmacognosy*, 20, 568-574. <http://dx.doi.org/10.1590/S0102-695X2010000400016>
- Pitarokili, D., Tzakou, O., Loukis, A. & Harvala, C. (2003). Volatile metabolite from *Salvia fruticosa* as antifungal agents in soilborn pathogens. *Journal of Agricultural and Food Chemistry*, 51(11), 3294-3301. <https://doi.org/10.1021/jf0211534>
- Samane, M. & Mohoammad, H. (2012). Effect of essential oils on postharvest decay and some quality factors of peach (*Prunus persica*) var. *Redhaven*. *Journal of Biological Environmental Science*, 6, 147-153. <https://pdfs.semanticscholar.org/4fff/788858dfdbd70f7fdd260847d33fbaa55a5c.pdf> (accessed on 15/07/2017)
- Sokovic, M. & Griensven, L. J. L. D. V. (2006). Antimicrobial activity of essential oils and their components against the three major pathogens of the cultivated button mushroom, *Agaricus bisporus*. *European Journal of Plant Pathology*, 116, 211-224. DOI 10.1007/s10658-006-9053-0
- Tripathi, P., Dubey, N. K. & Shukla, A. K. (2008). Use of some essential oils as post-harvest botanical fungicides in the management of grey mould of grapes caused by *Botrytis cinerea*. *World Journal of Microbial Biotechnology*, 24, 39-46. DOI 10.1007/s11274-007-9435-2
- Tripathi, P. & Shukla, A. K. (2009). Application of essential oils for postharvest control of stem end rot of mango fruits during storage. *International Journal of Postharvest Technology and Innovation* 1 (4), 405-415. DOI:10.1504/IJPTI.2009.030689
- Umuhozariho, M. G., Shayo, N. B., Sallah, P. Y. K. & Msuya, J. M. (2013). Sensory evaluation of different preparations of cassava leaves from three species as a leafy vegetable. *African Journal of Biotechnology*, 13(46), 6452-6459. DOI: 10.5897/AJB2013.12490

Utta-U`r, R., Choudhary, M. I., Ahmed, A., Iqbal, M. Z., Demirci, B., Demirci, F. & Baser, K. H. C. (2000). Antifungal activity and essential oil constituent of some spices from pakistan. *Journal of Chemistry Society of Pakistan*, 22, 60-65. <https://sciforum.net/manuscripts/1773/original.pdf> (accessed on 20/08/2017)

Commuter Travel Pattern to OUSL Nawala: A Case Study

**L. M. Prathapasinghe, D. B. Maddumaarachchi,
G. N. Damayanthi, and K. S. Weerasekera***

*Department of Civil Engineering, The Open University of Sri Lanka,
Sri Lanka*

Abstract

This study intends to analyse the inflow pattern of commuters of OUSL Colombo Regional Center and Main University Nawala with their travel origins, and study their travel-mode patterns and travel nature. The study followed road side interviews, which was the most suitable method to be adopted for such study purpose. This was identified by an extensive literature survey. Pilot studies were conducted during midweek and weekends to identify the volume of walkers and motorists coming through the four gates of the university to get an idea on size of survey teams to conduct interviews and to decide how to locate survey teams around the entry gates during the main surveys.

Main surveys were carried out on a Saturday (weekend) and a Wednesday (midweek), from 8:00 to 18:00 hours covering a 10-hour

Corresponding should be addressed to **Prof. K. S. Weerasekara,
Department of Civil Engineering, The Open University of Sri Lanka, Sri Lanka*

Email: kswee@ou.ac.lk

 <https://orcid.org/0000-0002-7108-4374>

(Received 25th April 2019; Revised 10th November 2019; Accepted 20th December 2019) © OUSL)



This article is published under the Creative Commons Attribution-Share Alike 4.0 International License (CC-BY-SA). This license permits use, distribution and reproduction in any medium; provided it is licensed under the same terms and the original work is properly cited.

How to Cite: Prathapasinghe, L.M., Maddumaarachchi, D.B., Damayanthi, G.N. and Weerasekera, K.S., 2019. Commuter Travel Pattern to OUSL Nawala: A Case Study. *OUSL Journal*, 14(2), pp.91-121.

survey duration. According to the questionnaire, the walkers and motorists coming to OUSL through all four gates were interviewed and contacted more than 1000 respondents. This survey has captured around 58% of total arrivals during the weekend and 56% during midweek. It was observed that a total of 51% of university community came through Nugegoda. Most of them came from Kotte Divisional Secretaries division (zone no 7). It was observed that from the total arrivals, 82 % (weekend) and 66% (midweek) came from zone 7. Out of the community coming to the University for study purposes during weekends, 51% were males and 48% females; during midweek, 54% were males and 46% females. Around 74% of community coming to OUSL use buses, while 9% come by trains.

As the final outcome of this study, a shuttle service of buses was designed to provide a better service to OUSL visitors during the rush hours (ie. 8:00 am to 10:00 pm). Shuttle services are proposed from some main towns. Through the study it was found that presently no adequate number of passengers use trains.

Key words: OD Pattern Study, OUSL Arrivals, OUSL Gate Study

Introduction

Origin destination surveys collect data regarding trip patterns, and such data can be used with other information to help transport planners to understand the needs of an area and develop appropriate sustainable transport solutions. To study the inflow pattern and travel modes of visitors to a particular location, it may become necessary to collect data as to where the traffic is coming from. In such transportation studies, it is often necessary to know the exact origin, time of the day when journeys are made, trip purpose and mode of travel. These studies are called Origin Pattern Studies. Most of these surveys are used in traffic planning at road junctions and mid-blocks. However, such a study can be used to analyse the inflow pattern of university visitors. A similar origin pattern survey has been conducted by Vandebona, et al., (1994, 1997) for KUR-RIN-GAI Campus in Sydney. This paper is the result of a similar Origin Pattern Study conducted at the OUSL Colombo Regional Centre and Main University, Nawala. The findings of this study is presented in this paper.

The Open University of Sri Lanka (OUSL) is the premier Open and Distance Learning institution in Sri Lanka where students can pursue their studies through the Open and Distance Learning (ODL) methodologies. The university is able to serve a large student population

spread throughout the country. Currently, there are nearly 40,000 students studying at OUSL. The central campus and the Colombo Regional Center (CRC) are situated in Nawala (<http://www.ou.ac.lk>). However, most of those students regularly visit the CRC for their study purposes from all regions and provinces. They use several transportation modes to travel to OUSL from their home towns. The modes frequently used are: bicycle, motor cycle, car/van, 3-wheeler, bus, train, while there are those who also walk to the campus. The primary objective of this study is to obtain the origins of OUSL users coming into CRC and the main university Nawala and study their arrival patterns and obtain an understanding of the characteristics of these visitors.

Objective

The objective of this study is to observe the travel origins of commuters arriving at OUSL Nawala, and study their travel patterns and their travel modes. Then by analysing the travel patterns and modes the study intends to improve the travel time of the commuters by proposing a shuttle bus service during busy hours between OUSL and major commuter collecting points.

Theoretical Framework

An origin & destination demand matrix is a vector that denotes the average number of trips going from origin to a destination point (Zuylen and Willumsen, 1980). Similar studies conducted by Vandebona et al. (1994, 1997) has investigated the origin pattern of those who came to KUR-RIN-GAI Campus with proposing second access to the campus from Lady Game Drive.

Traffic studies are carried out to analyze the traffic characteristics. These studies help to decide the geometric design features of traffic control for safe and efficient traffic movement (Patel, 2006). The various traffic survey studies generally carried out are: traffic volume studies, speed studies, spot speed studies, speed and delay studies, origin and destination studies, traffic flow characteristics, traffic capacity studies, parking studies and accident studies.

Origin pattern data is of prime importance to understand the travel patterns and the associated demands on a transportation network over the entire region. These surveys collect valuable data related to trips. This data is normally used as the basic input to transportation models developed to support the decision-making process of the transport agencies (Manikantaswamy, 2005. From: www.slideshare.com). Origin

pattern surveys provide a detailed picture of the trip patterns. These surveys collect valuable data related to trips in order to; understand travel patterns and characteristics, judge the adequacy of existing routes, locate new proposed roads, locate parking places, locate expressways, regulate movement of heavy vehicles, and locate new bridge as per the traffic demand. Historically, there have been considerable research and studies focusing on origin pattern data collection methodologies including; roadside interviews, mail-back postcard surveys, telephone surveys, license plate mail back surveys, home interview surveys, online surveys, tag surveys and combinations of the above methods.

This commuter travel pattern study of OUSL Nawala is conducted with the primary objective to improve the traveling facilities for OUSL users. It aims to minimize the traveling time, design suitable bus routes for users who use buses, propose shuttle service, propose suitable train schedule for relevant commuters and study the details of arriving community to the university. A number of survey methods were considered prior to the selection of the present methodology, which is articulated in the literature review, to capture the OUSL users to get their origin-distribution. A method which is not much resource intensive, but expected to provide good response rate for prescribed questionnaire with complete information in short duration has to be selected. Therefore, road side interviews were selected as most suitable way to conduct the survey at CRC and the main university in Nawala origin pattern study. Hence it was the intention to maximize the survey sample as much as possible, if not to 100%.

Zoning, Desire Lines and Nodes

Zoning is the process of dividing land in a municipality into zones (e.g. residential, industrial). Areas of land are divided by appropriate authorities into zones within which various uses are permitted. Thus, zoning is a technique of land-use planning as a tool of urban planning used by local governments in most developed countries.

Desire lines are drawn so that they clearly show on a map the flows of people or goods from point to point based on the values from a matrix. Zones represent trip origin and destination areas while desire lines connect the centroids of the origin and the destination zones, and thereby denote where people desire to go between zones. They represent the straight-line route between A and B that would be taken, if it were not for obstacles such as buildings and curved roads getting in the way. The width of such desire line is drawn proportional to the number of trips in both directions. The desire line density map easily helps decide

the actual desire of the road users and thus facilitates the finding of the necessity of a new road link, a diversion, a by-pass or a new bridge (Kanna and Justo, 2011).

Nodes in physical transport data are zero-dimensional features (points) among the predominantly one-dimensional features (lines) that comprise the network. There are two types of transport nodes. They are: (1) nodes not directly on the network such as zone centroids or individual origins and destinations (such as houses and workplaces); (2) nodes that are a part of transport networks representing individual pathways, or intersections between pathways (junctions) and points for entering or exiting a transport network (such as bus stops and train stations).

Methodology

Pilot Survey

It has to be stated that the term 'walkers' means all those persons entering the university premises through the 4 gates by foot, although they may have used any transport mode to arrive at the university.

A pilot study was conducted to obtain an initial feel of the number of walkers and motorists coming in to the university, and the gate operations to find out the size of survey teams to be deployed during the survey and to ensure their smooth operation during the surveys. During the pilot survey, at all 4 gates, the incoming walkers and vehicles were counted at 15-minute intervals from 8:00 am to 10:00 am, when the inflow was at its maximum. These counts were taken on Wednesday (midweek day) and Saturday (weekend) since the arrivals are different in week days and weekends.

At all 4 gates (see Figure 1) separate inflows of walkers and vehicles were obtained during midweek and the weekend and the peak flows observed are indicated below. It was also found that questionnaire survey took around 2 minutes to interview a single respondent. Hence, based on the inflow, the size of the survey teams for the 4 gates was finalized.

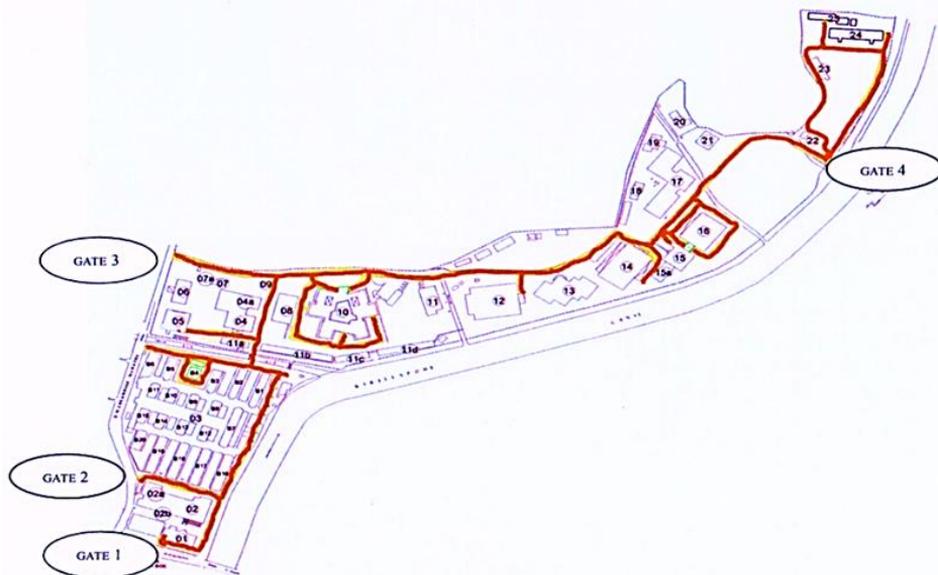


Figure 1. Locations of four gates

Table 1. Survey Teams at the four gates

Gate No.	Activity of the Counter	No.	Total
Gate 01	Total arrival counters	01	07
	Interviewers	06	
Gate 02	Total arrival counters	01	05
	Interviewers (walk-in)	02	
	Interviewers (drive-in)	02	
Gate 03	Total arrival counters	01	05
	Interviewers (walk-in)	02	
	Interviewers (drive-in)	02	
Gate 04	Total arrival counters	01	05
	Interviewers (walk-in)	02	
	Interviewers (drive-in)	02	
	Total survey team	22 No.	

Hence, to conduct the survey at all the 4 gates in one day 22 survey team members were required

Main Survey

Main survey was conducted using the road-side interview method which is justified in the literature review. The road-side interview method requires collecting responses to questionnaire with very high response rates and completing information within a short duration on the road way by stopping motorists and walkers at the interview stations by a group of interviewers. By analyzing the pilot survey data, it was decided to interview a sample of at least 1000 entrants per day.

The following steps were followed during the road side survey:

1. Preparing two different questionnaires for walkers and motorists
2. Selecting interview points at the site
3. Deciding the interview dates
4. Deciding the survey period
5. Identifying survey team and materials
6. Obtaining the permission from university authorities
7. Conducting brief training session for the survey team
8. Collecting the data from the questionnaires

A predefined series of questions was used (see Figure 2 and Figure 3) to collect information from individuals to identify origin pattern, peak time and mode of transport and obtain the outcomes at four gates. For those two categories, different questionnaires were required from walkers and motorists.

ROAD SIDE QUESTIONNAIRE - GATE										
Category A : Walk-in					Time:					
					hr		:	mt		
1) Purpose of arrival to OUSL ?										
Study <input type="checkbox"/>			Work <input type="checkbox"/>			Other <input type="checkbox"/>				
2) Origin of trip ?										
Village:			Nearest Town:			District:				
3) Mode of travel ?										
Walk <input type="checkbox"/>			Bus <input type="checkbox"/>			Train <input type="checkbox"/>				
Transport Service <input type="checkbox"/>			Expressway Bus <input type="checkbox"/>			Private Vehicle <input type="checkbox"/>				
4) Transit Point Sequence										
1 st Transition Point:										
2 st Transition Point:										
3 st Transition Point:										
5) Gender										
Male <input type="checkbox"/>					Female <input type="checkbox"/>					
6) Last town you passed ?										
Nawala <input type="checkbox"/>			Narahenpita <input type="checkbox"/>			None <input type="checkbox"/>				
Nugegoda <input type="checkbox"/>			Polhengoda <input type="checkbox"/>							
7) How regularly you do this trip?										
Daily <input type="checkbox"/>			How many <input type="checkbox"/>			How many <input type="checkbox"/>				
			days per week			days per month				
8) Time Left Home ?										
Direct <input type="checkbox"/>					In-direct <input type="checkbox"/>					

Figure 2

Figure 2. Questionnaire for the walking in

1. Purpose of visiting OUSL
2. Origin of trip
3. Mode of travel
4. Transition point sequence
5. Gender
6. Last town passed
7. Frequency of use of this trip
8. Time left home
9. Direct or indirect travel

Predefined series of questions (Figure 2)

ROAD SIDE QUESTIONNAIRE - GATE					
Category B : Drive-in			Time: _____		
			hr	:	mt
1) Purpose of arrival to OUSL ?					
Study	<input type="checkbox"/>	Work	<input type="checkbox"/>	Other	<input type="checkbox"/>
2) Origin of trip ?					
Village: _____		Nearest Town: _____		District: _____	
3) Vehicle Type ?					
Cycle	<input type="checkbox"/>	Motor Cycle	<input type="checkbox"/>	3-Wheeler	<input type="checkbox"/>
Private Transport Car/SUV	<input type="checkbox"/>	Public office Transport	<input type="checkbox"/>	Delivery Vehicle	<input type="checkbox"/>
4) Number of persons in the vehicle who coming to OUSL ?					<input type="checkbox"/>
5) Gender		Male	<input type="checkbox"/>	Female	<input type="checkbox"/>
6) Last town you passed ?					
Nawala	<input type="checkbox"/>	Narahenpita	<input type="checkbox"/>	None	<input type="checkbox"/>
Nugegoda	<input type="checkbox"/>	Polhengoda	<input type="checkbox"/>		
7) How regularly you do this trip?					
Daily	<input type="checkbox"/>	How many days per week	<input type="checkbox"/>	How many days per month	<input type="checkbox"/>
8) Time Left Home ? _____		Direct	<input type="checkbox"/>	In-direct	<input type="checkbox"/>

Figure 3

Figure 3. Questionnaire for drive-in

1. Purpose of visiting OUSL
2. Origin of trip
3. Vehicle type
4. No. of persons coming to OUSL
5. Gender
6. Last town passed
7. Frequency of use of this trip
8. Time left home
9. Direct or indirect travel

Predefined series of questions (Figure 3)

The survey teams attempted to approach all pedestrians walking through the gates and all the motorists coming in to capture the maximum number of arrivals to the university. Interviewers recorded the responses in a simple tabulation during the survey. The arrival time of each respondent was recorded. When walkers arrived in large groups, the survey staff could only contact a limited number of persons from that group. This phenomenon was specially accounted for in the design of the survey and a separate count was taken for the total arrivals (both walkers and motorists) at every 15-minute interval.



Figure 4. Survey in progress

Results

Nature of Survey Sample

The results of the survey were analyzed separately for (a). Weekend arrivals, and (b). Mid-week arrivals.

(a). Weekend arrivals

The survey team questioned 870 out of 1,510 of those who arrived at OUSL by walking through the 4 gates, which was a response rate of 57.6%. Similarly, 246 vehicle drivers were interviewed out of 424 total arrivals through the 4 gates which is a response rate of 58%. Table 2 indicates the percentages of interviewed samples at the 4 gates separately. Hence the samples interviewed have been more than 50% at all 4 gates on both days.

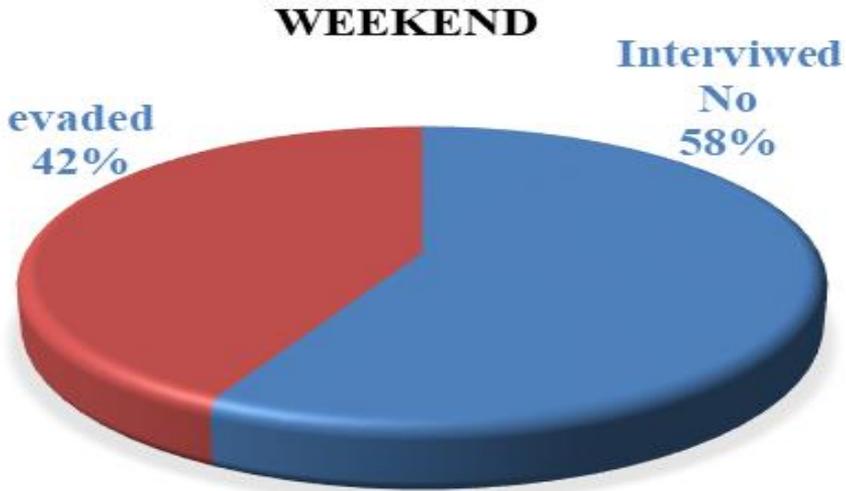


Figure 5. Interview percentage during the weekend

Table 2. Weekend interview chart

	WALK-IN			DRIVE-IN		
	Total Arrived	No of Interviewed	%	Total Arrived	No of Interviewed	%
GATE 1	1046	615	58.8	-	-	-
GATE 2	296	153	51.7	67	35	52.2
GATE 3	107	67	62.6	210	128	61.0
GATE 4	61	35	57.4	147	83	56.5
TOTAL	1510	870	57.6	424	246	58.0

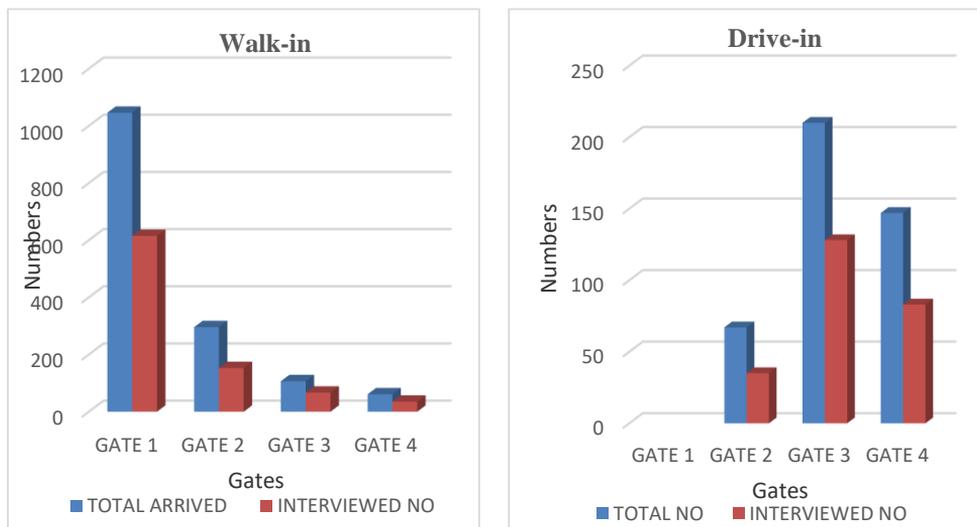


Figure 6. Weekend interview capacities

Figure 7 shows the count of walkers on Saturday at every 15-minute interval. 8:15 am to 9:15 am is the peak time in the campus.

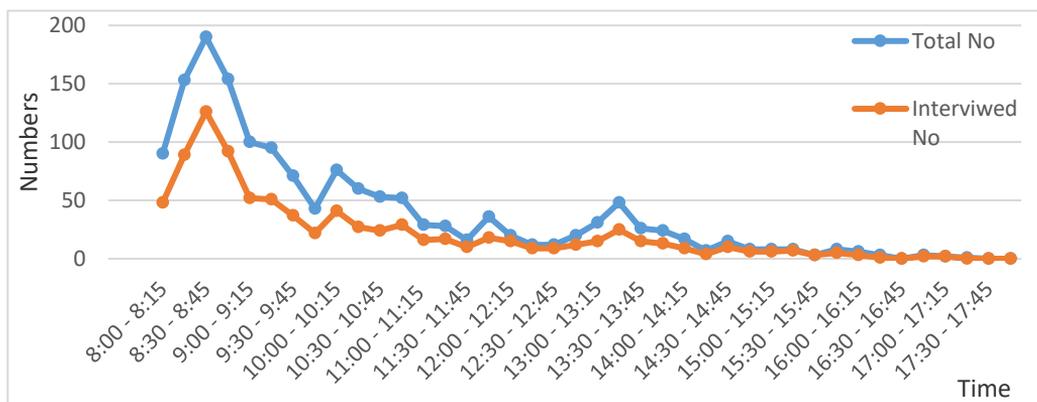


Figure 7. Weekend walk-in at all four gates (Interviewed number and total arrivals)

The Figure 8 shows the count of Vehicles on Saturday at every 15 minutes. From 8:15 to 9:15 am is the peak time in the campus.

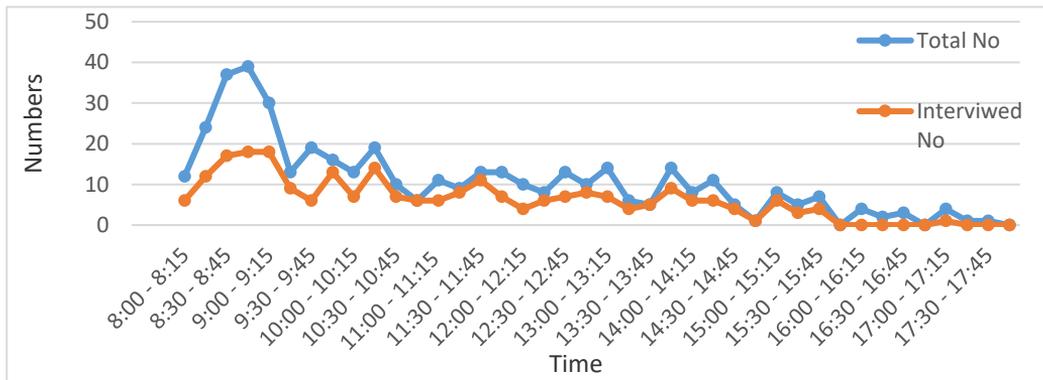


Figure 8. Weekend drive-in at all four gates (Interviewed number and total arrivals)

(b). Midweek arrivals

The survey team questioned 837 out of 1,261 of those who arrived at OUSL by walking through the 4 gates, this is a response rate of 66.4%. Similarly, 339 vehicle drivers were interviewed out of 821 total arrivals through the 4 gates which is a response rate of 41.3%. Table 2 indicates the percentages of interviewed samples at the 4 gates separately. Hence samples interviewed have been more than 35% at all 4 gates on both days.

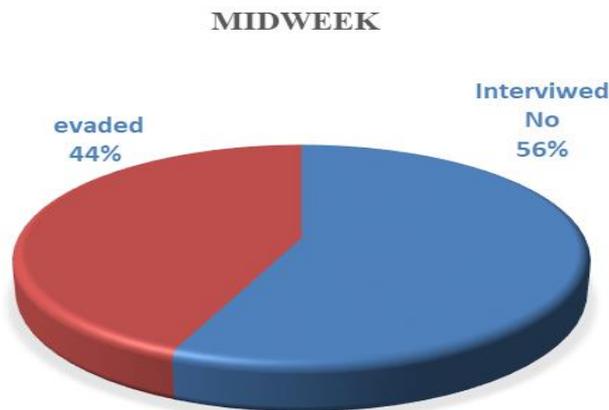


Figure 9. Interview percentage at Midweek

Table 3. Midweek interview chart

	WALK-IN			DRIVE-IN		
	Total Arrived	No of Interviewed	%	Total Arrived	No of Interviewed	%
GATE 1	859	586	68.2	-	-	-
GATE 2	169	113	66.9	73	47	64.4
GATE 3	168	98	58.3	510	204	40.0
GATE 4	65	40	61.5	238	88	37.0
TOTAL	1261	837	66.4	821	339	41.3

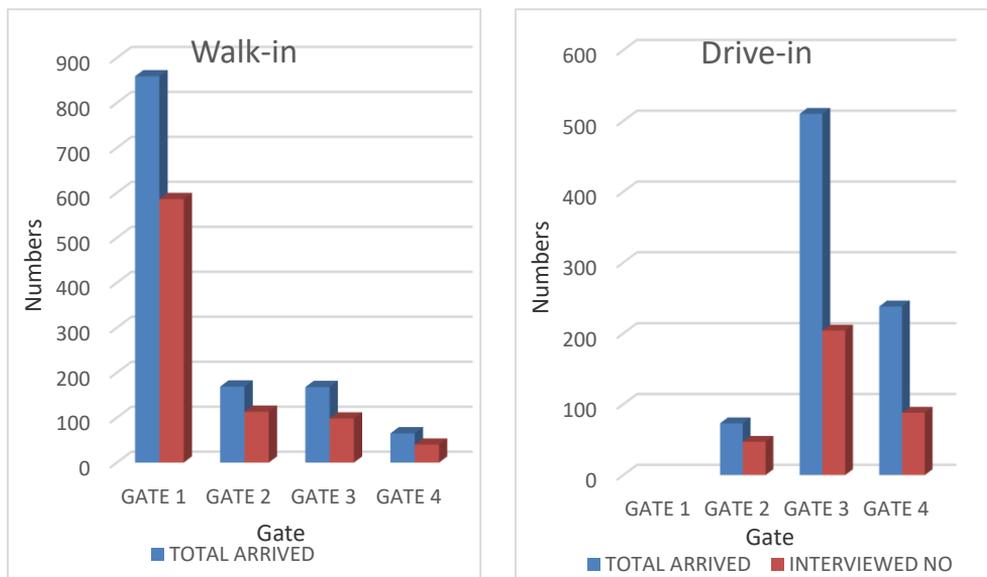


Figure 10. Midweek interview capacities

Figure 11 shows the count of walkers on Wednesday every 15 minutes. 8:30 am to 9:30 am is the peak time in the campus.

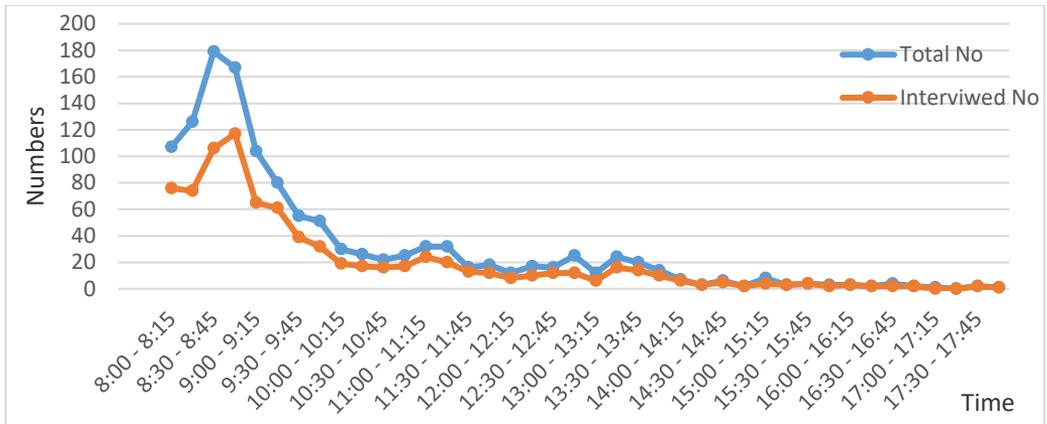


Figure 11. Midweek walk-in at all four gates (Interviewed number and total arrivals)

Figure 12 shows the count of vehicles on Wednesday every 15 minutes. 8:30 am to 9:30 am is the peak time in the campus.

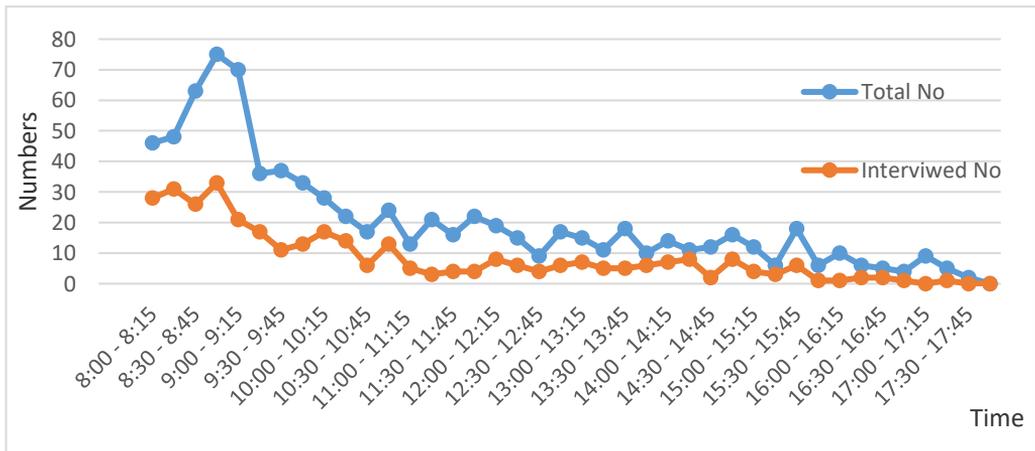


Figure 12. Midweek drive-in at all four gates (Interviewed number and total arrivals)

Purpose to Arrival

The purpose of coming to OUSL can be mainly categorized as: study, work, other (category ‘other’ includes all the other visitors to OUSL).

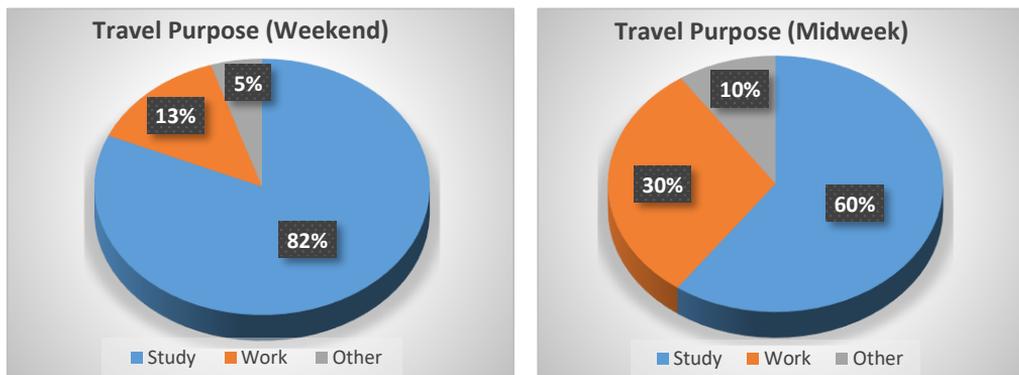


Figure 13. Percentages of purpose to total arrival

During the weekend, 82% of visitors came for study purposes, 13% for work, and 5% for other purposes. During midweek, 60% of visitors came for study purposes, 30% for work, and 10% for other purposes.

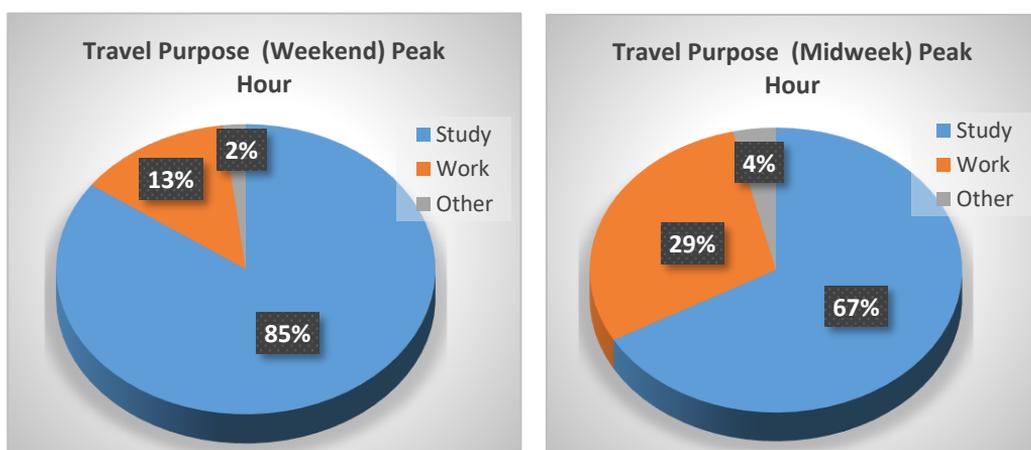


Figure 14. Percentages of purpose at peak hours

When considering the peak time, the purpose of arrival is shown in Figure 14:

According to the peak hour pie charts, during the weekend 85% of the visitors came for study purposes, 13% for work, and 2% for other purposes. During midweek, 67% of the visitors came for study purposes, 29% for work, and 4% for other purposes. There is significant reduction

of visitors who would frequently come to OUSL for purposes such as delivery, collect certificates, etc. during peak hours.

Last Town Passed

All visitors coming to OUSL have to pass one of these towns: Nawala, Narahenpita, Nugegoda, Polhengoda or 'none'. The pie charts given below show the results (category 'none' consists of the people living in close proximity to OUSL).

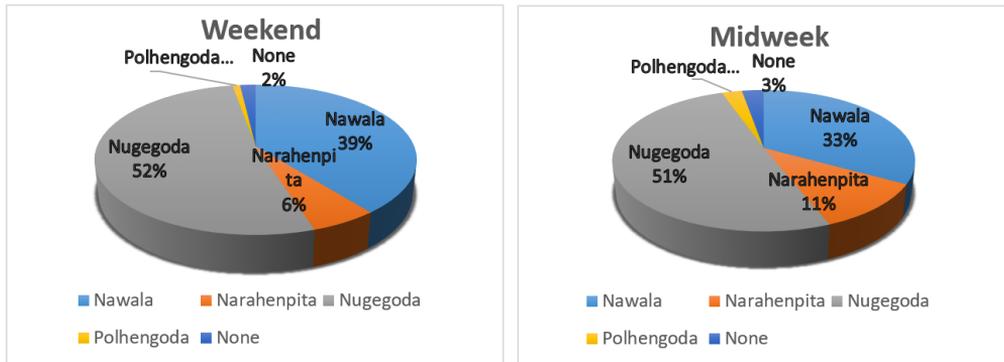


Figure 15. Percentage of last town passed out of total arrivals

The analysis shows that during the weekend and midweek most of visitors (52% in weekend, 51% in midweek) come through Nugegoda. Peak hour percentages are similar to the above.

Mode of Travel

The commuters coming to OUSL use several travel modes. The pie charts next page show it clearly.

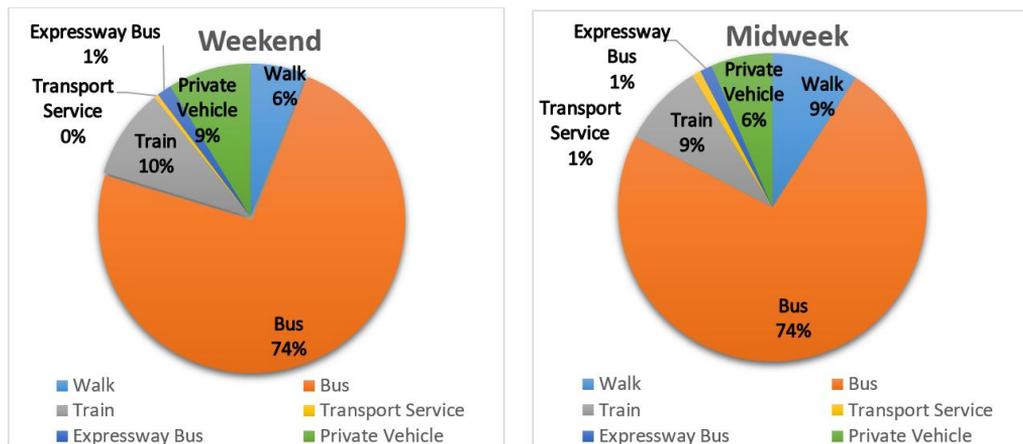


Figure 16. Percentage of Travel Mode

The analysis shows that during the weekend 74% visitors used the bus, 10% train, 9% private vehicle, 6% walked and 1% expressway bus to come to OUSL. During midweek 74% visitors used the bus, 9% walked, 9% train, 6% private vehicle, 1% expressway bus and 1% transport service to come to OUSL.

Results

As a part of this study analysis includes zoning the Sri Lanka map relating to study objectives, expanding number of subjects were interviewed to identify corresponding arrival origins and to construct desire lines from every zone to OUSL. The intention of obtaining the origin patterns was to propose shuttle service. Analysis was extended to further investigate the arrival pattern of users of OUSL Nawala with their travel origins and travel mode patterns. For this purpose, the data collected from survey and other sources were carefully analyzed. To make things more meaningful in the context of the study objectives, it was decided to divide Sri Lanka and the Western Province into several zones. Analysis consists of following steps:

- (a). Divide Sri Lanka in to reasonable zones
- (b). Calculate expansion factors and tabulate the real data for different zones with 15-minute intervals
- (c). Identify the maximum arrival zones at total duration and peak time
- (d). Develop the desire line maps

(e). Propose the shuttle service

Zoning

To develop a pattern of arrival that correlates to study objectives it was decided to divide Sri Lanka and Western Province into several zones. For this purpose, the Western Province Divisional Secretariat Division (DSD) map and all island map collected from the Survey Department were used. Proximity to the University was the main consideration in this segmentation method. For this the information was short listed. It was decided to divide Sri Lanka in to 50 broad areas. Since the university is situated in the Western Province, it was divided into divisional secretariat divisions. Western province consists of 3 districts; Colombo, Gampaha and Kalutara. Colombo district consists of 13 divisional secretariat divisions, Gampaha district 13 and Kalutara district 14. They are indicated from zone 1 to zone 40. Nearer districts to the Western Province such as, Puttlam, Kurunegala, Kegalle and Ratnapura are taken as zone 41 - zone 44. Several faraway districts were taken altogether to create provinces such as Southern, Uva, Eastern, North Central and the Northern indicated by Zone 45 - zone 50. To assume the reasonable quantity of arrivals from these separate zones, the data were multiplied using the expansion factor.

Expansion Factor

To arrive at an accurate number of arrivals to OUSL from these separate zones, the real data collected from the survey were multiplied by an expansion factor. Expansion factors which were the ratio of the number of interviewed and the corresponding arrivals during 15-minute counting intervals that were counted. These factors are used to expand origin at survey zones.

$$\text{Expansion Factor} = \frac{\text{Total number of arrivals}}{\text{Number of interviewed}}$$

There are two kinds of expansion factors in tabulations called Total Expansion Factor and Peak Total Expansion Factor. The total expansion factor is calculated considering the total arrivals during the survey time (8:00 to 18:00). The peak total expansion factor is calculated considering the total arrivals during the peak time (8:15 to 9:15).

According to Figure 17, the maximum number of 158 walkers came from zone 07 Kotte Divisional Secretariat Division.

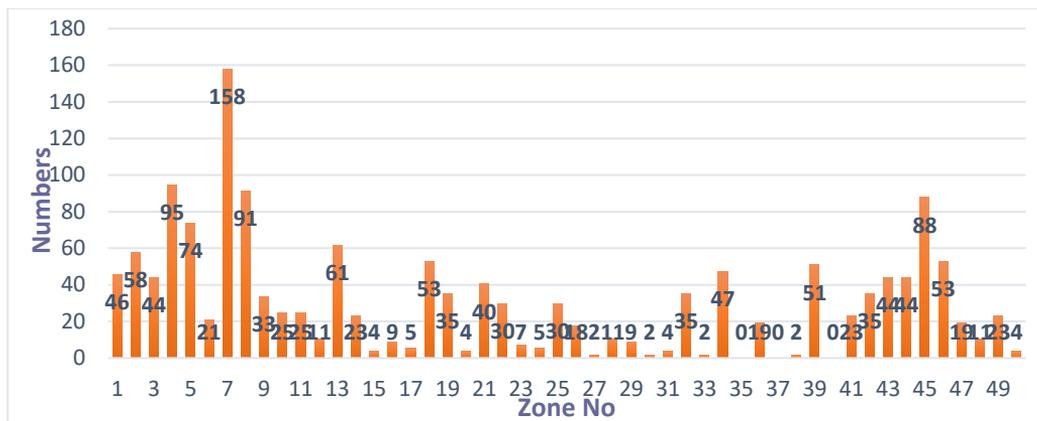


Figure 17. Weekend walk-in zone capacity

According to Figure 18, the maximum number of 98 vehicles came from zone 07 Kotte Divisional Secretariat Division.

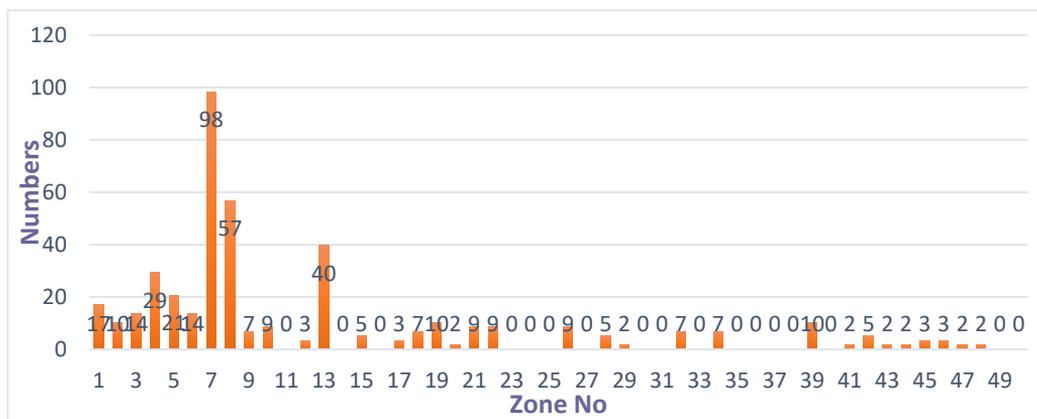


Figure 18. Weekend drive-in zone capacity

According to Figure 19, the maximum number of 176 walkers came from zone 07 Kotte Divisional Secretariat Division.

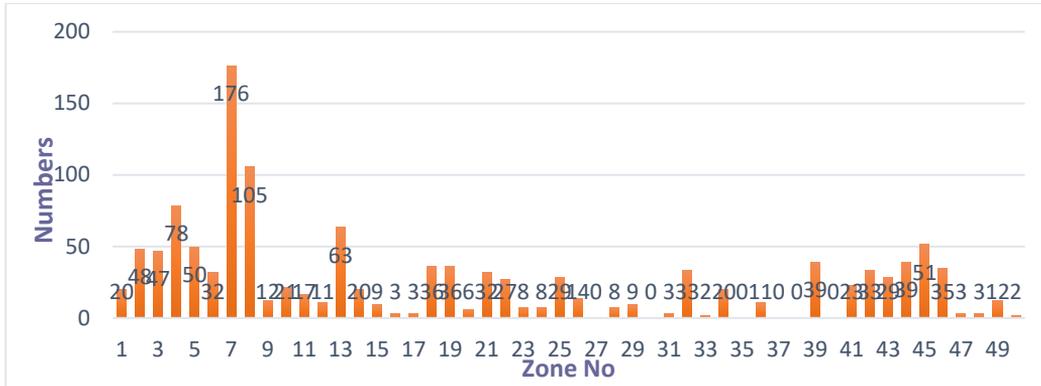


Figure 19. Midweek walk-in zone capacity

According to Figure 20, the maximum number of 174 vehicles came from zone 07 Kotte Divisional Secretariat Division.

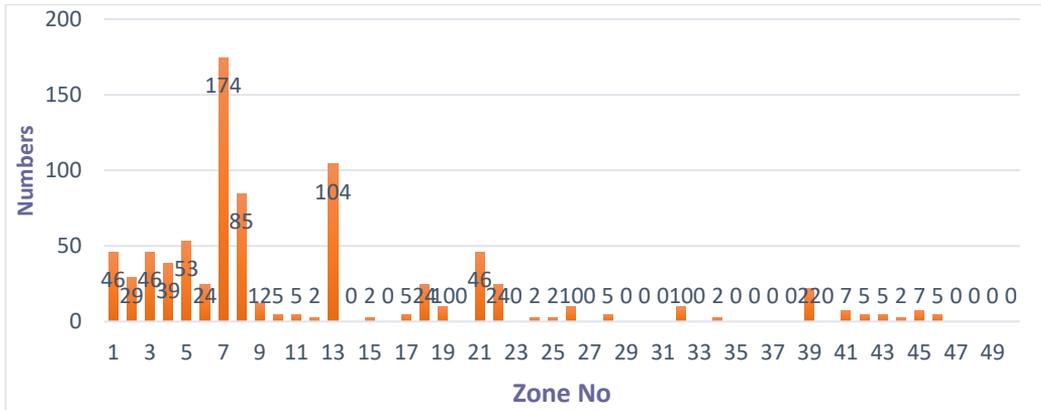


Figure 20. Midweek drive-in zone capacity

Desire Lines

Desire lines are used to illustrate on a map the flows of people or goods from point to point based on the values from a matrix. Desire line is a straight line on a map representing the movement of people and goods from region to region. They show movements from any zone to OUSL. The nucleus of each and every zone was located to design the desire lines. Every desire line starts from the nucleus of the zone (Kanna and Justo, 2011). Table 4 shows nucleus of zones.

Table 4. Zones and nucleus points

Zone No	Zone	Nucleus Point	Zone No	Zone	Nucleus Point
1.	Colombo D.S.	Pettah	26.	Wattala D.S.	Katunayaka
2.	Dehiwala D.S.	Dehiwala	27.	Agalawatta D.S.	Agalawatta
3.	Homagama D.S.	Homagama	28.	Bandaragama D.S.	Bandaragama
4.	Kaduwela D.S.	Malambe	29.	Beruwala D.S.	Aluthgama
5.	Kesbewa D.S.	Piliyandala	30.	Bulathsinhala D.S.	Bulathsinhala
6.	Kolonnawa D.S.	Mulleriyawa	31.	Dodangoda D.S.	Neboda
7.	Kotte D.S.	Rajagiriya	32.	Horana D.S.	Horana
8.	Maharagama D.S.	Maharagama	33.	Ingiriya D.S.	Ingiriya
9.	Moratuwa D.S.	Moratuwa	34.	Kaluthara D.S.	Kaluthara
10.	Padukka D.S.	Padukka	35.	Madurawela D.S.	Anguruwatota
11.	Rathmalana D.S.	Mt. Lavenia	36.	Mathugama D.S.	Mathugama
12.	Seethawaka D.S.	Awissawella	37.	Millaniya D.S.	Galpatha
13.	Thimbirigasyaya D.S.	Borella	38.	Palinda Nuwara D.S.	Banduraliya
14.	Attanagalla D.S.	Warakapola	39.	Panadura D.S.	Panadura
15.	Biyagama D.S.	Biyagama	40.	Walallawita D.S.	Pelawatta
16.	Divulapitiya D.S.	Divulapitiya	41.	Puttalama District	Cheliwe
17.	Dompe D.S.	Pugoda	42.	Kurunegala District	Kurunegala
18.	Gampaha D.S.	Gampaha	43.	Kegalle District	Kegalle
19.	Jaela D.S.	Ragama	44.	Rathnapura District	Rathnapura
20.	Katana D.S.	Wattala	45.	Southern Province	Matara
21.	Kelaniya D.S.	Kiribathgoda	46.	Central Province	Kandy
22.	Mahara D.S.	Mahara	47.	Uva Province	Badulla
23.	Minuwangoda D.S.	Minuwangoda	48.	Eastern Province	Trincomalee
24.	Meerigama D.S.	Meerigama	49.	North Central Province	Anuradapura
25.	Negombo D.S.	Negombo	50.	Northern Province	Kilinochchi

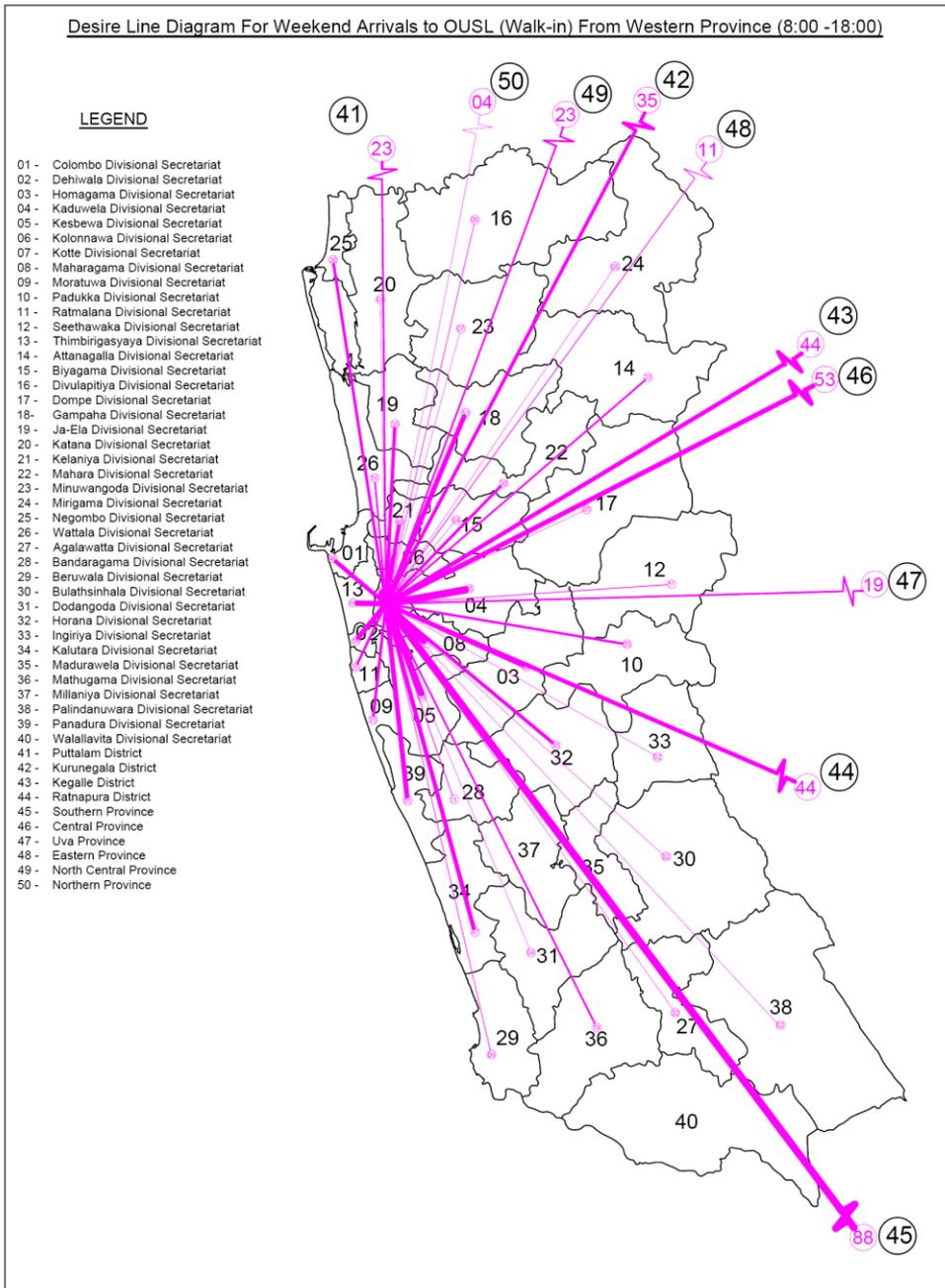


Figure 21. Picture of Desire Line Diagram for weekend walk-in

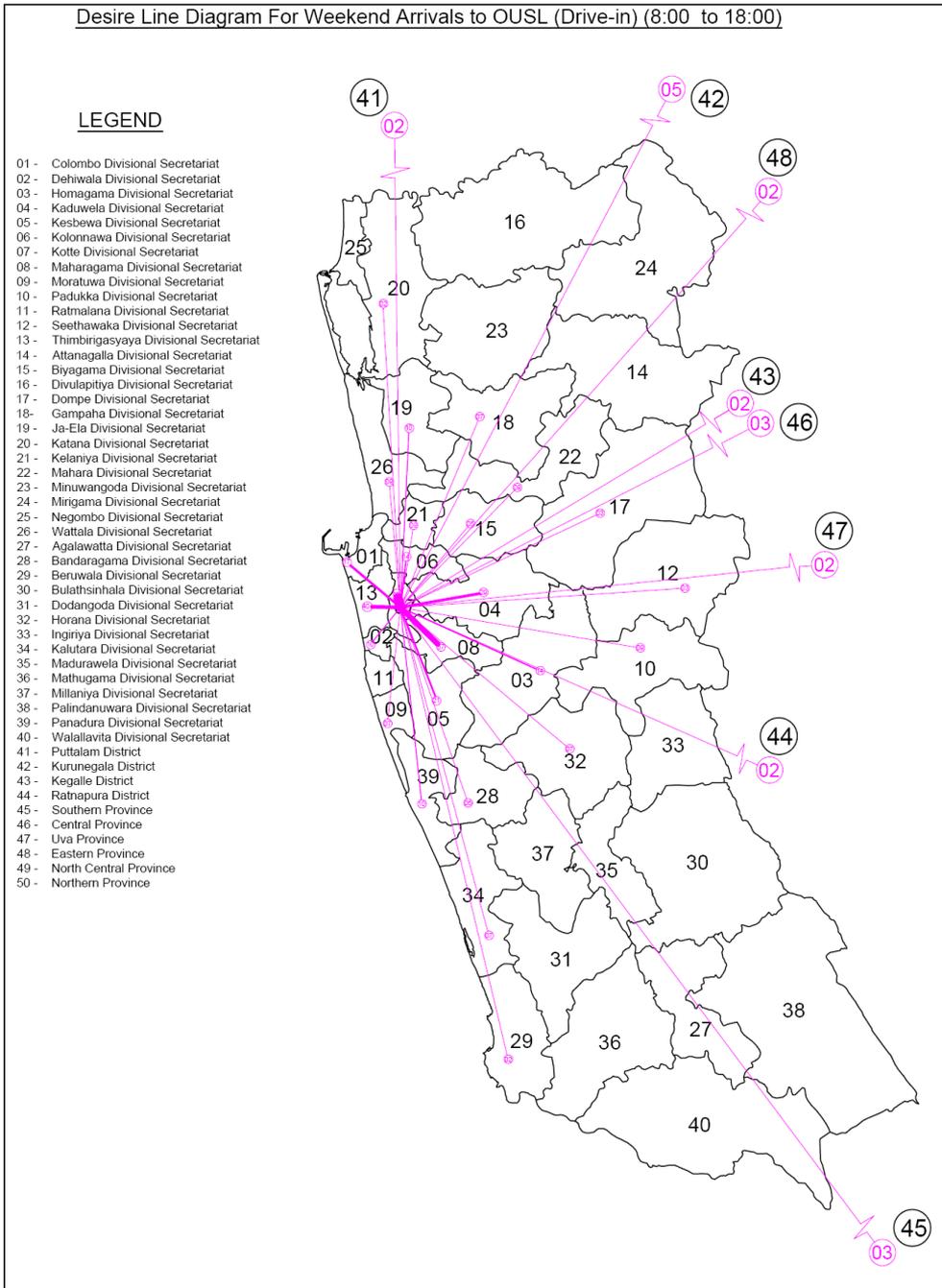


Figure 22: Picture of Desire Line Diagram for weekend drive-in

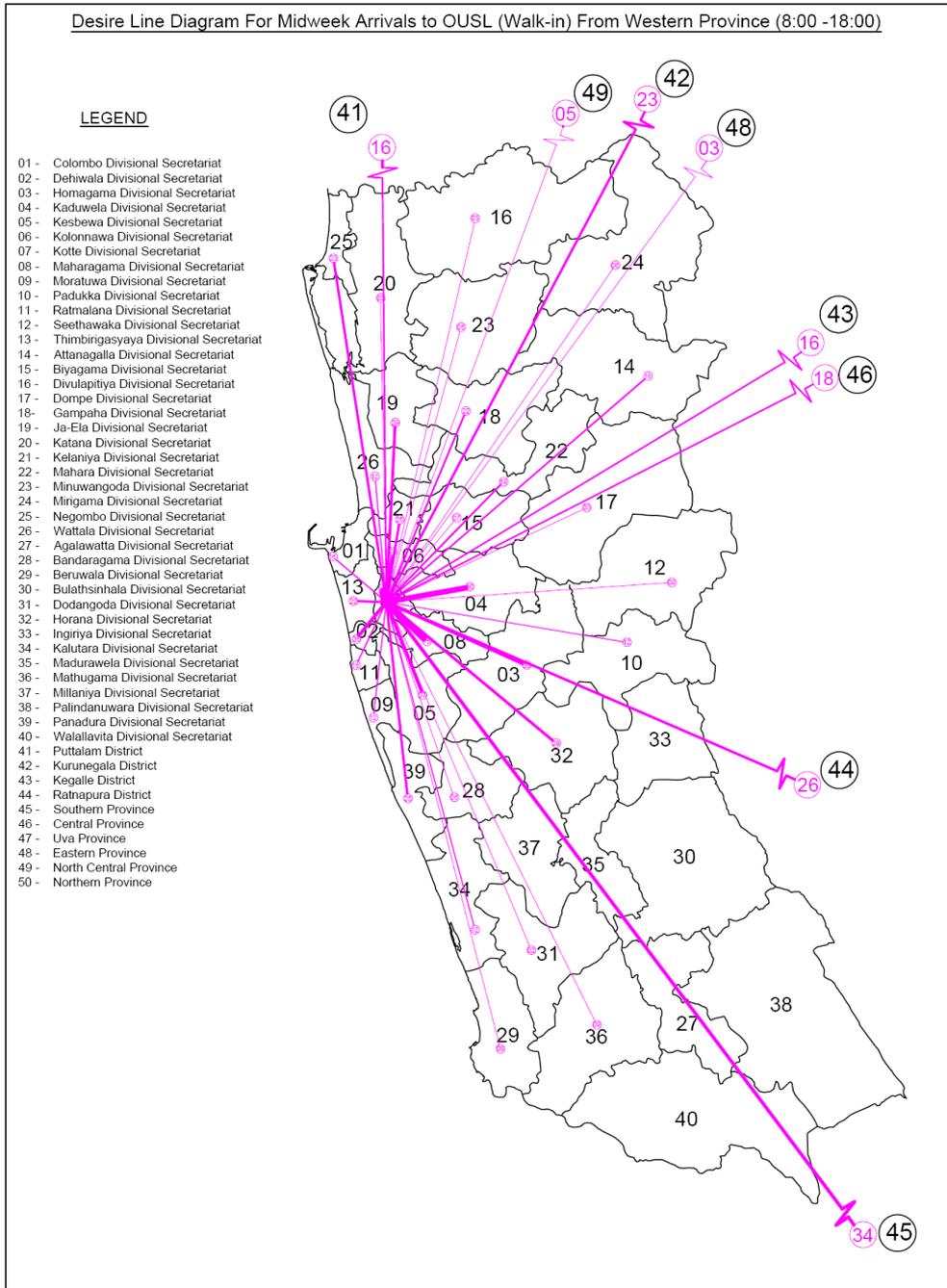


Figure 23: Picture of Desire Line Diagram for midweek walk-in

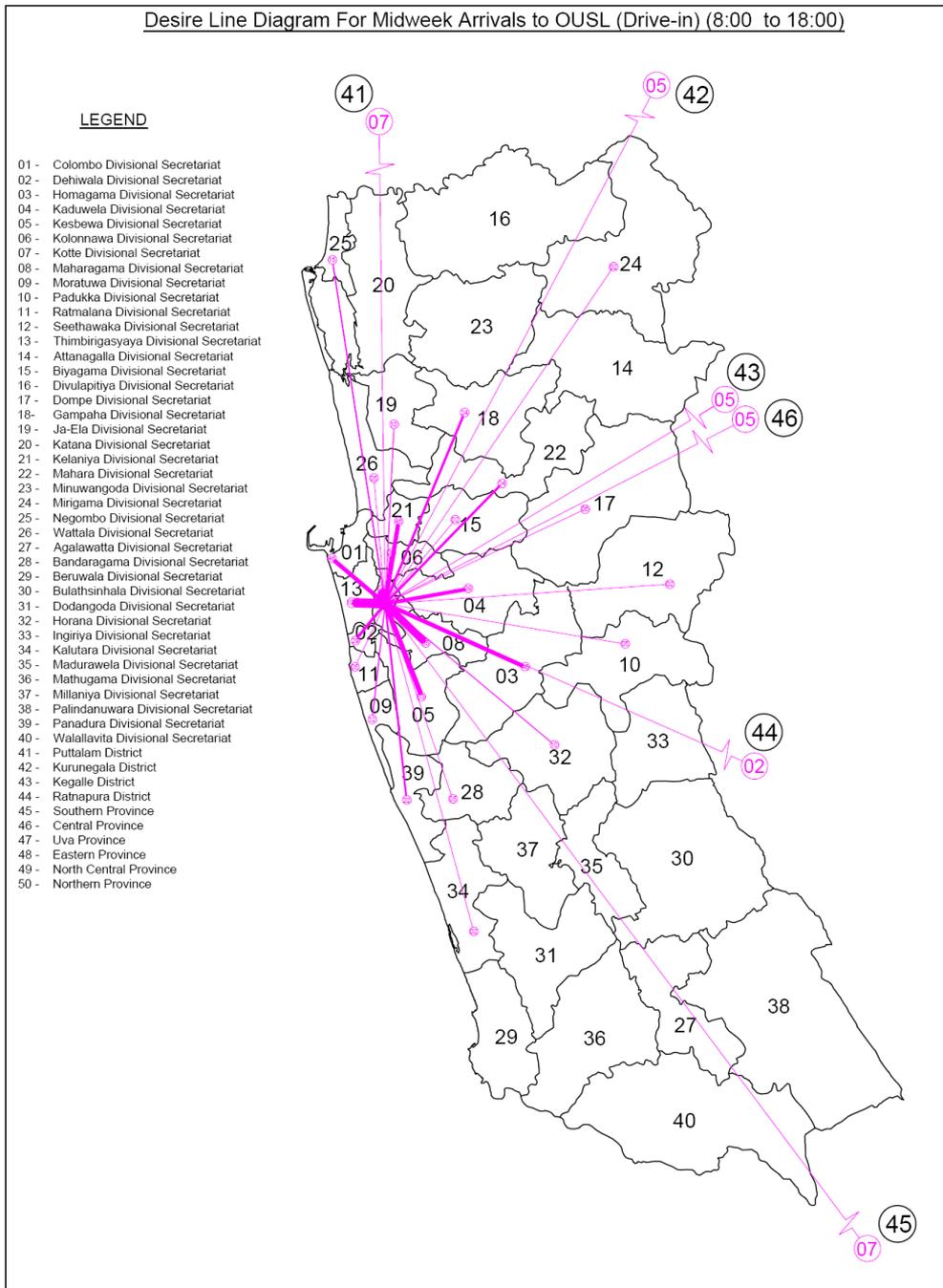


Figure 24: Picture of Desire Line Diagram for midweek drive-in

Proposed Shuttle Service

By analyzing the data, it was identified that the peak inflow to the university occurs between 8:15 am – 9:15 am. Also, there was a steady continuous inflow between 8:00 am – 10:00 am. To provide a better service for a considerable community it was decided to propose a bus shuttle service for 02 hours considering the distance and travel timing via a Google map. The starting point of the bus is to be the nucleus of each zone. The proposal is as follows:

Table 5. Weekend proposed shuttle service

Zone No	Zone	Maximum Arrivals by Public transport services for peak (8:15 – 9:15)	Assume Arrivals by Public transport services for 2hr. (8:00 – 10.00)	Distance to OUSL from zone nucleus (Krn)	Time consume for a trip	Proposed starting point and the route	No of buses with seat capacity	Departure time from starting point
07	Kotte	48	96	3.9	10 min	Rajagiriya bus stand to OUSL	26 seats X 04 nos.	8.00 am 8.30 am 9.00 am 9.30 am
04	Kaduwela	42	84	12.8	35 min	Malabe bus stand through Kaduwela, Rajagiriya to OUSL	26 seats X 04 nos.	7.30 am 8.00 am 8.30 am 9.00 am
08	Maharagama	37	74	6.6	25 min	Maharagama bus stand through Nugegoda to OUSL	26 seats X 03 nos.	8.00 am 8.30 am 9.00 am
45	Southern Province	37	74	11*	40 min*	Kottawa bus stand through Maharagama, Nugegoda to OUSL	26 seats X 03 nos.	7.45 am 8.15 am 8.45 am
05	Kesbewa	30	60	11.7	25 min	Piliyandala bus stand through Nugegoda to OUSL	26 seats X 02 nos.	8.00 am 8.45 am
18	Gampaha	27	54	32.3	01 hr 05 min	Gampaha bus stand through Kadawatha, Rajagiriya to OUSL	26 seats X 02 nos.	7.15 am 8.15 am
02	Dehiwala	27	54	5.8	25 min	Dehiwala bus stand through Kohuwala, Nugegoda to OUSL	26 seats X 02 nos.	7.45 am 8.30 am

Table 6. Midweek proposed shuttle service

Zone No	Zone	Maximum Arrivals by Public transport services for peak (8:15 – 9:15)	Assume Arrivals by Public transport services for 2hr. (8:00 – 10:00)	Distance to OUSL from zone nucleus (Km)	Time consume for a trip	Proposed starting point and the route	No of buses with seat capacity	Departure time from starting point
07	Kotte	94	188	3.9	15 min	Rajagiriya bus stand to OUSL	52 seats X 04 nos.	8.00 am 8.30 am 9.00 am 9.30 am
08	Maharagama	48	96	6.6	30 min	Maharagama bus stand through Nugegoda to OUSL	26 seats X 04 nos.	7.30 am 8.00 am 8.30 am 9.00 am
04	Kaduwela	35	70	12.8	45 min	Malabe bus stand through Kaduwela Rajagiriya to OUSL	26 seats X 03 nos.	7.30 am 8.00 am 8.30 am
45	Southern Province	30	60	11*	45 min*	Kottawa bus stand through Maharagama, Nugegoda to OUSL	26 seats X 03 nos.	7.45 am 8.15 am 8.45 am
18	Gampaha	24	48	32.3	01hr 15min	Gampaha bus stand through Kadawatha, Rajagiriya to OUSL	26 seats X 02 nos.	7.15 am 8.15 am
32	Horana	22	44	35.9	01hr 15min	Horana bus stand through Bandaragama, Piliyandala to OUSL	26 seats X 02 nos.	7.15 am 8.15 am
13	Thibirigasyaya	22	44	6.4	30min	Maradana bus stand through Borella, Narahenpita to OUSL	26 seats X 02 nos.	7.45 am 8.30 am

* The OUSL users who come from the Southern Province use various modes of travel. But we assume that most of them use the southern expressway. Also, since there is a multi-model transport center that is constructed in Kottawa by the Colombo Mega-polis program we decided to collect those people from Kottawa bus stop.

According to Table 5, the required number of buses is 20 (26-seater capacity) during the weekends. Also, according to Table 6, the required number of buses is 04 (52-seater capacity) and 16 (26-seater capacity) during midweek.

Conclusions

The intention of this study was to analyse the arrival pattern of commuters to OUSL's Colombo Regional Center and the main university in Nawala with their travel origins and their travel mode patterns. Also, it looked at the factors with the intention of improving the traveling facilities for OUSL users by minimizing the travel time and studying their travel mode. At the beginning of this study, it hoped to propose a shuttle service for users who use buses and propose a suitable schedule for trains for the users who use trains during peak travel times. The survey was conducted over two days, one during mid-week and the other during the weekend. During the survey, walkers and motorists coming to OUSL through all four gates were interviewed and this process saw the research team contacting more than 1,000 respondents. The survey captured about 58% of total arrivals during the weekend and 56% during a mid-weekday.

During the weekend, most of the walkers came through gate 01, of the 1,000 arrivals and more than 600 were interviewed. Most of the weekend motorists came through gate 03, of the 200 more than 125 were interviewed. During midweek most of the walkers came in through gate 01, of the 850 more than 550 were interviewed. Most of the motorists during midweek and weekend came through gate 03, of the 500 and more than 200 were interviewed.

Correlated to the objectives of study, Sri Lanka was divided in to 50 zones with identified nucleus points. Expansion factor was used to obtain the actual vales of arrival via the individual zone. Accordingly, during the weekend most of the walkers to OUSL came from Kotte DSD (158). Also, most of the motorists came from Kotte DSD (98). During midweek, most of the walkers (176) and most of the motorist (174) came from Kotte DSD. Those flows of arrivals from zone to OUSL are illustrated on maps using desire lines.

Shuttle Services are designed to provide a better service for OUSL users during the peak arrival time (8:00 am to 10:00 pm). During the weekend, it is proposed to start shuttle services from Kotte, Kaduwela, Maharagama, Kottawa, Kesbewa, Gampaha and Dehiwala. During the midweek, shuttle services are proposed from Kotte, Maharagama, Kaduwela, Kottawa, Kesbewa, Gampaha, Horana and Thibirigasyaya.

Weekend arrivals

During the weekend most visitors to the university (more than 52%)

come through Nugegoda. Most visitors come from zone no 7 (Kotte DS Division). The community who came to the university for study purposes is 82% while for work 13 %, and for other purposes 5%. 48% of those are females; 52% of males came to the university during the weekend. More than 69% use public transport services, while more than 27% private transport and 4% walked. From those public transport users, more than 74% came to OUSL by bus and more than 10% by train. Majority of motorists used the motor cycle (49%) while the others used private transport services (35%) and three-wheeler (10%). When considering the peak time arrivals, 89% of them directly come to OUSL for academic purposes while the others came for other business.

Midweek arrivals

During midweek the most of the university community (more than 51%) come through Nugegoda. Most visitors came from zone no 7 Kotte Divisional Secretary. The community who came for study purposes is 60 %; those who came to work is 30%; for other purposes is 10%. 46% of them are females; 54% males came during midweek. More than 55% use public transport services, more than 39% private transport and 6% walked. From those public transport users more than 74% came to OUSL by bus and more than 9% by train. Majority of motorists used private transport servicea (40%) while others used motor cycles (38%) and three-wheeler (13%). When considering the peak time arrivals 93% came for academic purposes while the others came for other business.

References

Hollander, Y. (2016), Transport Modelling for a Complete Beginner, CTthink, London.

<https://en.wikipedia.org>

<https://nptel.ac.in>

<http://www.maps.google.lk>

<http://www.moha.gov.lk>

<http://www.ou.ac.lk>

<http://www.slideshare.com>

<https://www.survey.gov.lk>

Kanna, S. K. and Justo, C. E. G. (2011), Highway Engineering, Nem Chand & Bros., India.

Manikantaswamy V. S. (2005), Origin and destination survey,

University of Mysore, Manasagangothri.
<http://www.slideshare.com>.

Patel, A. N. (2006), Traffic Studies, <http://www.slideshare.com>.

Vandebona, U., Weerasekera, K. and Kim, K. S. (1997), KUR-RIN-GAI Campus Origin Distribution Survey - 1997 Update, Department of Transport Engineering, University of New South Wales, Sydney.

Vandebona, U., Weerasekera, K. and Upadhyay, P.K. (1994), KUR-RIN-GAI Campus Origin Pattern Survey, Department of Transport Engineering, University of New South Wales, Sydney

Zuylen, J. V. and Willumsen, G. (1980), The Most Likely Trip Matrix Estimated from Traffic Counts, University of Leeds, Leeds.

Perceptions of Buddhism among Professionals in Nepal

Mahendra Kumar Shakya*

Lumbini Buddhist University, Nepal

Abstract

Prince Siddhartha, who later became the Buddha, was born in the city of Lumbini in Nepal circa 623 BC. His spiritual guidance inspires millions of followers and practitioners globally. The teachings of the Buddha, who throughout his life preached about integrity and morality, could be valuable in promoting ethics and integrity and could also play an influencing role in the current drive of the Nepalese government to create a prosperous nation. Thus, understanding the perceptions of the development professionals and the intellectuals of Nepal towards this system of philosophy would be critical to understand not only the current status of Buddhist teachings in Nepal but also how this

*Corresponding should be addressed to **Mr. M. K. Shakya**,
Lumbini Buddhist University, Nepal

Email: shakyamahendra@hotmail.com

 <https://orcid.org/0000-0002-8463-1242>

(Received 4th July 2019; Revised 10th December 2019; Accepted 30th December 2019) © OUSL)



This article is published under the Creative Commons Attribution-Share Alike 4.0 International License (CC-BY-SA). This license permits use, distribution and reproduction in any medium; provided it is licensed under the same terms and the original work is properly cited.

How to Cite: Shakya, M.K., 2019. Perceptions of Buddhism among Professionals in Nepal. *OUSL Journal*, 14(2), pp.123–139.

system of thought could be diverted for the purposes of nation-building.

To understand the existing knowledge and perceptions of the professionals, an exploratory survey was carried out in October 2018 with questionnaires developed using Google Forms. The link was shared among 250 professionals and the first 100 responses received online were tabulated and analyzed. The study found that more than two-thirds of the respondents do not have even a basic knowledge about the Buddha's teachings and practices, which would comprise the teaching disseminated through the texts such as *The Dhammapada*, *Jataka Stories*, and the philosophical foundations of the Four Noble Truths, the Noble Eightfold Path, and Meditation. Some of these professionals illustrated the importance of including the teachings of the Buddha in the school curriculum and offering meditation as an extracurricular activity.

Key words: Four Noble Truth, Noble Eightfold Path, Jataka Stories, Dhammapada

Introduction

Prince Siddhartha, who later became the Buddha, was born in the city of Lumbini in Nepal circa 623 BC. His spiritual guidance inspires millions of followers and practitioners globally. The religion is practiced today in Cambodia, Thailand, Myanmar (Burma), Bhutan, Sri Lanka, Laos, Mongolia, Japan, China, Singapore, Taiwan, Vietnam, Macau, South Korea, and Malaysia. China is the country with the largest population of Buddhists. As it does not require any formal "conversion", Americans from every ethnicity, nationality and religious tradition incorporate Dharma practices into their normal routines and traditions. Consequently, Buddhism is rapidly spreading in the USA these days.

Buddhism in Ancient Nepal

Buddha visited Kapilvastu the same year of his enlightenment with 20 thousand perfectly liberated monks (Sancrityayan, R. 2018, P: 91). While in Kapilvastu he is said to have demonstrated psychic powers, preached to his relatives including his father, king Sudhodhana and ordained some people including his son, Rahula. Theravada tradition is believed to be the oldest unbroken tradition that existed in Nepal from the time of the Buddha. Later, Emperor Ashoka sent nine missionary groups to different locations to spread the Dhamma (Dutt, 1966). A group missionary of monks led by Venerable Majjima came to Nepal and succeeded in propagating Buddhism (Ven. Sujano, 2008). In ancient Nepal, the Lichchavi period is regarded as the golden age where Buddhism flourished (Thapa, 2014). During the period Nepali princes married Song-Tsen Gampo and assisted in the introduction of Buddhism to Tibet.

Buddhism remained a dominant religion until the time of Jayasthiti Malla who ruled Nepal during the medieval period (around 1382 C.E.). He imposed the caste system in Nepal according to Manudharmasastra, a Hindu holy book (Ven. Sujano, 2008). He banned Buddhist culture and tradition and forced the celibate monks to disrobe and marry. Thus Buddhism continued to decline in the birth country of the Buddha because of the restrictions imposed by the state.

Buddhism in Nepal today

Nepal is a landlocked country with a population of 26.4 million. It enjoyed an official status of a Hindu kingdom until December 2007 when the interim constitution declared Nepal as a secular state. Now, all religions in Nepal by the constitution have equal opportunities to propagate. Despite this fact, Buddhist intellectuals have the view that the environment in Nepal is not supportive of Buddhism. They alleged that the government is interested in offering a positive impression to the international communities; however, in reality, the situation is much different (Udash, 2018). Nepal frequently claims to be the birthplace of the Buddha; however, it does not treasure the Buddha and his

teachings (Paudel, 2018). According to him, the budget set aside for promoting Buddhism is inadequate. The budget allocated by the government to the Lumbini Buddhist University is proof of how the state is ignoring Buddhism. Hindus regarded the Buddha as the ninth incarnation of Lord Narayana and argue that Buddhism is a branch of Hinduism.

Nepal is blessed with many sites associated with the Buddha including Lumbini, Gotihawa and Tilaurakot, the birthplace of Shakyamuni, Krakuchhanda and Kanakmuni Buddha; therefore, Nepal has every potential of being benefitted from Buddhism. The teachings of the Buddha, who throughout his life preached about integrity and morality, could be valuable in promoting ethics and integrity and could also play an influencing role in the current drive of the Nepalese government to create a prosperous nation. At the time when corruption and lawlessness have become endemic in the country, the significance of Buddha's teachings has become even more relevant.

According to the chronicles of Buddhist history, Mauryan Emperor, Ashoka in his 20th year of coronation visited Lumbini, erected pillar and released the peasants from all taxes. The pillar is an absolute evidence for the birthplace of the Buddha; despite the fact, many international devotees still have a misguided belief that India is the birthplace. Many a time Nepalese have united to globalize the message that Lumbini of Nepal is the birthplace of the Buddha. The most recent effort is the "Buddha was born in Nepal" campaign organized by the Nepalese youth and artists in Kathmandu on 3rd March 2018. The organizers believed that around 100,000 people assembled in *Tundikhel*. The event was a historic one in terms of the biggest number of people coming together to proclaim the message that "Buddha was born in Nepal" simultaneously. On the occasion, they also recited 25 verses of *The Dhammapada*, a collection of the Buddha's aphorisms. The Campaign not only demonstrated solidarity for reclaiming Lumbini as the birthplace of the Buddha, it also laid a

strong foundation for the Buddha to become a symbol of national unity.

In this regard, this researcher is of the view that the time has come for Nepal to cherish the Buddha and his teachings and reap the benefits of such acts. While claiming Nepal as the birthplace of the Buddha, the nation should also cherish the Buddha and his teachings. Nepal should understand that the best way of inheriting the legacy of the Buddha is to treasure and practice his teachings. Thus, understanding the perceptions of the development professionals and the intellectuals of Nepal towards this system of philosophy would be critical to understand not only the current status of Buddhist teachings in Nepal, but also how this system of thought could be diverted for the purposes of nation-building.

Objectives

The main objective of this study was to explore the level of understandings of Nepalese professionals about the fundamental teachings of the Buddha and their perception of how Nepal could benefit from the teachings.

Other specific objectives of the exploration are to draw attention of the national and international communities towards the survey findings, which could help promote Buddhist teachings and practices in Nepal and highlight the measures suggested by the respondents for the benefit of Nepal and her people.

Methodology

The relevant literature on the existing situation of Buddhism in Nepal was reviewed before developing the questionnaire. Consultations were made with knowledgeable persons while drafting and finalizing the questionnaires. The different templates available online were used to develop the basic questionnaires and they were pretested for technical validation. Because of its

technical superiority, the questionnaire was developed using Google Forms with 3 multiple choices and 8 Yes/No type questions, one short and one long answer question on basic understandings of Buddhism. Five categories were provided in the section of age group, education level, and three (male, female and prefer-not-to-say) choices were offered on gender.

A list of professionals working in government and non-government organizations was prepared with their contact addresses using alumni directory, mailing lists, and staff contact details. The list included mostly the group of professionals this researcher came across in his 3 decades-long academic and professional life. The survey was conducted during October 2018 by sharing the digital link among 250 of these professionals, both male and female, through mobile phone, Facebook messenger, email and Whatapps and they were requested for their responses. Furthermore, as questionnaires included very basic features about Buddha's teachings, specifically the traditional Buddhists were not included in the survey. Care was exercised to increase the number of responses from female respondents to ensure gender balance. The name of the respondent was not asked; however, they were requested to provide an email address for further clarification. Regular follow-ups were made through telephones and messenger for timely responses. The responses received online from the first 100 respondents in each of the topics were tabulated and analyzed based on the frequency distributions. A Chi-square test was done to examine if the responses received from respondents with respect to education levels and age groups vary significantly or not. Likewise, the suggestions received were reviewed, classified and summarized.

Limitations

This study was conducted within a limited time and resource constraints. Due to this, the sample size had to be limited to 100.

Result and Discussion

Nepal is divided into three topographic regions and has a diverse culture with people representing different caste and ethnic groups. The survey link was shared with the group of professionals and the responses from the first 100 respondents were analyzed irrespective of region, caste, and ethnicity.

Among the respondents, 21% were female and 79% male, 93% belonged to the age group above 30 years with a mean age of 48.5 years. Similarly, 82% of the respondents have the education level of Masters and above. The responses received in each of the topics have been discussed below.

Knowledge of the life story of the Buddha

This question was included to know if the subjects were familiar with the life story of the Buddha. The majority (85 %) of respondents (82% male and 95% female) have provided a positive answer and it did not vary significantly among the respondents with different age groups and education levels. Whereas 14% have not read about the Buddha and one did not answer.

Reading The Dhammapada

The *Dhammapada* is considered to be a collection of the discourses of the Buddha delivered on various occasions, on various topics (Shakya, 1980). It is regarded as a guidebook for resolving the countless problems of everyday life; therefore, this is very important for every Buddhist to be familiar with the verses of *The Dhammapada*. Being simple and concise, *The Dhammapada* is usually the first book on Buddhism for both Buddhists and non-Buddhists interested in the study of the religion. Despite this, in the birthplace of the Buddha, only 18.0% (17.7% male and 19% female) of the professionals have studied *The Dhammapada*, whereas 81% (81% male and 80.9% female) have not read it and one percent did not answer. This varied significantly with the different educational and age groups having Chi-square values of 11.52 and 46.64 at d. f. 4 and p-value 0.05

respectively. More than 45% of the respondents within the age group above 60 years have provided a positive answer.

Hearing about The Jataka Stories

The Jataka Stories are a voluminous body of literature concerning the previous births of the Gautam Buddha in both human and animal form. There are 550 such stories that tell about the bravery and humanity of the Bodhisattva, the being attempting to fulfill the perfections to be the Buddha. Therefore, to understand Buddhism one must be familiar with The Jataka Stories. In the survey, only 27% (27.8% male and 23.8% female) mentioned that they have heard about The Jataka Stories, whereas 71.9% (68.35% male and 71.4% female) have never heard and were unaware about The Jataka Stories. The response varied significantly with educational and age groups with the Chi-square value of 11.83 and 80.74 at d. f. 4 and p-value 0.05 respectively. All of the subjects within the age group below 30 were found to be aware of The Jataka Stories. Three males and one female respondent did not reply.

Table 1. The responses received on the basic understanding of Buddhism.

Sl No.	Question	Male			Female			Total Yes (%)
		Yes (%)	No (%)	Blank (%)	Yes (%)	No (%)	Blank (%)	
1	Studied the life story of the Buddha	65	13	1	20	1	0	85
2	Have read The Dhammapada	14	64	1	4	17	0	18
3	Heard about The Jatak Stories	22	54	3	5	15	1	27
4	Practiced Vipassana meditation	26	50	3	9	12	0	35
5	Knowledge of The Four Noble Truths	36	42	1	14	6	1	50
6	Knowledge of The Noble Eightfold Path	21	56	2	6	15	0	27
7	Heard of the Five Moral Precepts	51	28	0	14	7	0	65
8	The Buddha's teachings to children	75	4	0	19	2	0	94

Having the opportunity to practice Vipassana meditation

Buddhism is primarily about the purification of the mind. Meditation with a strong moral ground is the means of gaining wisdom to purify the mind. Vipassana is an insightful form of meditation promoting self-awareness which was taught by the Buddha 2600 years ago. Vipassana techniques are non-sectarian and can be practiced by all, irrespective of caste, creed, religion or nationality (Singh, 1997). In Nepal, Vipassana meditation sessions of 10 days duration are offered in eight centers throughout the country (Budhanilakantha, Kirtipur, Itahari, Chitwan, Pokhara, Birgunj, Lumbini and Surkhet) with free food and boarding facilities. Likewise, *Satipathan* and other forms of meditation sessions are offered in many other centers. The enlightened one developed meditation entirely for the benefit of the humankind. Human life will definitely be incomplete if one does not experience meditation in one of these centers at least once (Shakya, 2019, P: 8); despite this, only 35% (32.9% male and 42.8% female) respondents mentioned that they had the opportunity of practicing Vipassana or other forms of meditation. 62% (63.3% male and 57.1% female) have mentioned that they have not got the opportunity to be familiar with meditation. On the contrary, 75% of the undergraduates and 70% of those with doctorates were found to have practiced meditation. The number of respondents having the opportunity of practicing Vipassana and other forms of meditation varied significantly with education levels; however, it is non-significant among different age groups with Chi-square values of 94.0 and 8.79 at d. f. 4 and p-value 0.05 respectively.

Table 2. Response Based on Education Level

	Educational Level										Chi Square (X ²)
	UG		Graduate		Masters		Doctorate		Post Doc.		
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Studied the life story of the Buddha	3	1	12	3	61	8	7	2	2	0	4.87

Have read The Dhammapada	1	3	4	11	9	59	4	6	0	2	11.52
Heard about The Jatak Stories	1	3	2	11	20	47	4	6	0	2	11.83
Practiced Vipassana meditation	3	1	4	9	21	47	7	3	0	2	94.00
Knowledge of The Four Noble truths	3	1	6	7	35	34	6	4	0	2	68.45
Knowledge of The Noble Eightfold Path	0	4	2	12	18	51	7	2	0	2	175.3
Heard about the Five Moral Precepts	3	1	12	3	43	26	5	5	2	0	19.38
The Buddha's teachings to children	3	1	14	1	65	4	10	0	2	0	4.56

Table value of Chi-square for a degree of freedom 4 at 5% level is 9.49

Knowledge on the Four Noble Truths

The Four Noble Truths include the truth of suffering, the truth of the origin of the suffering, the truth of the cessation of suffering and the truth of the path that leads to the cessation of suffering. It is the heart of Buddha's teachings. It is the truth Bodhisatwa Siddhartha found on the full moon night of May. It is said that before understanding the Noble Truths clearly in 3 forms and 12 aspects, the Bodhisatwa Siddhartha did not claim to be the Buddha; therefore, the Four Noble Truths is the nucleus of teachings of the Buddha. Despite this, only 50 percent (45.5% male and 66.6% female) mentioned that they have some knowledge of the Four Noble Truths. Whereas, 48% (53.1% male and 28.5% female) mentioned that they do not know the Noble Truths. Those having knowledge of the Four Noble Truths varied significantly with educational and age groups at d. f. 4 and p-value 0.05 respectively. 75% of the undergraduates were aware

of the Four Noble Truths; on the contrary, all of the post-doctorate subjects were unaware of the Truths. On the other hand, more than 72% of the respondents within the age group above 60 had knowledge of the Four Noble Truths. One male and one female did not respond.

Table 3. Response Based on Age Groups

Questions	Age group										Chi Square (X ²)
	Below 30		30 to 40		40 to 50		50 to 60		Above 60		
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Studied the life story of the Buddha	6	1	18	1	15	3	34	9	12	0	3.35
Have read The Dhammapada	1	6	1	18	5	13	6	38	5	6	46.64
Heard about The Jatak Stories	7	0	5	13	7	11	11	32	4	6	80.74
Practiced Vipassana meditation	3	4	5	14	9	9	14	29	4	6	8.79
Knowledge of the Four Noble Truths	4	3	9	10	8	10	21	22	8	3	9.65
Knowledge of the Noble Eightfold Path	4	3	3	16	4	14	10	33	6	5	44.56
Heard about the Five Moral Precepts	5	2	11	8	12	6	26	18	11	1	10.76
The Buddha's teachings to children	7	0	17	2	17	1	42	2	11	1	0.68

Table value of Chi-square for d. f. 4 at 5% level is 9.49

Knowledge on the Noble Eightfold Path

The fourth Noble Truth is the Noble Eightfold Path that one has to follow to attend Nibbana, the ultimate goal of Buddha's teaching. For purposes of simplicity, the Noble Eightfold Path is classified into morality, meditation, and wisdom. According to the Buddha, no one can attain Nibbana without following the 'Noble Eightfold Path'; therefore, it is regarded as the only exceptional path (*ekaena ayan maggo*) to emancipation (Ven. Nyanatiloka, 1971). Only 27% (26.5% and 28.5% female) mentioned that they

have knowledge of the Noble Eightfold Path. Whereas, 71% (70.8% and 71.4% female) mentioned that they are not aware of the Noble Eightfold Path. The responses varied significantly with educational levels and age groups at d. f. 4 and p-value 0.05 respectively. All of the undergraduates and post-doctorate subjects were unaware of the Eightfold Noble Path whereas more than 77% of those with doctorates mentioned that they were aware of the Noble Path. Two male respondents did not answer.

Knowledge of the Five Moral Precepts

Morality is an integral part of the path to Nibbana and the five moral precepts include abstaining from: killing, stealing, sexual misconduct, telling lies and taking toxicants. These are the basic moral obligations for Buddhists that they are expected to follow them every day as a prerequisite to leading a decent life. 65 percent (64.5 and 66.7% female) of the respondents were aware of the 'Five Moral Precepts'. Whereas, 35% (35.4 and 33.3% female) did not know about them. The response varied significantly with educational levels and age groups. 75% of undergraduates, 80% of graduates and 100% of the post-doctorates knew about the five moral precepts. Similarly, 91.67% of the respondents within the age-group above 60 had knowledge of the moral precepts.

The Buddha's teachings to the Nepalese children in schools

The education system has a significant role in producing good and dedicated citizens. Early childhood education up to the secondary level is considered to be the most important in promoting ethical standards and moral values. The Buddhist intellectual Prof Dr. Bajra Raj Shakya in an interview with a National Buddhist bimonthly (2018) indicated that the education system in Nepal is not practical because it lacks in religious and cultural materials that are essential to make people moral, disciplined and responsible. Introducing moral education and meditation practices in schools could have a significant role in increasing the number of ethical, honest and patriotic citizens. Responding to the queries, 94 percent (95% male and 90.5% female) of the respondents expressed the notion that children of Nepal should be provided with exposure to the teachings of the

Buddha at school. As the children of the nation which is the birthplace of the Buddha, they should know about the Buddha and his teachings. Whereas, 6 percent (5% Male and 1% female) provided a negative answer. The respondents with different education levels as well as age groups had similar views with Chi-square values of 4.56 and 0.68 at d. f. 4 and p-value 0.05 respectively.

Professionals' perceptions regarding Buddha's teachings in Nepal

Nepal is blessed with many sites linked to the Buddha, including Lumbini; therefore, Nepal has every potential of benefiting from the legacy and the teachings of the Buddha. Almost all (99%) of the respondents agreed that Nepal should be benefitted from the teachings of the Buddha. Nepalese youths should not ignore their cultural roots so they could prevent proselytization and promote age-old religious and cultural traditions. They suggested the ways in which Nepal as a nation could benefit from the teachings of the Buddha. They are as follows:

Introduction of the Buddha's teachings to the school curriculum

The majority of the respondents recommended the inclusion of the teachings of the Buddha to the school curriculum from the primary level. The potentials of Buddhism should be exploited in producing morally good and patriotic citizens. Some suggested that his teachings should be included in college-level also. The teaching materials should be prepared in simple and understandable language and offer insights into the fundamentals of Buddhism to students and the general public. Some respondents mentioned that the people from the birthplace of the Buddha should know and practice His teachings in daily life.

Some of the respondents also recommended including meditation as an extracurricular activity. Particularly, *Anapana*, breathing meditation should be introduced to children in schools. Likewise,

few suggested introducing moral education with other religious teachings including the texts The Bhagawat Gita.

Nepal should utilize Buddha's teachings and practices to its mission of prosperity

Many had the opinion that Nepalese should not only claim Nepal as the birthplace of Buddha but should practice His teachings. Being the birthplace of the Buddha, his teachings should be offered prominent access throughout the country so that both individual and community can benefit from the teachings. Many viewed the exposure to the teachings of the Buddha, particularly morality and meditation, as a lasting solution to the current problems the country is facing due to rapid decline in ethics and the moral values among leaders, bureaucrats and the private sectors.

They shared a view that the teachings of the Buddha will offer ways for authentic self-reflection and by following His path one can become a responsible human-being full of love and compassion, minus greed and misconduct. These responsible citizens of the country only can bring positive changes to the country. Hence, the politicians, decision-makers, bureaucrats, businessmen, and stakeholders from all walks of life should be provided the opportunity to be familiar with His teachings, particularly morality, meditation and the law of karma so that they can play a role in the mission to make Nepal prosperous. Moreover, it is not only Nepal, but the whole world could benefit from the teachings of non-violence and loving-kindness.

At the time when ethics and integrity are deteriorating everywhere, The Buddha's teachings should be made compulsory study for politicians, decision-makers and people from all walks of life. All the Buddhist (Mahayana, Vajrayana, and Theravada) and Non-Buddhist Nepalese people, including politicians, professionals, and non-professionals should be aware of the Gautama Buddha's teaching and its practical application to the communities. Respondents also recommended that *Anapana* and

mindfulness techniques should be taught to the bureaucrats and politicians as stress management.

Lumbini as the Center for World Peace

Likewise, respondents suggested developing Lumbini, the birthplace of the Buddha, as a site of meditation as well as a Center of Buddhist studies. Lumbini should be developed as the center for disseminating the message for world peace. It should be developed like Mecca and Medina in Saudi Arabia.

Furthermore, Nepal is so fortunate to be sanctified with Niglihawa, and Gotihawa the birthplaces of the previous Buddhas and many historic sites associated with the Buddha. These sites could have invaluable importance in promoting spiritual tourism. Nepal should develop a Buddhist circuit encompassing all these Buddhist sites and benefit from religious tourism.

Conclusions

The perception level of the intellectual circle in Nepal about the Buddha and His teachings is found to be not satisfactory. In the context when Buddhism is spreading all over the world, the level of awareness of professionals in the birthplace is quite low that 81 percent of the intellectuals are unaware of The Dhammapada, 72 percent of The Jataka Stories, 71 % of the Noble Eightfold Path and 65% of meditation. Furthermore, 15% of the professionals are still unaware of the life story of the Buddha; likewise, 35% are unaware of the Five Moral Precepts and 50% about the Four Noble Truth. These figures, which reflect the perceptions of intellectuals on the basic teachings of the Buddha, are enough to understand the way the general public of Nepal conceive of Buddhism. Amritopadesh (2007), a Buddhist monthly, in its editorial uncovered an alarming fact supportive to these findings that the people from Lumbini, Devdaha, and Ramgram, the famed Buddhist heritage sites, were unaware of the Buddha *Purnima*, the day when Prince Siddhartha was born, enlightened and attended *Mahaparinirwana*.

However, almost all (94%) of the respondents agreed that the Nepalese children should know about the Buddha and the teachings of the Buddha should be included in the school curriculum. Likewise, 99% had the view that Nepal should benefit from the Buddha and his teachings. The potentials of Buddhism should be exploited in producing morally good and patriotic citizens. They have also suggested developing Lumbini as the center for world peace and Buddhist studies.

The demolition of the Rana Regime in 1951 made the situation favorable for Buddhism. The fourth World Buddhist Conference (1956) was held in Kathmandu with the participation of dignitaries from different countries, including the father of the Indian constitution, Dr. Ambedkar. It was the first international conference ever held in Nepal (Bajracharya, 2019, P. 39) and played an important role in introducing Nepal in an international forum at the time when Nepal was in urgent need of international recognition. Lumbini continued to be the center of the growing international attraction and it was Lumbini that put Nepal on the World Map as a “*Zone Of Peace.*” Despite this, the Buddhist intellectuals have accused that the state of ignoring Buddhism. Lack of moral education in the curriculum has made Nepalese youths less responsive to their parents and community (Shakya, 2019, P: 61).

It is already more than a decade since Nepal declared herself as a secular country by the Constitution. Many respondents shared the view that Nepal while claiming to be the birthplace of the Buddha, should bring His teachings into practice. Being the birthplace of the Buddha, His teachings should be offered mass access throughout the country so that both individual, community and the entire country can benefit from such initiatives.

References

Bajracharya, M. (2019). Dharmodaya Sabha: A Historical Association. Dharmodaya Memorial. 12th National Buddhist

Conference, 6 & 7 April 2019. Besisahar, Lamjung, Nepal. P: 38-40.

Dutt, N. (1966). "Buddhism in Nepal". *Bulletin of Tibetology*. 3 (2): 27-45.

Education in Figures (2017) at a glance. Ministry of Education, Science, and Technology, Singadurbar, Kathmandu, Nepal. P: 3 to 4.

Paudel, A. (2018). Buddhako Nagarikata (Citizenship of the Buddha). *The Anandabhoomi*, year 45, Number 12, P: 19 to 21.

Sancrityayan, R. *Buddhacharya*. 6th Edition (2018). Samyak Prakashan, New Delhi. P: 91.

Shakya, B. R. (2018). Dharma Prakritik Niyam ho (Dhamma is a law of nature). *Sammyek Sandesh (Right message)*. National Bimonthly. Year 2, number 10, P; 17 -20.

Shakya, M. K. (2019). *Journey to Happiness*. Dongol Printers, Kalanki, Kathmandu, Nepal. P: 8 and 61.

Shakya, S. K. (1980). *Wisdom in Buddhist Psychology*. Synthetic Psychology Center, Tahachal, Kathmandu. P: 21.

Singh, R. (1997). *Vipassana in Government – An Effective Instrument for Change and Reform*, Vipassana Research Institute, Dhammagiri, Igatpuri - 422403 Maharashtra, India.

Thapa, S. (2001). *History of Nepalese Buddhism: From Mythological Tradition to the Lichhavi period*. *Voice of History*, Vol. XVI, No. 2, (Dec. 2001) P: 39

Udas, G. M. (2018). Buddha Dharmapratī Anudarwadīharuko Asahisnutako Prarambha, Wikas ra Parinam (Initiation of uncooperative behavior from the narrow-minded people to Buddhism: Development, and Result). *Anandabhoomi*, year 46, Number 5, P: 7 to 9.

Ven. Sujano, S. M. (2008). *Theravada Buddhism in Modern Nepal*. Lumbini Nepalese Buddha Dharma Society (UK) www.lumbini.org.uk

Notes for Contributors

The **OUSL Journal** provides a forum for previously unpublished research and review articles related in the areas of Agriculture, Natural Sciences, Education, Engineering, Humanities and Social Sciences and Health Sciences. It also provides a platform to publish research and pedagogy relating to teaching and learning at the University level, and in particular to Open and Distance Learning (ODL). It aims at encouraging sharing of quality research among a broader spectrum of an international audience.

Submissions: Submissions should be made either online at <https://ouslj.sljol.info/about/submissions/> or sent via email to the Editor-in-Chief at ouslj@ou.ac.lk.

Language: All submissions must be in English.

Length: Length of the article should be 3,000 to 6,000 words, excluding the Reference List. An Abstract of 200-250 words should be provided with the article.

Organization: The general organization of the article should be as follows: An introduction, clearly explaining the nature and scope of the study, purpose, and significance; Conceptual/Theoretical Framework; Review of Literature; Research Methodology; Results and Discussion of Findings; Conclusions and Recommendations. A brief acknowledgement section may be included. Appendices may be used.

Cover Page: Authors should include a cover page including a concise and informative title and the name/s of the author/s with affiliation/s, address/es, contact number/s and e-mail address/es of each author. (Authors' names should not appear elsewhere in the article).

Formatting: All submissions should be typed double-spaced with one-inch margin on all sides.

Tables and Figures: All Tables and Figures must be placed in the correct location within the article. These should be numbered separately using Arabic numerals, in the order in which they are

cited in text. Each Table/Figure should have a clear and concise caption. Figures must be submitted in camera-ready format.

Citations/References: The presentation of all citations and references should strictly adhere to the guidelines of the *Published Manual of the American Psychological Association-APA*. Use the most recent edition of *APA Style Guide*. Authors are responsible for the accuracy of all references. Where available, URLs and DOIs for the references should be provided.

OUSL Journal

Volume 14 No. 2 – December, 2019



Order Form

Name : -----

Position : -----

Organization : -----

Address : -----

Telephone : -----

Fax : -----

Email : -----

How to Pay

Please send me ----- copy/copies of the above Journal at Rs. 200.00 (Local)/ US\$20.00 (Foreign) each.

I enclose a Cheque (No. -----) for Rs. / US\$ ----- crossed and made payable to the "The Open University of Sri Lanka".

Date: -----

Signature: -----

Mailing Instructions

Please mail completed order form and cheque to:

The Librarian

The Library

The Open University of Sri Lanka

P O Box 21, Nawala, Nugegoda, Sri Lanka

Tel. 0094 11 2881254

Email: wsene@ou.ac.lk

OUSL JOURNAL

(JOURNAL OF THE OPEN UNIVERSITY OF SRI LANKA)

AUTHORS' RESPONSIBILITY STATEMENT

(To be read and signed by each author)

I/We certify that I/we have participated sufficiently in the conception, design and execution of this work and the analysis of the data (where applicable) as well as in the writing of the manuscript, to take public responsibility for it.

I/We certify that the material reported here represents original work carried out by me/us and that I/we shall produce the original data upon which the manuscript is based for examination by the editors or their assignees should they request it.

I/We understand that submission to the OUSL Journal implies that the manuscript will not be submitted elsewhere. Neither this manuscript nor one with substantially similar content under my/ our authorship has been published or is being considered for publication elsewhere, except as described in an annexure.

I/We hereby transfer (s), assign (s), or otherwise convey (s) all copyright ownership, including any and all rights incidental thereto, exclusively to the OUSL Journal, in the event that such work is published by the OUSL Journal.

We give the rights to the corresponding author to make necessary changes of the manuscript and he/she will act as the guarantor for the manuscript on our behalf. Title of the manuscript: We hereby jointly and severally take responsibility for authorship of the above paper submitted for publication in the OUSL Journal.

Title of Manuscript:

.....
.....

Authors' Names	Signatures	Date
1.....
2.....
3.....
4.....

OUSL Journal

Volume 14, No. 2 – December, 2019

Published Biannually by The Open University of Sri Lanka

- 1 Editorial
- 7 The Efficacy of Different Mulching Materials in Influencing Growth, Yield, Soil and Quality Parameters of Ginger Cultivated in Low Country Intermediate Zone (IL1) of Sri Lanka
R. P. D. N. Kumara and C. S. De Silva
- 31 Quality of Life Among Patients With Chronic Kidney Disease Who are Undergoing Haemodialysis at Two Selected Teaching Hospitals in Sri Lanka
M. A. S. S. Premadasa, H. G. I. M. Hulangamuwa, W. A. D. H. Wijesooriya and T. D. Amarasekara
- 57 “Your Majesty, your son is unable to learn?”: A Study of the Notions of ‘Learning’ and ‘Teaching’ Inscribed in a Sample of Southern Folk Tales from Ancient Lanka
Lal Medawattegedara
- 75 Use of Selected Essential Oils for Controlling Stem-end Rot Disease in Mango (cv. Karuthacolomban)
Anjali A. Kulasinghe, K. O. L. Chathurika Karunanayake and S. Somaratne
- 91 Commuter Travel Pattern to OUSL Nawala: A Case Study
L. M. Prathapasinghe, D. B. Maddumaarachchi, G. N. Damayanthi, and K. S. Weerasekera
- 123 Perceptions of Buddhism among Professionals in Nepal
Mahendra Kumar Shakya