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Editorial

This is the eighth Volume of the OUSL Journal, the journal of the Open University of Sri Lanka. The articles published in this issue cover research on Distance Education, Agriculture, and Bilingual Education Policy in Sri Lanka, Lifestyle Factors influencing Coronary Heart Diseases, Protective Techniques needed in Fluoroscopic Guided Surgeries, and Legal Issues related to Domestic Violence.

Extensive cultivation of vegetables and other crops causes depletion of natural phosphate content in soil. In order to enrich soil, farmers use phosphate fertilizer. A majority of Sri Lankan farmers applied higher quantities than the recommended amount, expecting higher yields. This over application of phosphorus fertilizer creates several environmental problems. Koralage *et al.* in their paper discuss these issues and the development of a simple and quick method to determine the available phosphorus in soil so that farmers themselves can estimate the amount of phosphorus fertilizer needed to apply to soil before they begin cultivation.

Agricultural activities (*e.g.* paddy and vegetable cultivation) in the dry zone of Sri Lanka are affected by inadequate rainfall and increased temperature. Gunawardena and De Silva, in their article, discuss the impact of induced temperature and water stress on vegetative and reproductive parameters of tomato variety *Rajitha*. Results show that there are severe yield reductions due to pollen sterility under high temperature. Therefore, farmers are advised to cultivate tomato variety *Rajitha* under greenhouse conditions providing adequate water as it was unsuccessful in open field conditions.

V. V. Medawattegedera, in her paper titled "*Kaduwa (a weapon) or Manne (a tool)? Issues and Tensions Related to Bilingual Education Policy in Sri Lanka*", examines issues and challenges of the Bilingual Education policy initiated by the Ministry of Education in 2002. It acknowledges that the Ministry of Education does not still have a policy document other than a set of circulars and that each new circular seems to be an attempt to rectify misunderstandings because of the lack of clarity in policy.

Sivajenani *et al.* study the influence of lifestyle factors (*e.g.* dietary habits, pattern of exercise, habit of smoking, and alcohol intake) on Coronary Heart Disease (CHD) patients at the Teaching Hospital Jaffna. The results reveal that substantial proportions of CHD patients in the Teaching Hospital Jaffna did not have regular exercise and that a considerable number of participants was influenced by smoking and a few of them were at risk of CHD due to habitual alcohol consumption. Most of the participants had a poor educational background and as a result, they were self-employed as drivers, mechanics, laborers and fishermen.

Three years ago, the Faculty of Education of the Open University of Sri Lanka introduced several innovations, namely course team approach, training workshops for marking examiners, Activity Based Assignment Day Schools (ABADS) and appointment of centre coordinators for improving the quality of the Continuous Assignments (CA) mechanism of the Postgraduate Diploma in Education (PDGE) programme. Lekamge *et al.* in their article, evaluate the effectiveness of those components in improving the quality of the CA mechanism. Their finding reveal that the majority of student teachers, visiting academics and marking examiners was satisfied with the new innovations and admired the positive changes taken place in setting, marking and monitoring of assignments.

Dilusha et al. in their paper, present protective techniques followed by nurses to prevent X-ray exposure during fluoroscopic guided surgery at three hospitals in Sri Lanka; namely the National Hospital of Sri Lanka (NHSL), Colombo South Teaching Hospital (CSTH), and Sri Jayewardenepura General Hospital (SJGH). It was found that insufficient protective garments and equipment, poor use of modern technology, lack of training and poor knowledge on international standards are the major concerns/problems in using protective techniques to prevent X-ray exposure. They recommend that the nurses be properly trained before they are appointed to work at theatres with fluoroscopic guided surgery.

Domestic violence has a long history in Sri Lanka where victims are mostly women. According to the Istanbul Convention of 11th May 2011, "*domestic violence*" means "*all acts of physical, sexual,*

psychological or economic violence that occur within the family or domestic unit or between former or current spouses or partners, whether or not the perpetrator shares or has shared the same residence with the victim". The paper titled "*Domestic Violence: Is the Sri Lankan woman still trapped in the private sphere?*" by Sunethra Goonetilleke examines the international treaties and conventions containing provisions relevant to domestic violence such as the Universal Declaration of Human Rights (UDHR), International Covenant on Civil and Political Rights (ICCPR), the International Covenant on Economic, Social and Cultural Rights (ICESCR) and the convention on the elimination of all forms of Discrimination against Women. Then, she discusses the Prevention of Domestic Violence Act No 34 of 2005, which provides a viable solution to those confronted with domestic violence in Sri Lanka. Finally, this article explains the Sri Lankan legal position on domestic violence and the extent to which Sri Lanka has succeeded in formulating a legal framework for victims of domestic violence.

The current issue also includes the Convocation Address-2015 made by Professor Naveed A. Malik on the importance of Distance Education and its relevance to the current job market based on his experience at the Virtual University of Pakistan. The present job market looks for individuals who are prepared to update/acquire knowledge in more than one specialisation. In this regard, ODL provides an invaluable opportunity for self-motivated independent learners to achieve their goals by studying or offering Open Educational Resources (OER), Open Courseware (OCW) and Massive Open Online Courses (MOOCs).

We welcome your suggestions for further improvement of this journal. We look forward to publishing your current research findings in our next issue.

Professor K. Sarath D. Perera
Editor-in-Chief

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The Determination of Available Phosphorus in Soil: A Quick and Simple Method

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Abstract

The study attempts to develop a quick and a simple phosphorus (P) testing method to get the idea about the P level in the soil for farmers so that they may be able to decide the amount of phosphorus fertilizer for their cultivation. Four new phosphorus extraction methods were used which are Mogen's method, distilled water method, basify distilled water method and acetic acid method. Extracted phosphorus was measured by Murphy and Riley colorimetric method and correlated each method with the Olsen method because Olsen method has grown in stature and reputation over the years as the best and cheapest method suitable for mild acidic to base soils. The significant correlations (r^2) of Mogen method, distilled water extraction method, basify distilled water extraction method and acetic acid extraction methods with Olsen method were 0.734, 0.585, 0.654, and 0.854 respectively. The acetic acid phosphorus extraction method which has the best correlation with the Olsen method was further simplified and its significant correlation with the Olsen method was 0.855. Simplified acetic acid method was the best simple P extraction method in the field level test and the extracted P can be measured using the newly introduced color chart in this study. Subsequently a field soil testing kit was developed based on the results for the farmers to test the soil phosphorus content by themselves before the cultivation and decide on phosphorus fertilizer application.

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Keywords: Soil phosphorus, testing, fertilizer application, Olsen's method, Murphy and Riley method

Introduction

Phosphorus is a major essential plant macro nutrient which is needed for plant growth and development. Extensive cultivation of vegetables and other crops along with natural hazards cause for depletion of natural phosphate content in the soil. Therefore, phosphate fertilizers have been used to overcome this depletion and to enrich the respective soil.

Different types of crops may differ in their fertilize requirements. Therefore, fertilizer recommendations are available for crop to crop which were recommended by the Department of Agriculture for each crop as per to the nutrient consumption of each crop. But the majority of Sri Lankan farmers apply higher than the recommended amounts of such fertilizer aiming for higher commercial benefits through a well growth. Due to this over application, phosphorus in some forms accumulates in intensive cropping lands which cannot be taken up by the plants, thus, creating several environmental problems. For soils, P fertilizer responsible in accumulating heavy metals in intensive cropping lands (Allaway, 1971) and for water ways, Phosphorous that is washed into waterways may lead to eutrophication, which has serious health problems for both human and animals (Rohlich *et al.*, 1980).

Knowing the level of available P in farmland is very important to manage the phosphorus supply by soils. Consequently, the most important tool for such is a soil test which could be used for P recommendations for the crop grown. Making site-specific fertilizer recommendation will no doubt result in economical and environmental benefits.

Soil analytical laboratories of Government Department of Agriculture in Sri Lanka provide the service of soil phosphorus testing in general which widely used Olsen's method (Olsen *et al*, 1954) to extract the available soil P from soils. Olsen's method is most accurate method for soils in the range of mild acidic to basic pH. Since farmers have to travel far and handover their soil samples to soil testing laboratories and to pay, they do not tend to get their soils analyzed before cultivation. If there would have been a rapid and an easy method for testing phosphorus in the soil outside of a laboratory, so that farmers could test the soil, by even with the assistance of

Agricultural Instructors, such may iron out the constraints faced by them.

The simple and rapid methods have several benefits such as reducing the time taken, skills, equipments and chemicals *etc.* Such may in turn create more benefits for farmers through motivating them to do soil testing without waiting for the result and to get the P level in their soil they cultivate just before the starting the cultivation enabling them to apply proper dose of P fertilizer. Therefore, this study was undertaken to introduce a new, simple and low cost soil phosphorus testing method which can determine soil available phosphorus *in-situ.*

The fundamental goal of soil P testing has always been to identify the "optimum" P concentration required for plant growth. The need for additional fertilization or manuring, and the economic return on an investment in P fertilizer, could then be predicted. Sims *et al.,* (1998) stated that other objectives of soil P testing have been to: (i) "index" the P supplying capacity of soils, thus estimating the time before fertilization would again be required; (ii) group soils, in terms of the likelihood of an economic response to P, based on their physical and chemical properties; and, (iii) most recently, to identify when soils are sufficiently excessive in P to contribute to non point source pollution of surface and groundwater. Bray (1948) proposed that an acceptable agronomic soil P test should have the following characteristics:

- The soil test should extract all or a proportionate amount of the plant-available P forms in soils with differing chemical and mineralogical properties.
- The soil test should be accurate and rapid.
- The P extracted by the soil test should be well correlated with plant P concentration, plant growth, and the response of the plant to added P in forms of fertilizers or manure.
- The soil test should accurately detect differences in soil P concentrations caused by previous fertilization or manuring.

Soil testing is a useful tool in making site-specific fertilizer recommendation, will no doubt result in economic and environmental benefits. During the past forty years, testing procedures have been improved remarkably with greater emphasis on precision and efficiency (Silva *et al.*, 2007).

Several soil tests are used to assess phosphorus availability. The Ammonium bicarbonate - Diethelenetriaminepentaacetic acid (NH_4HCO_3-DTPA) soil test for the simultaneous determinations of available N, P and micronutrients was developed by Soltanpour and Schwab (1977).

Sodium bicarbonate ($NaHCO_3$) soil test for phosphorus has been used extensively. The experience in Britain is that extraction of soil with sodium bicarbonate is generally the best method on which to base advice to farmers on fertilizer used. In this method, 5 cm^3 soil (<2 mm) is extracted for 30 minutes with 100 cm^3 0.5 $NaHCO_3$ solution (pH adjusted to 8.5). After filtration the phosphate concentration of the solution is measured calorimetrically and the result is expressed as mg per liter of soil (Olsen *et al.*, 1954).

Extractable Phosphorus in dilute solutions as $CaCl_2$, saturation extracts, and displaced soil solutions are useful indices of phosphorus availability (Olsen and Sommers, 1982; Soltanpour and Schwab (1977). However use of a $CaCl_2$ solution is easier than the use of displaced soil solution or saturation extract to measure phosphorus availability. The $CaCl_2$ extract approximates the composition of the soil solution (Khasawneh *et al.*, 1967).

Researchers have used Ethelenetriaminepentaacetic acid (EDTA) or its salts for evaluating the nutrient status of soils. A neutral solution of 0.02 M Na_2EDTA extracted solution has a high correlation between Na_2-EDTA extractable soil P and plant P (Ahmad and Islam, 1975).

Measurement of the P amount transferred to the solution phase during the extraction can be done colorimetrically or by using inductively coupled plasma (ICP) spectroscopy. The ICP determination gives the total amount of P in solution and thus, to analyse phosphate, requires the use of colorimetric methods. The most commonly used molybdenum blue method, developed by Murphy and Riley (1962), is based on the reaction of PO_4-P with molybdate to form a blue compound at low pH in reducing conditions. The intensity of the color corresponds to the concentration in the solution and can be measured with a spectrophotometer. The concentration of total phosphorus (TP) in the solution can be determined colorimetrically after digestion of the sample, *e.g.* in autoclave with oxidizing chemical, such as persulfate ($K_2S_2O_8$).

In molybdenum blue method, the colored compound is formed with free PO_4-P and the resulting concentration is thought to represent the dissolved phosphate. However, problems involved in measuring dissolved phosphate with the molybdenum blue method were acknowledged already in 1968 when Rigler hypothesized that the molybdenum blue methods give values for dissolved PO_4-P that are too high because of the hydrolysis of PO taking place in the acidic conditions required for molybdenum blue complex formation. Turner *et al.* (2005), however, concluded that the error caused by acid hydrolysis is likely to be negligible in quantitative analysis and, in fact, reported molybdenum blue method to give too low values for PO_4-P in solution because of PO_4-P associated with organic molecules may precipitate in acidic conditions during the color formation. Yet another source of error in the analytical procedure for measuring the phosphate with the molybdenum blue method results from the fact that the intensity of the color reflects only the amount of phosphate phosphorus (PO_4-P) in the sample leaving the other phosphate compounds, such as poly-pyrophosphates, undetected (Turner *et al.*, 2005). This kind of underestimation of phosphate concentration by molybdenum blue method can be demonstrated by using ^{31}P-NMR spectroscopy (Turner *et al.*, 2006).

There are several rapid soil testing kits are used all over the world. Most of the field soil kits available based on test strips, visual comparator and photometer kits. These kits are very expensive and the minimum cost will be around 10000 rupees. This will be expensive for Sri Lankan farmers. Therefore, this study intend to develop a simple and rapid soil phosphate testing kit to be provided for the farmers free of charge or at an affordable price. Then the farmers can determine the P concentration in soils in order to decide the P manuring.

Materials and Methods

Soil samples received under the soil testing program of Agricultural Chemistry division at the Horticultural Crops Research and Development Institute, Gannoruwa were used for this study. Seventy five samples were included for the study. Phosphorus content in each sample was determined using the Olsen method to extract the available soil phosphorus (Olsen *et al.,* 1954) and Murphy and Riley method (1962) was used to measure the extracted phosphorus amount. Olsen method was used because the pH of soil samples collected were in the range of 4.4 to 7.1 represents the mild acidic to basic condition. Olsen method was the appropriate and low cost

method widely accepted over the years for such mild acidic to basic soils.

Development of a New Method for Measure the Soil Phosphorus

As the available phosphorus testing methods, development of a simple and rapid method to quantify the soil available phosphorus was carried out with two steps; namely 1. Extract the available phosphorus in soil and 2. Measure the extracted phosphate. The selected soil samples were used to do this study.

Available Phosphorous in each sample was extracted using four different extraction methods

i. **Morgan's method.**
   0.72 N Sodium acetate + 0.52 N Acetic acid solution was used as the extractant in this method.

ii. **Basify distilled water method.**
   Distilled water basified using NaOH and pH adjusted to 8.5 was used as the extractant.

iii. **Distilled water only method.**
   The extractant was the distilled water (pH 4.8) in this method.

iv. **Acetic Acid method.**
   2.5% acetic acid solution was used as the extractant.

The same soil sample was used to measure the amount of phosphorus extracted by 4 different extraction methods. For each method, 5.0 g of soil and pinch of P free charcoal were mixed with 50 ml of each extractant in a dry and clean plastic bottle. The solution was shaked manually for 2 minutes and filtered using No. 5 Whatman filter paper. The extracted soil phosphorus was measured by Murphy and Riley (1962) method.

Phosphorus concentrations obtained from each extraction method were compared by correlating with phosphate obtained by the Olsen's method.

Further Simplification of the Best Correlating Method

Acetic acid extraction method was further simplified. The selected 75 soil samples were also used for this method. 5.0 g of soil sample was added in to a clean and dry plastic battle. 50 ml of 2.5% acetic acid solution was also added and extracted for 2 minutes mixed with hand, kept for about 3 hours (Figure 1) until the supernatant was separated. The supernatant was analyzed for phosphorus using "Murphy and Riley colorimetric method" (1962). In this method neither phosphorus free charcoal added nor filter paper was used to filter the solution which reduces the cost further to develop the soil testing kit in this study.

The experience in Britain is that extraction of soil with Olsen's method is generally the best method on which the advice to farmers on fertilizer application was based. Presently the Olsen's extraction method is used to measure the available phosphorus in soil which estimates the relative availability of *ortho*-phosphate (PO_4-P) using 0.5 N $NaHCO_3$ adjusted to pH 8.50 (Olsen *et al.*, 1954). Further the soil samples collected in this study has the pH range of mild acidic to basic (pH 4.4-7.2) and the Oslen method is the best suited method for such soils. Therefore, all the extraction methods were statistically compared by correlating with the Olsen method.

(a) (b)

Figure 1. (a) The mixed soil solution in simplify acetic acid method.
(b) The soil solution after 3 hours with the supernatant

Results and Discussion

1. Selection of the Best Phosphorus Extraction method

Four different extraction methods, Morgan's extraction method, distilled water and basify distilled water extraction methods and acetic acid extraction method were used to extract available phosphorous in selected soil samples. The soil phosphorus contents extracted using the four different extraction methods were measured using the Murphy and Riley colorimetric method and the results were correlated with the Olsen's method. The correlations were taken from the Regression analysis, thereby selected the best extraction method which has highest correlation with Olsen's method.

Figure 2 shows that the corelation of each extraction method; distilled water and basify distilled water methods, Morgan's method and acetic acid method respectively. The linear relationship is expressed as r^2. The r^2 values of distilled water only method, basify distilled water method; Morgan's method, and acetic acid method were 0.589, 0.653, 0.734 and 0.853 respectively. According to the study, all the r^2 values were in the range between 0.5 – 1.0, hence, all the new methods have ideal correlations with Olsen's method.

Distilled water was used in the study as an extractant as per to its several advantages. Distilled water in common is easily available, relatively inexpensive; shelf life is longer in optimum conditions, ease of handling in simple field level tests. But, r^2 value for distilled water only method with Olsen's method was 0.589 which was the lowest correlation among other 4 extraction methods following to Basify distilled water method. Therefore, this method disqualifies in extracting available phosphorous in soil.

The r^2 value of Morgan's method used in this study was 0.734 and it was closed to the r^2 value (0.74) reported by Foy et al. (1997). Foy *et al.*, have compared Olsen and Morgan soil phosphorus tests using 199 soil samples using electrical shaker to mix the soil suspensions and in our study soil suspensions were mixed by hand. The r^2 difference between Foy's study and the present study was 0.006. It shows there has no significant difference between hand mixing method and electric shaking for mixing soil suspension. In this study hand mixing method was used for all the modified extraction methods as the particular extraction method should be simple and easy to do at field level.

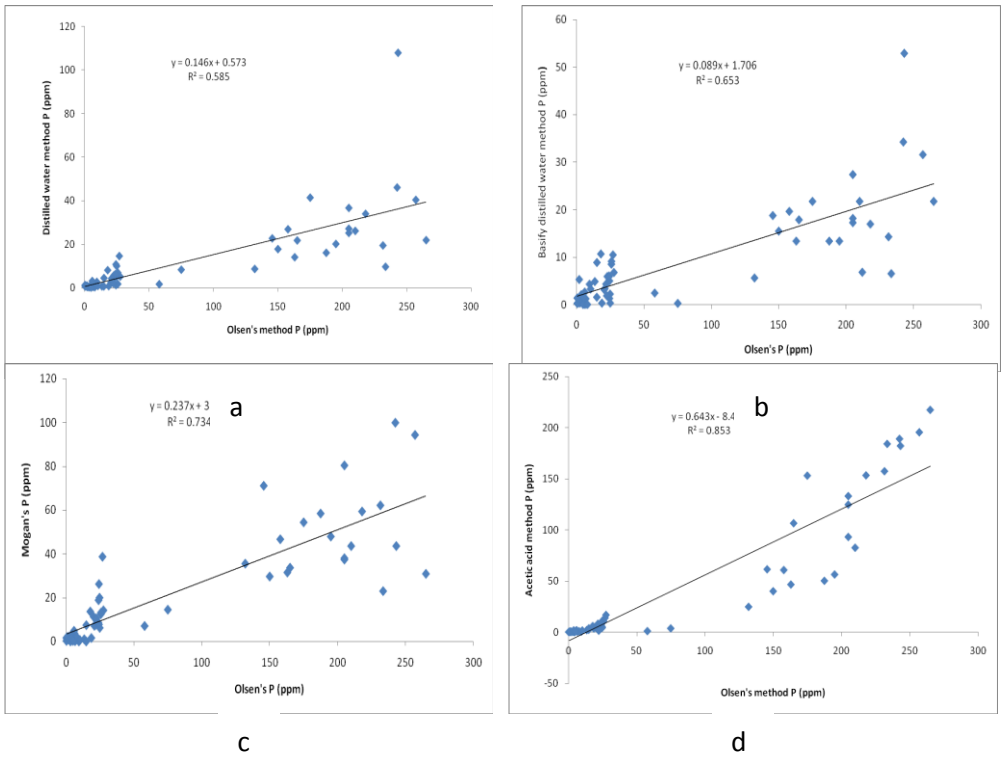


Figure 2: (a) Regression analysis of distilled water method and Olsen's method

(b) Regression analysis of basify distilled water method and Olsen's method

(c) Regression analysis of Morgan's method and Olsen's method

(d) Regression analysis of acetic acid method and Olsen's method

Acetic acid method consists only of 2.5% Acetic acid solution and no sodium acetate as in Morgan's method. However the r^2 value of Acetic acid method was 0.853, which was the highest correlation with Olsen's method.

According to the results obtained in the study, correlation order can be expressed as; Acetic acid method > Morgan's method > Basify distilled water method > Distilled water method. Hence, the Acetic

acid method was selected as the best extraction method to extract available phosphorous in soils.

2. Simplification of the Best Extraction Method

The Acetic acid method was further simplified to fine tune the results. The supernatant of the soil suspension was used to measure the extracted phosphorus without using the filtrate. It saves the cost of filter papers too in the simplified method. Figure 3 shows the Regression analysis of simplify acetic acid methods with Olsen's method.

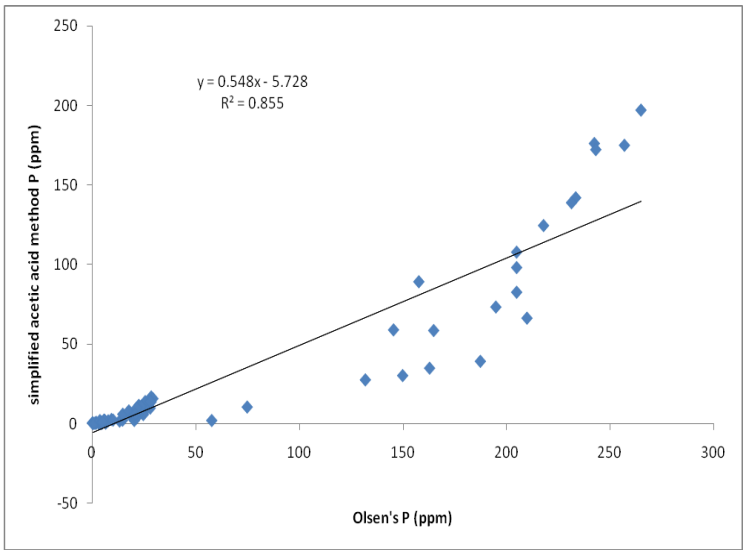


Figure 3. Regression analysis of Olsen's method and simplify Acetic Acid method

Regression analysis of figure 3 shows a significant correlation between Olsen's method and simplified acetic acid method (R^2 = 0.855). Therefore the simplified acetic acid method was selected as the simplest soil phosphorus extraction method which can be applied for phosphorus test in field level.

3. Development of Phosphorus Identification Color Chart

Murphy and Riley colorimetric method was used to determine the phosphorus amount in extracted solution. Color developing regent was added in to the soil filtrate before measure the phosphorus amount. The molybdate ions in the color developing regent ordinate with phosphorus in the soil extract as the central coordinating atom

forming heteropoly complexes (Murphy and Riley, 1962). This complex was blue in color. The intensity of the blue color was increasing with the phosphorus ions in the extract. Therefore according to the blue color intensity of the repaired phosphorus extract the phosphorus level of it can be determined.

A color chart was prepared for the identification of the phosphorus level in the extraction through the blue color intensity. Simplified acetic acid method phosphorus content of low phosphorus soil, medium phosphorus soil and high phosphorus soil were calculated to make the color chart.

Olsen's phosphorus content of soil is expressed as ppm in table 1

Table 1. Olsen's phosphorus content of soil

	Available P (ppm)
Extremely high	>30
High	22.5 - 30
Medium	15 - 22.5
Low	<15

According to the equation of regression graph of Olsen's method and simplified Acetic acid method (Figure 3) simplified acetic acid method phosphorus content of soil was calculated and presented in Table 2.

To get the blue color intensity of 2.5 ppm, 6.6 ppm and 10.7 ppm P solution, sample series was prepared using 5 ppm phosphorus solution, color developing regent and distilled water. The phosphorus contents of prepared samples were measured using the spectrophotometer at the wave length of 880 nm. Samples were selected the which had 2.5 ppm, 6.6 ppm and 10.7 ppm phosphorus (Figure 4) and their blue color intensities were used to prepare color chart. The color chart consists of 3 different intensity of blue color (Figure 5).

Table 2. Simplified acetic acid method phosphorus content of soil

	Available P (ppm)
Extremely high	>10.7
High	6.6 - 10.7
Medium	2.5 - 6.6
Low	<2.5

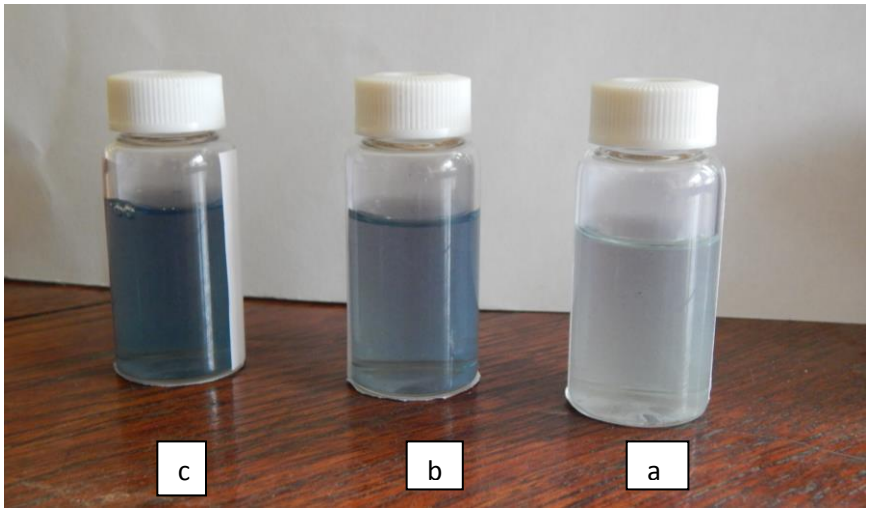
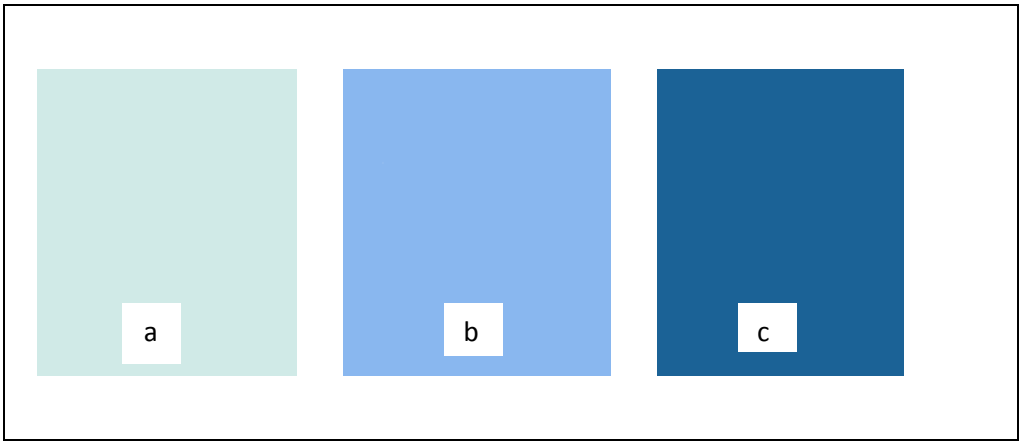


Figure 4. 2.5 ppm (a), 6.6 ppm (b) and 10.7 ppm (c) phosphorus samples



Colour	**P content**
>(c)	Extremely high P soil
Between (b) and (c) color	High P soil
Between (a) and (b) color	Medium P soil
<(a)	Low P soil

The color chart consists of three different intensity of blue color. A color developed sample's phosphorus level can be determined using this color chart.

4. Newly Developed Soil Phosphorus Testing Tool Kit

This tool kit was developed based on the findings of this study. The new soil available phosphorus test can be applied in the field with this tool kit. The tool kit includes distilled water, 2.5% acetic acid solution, mixed regent, ascorbic acid, a clean glass bottles, the soil P color chart and also the note of the procedure of new phosphorus testing method. Figure 6 shows a model of a simple tool kit developed in this study. This tool kit is very easy to transport and handle and not cost more than Rs 200. However, these kits could be given to farmers free of charge or at an affordable price. The soils P can be measured according to the procedure introduced by this

study by using this tool kit by the farmers themselves and decide the phosphate fertilizer application.

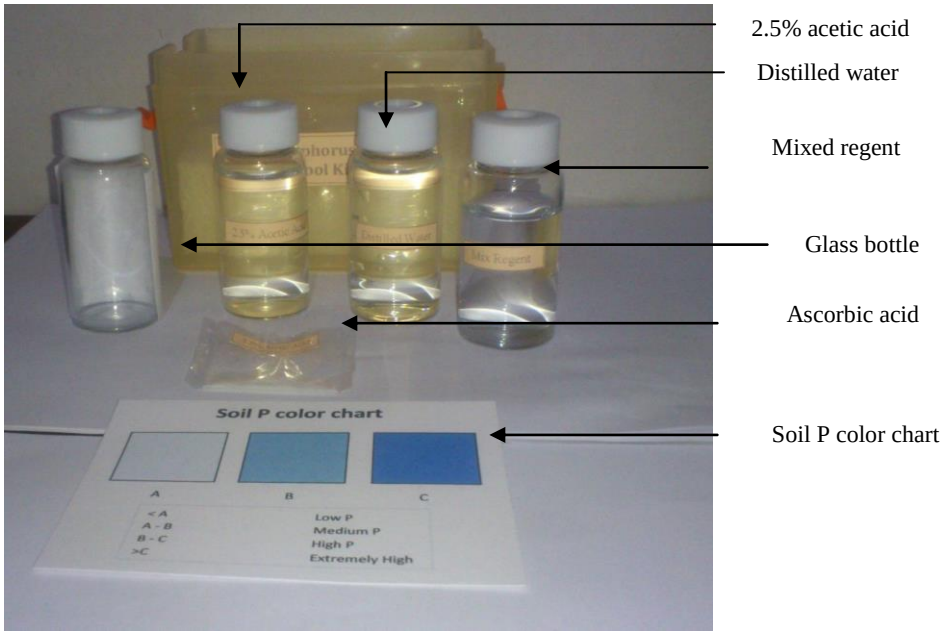


Figure 6. Newly developed soil available P testing tool kit

**color developing regent cannot be stored long period of time. Mix reagent and ascorbic acid can be stored separately and can be prepared the color developing regent by mix those together few minutes before using.

The Procedure of New Phosphorus Testing Method

1. Take a soil sample as the recommended procedure
2. Remove the large soil particles and foreign materials from the sample.
3. Take 5 g of soil and put it in to a clean and dry plastic bottle.
4. Add 50 ml of 2.5% acetic acid solution in to the bottle.
5. Mix the solution two minutes manually.
6. Keep the solution for about three hours until the supernatant separates.
7. Put 5 ml of supernatant in to a transparent glass bottle.
8. Add 5 ml of color developing regent** in to it.
9. Add 5 ml of distilled water.
10. Mix the solution well and keep it for about 15 for minutes to develop the blue color.
11. Measure the blue color intensity using the color chart. Thereby identify the phosphorus level in the soil.

To get the accurate level of phosphorus, soil sample should consist of fine particles and it should be dry. Wet soils samples can be used to test for phosphorus after allow it to dry.

Conclusion

The simplify acetic acid method which has the best significant correlation with the Olsen's method can be introduced for the determination of available phosphorus. The method developed in this study by reducing the tools and equipments, reducing the extraction time, introducing manual shaking for 2 minutes which is suitable for extract soil phosphorus in the field level test. Not specific equipments need to apply this method. The soil testing kit developed in this study use the commonly available low cost materials which

can be given for farmers as a tool kit free of charge. The total cost for this developed tool kit is less than Rs 200.

Extraction phosphorus measuring method is very easy. The introduced phosphorus color chart can be handled easily to measure the extracted phosphorus level, after developing the blue color of extracted solution. Therefore even farmers can use this test tool kit to measure the available soil phosphorus in the lands before the cultivation and decide the phosphorous fertilizer application appropriately. This finding will help the farmers to test the available soil phosphorus content without any additional cost accurately and reduce the cost of fertilizer application. Consequently it will reduce soil and groundwater pollution due to over use of phosphorus fertilizer application which is a national need.

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Impact of Induced Temperature and Water Stress on Vegetative and Reproductive Parameters of Tomato *(Lycopersicum esculantum)* Variety Rajitha

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Abstract

The main aim of this research was to study the influence of simulated temperature and water stress on vegetative, reproductive and quality parameters of Tomato (variety Rajitha). Experiments were conducted in the temperature regulated poly tunnel during the growing seasons of 2010 and 2011 in the agricultural field located at Nawala, Nugegoda at the Open University Sri Lanka to evaluate the enhanced temperature (temperature rise by 2°C) and water stress (50% depletion) effects for Tomato plants. Split plot experiment based on complete randomized design with 10 replicates was applied as experimental design. The plants were grown in pots under temperature-controlled poly tunnels and half of the samples was subjected to water stress (50% from field capacity), and the rest of the samples were kept at field capacity of soil moisture. Main plot included two different irrigation applications (No water stress, 50% water stress from the field capacity) and sub plots contained 3 different temperature regimes (34°C maximum temperature poly tunnel, 32°C maximum temperature poly tunnel, ambient temperature 30°C). Individual water stress showed a highly significant effect on vegetative and reproductive parameters. Tomato fruit setting was minimum at 32-34°C temperature range due to pollen sterility. The combined effect of water stress and temperature stress proved to be a significant drawback for vegetative and reproductive growth and also for quality parameters of Tomato. Therefore, Tomato (variety Rajitha) cultivation becomes unsuccessful if there is water and temperature stress condition.

Keywords: Tomato, temperature stress, water stress, yield parameters, quality parameters

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Introduction

"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC, 2007). Even with sufficient mitigation measures the current scientific consensus holds that greenhouse gas emissions and atmospheric concentrations are set to increase for some decades. Consequently, global mean surface temperature will continue to rise long after an emissions peak has passed. There is room for debate and uncertainty as to exactly how much warming there will be and at what rate it will unfold, but the general trend of the curve is clear when it concerns about the world average records (IPCC, 2007). Predicted changes in temperature and other climate functions will impact Agro-ecological conditions and food production of the world.

"Tomato" (*Solanum lycopersicum*) refers to the plant or the edible, typically red, fruit that it bears. Tomato (*Solanum lycopersicum*) fruit is consumed in diverse ways, such as raw in salads and as an ingredient in many dishes and sauces, and as drinks. The fruit is rich in lycopene, which may have beneficial health effects (Rangana, 1986). In some studies, lycopene, especially in cooked tomatoes, has been found to help prevent prostate cancer (Rangana, 1986). Lycopene has also been shown to improve the skin's ability to protect against harmful UV rays. Natural genetic variation in tomatoes and their wild relatives have given a genetic plethora of genes that produce lycopene, carotene, anthocyanin, and other antioxidants. Tomato varieties which are available will double the normal vitamin C, 40 times normal vitamin A, high levels of anthocyanin (resulting in blue tomatoes), and two to four times the normal amount of lycopene (numerous available cultivars with the high crimson gene).

Amongst vegetable crops, Tomatoes are the most important horticultural crop in the world and grown on over 4 million hectares of land area (FAO, 2004). Tomato is an important popular vegetable crop grown throughout the year in both *Maha* (October to February) and *Yala* (March to September) seasons in the dry zone of Sri Lanka. It is a rapidly growing crop with total growing period varying from 90-150 days and also a day neutral plant. Tomato can grow in a wide range of soils but a well drained sandy loam with pH of 5 to 7 is preferred. Water logging leads to incidence of diseases such as bacterial wilt. The ideal population is about 40000 plants/ha (Anon, 1990 - Department of Agriculture-Techno guide, 2009).

Tomato is widely cultivated by a considerable portion of farming communities in all agro-ecological zones of Sri Lanka. It is important to study the effects of both temperature and water stress on the growth and yield of this vegetable which may result from global warming. Tomato production is limited by high day time temperature and, especially by high night time temperature (Moore and Thomas, 1952). Peet *et al.* (1997) which demonstrates that daily mean temperature is more critical than night time temperature. Dinar and Rudich (1985) reported that in Tomato plants, high temperatures affect several physiological and biochemical processes dealing finally with yield reduction. This research aimed to determine the effect of temperature and water stress on vegetative, yield and quality parameters of Tomato (*Lycopersicon esculentum*) variety, Rajitha as this variety is widely cultivated by farmers for its good marketability.

Methodology

Induced Environmental Conditions

All the experiments were conducted at the Open University of Sri Lanka, Nawala, Nugegoda, from September 2009 to April 2011 for the 3 consecutive seasons. Poly tunnels were constructed in order to maintain the stipulated temperature conditions by means of thermostat and air circulation fans (Figure 1). Poly tunnels are 7 m in length, 3 m in width and 4 m in height with a half dome shape top and opened in the middle of the half dome to facilitate the air circulation. One set of poly tunnel was maintained at 32°C (± 2°C) maximum temperature and the other set of polytunnel was maintained at 34°C (± 2°C). When the temperature increases above the respective maximum temperature, the fans start to operate automatically until the temperature is controlled to the maximum temperature fixed for that particular poly tunnel.

Crop Management

Tomato (variety Rajitha) seeds were obtained from the Department of Agriculture, Gannoruwa where quality and purity are certified. Nursery was prepared with well aerated and fumigated top soil on a tray and seeds were sown in rows at 1 cm depth. Tomato seedlings were transplanted into individual plastic pots (30 cm diameter and 30 cm deep). The pots were filled with a compost and reddish brown earth soil mixture. This vegetable was grown at 3 different conditions as explained above. In the management of this crop, recommendation of the agricultural department was adopted for

fertilizing, weeding etc. except water management (Anon, 1990). N, P and K fertilizer applications were also followed according to the Department of Agriculture recommendation such as 100 kg/ha N, 65 kg/ha P, and 160 kg/ha K depending on the soil test. The crop has a fairly deep root system reaching as far as 1.5 m. The maximum rooting depth occurs about 60 days after transplanting resulting in a maximum ET_o of 6 mm/day. The plants are adversely affected when more than 40 present of the total available soil water has been depleted (Doorenbos and Kassam, 1979).

Chemical control of pest and diseases was done by application of Atabron (a.i. chlorfluazuron) and Vondozeb (a.i. Mancozeb) at 4, 6 and 8 WAP. In addition, pegging at 4WAP, application of top dressing at 3 and 6 WAP and regular observations were done.

(a) (b)

Figure1. Temperature regulated poly tunnel (a) outside and (b) inside

Experimental Design and Statistical Analysis

The experiment was laid out at split plot experimental design in a complete randomized manner with ten replicates for the main plot treatment. The main plot included two different soil moisture conditions by irrigating such as field capacity (no water stress) and 50% of the field capacity imposed (water stress) while the sub plots contained 3 different temperature regimes; 34°C (maximum), 32°C (maximum) and ambient temperature at open space. Soil moisture measurements were carried out using tensiometer. Data were analyzed using split plot analysis of variance. There were two factors *i.e.*, temperature stress and water stress. All extraction runs and analyses were carried out at least in duplicate and in randomized

order with the mean values being reported. Analysis of variance (ANOVA) of the results was performed using General Linear Model procedure of SPSS (Software Version 19). Multiple comparison of the various means were carried out by LSD (Least Significant Difference) test at P = 0.05 and p = 0.01 as the usual procedure.

Irrigation Levels

The soil water content in half of the pots was kept at field capacity by compensating the loss in weight by adding water. Each pot was filled with 5 kg of air dried soil. Other normal agronomic practices for each crop were followed. Two water regimes were imposed which were well-watered treatment at field capacity and water stress imposed by reducing the soil water content until 50% of the field capacity level .

Soil moisture was determined prior to each irrigation event and daily rainfall and pan evaporation data were recorded. Soil bulk density was measured to calculate volumetric water content of soil. The upper limit (field capacity) and the lower limit of the available soil moisture contents of volumetric basis were considered as 28% and 16% respectively.

Soil field capacity was calculated on soil dry weight basis. Water stress treatments were, imposed when the plants were established. Only the deficit amount of moisture was added to the root zone to attain field capacity. Before starting addition of water, Tensiometer was fixed to the soil of the polyethylene encircled root zone.

Evaluating Vegetative and Reproductive Parameters of Tomato Plants

The transplant success (survival rate) was estimated by the percentage of plants that showed successful establishment at 3 weeks after planting (WAP). Morphological and yield parameters of Tomato were investigated during the growing and reproductive periods**.** Chemical control of pest and diseases was done by application of Atabron (*a.i.* chlorfluazuron) and Vondozeb (*a.i.* Mancozeb) at 4, 6 and 8 WAP. In addition, stalking at 4 WAP, application of top dressing at 3 and 6 WAP and regular observation were being made. Number of leaves, leaf area index (LAI) and plant height was measured at weekly intervals up to 6 weeks after flowering (WAF) as morphological parameter. Numbers of leaves per plant were counted once for two weeks. The number of leaves on the main stem (primary leaves) and the rest of the leaves on the shoots

subtending the primary flowers which were longer than 1 cm (secondary leaves) were counted and totaled to determine effects on leaf initiation.

Leaf area index (LAI) was determined directly by taking a nondestructive sample of foliage from a plant canopy, measured the leaf area per sample plot, and divided it by the plot land surface area. For that, three replicated plants per each treatment were selected for the study. Leaves were sampled from different levels of the canopy, twenty each from replicated plants, during the full-foliage period in growing seasons. Each leaf was spread over millimeter graph paper, and the outline of leaf was drawn. Using the paper knife, the area of the millimeter graph paper covered by the outline was cut and weighed on an electronic balance. One cm^2 of the same millimeter graph paper was also cut and weighed. The following equation was used to calculate the leaf area nondestructively:

$$\text{Leaf area (cm2)} = \frac{X}{Y}$$

Where

X is the weight of the graph paper covered by the leaf outline (g) Y is the weight (g), of the cm^2 area of the graph paper.

The plant height of 15 randomly selected plants (five plants per each replicates) was recorded in each treatment from ground level to the tip of plants by means of meter rod and average height of plant was calculated.

Time of flowering (days to attain 50% or 100% flowering at weekly interval), flower production (number of flowers per week), and fruit set (number of fruits per week) were recorded to study the flowering behaviour and fruit production under different treatments.

Due to temperature and water stress, there were changes in vegetative growth stages of the crops before getting in to reproductive growth as fruit pods. Therefore, parameters such as fruit yield per plant (g), fruit weight (g), number of fruits per plant, and plant height (cm) were measured weekly.

Results and Discussion

Temperature and Water Stress Effect on Growth Parameters of Tomato

1. Transplant Success

The results of vegetative parameters for the mean of three seasons are presented in Table 1. Mean value of transplant success percentage for different treatments were compared, 32°C maximum temperature with no water stress had the highest significant ($P \leq 0.05$) transplant success of 93.67% followed by ambient temperature with no water stress (93.3%), 34°C maximum temperature with no water stress (92.15 %), ambient temperature with 50% water stress (76.20%) 32°C maximum temperature with 50% water stress (70.20%) and 34°C maximum temperature with 50% water stress (64.05%) respectively (Figure 2). However, the transplant success showed a significant decline with water stress while the combination of water and temperature stresses have resulted in the lowest transplant success due to enhancement of the plant stress (Table 1 and 2).

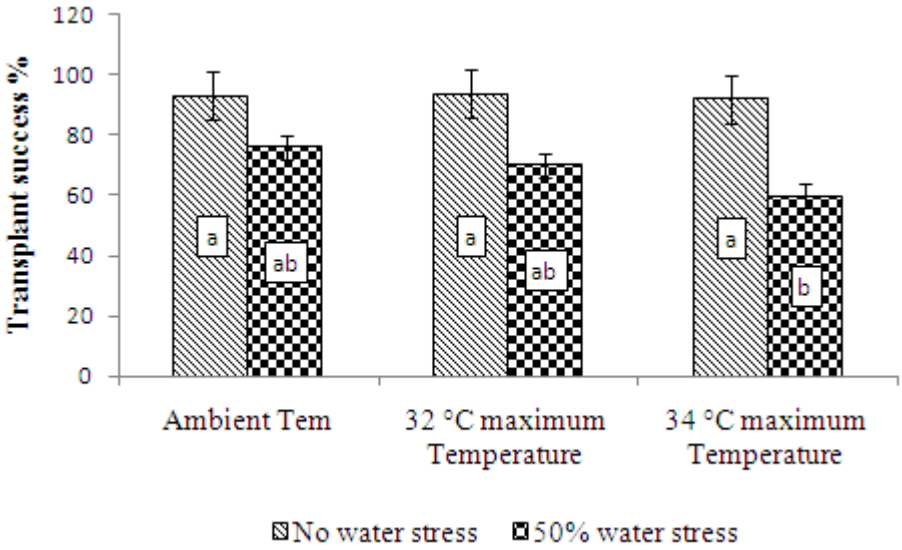

Figure 2. Effect of treatments on transplant success of tomato seedlings

Stresses restraint can result in hardened or stress-tolerant seedlings. This stress tolerance is important for transplanting when field establishment cannot be done immediately or sustained under future predicted hazards (Marr and Jirak, 1990). The goal in transplant production is to achieve an optimal seedling size with the appropriate level of stress tolerance to withstand environmental or other stresses when the plugs are transplanted into the field.

2. Plant Height

Based on the results on plant height, it was clear that, plants which received more water could grow well and accumulate a higher amount of fresh and dry matter in the shoots. Mature plants, which received enough water without any limitation, had significantly higher stems. These results indicate that water stress on the plants may significantly reduce the vegetative growth of tomato (Table 1). Imposed water stress decreases plant height and shoot growth, but this is not statistically significant at 3 and 6 weeks after transplanting. When comparing the mean value of plant height at three weeks after planting (3WAP) for different treatments, both 32°C maximum temperature with no water stress and 34°C maximum temperature with no water stress had shown the highest plant height of 21.3 cm followed by 34°C maximum temperature with 50% water stress (19.20 cm), 32°C maximum temperature with 50% water stress (18.93 cm), ambient temperature with no water stress (18.10 cm) and ambient temperature with 50% water stress (17.63 cm) respectively (Figure 3).

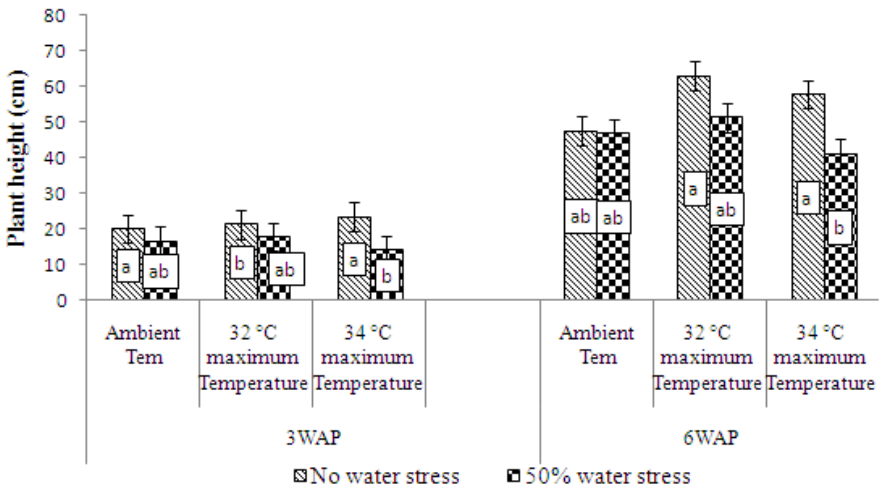

Figure 3. Effect of treatments on plant height at three weeks and six weeks after planting

Plant height at six weeks after planting (6WAP), 32°C maximum temperature with no water stress had shown the highest plant height of 63.16 cm followed by 34°C maximum temperature with no water stress (58.01 cm), 32°C maximum temperature with 50% water stress (51.36 cm), 34°C maximum temperature with 50% water stress (49.20 cm), ambient temperature with no water stress (47.64 cm) and ambient temperature with 50% water stress (46.89 cm) respectively (Figure 3).

Although combine stress treatment showed the lowest plant height at both 3 and 6 WAP, it did not significantly effect the reduced shoot growth. Similarly Adil *et al* (2003) shows that plant height was generally reduced when subjected to heat shock treatment at 37 °C.

3. Leaf Number

The effect of water and temperature stress conditions on leaf number at 3 week after planting and 6 week after planting is respectively shown in Figure 4. When comparing mean value of leaf number at three weeks after planting (3WAP) for different treatments, no water stress at 34°C maximum temperature had shown the highest leaf number of 33.5 followed by and 32°C maximum temperature with no water stress (28.67), 34°C maximum temperature with 50% water stress (25.17), ambient temperature with no water stress (25), 32°C maximum temperature with 50% water stress (21.33), and ambient temperature with 50% water stress (20.33) respectively (Figure 4). Leaf number at six weeks after planting (6WAP), 32°C maximum temperature with no water stress had shown the highest leaf number of 49 followed by 34°C maximum temperature with no water stress (46), ambient temperature with no water stress (35.5), 34°C maximum temperature with 50% water stress (31), 34°C maximum temperature with 50% water stress (49.20cm), ambient temperature with 50% water stress (28) and ambient temperature with 50% water stress (27.5) respectively. Significantly high leaf number at 0.05 probability level was shown by no water stress treatment at 3WAP (Figure 4).

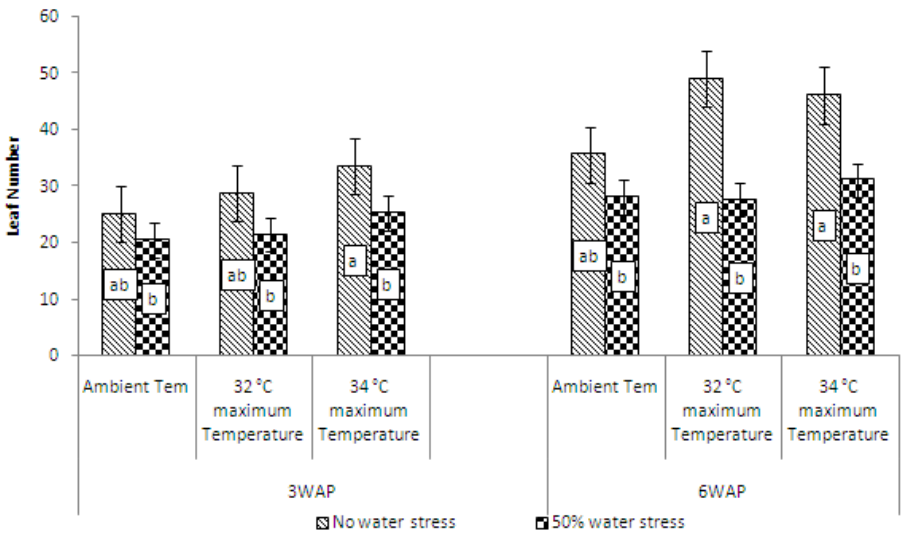

Figure 4. Effect of treatments on leaf number at three weeks and six weeks after planting

Temperature and Water Stress Effect on Yield Parameters of Tomato

1. Flowering

With respect to flower formation and fruit setting the number of flowers formed at 9, 11, 13, and 15 WAP are illustrated in Figure 5. Early flowering was observed in plants kept at higher temperatures similar to the report of Weerakkody and Peris (1996) where early flowering of tomato in the indoor culture was a result of the vigorous vegetative growth of the plants. Although there was early flowering, there was no significant variation ($p \geq 0.05$) of number of flower/plant among the treatments.

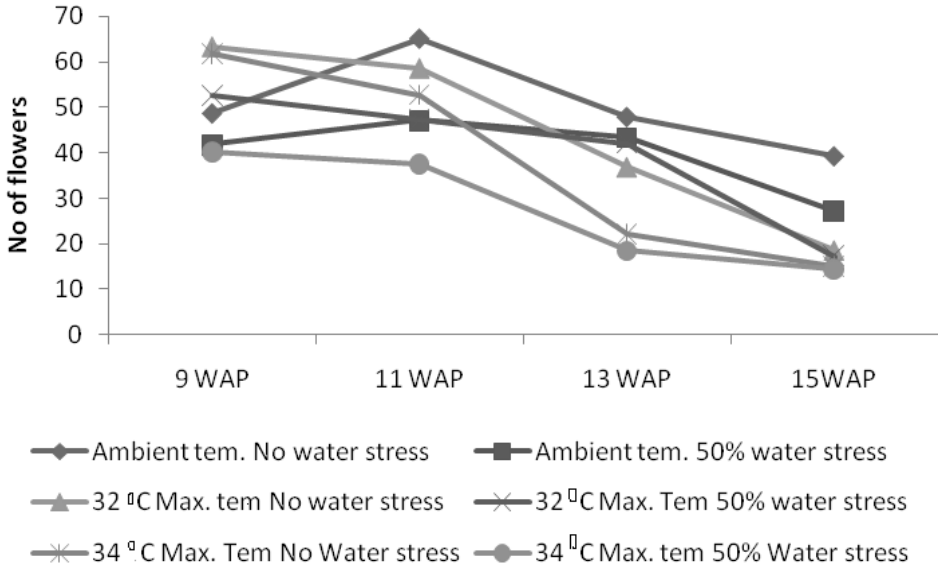

Figure 5. Effect of treatments on Flowering

Table 1. Variations of crop characters of tomato under stress condition

Treatment	Transplant success % 3WAP	Plant Height (cm)		Leaf Number		Weight (g/fruit)	No of Fruit /plant	Yield kg/plant	Moisture %	Soluble Solid (^{0}Brix)	p^H	Titrable Acidity %
		3 WAP	6 WAP	3 WAP	6 WAP							
Ambient tem No water stress	93.30	18.10	47.64	25.00	35.50	42.62	34.50	1.47	48.00	4.50	4.47	0.36
Ambient tem 50% water stress	76.20	17.63	46.89	20.33	28.00	36.16	32.50	1.18	30.00	5.13	4.47	0.43
32^{0}C Max. tem No water stress	93.67	21.36	63.16	28.67	49.00	56.17	14.00	0.79	53.50	6.40	4.23	0.31
32^{0}C Max. tem 50% water stress	70.20	18.93	51.36	21.33	27.50	33.16	8.50	0.28	31.00	7.67	4.03	0.39
34 ^{0}C Max. tem No Water stress	92.15	21.36	58.01	33.50	46.00	31.36	5.50	0.17	54.00	9.80	4.20	0.51
34^{0}C Max. tem 50% Water stress	64.05	19.20	49.20	25.17	31.00	15.99	4.00	0.06	26.00	12.07	3.97	0.64

Table 2a. Analysis of variance of temperature and water stress on yield and growth parameters

Source of variations	df	MS							
		Transplant success % 3WAP	Plant height 3WAP (cm)	Plant height 6WAP (cm)	Leaf Number 3WAP	Leaf Number 6WAP	Fruit weight (g)	No fruits per plant	Yield kg/plant
Main plot trt (WS)	1	2357.784**	12.802	228.445	206.722*	968**	703.4**	40.5**	0.411**
Sub plot trt (TS)	2	66.854**	11.038	153.455	68.667	87.875**	473.054**	1363.875**	2.237**
WS*TS	2	45.753*	1.705	49.002	5.389	73.625*	125.141**	7.125	0.58**
Error	12	8.741	4.28	49.901	32.22	12.25	9.106	2.5	0

* indicates significant at the 0.01< P ≤ 0.05 probability level; and ** indicates significant at the ≤ 0.01 probability level

Table 2 b. Analysis of variance of temperature and water stress on qualitative parameters

Source of variations	df	MS			
		Moisture %	Soluble Solid (^{0}Brix)	p^H	Titrable Acidity %
Main plot trt (WS)	1	2346.125**	57.537**	0.261**	1.194*
Sub plot trt (TS)	2	16.625	8.681**	0.094**	1.249*
WS*TS	2	37.625**	1.017*	0.24	0.428
Error	12	5.208	0.202	0.08	399

* indicates significant at the 0.01< P ≤ 0.05 probability level; and ** indicates significant at the ≤ 0.01 probability level

2. Fruit Weight

When comparing the mean value of fruit weight for different treatments, 32°C maximum temperature with no water stress had shown the highest fruit weight of 56.17 g followed by ambient temperature with no water stress (42.62 g), ambient temperature with 50% water stress (36.16 g), 32°C maximum temperature with water stress, 34°C maximum temperature with no water stress (31.36 g) and 34°C maximum temperature with 50% water stress (15.99 g) respectively (Figure 6). High temperatures can cause significant losses in Tomato productivity due to reduced fruit set, and smaller and lower quality fruits (Stevens and Rudich, 1978). Abdalla and Verderk (1968) showed that vegetative and reproductive processes in tomatoes are strongly modified by temperature alone or in conjunction with other environmental factors. High temperature stress disrupts the biochemical reactions fundamental for normal cell function in plants. It primarily affects the photosynthetic functions of higher plants (Weis and Berry 1988).

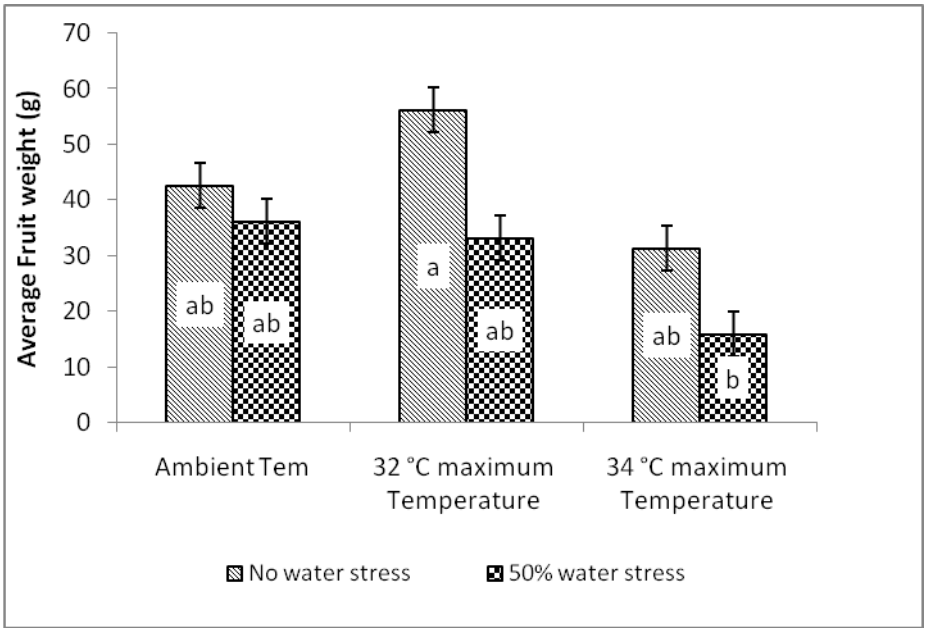

Figure 6. Effect of treatments on average fruit weight

3. Number of Fruits per Plant

When comparing mean value of number of fruits per plant for different treatments, ambient temperature with no water stress had shown the highest fruit number 34.5 followed by ambient

temperature with no water stress (32.5), 32°C maximum temperature with no water stress (14.00), 32°C maximum temperature with 50% water stress (8.5), 34°C maximum temperature with no water stress (5.5), and ambient temperature with 50% water stress (4) respectively (Figure 7).

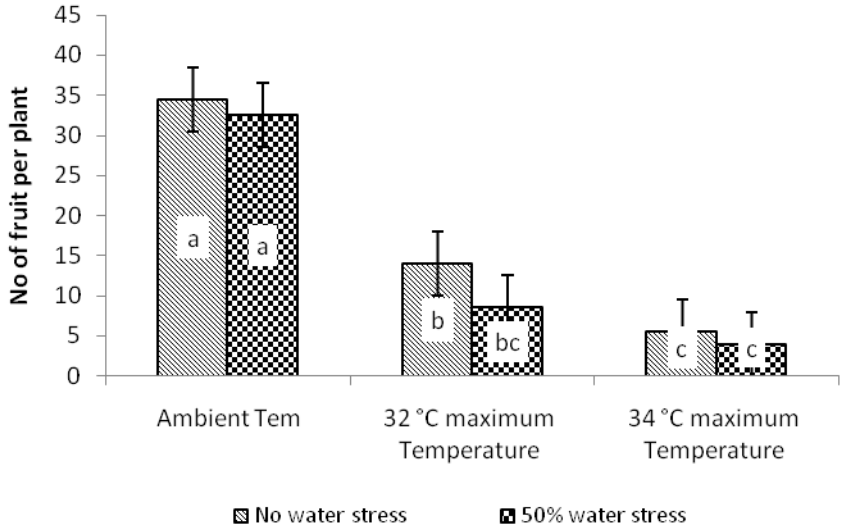

Figure 7. Effect of treatments on number of fruit per plant

4. Fruit Yield

Fresh fruit yield, fresh fruit weight, fruit number per plant and crop residue weight (vegetative biomass) of tomato were significantly different among treatments. The interaction effect resulted the highest mean yield (1.47 kg/plant) in plants grown in outdoor ambient temperature without water stress, followed by outdoor grown plants with water stress (1.175 kg/plant) (Figure 8). The potential yield range of tomato with the application of recommended chemical fertilizer is 20 to 30 t/ha (Anon, 1990-Department of Agriculture Crop recommendation – Techno guide).

Therefore, above yield of tomato in ambient temperature (outdoor condition) without water stress is in the potential yield range of tomato. Although the vegetative growth was higher and early flowering occur at the 32°C temperature, the yield was low (0.78 kg/plant) and with water stress it was further reduced to 0.281 kg/plant. Meanwhile the yield obtained at 34°C maximum temperature was 0.172 kg/plant and with water stress it was further

reduced to 0.063 kg/plant. Hence loss of pollen viability could be a main reason for the lower fruit set under high ambient temperatures. Adil *et al.*, (2003) showed reproductive processes in tomato were more sensitive to high temperatures than the vegetative process. The number of pollen grains produced by the heat tolerant genotypes was higher than the numbers produced by the heat sensitive genotypes.

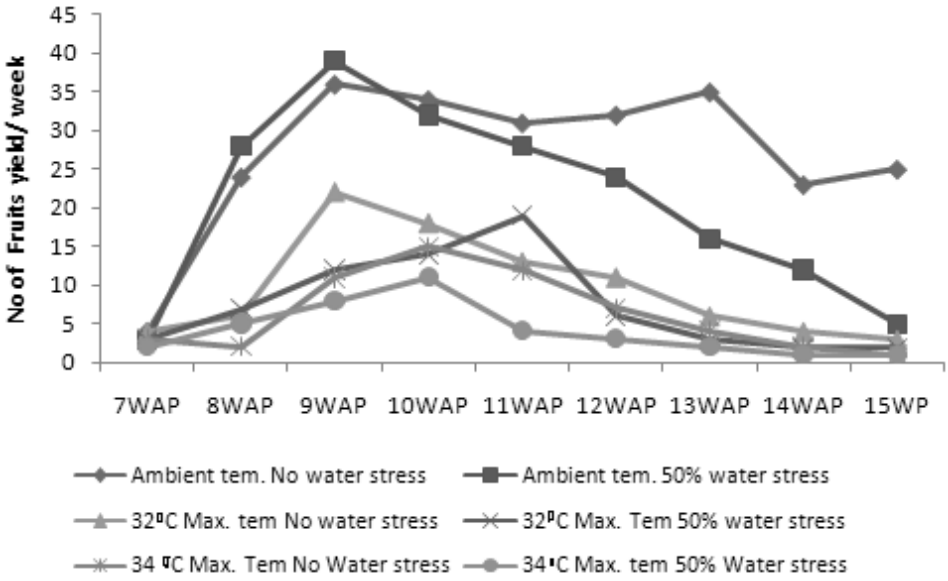

Figure 8. Number of fruits counted for different treatments

Etanpressman *et al*, (2002), and Adil *et al.,* (2003) demonstrated that continuous exposure of fruit truss to high temperatures markedly reduced the number of pollen grains per flower and decreased viability. The effect of heat stress on pollen viability was associated with alterations in carbohydrate metabolism in various parts of the anther during its development. High post-pollination temperatures inhibited fruit set, suggesting that fertilization is sensitive to high temperature stress (Erickson and Markhart, 2002). Hazra *et al.* (2007) summarized the symptoms causing fruit set failure at high temperatures in tomato; this includes bud drop, abnormal flower development, poor pollen production, dehiscence, and viability, ovule abortion and poor viability, reduced carbohydrate availability, and other reproductive abnormalities. In addition, significant inhibition of photosynthesis occurs at temperatures above optimum, resulting in considerable loss of potential productivity.

A pattern of yield variation among treatments is well supported by data on fruit size and number. At temperature of 34°C without water stress produced the lowest number of fruits per plant (5.5) while plants grown under ambient temperatures (out door) produced the highest number of fruits per plant. Both fruit weight and size significantly reduced when water stress was imposed. Fruits at the ambient temperature and 32°C without water stress were heavier than those in the other treatments. 34°C maximum temperature with 50% water stress produced the smallest fruits. Fruit grew heavier in plants grown with adequate soil moisture during stages of vegetative growth and fruit setting. Similarly Molla Md *et al.*, (2003) showed that the water stress throughout the growing season significantly reduced yield and fruit size.

Conclusions

According to the results, water and temperature stresses and their interaction significantly effect on the growth and yield parameters such as plant height, fresh weight, number of fruit per plant, fruit yield etc. Temperature stress was positive on the plant height and shoot and leaf formation under indoor condition. Water and temperature stress in combination had severe negative effects on growth parameters as compared to the individual water stress treatments. The combination effect of water stress and temperature stress exert significant drawbacks on tomato (variety Rajitha) plant growth, fruit quality, and the chemical composition of the fruit. Throughout the season or during the early stage of ripening, and at fruit growth, combination of temperature and water stress leads to severe yield reductions of the crop. Tomato variety Rajitha, showed severe crop failures and thus negative effects on the overall yield and growth characters. Therefore, tomato variety Rajitha can not be identified as a successful crop for the dry zone of Sri Lanka if temperature is increased due to global warming. However, tomato could be successfully cultivated under green house conditions by providing adequate water and the required kind of soil and air temperature management practices.

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Kaduwa or *Manne*? Issues and Tensions Related to Bilingual Education Policy in Sri Lanka

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Abstract

Policies related to language have had far reaching consequences for social inequality in Sri Lanka as they have had in many other post-colonial nations. Consequently, language policy, specifically language in education policy has been frequently mobilized in efforts to address social inequality, with varying degrees of success. This paper focuses on a decade of implementation of such a policy that was conceptualized to address inequality - the bilingual education (BE) policy of 2002 initiated primarily in order to effect changes in language learning and thereby deal with issues of inequality based on differences in levels of language proficiency. Utilizing a methodology that includes document analysis, focus group interviews and semi structured interviews with important stakeholders in the bilingual education project this study attempts to report on the status of an initiative after more than ten years of its implementation, with regard to attitudes, issues and challenges. It was revealed that unresolved tensions to do with the demand and clamour for English due to its market value and the forces of globalization on one hand and the struggle to maintain a national and local identity on the other are reflected both in the circulars and in the structural and attitudinal factors related to implementation. The study revealed the emergence of a new 'elite' group among students, those who, because they study in the 'English medium' see themselves as superior and distance themselves from the mother tongue medium students, and the ineffectiveness of ministry circulars and campaigns to position English as a tool rather than a weapon

Keywords: Bilingual Education, English medium instruction, English in Sri Lanka, Medium of Instruction policy

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Introduction

Language policy in Sri Lanka, as in many other parts of the world, has had far reaching consequences for social inequality. Correspondingly, language policies, specifically language in education policies have been frequently utilized in attempts to redress social inequality in this country, with varying levels of success. Approaches to Language policy in general can be divided into those related to Language practices, to Language ideology, and to language planning activities that attempt to modify the practices and ideology of a community (Spolsky, 2004). The question of which language(s) should be used as the/a Medium of Instruction is a significant activity related to what has been termed 'Acquisition Planning' (Cooper, 1989). As such, this paper focuses on the bilingual education (BE) initiative implemented in 2002 in Sri Lanka in order to effect changes in language learning and thereby address issues of inequality based on differential access to English, which constitutes significant linguistic capital in Sri Lanka and many other countries today.

Bilingual Education in Sri Lanka

Learning subject matter rather than the target language directly has been found to be more effective in second language acquisition. This is attributed to the fact that since "school subjects are what children need to talk about in school", learning content in the target language medium "provides the motivation and opportunity for meaningful communication". Conventional 'English as a second language' instruction on the other hand tends to create artificial situations and unreal contexts which do not provide the same degree of motivation for meaningful communication. The concept of learning subject matter in a language that is not one's own in order to learn both the subject and another language can be traced back many centuries. However, the contemporary notion of Bilingual Education – which has come to be understood as synonymous with English medium instruction - is often viewed as being controversial because of the political implications of which language is chosen as a medium of instruction and the tensions it has come to create.

Rubin (1983) defines the decision as to what language to use as a medium of instruction as a "language problem" which "organizations …given a mandate to fulfill" purposes of language planning, need to solve by deciding "which variety/language will be used by certain sectors of the polity" (p.4). It has also been noted that the language

of the school begins to assume much importance and such an important status is one not usually accorded to other contexts for language use.

The current Bilingual Education Policy has its official origins in a Ministry of Education (MoE) circular dated February 2001 which makes GCE Advanced Level science stream courses available to students in the English medium. The first reference to Bilingual Education is in Circular 2001/05 titled *Teaching of A/L Science Subjects in the English Medium*. The Circular directs Principals to start teaching A/L Science Subjects in English for the following reasons:

i) The growing importance of English as the language of global communication in an increasingly more globalized world;
ii) The need to facilitate the transfer of students to either the world of work or to higher education in the sciences.

The policy at junior secondary level (Grades 6-8) was initiated as a follow up initiative to the one which permitted GCE (Advanced Level) Science stream students to study their subjects in the English medium, beginning in May, 2001. Interestingly, the only 'research' which justified this initiative was that 26% of all students in Type 1AB and Type 2 schools[2] who sat the GCE (Ordinary Level) exam in 2000, expressed their desire to study in the English medium and 50% of Science-graduate teachers in all Type 1AB schools expressed a desire to teach in the English medium[3].

By introducing these initiatives in government schools it was assumed that all would have equal access to linguistic capital, thus improving equity. In a country where the richest 20 percent receives nearly 55 percent of the total income, while the poorest 20 percent receives only 5 percent (Department of Census and Statistics, 2007), issues of equity abound in educational debates and policy making. Thus, the policy aims are consistent with what Gibbons (2003: 247) points out: "for students who are learning ESL in an English-medium school, English is both a target and a medium of education: they are not only learning English as a subject but are learning

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[2] *1 AB – School having Advanced Level Science stream classes, 1 C - School having Advanced Level Arts and /or Commerce streams but no Science stream, Type 2 - Schools having classes only up to grade 11, Type 3 - Schools having classes only up to grade 8. (http://www.statistics.gov.lk/Newsletters/Education%20Bulletin.pdf)*

[3] *Ministry of Education (MOE) Circular No: 2001/05 of 23.02.2001 to all zonal and provincial directors of education.*

through it as well. In these content-based classrooms, the construction of curriculum knowledge needs to progress hand-in-hand with the development of English". The rationale behind the introduction of EMI was that the ELT project "had failed miserably in this country for more than forty years"[4]. The National Education Commission (2003) justifies this claim thus:

While English has been a compulsory second language in all schools from grade 3 since the 1940s, the teaching of English as a subject confined to one period a day has not enabled the vast majority of students to communicate in English effectively or to be equipped with language skills to explore the expanding world of learning, resulting in a decline in the quality of higher education" (p. 115).

Some of the many tensions that revolve around 'English as a medium of instruction' and language in education policies are those that exist between preserving the value, proficiency and status of local languages and empowering young people to be successful in the wider world via proficiency in English, between English medium instruction policy and the implementation of that policy, between teaching content and teaching English in the subject classroom, and between students who are more proficient in English and those who are not.

Many other post-colonial countries which were left with the dubious legacy of English as a language of privilege and the divisions created thereby, have tried to negotiate the tensions between local languages and English, first in the face of decolonization and nation building and more recently in the face of globalization. It is in the language acquisition policies of these countries that this tension is most visible. For example, Malaysia has introduced two major policies regarding the Medium of Instruction. The first one involves the sudden change from Bahasa Malaysia to English for Mathematics and Science in 2003, and the second, a reversal in 2012. This has resulted in the introduction of a new language policy, that is, '*To Uphold Bahasa Malaysia & to Strengthen the English Language*' (MBMMBI) (Ha *et al.*, 2013).

Social transformation oriented curriculum attempts to increase the life chances of disadvantaged groups. It aims "not to transmit the past to the future but to change the present for the disadvantaged"

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[4] *Rajiva Wijesinha, one of the two principal architects of the EMI reforms and member of the Presidential Task Force on Educational Reforms 1997-2002, in interview (Medawattegedera, 2011).*

(Lo Bianco, 2001: 460). As such, the government currently in power has focused on changing the ideological associations of English with power and prestige to those associated with function and pragmatics. A widespread media campaign featuring popular sports figures, film actors and other public personalities to whom English was not a language spoken in the home but a learned second language was launched to popularize the concept of English being an instrument and not a tool of oppression, not a *Kaduwa* (sword =weapon) but a Manne (machete = tool)

It is against this background that this study seeks to answer the following research questions in an attempt to investigate the issues and tensions in implementing bilingual education and in Sri Lanka over the last decade

Research Questions

- What trends and tensions can be discerned from the scrutiny of Ministry of Education circulars?
- What are the current issues and challenges related to stakeholder attitudes and the implementation of the medium of instruction policy?

Methodology

The methodology included a document analysis i.e. the scrutiny of all the Ministry of Education circulars issued to schools on the implementation of Bilingual Education since its inception more than a decade ago, an in depth semi structured interview with the current Director of the Bilingual Education Programme of the Ministry of Education and the relevant officer at the National Institute of Education, semi structured interviews with teachers, principals and deputy principals, and focus group interviews with teachers, principals, in-service advisors, coordinators of the bilingual education programme in department of education zonal offices, and randomly selected students studying in bilingual medium classes from grades 6-10.

The participants - approximately 150 - were drawn from three provinces; the Western, Southern and North Western Province based on convenience sampling, when this researcher visited these provinces for research purposes related to a commissioned study done for the National Education Commission.

Findings

In 2001 there was no clear or overt policy on Bilingual Education or English Medium Instruction when it started, having been initiated via a Cabinet paper. So the current bilingual education initiative originates with a Ministry of Education (MoE) circular dated February 2001 which makes A/L science stream courses available to students in the English medium titled *Teaching of A/L Science Subjects in the English Medium*. It was meant to be an egalitarian policy to redistribute the linguistic capital of English more evenly among the diverse social classes and was first called "English Medium Instruction". Just like the more recent "English as a Life Skill campaign" the Circular packages English in terms of its instrumental uses. The reasons it provides are

- The growing importance of English as the language of global communication in an increasingly more globalized world;
- The need to facilitate the transfer of students to either the world of work or to higher education in the sciences;

However, calling this new initiative "English Medium" turned out to be a 'mistake because it was misunderstood and taken as a green light to reverse existing policy. Schools, under pressure from parents, among other reasons, started having 'English medium' for all grades. How this was perceived and practiced by stakeholders can be seen in the tone of circulars which were consequently issued by the ministry to try and control the misunderstandings.. First, a Circular was issued which decreed that GCE Advanced Level candidates can choose to mix media of instruction in their choice of Science subjects for the examination thus allowing them to do one subject in English and the others in Sinhala/Tamil was issued.

Next, a stern directive issued via Circular 2003/18, expressly forbade the start of exclusively English Medium classes especially at the primary level and points out to principals that they only had authorization to teach *select subjects in English* from Grade VI onwards (emphasis added).

By 2008 the Ministry seems to have decided that it must ensure compliance with a name change from "English Medium" instruction to "Bilingual Education" via yet another circular. The content of the circular dated 2008.04.21 titled "The Implementation of the New Syllabus in Grades VI-XI", is in essence an elaborate explanation of the change in name. It states that the aim of the initiative was:

- To promote English through teaching select subjects in English without devaluing the status of the two national languages, Sinhala and Tamil; (Which sounds very similar to the current Malaysian language medium of instruction policy);
- Because of the need to bring about an attitudinal change among people who regard English not in its purely instrumental sense but *as an ornament* that can be used to bring about social division as evident from certain incidents reported to the Ministry ;
- To turn English into a tool available to all and thereby to encourage people to see it as something "ordinary" and not the prestige language that it is today;
- To encourage communication among students through the use of two languages and thereby to advance cognitive development.

The now infamous incident where a student in the 'English medium' at a prominent girls' school in Colombo had a fight with a student from the Mother tongue medium class and called her "you Sinhala medium bitch" was reported to the ministry. Such incidents also prompted the change to 'bilingual rather than English medium' Thus, although the circular issued in 2001 had attempted to turn English into a purely instrumental language, its interpretation by the stake holders shows us the symbolic value that it carries as a prestige language. Wickremagamage *et al.* (2010) in a study focused on the Central Province of Sri Lanka, which also did a critical reading of the Ministry of Education Circulars, point out that the later circulars of the Ministry contain "a belated recognition of the inextricable link between language politics and language policy" (2010:18).

With effect from 2009, another circular was issued, enforcing a directive to schools to have bi medium classes, and setting up a maximum number of subjects (5) that could be done in English medium, ruling that bilingual students should be taught a higher number of subjects in their mother tongue than in English medium and explicitly forbidding teaching of History in the English medium. This can be interpreted as an effort to demonstrate that the Mother Tongue is more important and valuable than English.

However, a number of schools rejected the decree spelt out in the circulars to have 'bi medium classes', or in other words to group together those who studied entirely in the mother tongue and those who were doing selected subjects in English.

Interview data from teacher interviews revealed that many teachers agreed with the notion that students should not be separated into monolingual and bilingual groups, and thought it was a clever strategy to prevent "English medium" students from feeling superior. However it was also found that in many instances schools do not follow the circular which specifies that bilingual classes should not be separated ; firstly due to pressure from influential parents, and secondly due to scheduling and time tabling issues which arise from attempts to do so. Further, there are incidents where parents even strongly objected to having their children (who are doing selected subjects in English medium) being grouped together in one class with the mother tongue medium students. Interview data with the ministry officials revealed that there was even one incident reported from Hambanthota where parents petitioned the then President about their objections and he then requested the principal not to mix the Binlingual Education (BE) stream (popularly referred to as 'English medium') and Monolingual stream students in one class. This incident echoes the one referred to in Wickremagamage *et al*, (2010:18) who found a similar incident a few years ago in the Central Province:

"Another incident they cited involved an "English Medium" student from Medawachchiya who had complained to the President in writing that s/he found it demeaning to remain in the same class with his/her *Sinhala Medium* counterparts and asking the

President's intervention to maintain separate classrooms at his/her schools".

Thus, having monolingual and bilingual students in the same class created tensions among the students and affected parents to the extent that in some cases, complaints were even referred to the President of the country. Interviews with Principals reveal similar findings, including an example of an incident in a prominent school in the Southern Province, where students had formed "English Medium" clubs, which included members from English medium classes in other schools in the region. Thus a group identity was constructed where the members went to the extent of printing T shirts in order to identify the members out of school hours. (Specimens which had been confiscated later by the school were shown to the researcher as proof)

Interview and focus group data also reveal that in some instances, school principals provided extra facilities to 'English medium' classes such as extra fans and better classrooms. On the other hand, interviews with students in bilingual medium classes revealed that monolingual teachers 'treated them differently' and 'were always finding fault' with them. Interviews with teachers revealed that there was a perception that 'English medium' students had a 'superiority complex' and though 'they were better than the rest' Teachers also believe that English Medium teachers should get extra recognition because they have a dual role: teaching language and teaching subject matter. In many schools, the English teacher is called upon to teach subjects such as Geography and Science in the English medium. This indicates a shifting role, extra challenges and new identities for the English teacher.

Although a few studies have shown that the notion of *Kaduwa* to represent English seems to be fast disappearing (Widyalankara, 2009, Samarakkody, 2001) and although the previous government has marketed English as a tool (Manne) rather than a weapon (Kaduwa) and as a 'life skill' spoken "our way" rather than as a dominant world language with the power to divide, the analysis of the circulars as well as the perceptions and practices of the stakeholders reveal the tensions that still exist regarding English in Sri Lanka. These tensions spring from the demand and clamour for

English due to its market value and the forces of globalization on one hand and the struggle to maintain a national and local identity on the other and are reflected both in the practice of BE and the Government circulars on the subject.

Conclusion

A decade later, Bilingual Education Initiative still has no policy document but functions as an evolving policy which has taken the form of a string of Ministry of Education (MoE) Circulars. Each new circular seems to be an attempt to rectify misunderstandings because of the lack of clarity in policy. The circulars also reveal tensions between local and global realities. Further, beliefs and attitudes towards languages cannot be changed via ministry circulars and directives, nor by large scale campaigns just as, in Lo Bianco's words "Languages cannot be invested with new value overnight" (Lo Bianco, 2007, cited in Wickremagamage *et.al.*, 2010). As such, despite state-sponsored efforts to turn English into an almost banal and unremarkable 'life" skill such as literacy, its sociocultural and political resonance still persists.

This study reveals that the elitism associated with English is still being reproduced among students for whom it is neither a first language nor a language used at home with their families but a mere medium of instruction at school. Teachers and administrators too continue to invest the English language with a divisive role, colluding with students (by treating them differently) and thus seeming to signal that English is superior and has more value than the national languages. The fact that there is no consistent policy about and for selection of students to study in the bilingual classes is also a pertinent issue which needs to be resolved equitably.

It appears as though the *Kaduwa* syndrome has renewed itself via new wielders of the English language as a weapon – a weapon which may yet take a few more decades to transform itself into a tool.

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Lifestyle Factors Influencing Coronary Heart Disease

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Abstract

This descriptive study examines the lifestyle factors influencing Coronary Heart Disease (CHD) patients in Teaching Hospital (TH) Jaffna. Jaffna has considerable incidence of CHD and there were high rates of admissions of acute and chronic CHD patients at TH Jaffna (Annual Hospital Statistics, 2014). Many cardiac treatments are available to prevent CHD in Jaffna but the incidences are still high. It is assumed that an active lifestyle may help to prevent these conditions. This study observed the lifestyle factors such as dietary habits, pattern of exercise, habit of smoking and alcohol intake.

The study has been carried out at the cardiology unit and all medical units of the TH Jaffna from the 15th of November to the end of December 2014. 150 CHD patients were administered a questionnaires which were used to collect data. Convenience sampling technique was used to collect the sample.

This study has shown that CHD patients at TH Jaffna were initially affected by lack of exercises (75%). Participants who followed an unhealthy dietary habit were 69% and participants who habitually smoked were 37% and alcoholics were 29%.

This study revealed that most of the participants do not perform any exercise and follow unhealthy food habits. A significant number of participants are influenced by smoking and few of them are at risk of CHD by alcohol consumption.

Keywords: Coronary heart disease, dietary patterns, lifestyle factors, smoking, alcohol intake.

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Introduction

CHD is the most important cause of death worldwide today. The numbers of CHD is still on the increase and it is estimated that in the coming years, the number of CHD patients will raise significantly, particularly in developing and transitional countries (Medicographia, 2009).

Life styles of CHD patients include non-smoking, acceptable amount of alcohol intake, proper dietary habits and engaging in physical activities. According to the British Heart Foundation (2009) men can drink no more than three to four units per day and women can drink no more than two to three units per day (300 ml beer, arrack 25 ml, 600 ml toddy = 1 unit). It is recommended that exercise daily for 30 to 60 minutes, like brisk walking, swimming and cycling, eating small fishes, vegetables, fruits, and avoiding fatty food, meat, beef, butter, coconut milk, prawn, crab, Cuttle fish and big fish can reduce CHD (Cadi Research Foundation, 2012).

In the general population, the risk of cardiac mortality is reduced by 50% in those who stop smoking, 20% to 30% by engaging in moderate physical activity, and 15% to 40% by adopting a combination of healthy dietary habits (limited intake of saturated fats, regular fish consumption, sufficient fruit and vegetable intake, and limited salt consumption (Cadi Research Foundation, 2012).

According to a recent study from Australia(Cadi Research Foundation, 2012), about nine billion of Australians could have been saved in 2008 if they had taken care of smoking, high-alcohol consumption, high body mass index (BMI), physical inactivity, inadequate fruit and vegetable intake (less than 3 servings per day).

Wijekoon (2013) stated that CHD is placed as the first cause for hospital mortality and the lifestyle is the key influencing factor of CHD. The average total fat intake of Sri Lankans contributes to 25% of total energy, with 80% of that consisting of saturated fat from coconut products, meat, milk, and oil. With regard to the type of dietary fatty acids, Sri Lankans consume nine times more saturated fats than polyunsaturated fatty acids compared with the current suggested ratio (less than one). According to statistics of the National Authority on Tobacco and Alcohol (NATA) smoking takes life of 50 to 60 people every day and approximately, four billion cigarettes are sold daily in the Sri Lankan market (Cadi Research Foundation, 2012).

CHD Deaths in Sri Lanka reached 15,961 or 11.69% of total deaths (WHO, 2011). Last year's statistics of TH Jaffna (2014) indicate that 4500 patients were admitted to the cardiology ward for heart disease complications of which 500 patients were CHD. Further, the number of patients who were admitted for cardiac intervention such as Angiogram and angioplasty was not segregated. Considering the above cases, available material resources such as monitoring beds, cardiac ward beds, infusion pumps, instruments used for Angiogram, Electrocardiographic machines, Exercise tolerance test machines, and other instruments and human resources such as doctors, nurses, attendants and laborers are inadequate to give quality treatment at TH Jaffna.

It is necessary to think broadly about the life style in Jaffna as it has greater influence on CHD. This study will help to raise the awareness on the need to change our lifestyle for better health.

Methodology

This is a quantitative descriptive study. Purpose of this study is to find out which life style factor has mostly influenced CHD among Jaffna population and educate the public on modifying their life style patterns accordingly and raise the awareness of health care professionals for best practices in preventing them.

The data collection was done in TH, Jaffna. It is the one and only tertiary care hospital in the Northern Province with advanced facilities and specialized units including the cardiology unit. That is the reason why many patients visit Jaffna TH from neighboring areas to get treatment. Participants were selected from the cardiology unit, cardiac ward and eight medical wards including four female wards (1, 2, 3, and 4) and four male wards (7, 8, 9, and 10) at Jaffna Hospital. Bed strength of each medical ward is about 40, cardiology ward bed strength is 16 and cardiology unit bed strength is six. There are six Nursing Officers and a Ward Manager working in each medical ward. Cardiology ward and coronary care unit are both under a Nurse In- charge and 14 Nursing Officers.

Convenience sampling method was used to select the sample. This was one of the sampling methods of non-probability sampling. It was most suitable for this research study, because people who were unsuitable for the sampling study have already been eliminated, so only the most suitable candidates remained. So this process became

less time consuming and the costs carried out for the sampling project were greatly reduced.

Many patients with several diseases come for inward treatment in TH, Jaffna. Among them the investigators selected all patients with CHD in TH, Jaffna as the accessible population in this study. Sample collection was done on non-visiting hours every day without interfering with the nursing care. The exclusion criteria of the sample was mentally and emotionally disabled people, deaf and blind persons, illiterate people, those who were diagnosed as CHD with other diseases and critically ill CHD patients.

Self-administered questionnaires were used to collect data to identify which life style factor influences CHD patients at TH Jaffna and the questionnaire was developed originally in English and then translated to Tamil and Sinhala Languages under the guidance of the research Supervisor. The questionnaire consisted of a series of questions covering the areas such as section A - socio-demographic information of the participants; section B - information about the disease and admission; and the section C - life style pattern which includes assessment of dietary habits, exercise patterns, alcohol and smoking habits.

Reliability and validity were maintained by extensive discussion and corrections done with the Ethical Review board, University of Jaffna and with the supervisor. The questionnaire was tested through a pilot study done at Medical unit, TH Jaffna. According to the results of pilot study, the questionnaire was modified appropriately.

Date Collection and Analysis

Data was collected at the medical and cardiology unit, TH Jaffna from 15th of November to end of December 2014. After the approval of the Ethical Review Board of the University of Jaffna, permission was obtained from the Director of TH Jaffna as well as ward consultants. On the third day of admission, the letter of invitation was given to the participants for those, with confirmed diagnosis by the doctor and for patients who were transferred from the coronary care units to wards. The investigators went to the wards in the evening and obtained permission from the ward staff to hand over the informed consent form and self-administered questionnaire to the participants. Instructions and explanations was given to participants regarding all questions nearly for one hour, then they

were asked to complete the questionnaire and hand it over to the nursing officers to keep in the box provided by the researchers. Afterwards, those questionnaires were collected by the researchers. 150 participants participated and the response rate was 100%. Data was collected in one month.

After completion of data collection, the data was transferred to SPSS 16 (statistical package of social science) and was analyzed according to the specific general objectives. The frequency of each need item was calculated and the associations of particular needs with particular variables were analyzed. Some of the questions were not answered by the participants; such questions were mentioned in the results.

Results

The present study focused on the lifestyle factors influencing CHD patients at TH Jaffna and the results of the study were analyzed according to the specific objectives. Socio demographic data, disease history, dietary habit, pattern of exercise and habit of alcohol and smoking will be given in tables and charts as well as explanation also will be presented.

Table 1. Demographic Data (n = 150)

Characteristics		Number of Patients	Percentage
Age Group	31- 40	2	1.3
	41- 50	10	6.7
	51- 60	30	20.0
	61- 70	70	46.7
	71- 80	35	23.3
	81- 90	3	2.0
Gender	Male	93	62.0
	Female	57	38.0
Religion	Hinduism	121	80.7
	Islam	6	4.0
	Christianity RCL	15	10.0
	Christianity NRC	8	5.3
Marital Status	Unmarried	5	3.3
	Married	143	95.3
	Widowed	2	1.3
Level of Education			
	No formal education	4	2.7

Up to Grade 05	38	25.3
Grade 06- 11	49	32.7
G.C.E O/L	32	21.3
G.C.E A/L	21	14.0
Graduate	3	2.0
Post Graduate	3	2.0
Occupation		
Government Job	25	16.7
Non-Government Job	17	11.3
Self-Employment	61	40.7
Missing Participants	47	31.3
Family Income		
< 5,000	17	11.3
5,000 – 9,999	25	16.7
10,000 –19,999	29	19.3
20,000 –30,000	18	12.0
>30,000	7	4.7
Missing Participants	54	36.0

A total of 150 patients were interviewed. Their ages ranged from 30-90 years and a significant amount of participants 70-(46.7%) were between 61 to 70 years. There were 93 (62%) males and 57 (38%) females. 121 (80.7%) participants were following Hinduism and 143 (95.3%) were married. Educational level from grade 6-11 were 49 (32.7%), while 21 (14%) had qualified in the Advanced Level Examination. Out of the participants, 61 (40.7%) were self-employed, whereas, 42 (28%) had white collar jobs.

Table 2. History of Disease and follow up (n = 150)

Characteristics	Number of Patients	Percentage
Admissions for CHD		
Only 01 time	73	48.7
02 times	33	22.0
03 times	42	28.0
Not Answered	2	1.3
Clinic Follow up		
Yes	139	92.7
No	11	7.3
Pattern of Regular Medication		
Yes	140	93.3
No	10	6.7
Family History		
Yes	29	19.3
No	121	80.7

However, 42 (28%) of the participants' family income was less than ten thousand (Table 1).Participants who regularly attended the cardiology clinic were 139 (92.7%) and 140 (93.3%) were taking medicine on a regular basis but 42 (28%) were recurrently admitted to hospital for CHD. Most of the participants, 121 (80.7%) did not have a family history of CHD (Table 2).

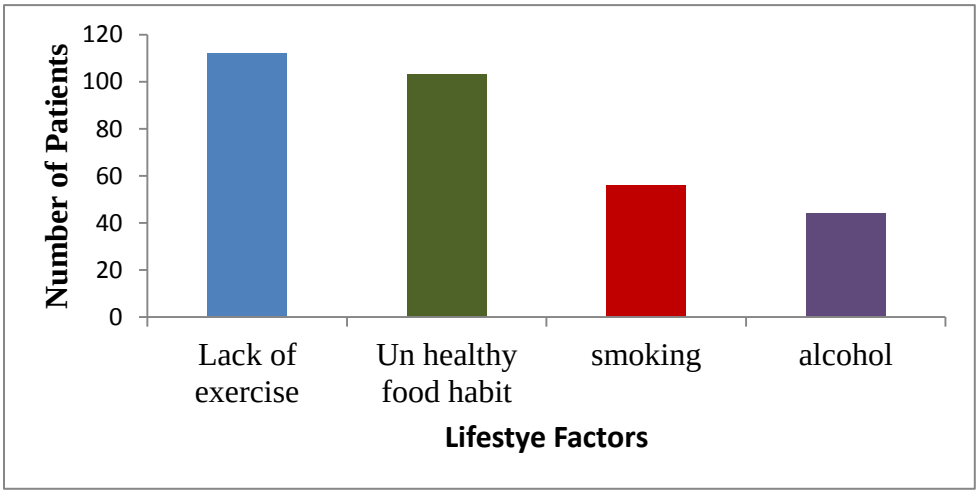

Figure 1. Influencing Lifestyle Factors of CHD at TH Jaffna

This study shows that CHD patients at TH Jaffna were mostly affected by lack of exercise (112) and a few 31 (20.7%) were doing moderate physical activities. Hundred and three participants were following unhealthy dietary habits. Participants who habitually smoked were (56) and alcoholics were 44 (Figure 1).

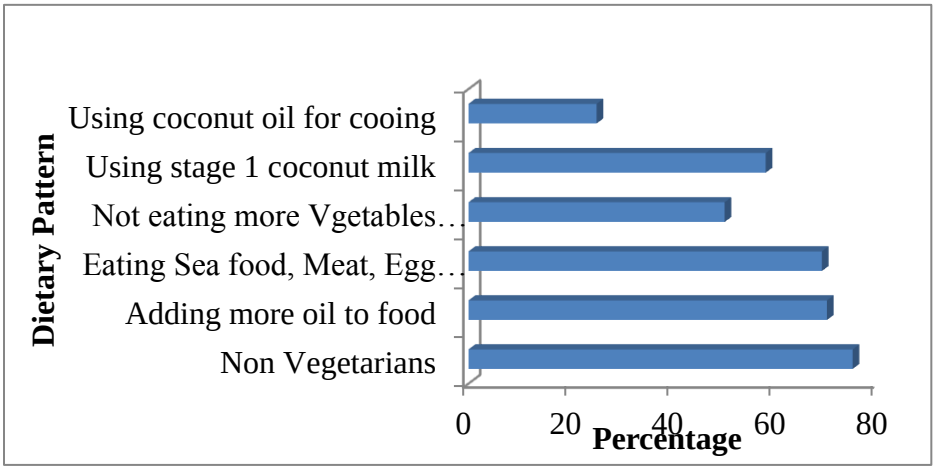

Figure 2. Dietary Pattern of the Participants

Most of the participants were following unhealthy dietary habits. Eighty six (57.3%) participants were adding stage 1 coconut milk (First milk prepared from coconut) and forty six (30.7%) participants were using gingili oil but a significant amount of participants thirty eight (25.3%) were adding coconut for cooking. There were 69% of the participants consuming large fish, meat, crabs, prawn, Cuttle fish and whole egg for more than two days in a week, whereas 24.5% of the participants were vegetarians. About 70% of the participants were adding oil in large quantity in food. There were 75% 0f the participants' not eating a large portion of vegetable and fruits (Figure 2).

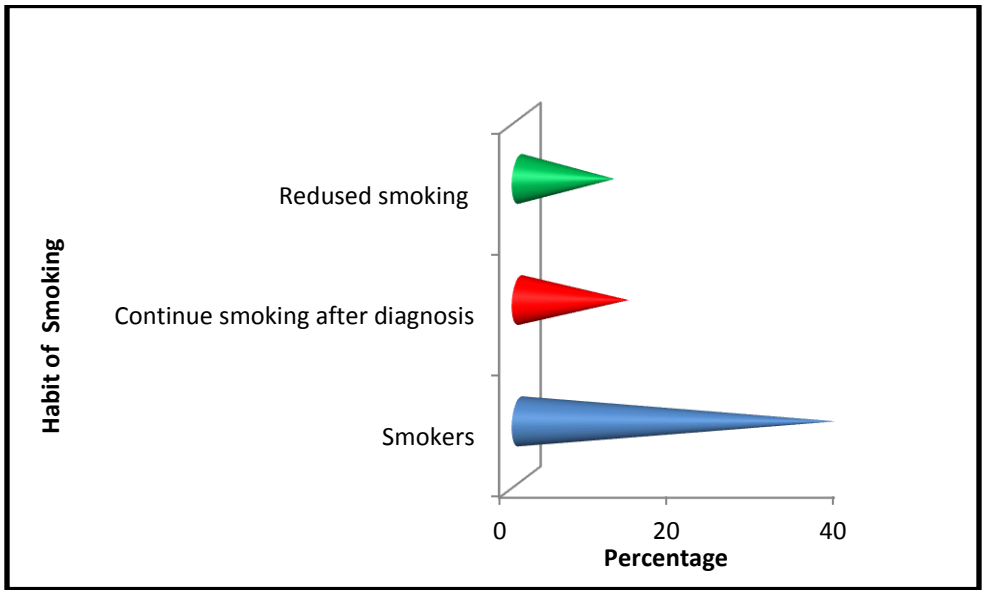

Figure 3. Habit of Smoking

Around 38% of the participants were smokers. Among them 13% of them were continuing smoking after diagnosis as CHD. However, 11.3% of the participants have reduced smoking compared to the past (Figure 3).

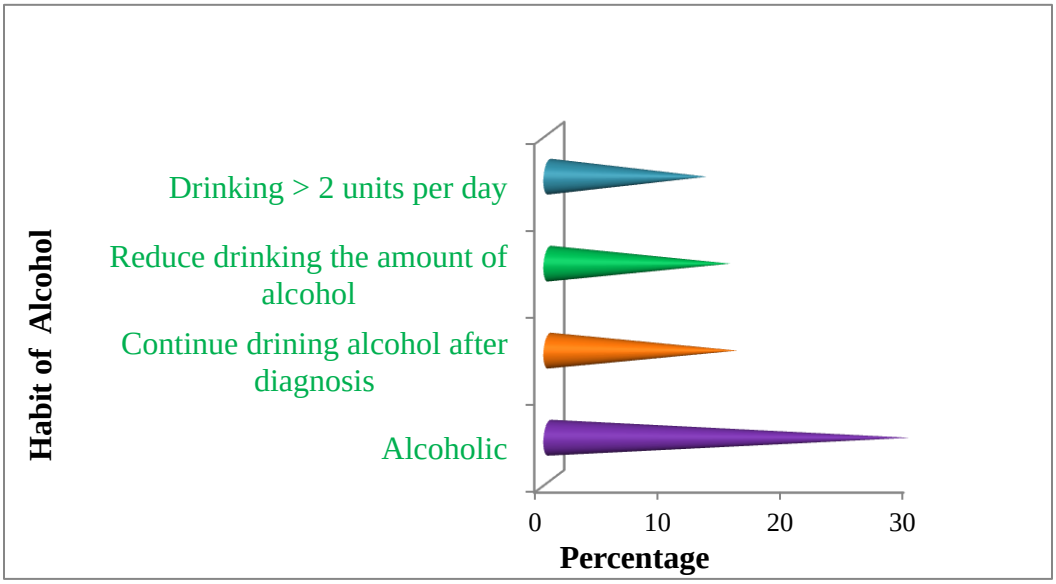

Figure 4. Habit of Alcohol

About 29% of the patients were consuming alcohol but 15.3% still continued drinking after diagnosis, though 14.7% of them had reduced drinking compared to the past. About 13% of the participants were drinking more than two units per day (Figure 4).

Results were given in relation to meet the specific objectives. Hundred and fifty participants participated and the interpretation of the findings will be discussed next.

Discussion

Pattern of Exercise among CHD Patients at TH Jaffna

The findings illustrated that the lack of exercise is the main influencing factor of CHD and a fewer number of the patients were doing exercise including vigorous activity and moderate physical activities. So the risk of CHD in TH Jaffna population may be at a lower level of physical activity as the same findings revealed in Taiwan (Tsai, Hsieh, Li, Chen & Jeng, 2013). Exercise depends on the disease condition of patients. But this study did not analyze the functions of the heart of these patients. The reason may be that the doctor might not have prescribed exercise due to their disease condition. Therefore, lack of exercise cannot be considered as the most influencing lifestyle factor of CHD patients in TH Jaffna.

Another reason may be the poor monthly income. A considerable number of cases were earning less than Rs.10,000 income per month. Therefore, they need to work more hours to earn extra money. Thus, they might not have the mentality of doing exercise in their stressful life.

Dietary Habit of CHD Patients at TH Jaffna

This study finding revealed that a significant number of the patients were using coconut oil for cooking. Studies on coconut oil have not proven whether it has good or bad fatty acids. Some studies stated that coconut oil has saturated fat and it will increase the Low Density Lipoprotein (LDL) and Triglycerides as well. Pehowich, Gomes & Barnes (2000) stated that coconut oil is good for the heart because it has median chain fatty acids (MCFA), which increases the High Density Lipoprotein (HDL). They also claim that virgin coconut oil is good for the heart but it was difficult to draw a conclusion whether the participants were adding virgin coconut oil or not because it is expensive and they are unable to get pure virgin coconut oil in the markets. Therefore, further research is needed to prove that the coconut oil is heart healthy. Therefore, adding coconut oil is considered as unhealthy in this study. More than half of the patients were using stage 01(1st milk juice prepared from coconut) coconut milk for cooking.

Small fish is good for the heart because it has omega 3 fatty acids. It decreases triglyceride levels; slows the growth rate of atherosclerotic plaque. However, coronary artery disease patients may not be able to get enough omega-3 by diet alone. These people may want to talk to their doctor about taking a supplement but big fish has too much of cholesterol. American Heart Association (2015) recommend eating fish (small fish) at least two times (Two servings) a week. Most of the patients were eating a considerable amount of sea foods (Big fishes, Crab, Cuttle fish & Prawn), egg and meat varieties.

So this finding indicates that the participants did not have enough knowledge regarding proper food habits for CHD and the unhealthy food habit is another influencing factor on the causation of CHD among the participants. It increases the risk of CHD even when they are on treatment. Similar results were found in a study by Vest fold Heart care Study Group (2003) and Hu (2009).

Results revealed in the study may be due to the habit of eating rich fatty food by participants since childhood because Sri Lankans mostly consume saturated fats from coconut products, meat, milk

and oil. Similar findings have been drawn by Cadi Research Foundation, 2012. Another reason could be, most of the participants were males and self-employed, hence unable to attend to proper food. Their educational level is also less because most of the participants studied only until grade 6 to 11.

Habit of Smoking Influencing CHD Patients at TH Jaffna

The findings demonstrate a significant number of participants affected by smoking and it is the third influencing lifestyle factor of CHD patients at TH Jaffna because most of the participants were male and more than half of them were self-employed such as drivers, mechanics, laborers, fishermen. A considerable number of participants continued smoking after diagnosis of CHD. So the risk of CHD among these people is high as found in United States (Bazzano, *et al,* 2003) and Japan (Hata *et al*, 2011).

Pattern of Alcohol Intake of CHD Patients at TH Jaffna

This study shows that a considerable number of participants were influenced by alcohol consumption in TH Jaffna. Even though the vast majority of participants still continuing, contrast findings drawn to Rimm, Williams, Fosher, Criqui and Stampfer (1999).

Moderate consumption decreases the risk of heart disease, whereas; high level of intake increases the risk. Here in this study, a significant number of participants, mostly male participants, were taking alcohol more than two units per day which is harmful to the heart a and considerable number of participants have the habit of both smoking and consuming alcohol so they are considered as at risk.

Conclusion

CHD patients in TH Jaffna are mainly influenced by an unhealthy dietary habit such as excessive use of 1st stage of coconut milk, coconut oil for cooking. Eating meat, large fish, crabs, cuttle fish, and prawn for more than two days a week and also less consumption of vegetables and fruits as supplementary items have also contributed to CHD.

This study finding also revealed that substantial proportions of CHD patients in TH Jaffna did not have regular exercise and that a

considerable number of participants was influenced by smoking and a few of them were at risk of CHD due to alcohol consumption.

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Effectiveness of New Innovations Introduced to the Continuous Assessment Mechanism of the Postgraduate Diploma in Education Programme

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Abstract

Two research studies (Lekamge & Jayathilake, 2002; Jayathilake, 1996) which focused on the Continuous Assessment (CA) mechanism of the Postgraduate Diploma in Education programme of the Open University of Sri Lanka (OUSL) had identified several problems such as lack of quality of the set assignments, limited comments on assignments, discrepancies among marking examiners, ill practices among student teachers and high turn-round time of assignments and suggested long term and short term measures to those problems. As a result, the Faculty introduced several innovations namely course team approach, training workshops for marking examiners, Activity Based Assignment Day Schools and appointment of Centre coordinators for improving the quality of the CA mechanism. Having implemented those innovations for nearly three years, it has necessitated an exploratory research study to examine the effectiveness in improving the quality of the CA mechanism and to reveal how it could be further modified to maximize their potentials. The sample of the study included 290 student teachers representing four regional and two study centres of the OUSL, 104 marking examiners and 21 visiting academics of those centres. Exploratory interviews, questionnaires and direct observations were used as the main data collection methods of the study. They revealed that the majority of student teachers, visiting academics and marking examiners were satisfied with the new innovations and admired the positive changes taken place in setting, marking and monitoring of assignments. Finally the study

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recommended several improvements to those strategies which would further maximize the benefits to all stakeholders.

Keywords: Continuous assessment mechanism, PGDE, ODL

Introduction

The Open University of Sri Lanka (OUSL) is a pioneering institution to adopt Open and Distance Learning (ODL) methodologies for professional development programmes in the fields of engineering, nursing and teaching. The Postgraduate Diploma in Education (PGDE) is one of the most popular and demanding programmes offered to in-service teachers by the Faculty of Education. Annually this programme is conducted in all three media (Sinhala, Tamil & English) at 15 regional and study centres for nearly 2500 student teachers. Take home assignments are considered as the main method of assessing student progress. Depending on the credit rating of the courses, student teachers have to complete either three (9 credits) or two (6 credits) assignments satisfactorily to get eligibility to sit for the final examination. Thus the total number of assignments handled annually in this programme amounts to 35000. A large number of visiting academics attached to different regional and study centres mark those assignments using the marking schemes prepared by themselves at the training workshops conducted by the central faculty.

However, as reported by Lekamge and Jayathilake (2002) the Faculty had continuously experienced problems with regard to copying of assignments, low quality of assignments submitted by students, lack of interaction between the students and teachers through assignments, discrepancies among marking examiners, unavailability of constructive comments in assignments, high turn-round time of assignments etc. Therefore, a number of innovative procedures had been developed and introduced for improving the quality of the Continuous Assessment (CA) mechanism. This process was exploratory and progressive and it took a few years to complete the full cycle.

Application of the course team approach for setting assignments and preparing model answers for the assignments can be considered as one such innovation which necessitates collaboration and co-operation among senior and junior academics to maintain the expected standards in the assignments. As a way of strengthening two-way communication between the marking examiners of

assignments and student teachers, a new comment sheet for writing overall comments and detailed comments has been introduced and a training workshop was conducted to improve the quality of marking among marking examiners. The appointment of centre coordinators to streamline the distribution of assignments at regional and study centres and to monitor marking of visiting academics was another new strategy adopted by the Faculty. Further, with a view to ensure active participation and the development of professional competencies of student teachers a new strategy called 'Activity Based Assignment Day Schools' from here on referred as ABADS had also been brought into the programme. Having implemented those strategies for nearly three years, an in-depth study was conducted to find out the effectiveness of those innovations introduced and to recommend necessary measures for further improvement of the CA mechanism of the PGDE Programme.

Literature Review

Assessment plays a vital role in the teaching learning process. According to Granados-García *et al* (2011), continuous assessments assess students throughout the course with periodic testing and they would ease their assimilation of contents and progressive development of skills. Further, Granados-García *et al*, (2011) pointed out several advantages and drawbacks of a continuous assessment mechanism in Open Distance Learning.

Some researchers reported that feedback generated from continuous assessment was a valuable tool in the learning process enabling the learner to assess their own progress, understand and remedy any error indicated by the assessment (Macdonald *etal.*, 1999: Zakrzewqki & Bull, 1999). Having conducted a study on students' perceptions about the impact of continuous assessment in learning Physiology in Sudanese Faculty of Medicine and Health Sciences, Kaddam and Elnimeiri (2013) had concluded that continuous assessment was an effective method in motivating the students.

Jayathilake (1997) had studied the Continuous Assessment System of the PGDE programme of the Open University of Sri Lanka with a view to identify strengths and weaknesses of the system, problems faced by students and tutors and to propose possible solutions for the existing problems. The study revealed the need for redefining the objectives of using CA as a method of evaluating student achievement, restructuring the format of assignments and establishing a supervision system to reduce turn around time of assignments.

The study conducted by Lekamge and Jayathilake (2002) on the Analysis of Tutor Comments on Essay Type Assignments of the PGDE Programme had also given insights into the problems experienced by the institution and students with regard to the CA mechanism. The study recommended several mechanisms to improve the quality of marking of assignments of the PGDE Programme which is the focus of the present study.

Methodology

Overall Objective and the Research Questions

The overall objective of this study was to investigate the effectiveness of the new innovations introduced in relation to the CA mechanism of the PGDE programme. The specific research questions formulated are given below:

1. How far has the participatory approach improved the quality of the set assignments?
2. How effective is the training mechanism implemented by the Faculty to train marking examiners?
3. How effective is the conduct of Assignment-Based Interactive Day Schools to improve student learning?
4. How have the centre coordinators made an impact on improving marking of assignments at centres
5. How have the marking examiners performed the expected roles in line with the CA component?
6. What are the problems (if any) and issues relating to the implementation of new interventions?
7. What are the suggestions for further improvement of the existing mechanism of CA?

Sample of the Study

Out of the total population, 290 student teachers, 21 visiting academics, 104 marking examiners, 09 Centre coordinators, 2 course teams and 800 assignments were selected for the present study. This incorporated both Sinhala and Tamil media and four regional (Colombo, Jaffna, Matara & Kandy) and two study centres (Kurunegala & Trincomalee).

Methods Used for Data Collection and Data Analysis

The mixed approach was selected for the present study as it permitted researchers to use the following multiple methods for data collection.

1. Questionnaire for student teachers
2. Questionnaire for visiting academics
3. Observations on Activity based Assignment Day Schools using a semi-structured schedule
4. Observation of marked assignments using a criteria developed by the team
5. Focus group discussions with course teams

The development of data collection instruments was done by the research team using a collaborative approach. Each instrument was piloted with a small number of participants in actual situations and revised on the basis of their responses before using them on a large scale. The members of the research team and some academics of the faculty were involved in the administration of instruments in this study. Before the commencement of the data collection process, each data collector was briefed about the purpose of the study and how data should be collected using different instruments in a workshop. Focus group discussions were initiated and monitored by a member of the research team.

Internal academics checked 500 assignments related to the same three courses marked by 19 marking examiners (25 from each) at regional and study centres using a criteria developed by the research team.

Simple statistical methods such as frequencies and percentages were used to analyze data collected through questionnaires and qualitative methods such as categorical analysis and content analysis were used to analyze data collected through observations, interviews and focus group discussions.

Findings and Discussion

The results are presented in this section in line with the research questions of the study.

The Impact of the Participatory Approach on Improving the Quality of Assignments

In the PGDE Programme, the compulsory courses (1/3 credit) have three assignments. Each one has to be set according to the format agreed by all the course teams. Marking schemes are also developed using the course team approach (working as a team) and finalized at the training workshops conducted for marking examiners.

Through the exploratory interviews conducted with two course teams and the assignment coordinator of the programme, it was revealed that the course teams had deviated from the said approach due to various reasons. The main reasons they have cited were related to the heavy workload in other programmes of the Department, difficulty in dealing with two batches of the same programme simultaneously and the practical difficulties in having discussions with all course team members on a particular day as some of them were out from the main centre at different times. Therefore, it was revealed that even though the participatory approach has been recommended, the course teams did not have the opportunity to practice it fully.

As revealed through the analysis of assignments of three main courses, the outcome had been that there were drawbacks in the format, practical nature, cognitive levels, novelty and challenging nature of assignments which could have been easily avoided by using the participatory approach.

However, according to views of student teachers, the time allocated for the completion of the assignments was sufficient (81%), sufficient information and guidance was provided in the assignments (75%) and opportunities to practice theory were available through assignments (76%). Similarly, more than half of the marking examiners had expressed their moderate satisfaction with the suitability of language (50.4%) and inclusion of challenging tasks in the assignments (55.6%) while 31.7% & 27.8% respectively had expressed their fullest satisfaction with the same aspects. However, nearly 20% of marking examiners were not satisfied with the appropriateness of the assignments for the level of the programme and the opportunities given for applying professional skills through the assignments. Therefore, it could be assumed that there is room for improvement of the level and quality of the assignments through the course team approach which would in turn facilitate the development of professional competencies of student teachers.

Effectiveness of the Training Mechanism Used by the Faculty for Marking Examiners

One major procedure adopted by the Department to improve the quality of marking is to conduct a one-day training programme annually to enhance the awareness of marking examiners about their role, writing constructive comments on assignments and to finalize the marking schemes in order to increase the consistency among marking examiners. The following tables (1 & 2) illustrate the opinion of the marking examiners.

As illustrated in Table 1, 50 out of 104 marking examiners were fully satisfied with the introduction given on the three roles namely the communicator, facilitator and assessor. It was further supported by their 'fully satisfied' and 'moderately satisfied' opinion on the detailed explanation given on how to mark assignments (41% & 45% respectively) and how to make comments on assignments (48% & 33% respectively). However, it is important to note that 21% and 17% respectively were not 'fully' or 'moderately satisfied' with those aspects.

Table 1. Perceptions of Marking Examiners about the Training Programme

Aspects	**Frequencies**			
	Not satisfied	**Moderately satisfied**	**Fully Satisfied**	**Total**
(a) Introduction on the role of marking examiners	21	33	50	104
(b) Explanation given on the process of marking assignments	17	46	41	104
(c) Explanation about the guidelines of marking assignments	17	46	41	104
(d) Procedures to be followed to reduce variations in marking of assignments	23	46	35	104
(e) Advice on how to make comments on assignments	21	48	33	104
(f) Experience gained about the assignments and marking Schemes	17	54	33	104

Table 2. Marking examiners' opinion about the strategies used in the training workshop

Aspects	**Not Satisfied** %	**Moderately satisfied** %	**Fully satisfied** %
(a)Guidance provided for different group activities	12.14	41.12	46.72
(b) Relevance and usefulness of the activities	20.95	29.52	49.52
(c) Time allocated for different activities	19.23	35.57	45.19
(d) Facilities provided for group work	13..33	37.14	49.52
(e) Opportunities provided for group interactions	18.44	37.86	43.68
(f) Opportunities provided to express your ideas	17.30	38.46	44.23
(g) Opportunities provided to interact with staff members	13.59	39.86	46.60

When marking examiners were asked to reveal their satisfaction with the strategies used (Table 2) in the training workshop, 45 to 52% and 29 to 41% respectively said that they were 'fully satisfied' or 'moderately satisfied' with them. It was only 13% of them were not satisfied with all seven aspects covered in this section.

The relevance and usefulness of activities and the time allocated for the activities at the workshop were the two aspects that the majority of marking examiners were not satisfied with. This is a clear indication that the strategies used at the workshop need further improvement to suit the expectations of the marking examiners.

Effectiveness of Activity-Based Assignment Day Schools (ABADS) to Improve Student Learning

ABADS was a new strategy introduced by the Faculty to avoid problems arising due to ill-practices and lack of prior preparation of students in completing take home assignments and to provide diverse and challenging opportunities for student learning. Through the utilization of ABADSs as a platform for developing inter-personal skills, presentation skills, and thinking skills of student teachers, a positive change in the personality of student teachers was also expected. It was assumed that the effectiveness of ABADS on student learning would rely on the correct perception of the visiting

academics about ABADS. Therefore, visiting academics were asked to highlight their perceptions on the difference between the normal day schools and the ABADS in the questionnaire.

The majority (47.6%) of visiting academics agreed that ABADSs have the ability to encourage student teachers to read modules and participate in activities. It was somewhat satisfying to find that 23.8% visiting academics believed that ABADSs are more powerful and effective than the normal day schools. A substantial percentage of visiting academics (38.1% & 33.3% respectively) had pointed out that more preparation and extra-reading and collection of material are needed for the conduct of ABADS satisfactorily (Table 3). Further, 19.0% said ABADSs require more involvement of visiting academics than the normal day schools. These data clearly confirms that the ABADS had made a remarkable change in the behavior of visiting academics which may have directly affected the changing learning patterns of student teachers.

Table 3. Preparation of visiting academics towards Activity Based Assignment Day Schools (ABADS)

Responses of visiting academics	**Percentage**
1.More prior preparation is needed for the ABADSs	38.1
2.Extra reading and collection of additional information needed	33.3
3.ABADSs need more involvement than other day schools	19.0
4.More attention should be paid on ABADSs	4.8
5.More prior preparation needed for the other day schools than ABADSs	4.8

When evaluating the effectiveness of ABADSs it was very important to find out how visiting academics felt about student teachers' preparation at the ABADSs (Table 4).

According to Table 4, 54% stated that the student teachers had shown poor preparation. However, 42.9% highlighted that the majority of student teachers were well prepared for the ABADSs. As they further revealed, student teachers were highly motivated in the ABADSs (90.5%) though student-student interaction was limited in group activities (23.8%). Therefore, it could be concluded that only some objectives formed in line with the introduction of ABADS had been realized.

Table 4. Preparation of student teachers at ABADS- Views of visiting academics

Responses	Percentage
1 Poor prior preparation of students for the ABADSs	52.4
2 Most students are well prepared but few are not well prepared for the ABADSs	42.9
3 Students are well prepared in ABADS for some courses only	4.8

The effectiveness of ABADSs could be further assessed through student teachers opinion on how those ABADSs were organized and managed by the coordinator and the Department. As they pointed out (Table 5), activities were challenging (80% was either agreed or strongly agreed), lecturers were well prepared (85%), allocation of activities were fair (77%), opportunities for peer interaction was productive (86%), atmosphere was friendly (89%) and feedback was received on the spot (84%).

Table 5. Student teachers perceptions on the arrangements made for ABADS

	Statements	St: disagree	Disagree	Neither agree/ disagree	Agree	St: agree
1	Activities planned for the ABADS are very challenging	7%	13%	10%	45%	25%
2	Lecturers are well prepared for the ABADS	6%	3%	5%	25%	60%
3	Allocation of activities in the ABADS is fair.	4%	4%	6%	34%	52%
4	Opportunities in the ABADS to interact with peers are very productive.	6%	3%	3%	27%	59%
5	A friendly and supportive atmosphere was maintained by the lecturers at the ABADS.	6%	3%	2%	28%	61%
6	Feedback was received on the spot for completion of activities at the ABADS	3%	7%	6%	35%	49%

***St:** - Strongly

According to Table 6, more than 80% of student teachers either 'agreed' or 'strongly agreed' with all the statements presented to them for assessing the effectiveness of ABADSs.

Further, student teachers agreed that the activities were having an impact on their skill development (85%), strategies used at ABADS were excellent (78%), feedback was useful (87%) and ABADS were more productive (84%), useful (84%) and effective (83%) than the written assignments. In comparison with the visiting academics view that they needed to do additional reading and other prior preparations to conduct ABADS, student teachers were having a similar opinion about their preparation. The above responses clearly confirmed that both visiting academics and student teachers have a positive opinion about the ABADS. Further they confirmed that ABADS had improved opportunities for student teachers to become active participants in the teaching-learning process and visiting academics' responses were also in agreement with it.

Direct observations of academics had revealed the following about the conduct of ABADS. The faculty staff spend a lot of time in preparing detailed guidelines for the conduct of ABADS and these guidelines are discussed at the training workshops with visiting academics. Those guidelines provide opportunities to minimize differences among visiting academics teaching at different centres. However, according to the observations, there were deviations from the guidelines at the man centre and in some other centres. Some academics had followed a different procedure without showing any concern about the guidelines provided.

According to the Table 6 one can assume that the student teachers who attended ABADSs get an opportunity to obtain challenging and motivating experiences, to participate in the activities or to interact with other colleagues and to apply what they had learned through the modules. It is somewhat encouraging to find that the majority of visiting academics had followed the format and the activities had been conducted according to the expected standard.

Table 6. Student Teachers' opinion on the effectiveness of ABADSs

	Statements	Strongly disagree	Disagree	Neither agree/ disagree	Agree	Strongly agree
1	Activities planned for the Activity-based Assignment Day Schools have an important effect on students	6%	3%	6%	40%	45%
2	Application of different strategies to get the participation of students in the Activity-based Assignment Day Schools is excellent.	6%	7%	9%	45%	33%
3	The feedback given in the Activity Based Day Schools is very useful.	5%	4%	4%	38%	49%
4	Activity-based assignment day schools are more productive than written assignments	7%	3%	6%	28%	56%
5	Activity-based Assignment day schools are more useful than written assignments.	6%	4%	6%	27%	57%
6	Activity-based Assignment day schools are more effective than written assignments.	6%	4%	6%	29%	54%

Impact of Centre Coordinators on Improving Marking of Assignments at Centres

The department had appointed centre coordinators for the regional centres and assignment coordinators for the study centres in order to achieve two main objectives:

- Streamlining coordination of marking of assignments
- Monitoring marking of assignments

As indicated by all the seven coordinators, they had a clear understanding about their roles (Strongly Agree & Agree = 100%). It was further evident that all the coordinators were spending time with marking examiners to finalize procedures (Strongly Agree & Agree = 100%) and willing to take obligatory decisions with regard to marking of assignments (Strongly Agree & Agree = 100%). With regard to copied assignments, they were following the proper procedures. However, it was discouraging to find that a considerable

number of coordinators (2 out of 7-28.6%) neither agree/nor disagree with the statements related to completion of work on scheduled dates and returning the assignments on time by marking examiners. In other words coordinators had shown little concern about reducing the turn-round time of assignments.

Having analyzed the responses of Centre coordinators in relation to monitoring of marking of assignments, a positive picture had emerged. All seven coordinators agreed that the assignment marking examiners had written the necessary comments/feedback on assignments though no one strongly agreed with this statement. It is encouraging to find that the centre/assignment coordinators had valued 'the opportunity available for them to provide service to the field of education'. A substantial number felt that it was an 'opportunity to use their knowledge and training for some useful purpose' (55%) and they were 'able to contribute to teachers' professional development (33%)' through assignments.

Performance of Marking Examiners in line with the Expected Roles

A detailed analysis was done with regard to assignments marked by 19 marking examiners according to the criteria developed by the course team. However, in this paper only the overall observations are presented in Table 7.

According to Table 7, the majority of marking examiners had received good ratings with regard to criteria 1, 3, 4, 5 and 6. In other words, the majority of marking examiners had been performing the role of facilitator and the role of assessor up to the expected level. With regard to criteria 6 and 8 (link with the role of the communicator), the performance of the majority of marking examiners was in a moderate level. Very poor ratings were received by two marking examiners (B & G) and their assignments were related to ESP 2201 and 2202 at Matara and Kandy centres. It could be further observed that two Tamil medium marking examiners (R & S) had received the highest ratings out of all 19 marking examiners and their assignments were related to ESP 2205. It was evident that the innovations had a substantial impact on improving the quality of marking of assignments and the majority of marking examiners were focusing on both assessor and facilitator roles. However, their focus was moderate with regard to the role of communicator which needs to be improved further.

Table 7. Overall observations of internal academics on marked assignments

Aspects	Observers' Ratings				
	Very Good	Good	Moderate	Poor	Very Poor
(1)Simple language is used for making comments	MKJS	FADGNHIL OQRS	BC	G	
(2)Positive and negative comments are made	JQRS	KHILM	FADENOP	BC	G
(3)Comments match with the given grade	L	FDKHIMN OSPQR	ABEJ	CG	
(4)Indicate where mark has been lost		ELJMSQR	ADHIJN	CFKP	BG
(5)Allocate marks according to the marking scheme	LJ	FDEGIMN OSQR	ABKHP	C	
(6)Give correct answer where necessary		DEM	CBJHILO QRS	AFKNGP	
(7)Consistency in marking has been maintained	S	FDEHILMN RPQ	ABJKGO	C	
(8)Encourage further learning	J	MLS	FECDNO KIPQR	AH	BG

A, B, C, D, E, F, G, H, I ,J ,K , L, M, N,O, P, Q, R, S = marking examiners

It was believed that the best people to inquire about marking of assignments were the student teachers themselves. Therefore, in their questionnaire, a major part was devoted to this aspect (Table 8). The data revealed that nearly 63% of student teachers were either fully satisfied or satisfied with the feed back given by the marking examiners on their assignments and a similar percentage felt that the comments made by them were very helpful for them to complete their future assignments. This was a substantial improvement experienced through the innovations introduced in this programme. Further, the majority (72%) of student teachers believed that grades given for the assignments were appropriate for their attempt. In addition, they had expressed their high or moderate satisfaction (77%) with the process applied for marking of assignments which

could be considered as a noticeable change experienced after the study conducted by Lekamge and Jayathilake (2002).

Table 8. Student teachers' opinion on the role of marking examiners

	Statement	**Fully dissatisfied**	**Dissatisfied**	**Neither satisfied/nor dissatisfied**	**Satisfied**	**Fully satisfied**
1	The feedback given for assignments is very forthcoming/ motivating.	10%	16%	11%	44%	19%
2	Feedback given on assignments is helpful in completing future assignments	14%	13%	11%	44%	19%
3	Grades received for the assignments are appropriate for the attempt.	6%	12%	10%	37%	35%
4	The process of evaluating assignments is satisfactory.	05%	08%	10%	41%	36%

However, student teachers were having problems with getting the marked assignments back. Only 55% of student teachers were in agreement with the idea that they received their assignments on time/without delay.

The organization of marking of assignments at centres and sending marked assignments back to students are duties expected from the centre coordinators and they are paid for completing this task. However, it seemed that even after appointing centre coordinators to monitor and expedite the process of marking assignments, student teachers were not happy with the turn-around time of assignments. Therefore, this situation demands urgent action from the Department.

Problems and Issues Related to the Implementation of New Innovations

a. Problems pertaining to the use of participatory approach for setting assignments

As revealed in a previous section, the less concern shown in applying the course team approach for setting assignments, resulted in lowering the quality of the set assignments. Further, the analysis revealed several problems in the coverage, wording and typography of assignments which may have created a lot of problems for student teachers when answering the assignments. However, problems such as 'lack of awareness about the course-team approach" inability to continue course-team approach due to unforeseen reasons' 'limited time gap between two intakes of students in the programme' and 'Senior academics being burdened with other issues of the Department' could be identified in line with the setting of assignments through the discussions with internal academics.

b. Problems encountered in the training mechanism

In line with the responses of the marking examiners who had participated in the training workshops, problems such as 'poor planning and organization of the training workshop' 'less challenging activities and strategies applied in the workshop' 'limited opportunities given for group work and 'limited interaction with internal academics' could be identified. Further, the discussions with internal academics had revealed that they had limited guidance within the Faculty and they were always busy with several other activities which did not permit them to concentrate fully on assignments of the PGDE Programme. However, these problems may have led to lower down the quality of the CA mechanism.

c. Problems encountered with the conduct of ABADS

In the above sections, the effectiveness of the ABADS was revealed. However,it does not mean that the ABADS are conducted without any problems. The majority of visiting academics had problems in managing time (47.6%) as ABADS are overloaded with too many activities (14.3%). Further, they had problems with guidelines given (9.5% and 4.8%) and late comers (9.5%). As they further revealed, the main problem of student teachers in relation to ABADS was their inability to present answers due to their poor preparation (28.6%). Lack of time given for student presentations (23.8%), limited presentation skills (19.0%) and lack of understanding and

motivation of student teachers (19.0%) were the other problems noted. Student teachers also indicated similar problems in line with ABADS.

d. Problems related to marking of assignments

Handing over the assignments before having the day school was the main problem faced by student teachers. This may be due to the belief of student teachers that day schools would help them to complete the assignments in a satisfactory manner. More than 20% stated that the department did not send their first set of assignments before submitting the next set of assignments. Therefore, the outcome would be that student teachers repeat the same mistakes through out the academic year. Their next issues relate to the limitations of modules prepared by the institution (16.6% & 12.8%) and the difficulty in handing over multiple assignments simultaneously. Thus, it is questionable whether the assignments can be considered as a learning tool in this programme. Student teachers also pointed out several problems in line with the preparation for assignments, assignments set by the department and comments and grades received for the assignments.

In addition, through the observations of marked assignments, the internal academics had also identified the problems related to 'delay in sending the marked assignments to students' and 'strength of the comments to motivate students for further studies' 'lack of direction for the correct answers' 'lack of specific or personalized comments'. Therefore, the quality of the set assignments and marking schemes, coordination of assignments, turn-round time, monitoring of marking and payments for marking needs further improvement.

Conclusions

It can be concluded that the internal staff members were aware of the positive impact of the participatory approach to the development of assignments, activity-based assignment day schools and marking schemes. Inability to apply the course team approach had led to low quality assignments and unworkable and impractical guidelines for ABADS which had caused numerous problems to student teachers as well as visiting academics. Further, marking examiners were fully satisfied with the introduction given on their roles and explanation given on how to make comments on the assignments though they expressed less satisfaction about the relevance and usefulness of activities, the time allocated for the activities and the strategies used at the training workshop. Visiting academics and student teachers

were in agreement with the view that ABADSs have the ability to encourage student teachers to read modules and improve their active participation in day schools. Monitoring of marking through centre /assignment coordinators had a substantial impact on improving the quality of marking of assignments and the majority of marking examiners were focusing on both Assessor and Facilitator roles. Overall, the study provided positive evidence to confirm the effectiveness of the new innovations introduced to the CA mechanism of the PGDE programme.

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Protective Techniques Followed by Nurses to Prevent X-ray Exposure During Fluoroscopic Guided Surgeries

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Abstract

Fluoroscopy is a type of medical imaging that shows a continuous X-ray (ionizing radiation) image on a monitor. Fluoroscopic guided surgeries are increasing all over the world. However, the danger of X-ray exposure may be an issue for health care workers including nurses. X-ray can cause both somatic and genetic damages such as squamous cell carcinoma of hands, leukemia, thyroid cancers, stomach cancers, and birth defects. The aim of this study was to examine protective techniques followed by nurses to prevent X-ray exposure during fluoroscopic guided surgeries. This quantitative descriptive study was conducted in three main hospitals in Sri Lanka; namely National Hospital of Sri Lanka (NHSL), Colombo South Teaching Hospital (CSTH), and Sri Jayewardenepura General Hospital (SJGH). The convenience sampling method was utilized to recruit 100 nurses who are working in fluoroscopic theatres of these hospitals. A self-administered questionnaire was used as a tool for data collection. The study revealed a sound knowledge regarding X-ray protective techniques and poor knowledge regarding international standard protective techniques to protect themselves from X-ray exposure among nurses. However, attitudes are satisfactory. Existing practices of X-ray protective techniques are poor. Insufficient equipment, lack of knowledge and modern technology, poor training facilities were identified as barriers to use X-ray protective techniques. Health authorities of Sri Lanka should

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accept the importance of X-ray protection, and should provide appropriate training, policies and equipment. Overall changes are also needed in hospital administration to facilitate adequate educational sessions, protective devices and technology on X-ray protection for health care workers including nurses.

Keywords: Fluoroscopy, Nurses, Protective techniques, X-ray

Introduction

Fluoroscopic guided surgery has increased in Sri Lanka. United States Food and Drug Administration (2014) defined fluoroscopy as a type of medical imaging that shows a continuous X-ray movie on a monitor. Therefore, the movement of a body part or an instrument or X-ray dye can be seen in detail throughout the fluoroscopic guided surgery. Fluoroscopy is a source of ionizing radiation (X-ray) and therefore, the operating theatre personnel including theatre nurses are exposed to X-ray frequently. It is a potential health hazard with continued exposure during fluoroscopic guided surgery (Mariscalco *et al.*, 2011).

The University of Chicago Medicine (2014) highlighted that fluoroscopy makes interventions less invasive. Further, they pointed out that the advantages of fluoroscopic guided surgery are less post-operative pain and discomfort, a shorter hospital stay and quicker return to normal activities, smaller incisions which means smaller and less noticeable scars, leading to less tissue damage and quicker recovery and a higher accuracy rate for most procedures. Hayashi (2008) stated that minimally invasive procedures have many benefits for the patient, but the use of fluoroscopy is problematic for operating room personnel concerned about X-ray exposure. The patient's exposure is limited to one or few operations but the surgeon and the operating room personnel are repeatedly exposed to X-ray during multiple procedures. This exposure can be a cause for changes of body cells and potentially increased risk of cancer. Even relatively small doses should be considered as dangerous over long-term (Patrick & McCormick, 2008).

World Health Organization (2011) has classified X-ray as a carcinogen. Risks of excess X-ray exposure are not insignificant, potentially leading to a variety of health issues such as birth defects, cataracts, hair loss and the development of cancers. It is easy to become complacent about the dangers of X-ray as it is invisible and odorless, and therefore health care workers are often caught up in

performing procedures. As a result, health care workers and patients may be exposed to a higher level of X-ray (Kiah & Stueve, 2012).

There were many studies highlighting the risk of X-ray exposure to the operating surgeons as well as assistants and nursing staff in other countries (Flor & Gelbcke, 2013; Linet *et al.*, 2010; Nelson *et al.*, 2014; Vano *et al.*, 2010; Yunus *et al.*, 2014 & Yurt *et al.*, 2014). Among these, most studies were done in developed countries than developing countries related to radiation safety. Many studies found that the knowledge regarding using protective techniques to prevent radiation exposure among nurses was not satisfactory all around the world (Linet *et al.*, 2010; Mariscalco *et al.*, 2011 & Yurt *et al.*, 2014). Osman et al. (2013) emphasized that well training and knowledge about hazards are initial steps needed to reduce radiation risk.

International standard protective techniques are methods using a set of mandatory requirements, based on the knowledge of biological effects of radiation and on principles for protection from undesirable effects (Wrixon, 2008). Sign on the door, wearing lead lined gloves, using eye wear, thyroid guards, lead aprons, steel-toed shoes, standing behind a lead lined shield; staying away from the X-ray beam at least six feet and using hand free techniques are considered as international standard protective techniques.

Kesavachandran *et al.* (2012) stated that the international commission on radiological protection has established the standards for radiation protection. Further, they pointed out that most of the nurses do not practice X-ray protective techniques properly. Health care workers involved in X-ray should be monitored monthly or quarterly by using dosimeters that help to quantify the X-ray exposure dosage and it should not be allowed to exceed the annual permissible limits (Wrixon, 2008). According to Banfield (2012), a unique problem in the operating room is protective devices that need to be worn under sterile clothing. The author further stated that the protective devices are heavy, uncomfortable and not welcomed by most operating room personals. There was some evidence highlighting the differences between using and not using protective techniques and garments. Bahari *et al.*, (2006) recommended the adherence to the basic principle of 'As Low as Reasonably Achievable (ALARA)' (making every reasonable effort) in any fluoroscopic assisted procedures. Therefore, routinely monitoring of X-ray exposure by using dosimeters is essential in preventing radiation related diseases. Soares, Pereira and Flor (2011) in Brazil, found that ALARA principles such as distance from the X-ray source, time

of X-ray exposure and shielding, decrease the dose exposure for occupationally X-ray exposed individuals.

In Sri Lanka, there were no published studies related to X-ray exposure and protective techniques used by health care workers including nurses. Due to the minimal literature, the Sri Lankan situation regarding the X-ray exposure in fluoroscopic guided surgery is not known. Yet, radiation protection is one of the main issues for occupational health of nurses who are engaged with fluoroscopic guided surgeries in Sri Lanka. Therefore, it is necessary to examine the protective techniques followed by nurses to minimize X-ray exposure during fluoroscopic guided surgery.

The main purpose of the study was to inquire in to the protective techniques followed by Sri Lankan nurses to prevent X-ray exposure during fluoroscopic guided surgery. The other specific aims of this study were to identify knowledge and attitudes among nurses to prevent X-ray exposure during fluoroscopic guided surgery, existing practices and barriers in following protective techniques to prevent X-ray exposure during fluoroscopic guided surgery.

Findings of this study will help to assess the awareness of nurses regarding protection from X-ray during fluoroscopic guided surgery. It will contribute to the development of the nursing practice by providing appropriate X-ray related education for nurses. It will also help to identify the importance of facilitating adequate protective devices, introduce guidelines for protection from X-ray and improve awareness of X-ray protection among Sri Lankan nurses. Finally, this study will help further studies related to X-ray protection among health care workers including nurses.

Methodology

A quantitative descriptive design was utilized in this study. It is best suited for the study as it helps to describe what exists and uncover new facts and meaning (Polit & Hungler, 1983; Martyn, 2008).

Sample and Setting

The participants of this study were nurses who work in the operating theatres in three main hospitals in Sri Lanka; which were National Hospital of Sri Lanka (NHSL), Colombo South Teaching Hospital (CSTH), and Sri Jayewardenepura General Hospital (SJGH).

There were 80 fluoroscopic guided surgeries done in NHSL, 45 fluoroscopic guided surgeries in CSTH and 40 in SJGH per month in 2014.

One hundred nurses who work in the operating theatres and who are involved with fluoroscopic guided surgeries in the selected three main hospitals were recruited as a convenience sample. Both male and female nurses who had at least 02 years of working experience with fluoroscopic guided surgery were considered as inclusion criteria for the selection. Further, the sample was under the different age limits and all are registered nurses in Medical or Nursing Council in Sri Lanka. The ethical approval was granted by the ethical review committees of NHSL, CSTH and SJGH and permission was taken from the Directors of these hospitals to conduct this study. After information sheets were distributed, informed consent was taken from the participants of the study. No ethical issues were encountered throughout the study.

Data Collection

The research tool was a self-administered questionnaire that was validated by using reviewed literature and finalized with expert opinion (Denzin & Lincoln, 2005). As a pilot study, the questionnaire was distributed among ten participants who did not participate in the study (Shuttleworth, 2010). It was focused on participants' demographic data; nurses' knowledge regarding the manner in which parts of the body are affected, and international standard safe techniques and attitudes towards X-ray safety; the existing practice of safety techniques to prevent X-ray and barriers to practice safety techniques. The pre tested and validated questionnaire was distributed among the selected group for data collection during 15th November to 10th December in 2014. Participants were fully informed regarding the purpose of the study and the methods to ensure ethical aspects of participants' involvement. Completed questionnaires were collected by keeping a separate file in the corner of the nurses' station to protect the confidentiality of the participants (Whelan, 2007).

Data Analysis

Data was analyzed by using Statistical Package for the Social Sciences (SPSS) 16.0 version with the purpose of drawing

conclusions from the information. Microsoft Excel Package was also used for data management.

Results

The general demographics of the participants for gender showed that 95% were female while 5% were male nurses. Forty one from NHSL, 30 from CSTH and 29 from SJGH were represented in the sample. In terms of academic qualifications, 60% of the respondents were diploma holders whereas 28% were undergraduates and 12% were B.Sc. nursing graduates. Only 7% of participants had more than 20 years of working experiences. There were 22% of participants had 11-20 years working experiences, 12% had 6-10 years of working experiences, and 42% had 3-5 years of working experience with fluoroscopic guided surgery.

Nurses' Knowledge regarding Protective Techniques

Surprisingly 99% of the nurses aware that the exposure of X-ray will damage the thyroid gland and more than 95% of nurses accepted that brain and genital organs could be damaged from X-ray. More than 80% of nurses mentioned that the eye, thoracic and abdominal organs can also be damaged due to X-ray. More than 60% of the nurses have reported that there is no harm to the hair and teeth due to X-ray exposure (Figure 1).

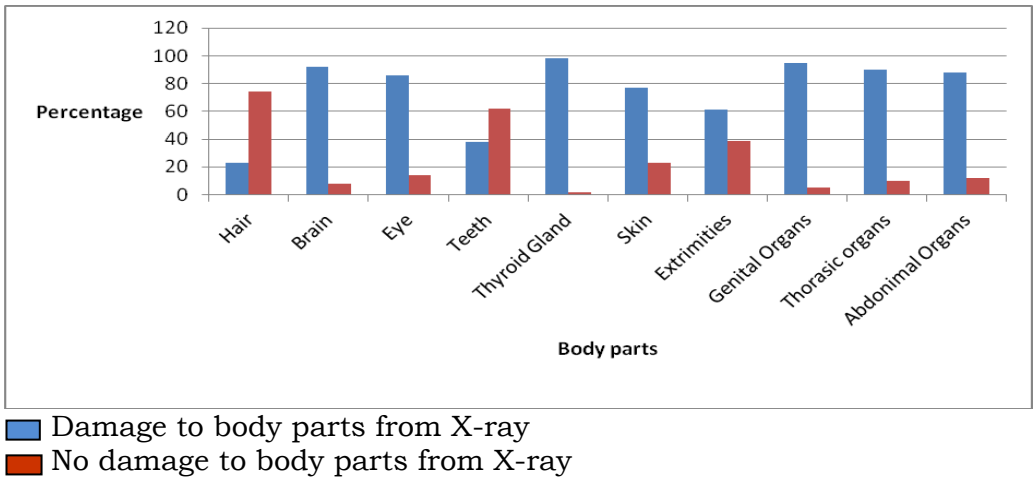
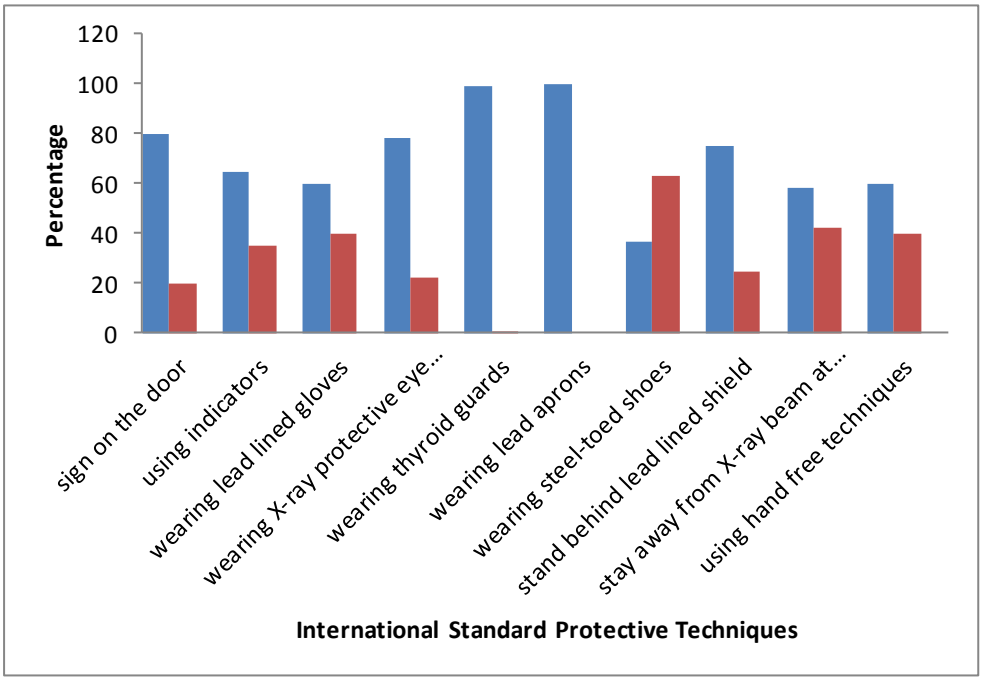


Figure 1. Nurses' knowledge regarding damage to body parts from X-ray

Additionally, 99% of the nurses were unaware of ALARA principles (time, distance, shielding), but 100% of participants accepted the importance of wearing led aprons and 99% accepted wearing thyroid guards as international standards. Nearly 80% of the nurses recognized the sign on the door about the risk of radiation, wearing X-ray protective eye wear, and standing behind a lead lined shield as international standard protective techniques. It seems that around 60% of the nurses wear lead lined gloves and use hand free technique as international protective techniques to protect hands from X-ray. Around 65% of them recognized the importance of using dosimeters to indicate dosage of personal X-ray exposure. Further 58% of nurses identified that to reduce X-ray exposure they should stay away from the X-ray beam (at least six feet) as an international standard protective technique. In contrast, 63% of the nurses did not believe wearing steel-toed shoes as an international standard protective technique (Figure 2).



Accept as international standard protective technique
Not accept as international standard protective technique

Figure 2. Nurses' knowledge of international standard protective techniques for X-ray protection

Nurses' Attitudes towards X-ray Protection

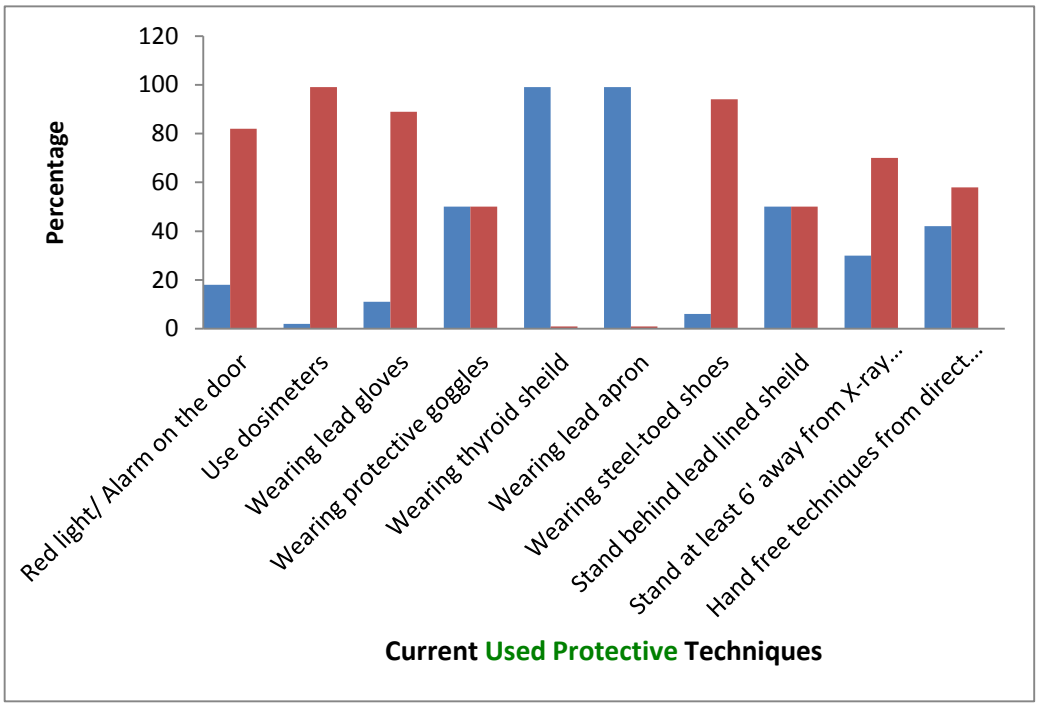
Eighty seven percent of nurses believed that the assisting nurse must wear protective lead shields, while 75% of the nurses believed that the circulating nurse must also wear protective lead shields. It was found that 96% of the nurses agree to wear protective lead shields even their family is completed (having enough children). In contrast, 44% of nurses pointed out that they have inadequate knowledge regarding X-ray protection. There was 92% of the study sample agreed that their knowledge regarding X-ray protection must be updated (Table 1).

Table 1. Nurses' attitudes towards X-ray protection

Statement	Disagree	Neutral	Agree
1. All the persons of the health care team wear protective lead shields during fluoroscopic surgery.	2%	14%	84%
2. When person present without lead apron and a thyroid shield in the theatre X-ray technician, stop X-ray screening.	3%	8%	89%
3. Persons enter the theatre without protective Wearing when using x-ray.	4%	4%	82%
4. When seeing X-ray screening by X-ray technician unnecessarily without surgeons' order, tell him to stop screening	3%	7%	90%
5. Wearing protective lead shields by assisting nurse is important during fluoroscopic surgery	3%	10%	87%
6. Wearing protective lead shields by circulating nurse is important during fluoroscopic surgery	7%	18%	75%
7. Wearing protective lead shields is necessary when my family is completed (having enough children).	1%	3%	96%
8. I have adequate knowledge regarding X-ray protection	44%	27%	29%
9. My knowledge regarding X-ray protection must be updated	4%	4%	92%

Existing Practices of Nurses in Protective Techniques with Fluoroscopic Guided Surgeries

The results of the study showed that 99% of nurses wearing thyroid shield and lead apron as current practice of protective techniques. In contrast 99% of them did not use dosimeters, 94% not used steel toed shoes, 89% refused to wear lead gloves and 82% were not used red light or alarm on the door as current use safe techniques. Nearly 70% of nurses did not follow the standard of 'at least six feet away from X-ray beam' and 58% of them did not practice hand free technique from direct X-ray beam to reduce X-ray exposure. Furthermore about 50% of the sample used protective goggles while 50% of them did not follow the standard of 'behind lead lined shield' (Figure 3). The overall sample (100%) was accepted that they did not have opportunity to engage in training programs or sessions on X-ray protection.



Practice as safe technique
Do not practice as safe technique

Figure 3. Existing practices of X-ray protective techniques among nurses

Barriers to Practice Protective Techniques to Prevent X-ray Exposure

There were barriers to practice protective techniques. According to the study results, 72% of nurses identified the heavy weight of the lead apron as a barrier to practice safe techniques. Additionally, 40% of nurses did not like to wear common aprons. Further, 54% of nurses recognized the shortage of lead aprons and other shields as barriers to practice protective techniques to prevent X-ray exposure during fluoroscopic guided surgery.

Discussion

This study found out that most of the nurses have satisfactory knowledge about damage of the brain, thyroid gland, genital organs, thoracic organs, abdominal organs, eye and skin due to X-ray exposure. However, they did not have adequate knowledge about the damage of extremities (hands), hair and teeth from X-ray. Based on the result, the researchers would like to highlight that nurses did not have knowledge about ALARA principles which help to minimize personal X-ray exposure same as in Turkey (Yurt *et al.*, 2014). Nurses' knowledge about radiation safety and X-ray protection in Korea is also poor (Park *et al.*, 2012). Similarly nurses did not have adequate knowledge regarding the effects of X-ray and international standard protective techniques. They do not have a basic training program about X-ray protection and it may be one of the reasons for this inadequate knowledge.

The nurses accepted wearing the lead apron as an international standard protective technique. Further, most of them identified the red alarm or sign on the door, wearing X-ray barrier goggles, thyroid shields and standing behind lead lined shields as international standard safe techniques against X-ray. Furthermore, they had knowledge regarding using dosimeters to indicate the dosage of personal X-ray exposure. However, the majority of the sample had inadequate knowledge related to the international standard protective techniques. They did not know hand free technique and distance principle. This situation is the same in Kuwait and they found that nurses who worked in the radiology department had inadequate knowledge of X-ray protection measures and less knowledgeable about the risks of radiation (Alotaibi & Saeed, 2006). This lack of knowledge in some areas means that the nurses are

unable to effectively protect themselves, the health team as well as their patients from unnecessary X-ray exposure.

According to the study, most of the nurses had positive attitudes towards using X-ray protective techniques. Almost all of the nurses had a positive attitude related to the concern of protection of themselves as well as their team members. Additionally a vast majority of the nurses wanted to update their knowledge and develop attitudes about X-ray protection. It is similar to the findings from the study done in Kuwait and they pointed out that nurses were concerned about radiation and would like to learn more about health risks associated with radiation (Alotaibi & Saeed, 2006).

Although nurses had positive attitudes towards X-ray protective techniques, there were no standard and acceptable education programmes on radiation safety related to X-ray protection. Situation of Turkey is also the same as in Sri Lanka (Yurt *et al.*, 2014).

In Sri Lanka there was no evidence of using dosimeters to measure personal exposure dosage of X-ray radiation during fluoroscopic guided surgery. Almost all the nurses of the study sample were using lead aprons and thyroid shields as their basic X-ray protective techniques. Some of them used protective goggles. They were not using any other protective technique such as wearing steel toed shoes and led lined gloves. There were no warning red lights or alarms at most of the theatres. Half of the sample did not follow protective techniques for safety of extremities. Especially, they were not aware of hand protection from direct X-ray beam. They did not use distance method which is standing at least six feet away from direct X-ray beam to prevent unnecessary X-ray exposure. In contrast, nurses in Korea used protective garments, safe distance and less exposure time as protective measures which are commonly used and therefore, they were able to limit the exposure from the primary and scatter radiation source (Jung *et al.*, 2013). The major reasons for not using X- ray protective techniques in this study may be shortage of protective garments, lack of knowledge and lack of training about radiation protection. Therefore, the practice of safe techniques to prevent X-ray exposure is significantly poor among nurses.

According to the findings, there were significant barriers for using radiation protective techniques in health care setting in Sri Lanka. Most of the nurses identified that the heavy weight of the lead apron as a main barrier to using protective garments. More than half of the

nurses noted the shortage of protective devices such as lead lined aprons, goggles and other shields. Half of them disliked wearing common aprons. There was a noticeable shortage of protective devices in above research setting. However, in United States of America the situation is different and they routinely monitor personal exposure of ionizing radiation dosage by using dosimeters (Bahari *et al.*, 2006). Unfortunately fluoroscopic theatres of NHSL, SJGH and CSTH in Sri Lanka dosimeters were not available. The reason for this may be that Sri Lanka is a developing country. As a developing country, insufficient equipment, poor use of modern technology, lack of training and lack of knowledge could be the barriers for radiation protection.

Conclusion

Huge advances in diagnostic imaging capabilities in the past two decades have made radiology as a crucial part to guide many surgeries. Safety from X-ray is a critical part for operating room personal often ignored in Sri Lanka.

Nurses have sound knowledge regarding X-ray protection. However, they did not have an adequate knowledge regarding ALARA principles and had poor knowledge regarding parts of the body that can be damaged by X-ray. A majority of nurses had inadequate knowledge related to international standard protective techniques to protect themselves from X-ray exposure. Further, they did not have adequate knowledge regarding effects of X-ray as they did not have any basic training programs about X-ray protection. However, nurses' attitudes regarding X-ray protection among nurses are satisfactory. They had positive attitudes towards X-ray protective techniques. Most of the sample had recognized that they need to update their knowledge about X-ray protection.

According to the study, practice of safe techniques to prevent X-ray exposure is significantly poor among nurses. They only use lead aprons and thyroid shields as their basic technique for X-ray protection. Most of them do not follow protective techniques for safety of extremities (hands). They did not follow standing outside the path of the primary X-ray beam or secondary scattered X-ray from patient and as far as away from it as possible and maintaining safe distance which were important protective techniques. There was no evidence of using dosimeters to monitor radiation exposure among fluoroscopic theatres.

Sri Lanka as a developing country, insufficient protective garments and equipment, and poor use of modern technology, lack of training and lack of knowledge could be the barriers in using protective techniques to prevent X-ray exposure.

Recommendations

It is recommended that the nurses' knowledge on X-ray be enhanced which includes basic education of radiation protection for nursing diploma curriculum through the Ministry of Health. The nurses should have a basic training regarding X-ray protection, before they are appointed to work at theatres with fluoroscopic guided surgery. Nurses already working with fluoroscopic guided surgery should update their knowledge and develop good attitudes regarding protective techniques. The researchers would further recommend following ALARA principles, providing adequate amount of protective devices, and using personal dosimeters to measure personal X-ray exposure level to prevent harmful levels of X-ray exposure in Sri Lanka, which is of critical importance at present.

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Domestic Violence: Is the Sri Lankan Woman Still Trapped in the Private Sphere?

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Abstract

Domestic violence is a phenomenon of which women are predominantly the victims. For a long period of time, legal regimes relegated such violence into the private or family sphere and refused to provide any relief to its victims.

The aim of this paper is to trace how domestic violence gradually evolved from this early position, to the modern perception of it as a violation of women's rights demanding state intervention. For this purpose the paper will begin by examining the international treaties and conventions containing provisions relevant to domestic violence such as the Universal Declaration of Human Rights, International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights and the Convention on the Elimination of All Forms of Discrimination against Women.

It will then proceed to identify the extent to which Sri Lanka, which is bound by these international instruments, has taken steps to incorporate treaty obligations into domestic legislation. The scope and role of the Prevention of Domestic Violence Act No 34 of 2005, which is seen as the key attempt of the state to combat domestic violence in Sri Lanka, will then be studied in order to identify the extent to which it provides a viable solution to those confronted with domestic violence and make homes safe spaces for women in Sri Lanka.

Keywords: Prevention of Domestic Violence Act, domestic violence; protection orders, feminism.

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Introduction

The Nature and Scope of the Study

Domestic violence has long been a phenomenon which occurred behind closed doors. For generations of women, violence was an inescapable part of family life for which stoic endurance was the only socially acceptable solution. As McColgan (1993) citing Tomie states, 'The characterisation of the family as private can be seen ... to have operated to create a sphere in which women are isolated, rendered invisible and placed beyond the protection of the legal system.'

Early law did not recognise the concept of domestic violence. Indeed as stated by Lord Denning in *Davies v Johnson* (1979) in UK '...By the common law a husband was allowed to beat his wife so long as he did it with a stick no bigger than his thumb'. It was only through the sustained efforts of the feminist movement and after a long period of time that a definition for domestic violence and a need for state intervention to prevent such violence evolved.

A study of key international instruments reveals how domestic violence emerged from the purely private family sphere to which it long remained relegated and into which law makers refused to venture, to the modern perception of it as a violation demanding state intervention.Today a clear understanding of domestic violence can be derived from these international conventions, as will be seen from the discussion below. These can be summarized by the definition (which although it does not apply in Sri Lanka and is of limited legal applicability as it originates from the Council of Europe is used as it is a comprehensive one) of the Council of Europe Convention on Preventing and Combating Violence against Women and Domestic Violence (The Istanbul Convention) of 11th May 2011, which defines domestic violence in Article 3 (b) as follows; "domestic violence" shall mean all acts of physical, sexual, psychological or economic violence that occur within the family or domestic unit or between former or current spouses or partners, whether or not the perpetrator shares or has shared the same residence with the victim'.

The main objective of this research is to study the Sri Lankan legal position on domestic violence, with special emphasis on the extent to which Sri Lanka has succeeded in effecting its transition from the private sphere to the public one.

The paper will begin by examining the international treaties and conventions relevant to domestic violence such as the Universal Declaration of Human Rights (UDHR), International Covenant on Civil and Political Rights (ICCPR), the International Covenant on Economic, Social and Cultural Rights (ICESCR) and the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) in order to trace the manner in which domestic violence has gradually become a state responsibility.

The paper will then proceed to examine how Sri Lankan law has responded to these international developments, by focusing on the Prevention of Domestic Violence Act No 34 of 2005 which is seen as one of the key attempts of the state to combat domestic violence in Sri Lanka. This landmark law is hailed as the law which paved the way for domestic violence to be recognized as an issue entitled to legal redress. However, the extent to which it provides a viable solution to those confronted with domestic violence is, the author believes, a moot point. Therefore, this paper endeavours to examine the scope of this law and its role in combating violence and making homes safe spaces for women in Sri Lanka by removing the issue from the private domain and placing it firmly within the public one.

Theoretical Framework

This study is approached from a feminist perspective. Feminism according to Clare Dalton (1987) is a 'range of committed inquiry and activity, dedicated first to describing women's subordination- exploring its nature and extent; dedicated second to asking both *how*- through what mechanisms, and *why* – for what complex and interwoven reasons - women continue to occupy that position; and dedicated third to change.' Feminist's postulate that the politics of law is to perpetuate patriarchal dominance and that the public, private division is created to maintain that status quo. Lacey (1998) argues that 'The ideology of the public private dichotomy allows governments to clean its hands of any responsibility for the state of the *private* world because as Freeman (2008) comments, defining the family as 'private' places it outside the authority of the state'.

Domestic violence has been historically considered to fall within the private domain, and outside state authority. Thus, the recognition of the gravity of domestic violence and the need to address it has required a battle to bring it out of this private domain. The author believes that the development of feminist jurisprudence has played a

key role in this battle and that its success can be traced through the international conventions relevant to this area. The focus of this study is to examine the extent to which Sri Lankan law has succeeded in removing the barriers to state intervention in order to protect women against domestic violence.

Methodology

This study is normative in nature and is based on documentary analysis. The paper will first study the international instruments and trace the gradual increase in emphasis on domestic violence as something more than a private matter concerning those within the home. The paper will then focus on the Sri Lankan law or more specifically the Prevention of Domestic Violence Act in order to analyze the extent to which Sri Lankan law has succeeded in keeping abreast with the changes on the international front.

Discussion

The presentation of the discussion will be two fold. The first part will deal with the international instruments and the second will focus on the Sri Lankan context.

International Instruments

Lawmakers have long been reluctant to intervene in issues of domestic violence and have, in fact, recognized the right of the husband to 'give his wife moderate correction' (Blackstone 1765) and the necessity of the wife to suffer rape 'because the wife has given herself up in this kind unto her husband' (Hale 1738). However, the following analysis of international instruments shows that domestic violence has been identified as a violation of human rights from the earliest recognition of the concept of human rights and that with the passage of time; liability has been imposed on states to combat it.

The Universal Declaration of Human Rights, International Covenant on Civil and Political Rights and International Covenant on Economic Social and Cultural Rights

The right of a person to live a family life free of violence can be traced back to many international documents. The Universal Declaration of Human Rights of 1948 in its preamble states,'…(that) the peoples of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of

the human person and in the equal rights of men and women'. Further, Article 1 recognizes that 'All human beings are born free and equal in dignity and rights' while Article 2 guarantees the rights and freedoms in the declaration to everyone without any distinction. Article 3 Recognizes the right to life, liberty and security of person while a similar provision to this exists in Article 6 of the International Covenant on Civil and Political Rights1966. According to Article 5 of the UDHR (and also Article 7 of the ICCPR) 'no one shall be subject to torture or to cruel, inhuman and degrading treatment or punishment'. Further according to Article 7 of the UDHR (and Article 16 of the ICCPR) 'All are equal before the law and are entitled without any discrimination to equal protection of the law' and the rights recognised by the declaration. Thus, the UDHR and the ICCPR contain provisions which deal with equality and focus on the dignity of the person, both of which militate against the use of violence.

Article 16 of the UDHR ensures equal rights to men and women during marriage and at its dissolution while Article 23 of the ICCPR includes equal responsibilities as well. According to Article 25, (1) of the UDHR; everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services …', while motherhood and childhood are entitled to special care and assistance. The International Covenant on Economic Social and Cultural Rights1966 (ICESCR) which entered into force in 1976, also recognises that special protection should be accorded to mothers, during, and a reasonable period after, childbirth (Article 10) and the right to highest attainable standard of physical and mental health (Article 12). These provisions clearly envisage a family unit where the spouses are on an equal footing and free from physical, psychological or economic violence.

By virtue of Article 3 of the ICCPR and Article 3 of the ICESCR, member states undertake to ensure the civil, political, economic, social and cultural rights set out in the respective covenants. These provisions could be viewed as empowering states to eradicate domestic violence especially in the form of physical and economic violence and arguably out of the private and into the public domain.

Thus, the UDHR, ICCPR and ICESCR recognised a range of rights which were equally available to men and women, thereby tacitly recognising that domestic violence by depriving men or women of these rights was a violation of their basic human rights.

The Convention on the Elimination of All Forms of Discrimination against Women

The first international document which focused exclusively on women and has since paved the way for significant improvement of the position of women is the Convention on the Elimination of All Forms of Discrimination against Women 1979 which entered into force in 1982. Article 5 of CEDAW requires States 'to modify the social and cultural patterns of conduct of men and women, with a view to achieving the elimination of prejudices and customary and all other practices which are based on the idea of the inferiority or the superiority of either of the sexes or on stereotyped roles for men and women' as well as ensure family education to promote understanding of maternity as a social function and the common responsibility of men and women in upbringing and development of children. Further Article 16 obliges member states to take all appropriate measures to eliminate discrimination against women in all matters relating to marriage and family relations and ensure among other things equal rights and responsibilities as parents and in deciding the number and spacing of children.

The above provisions thus bind Signatories to CEDAW to actively take steps to eradicate the major causes of domestic violence. It would then appear that by these requirements of state intervention, CEDAW has envisaged dissolution of the private, public divide behind which most perpetrators of domestic violence take refuge.

The Declaration on the Elimination of All Forms of Violence against Women

CEDAW was followed in 1993 by the Declaration on the Elimination of All Forms of Violence against Women. This declaration, in its lengthy preamble, identifies the various conventions, such as the UNDHR, ICCPR, ICESCR and CEDAW which set out articles dealing with equality between the sexes, and recognizes that violence against women prevents the achievement of this equality. The declaration adopts the feminist theory in the preamble 'Recognizing that violence against women is a manifestation of historically unequal power relations between men and women, which have led to domination over and discrimination against women by men and to the prevention of the full advancement of women, and that violence against women is one of the crucial social mechanisms by which women are forced into a subordinate position compared with men…' (This view also finds expression in Article 118 of the Beijing

Declaration discussed below). It points to the Economic and Social Council resolution (1990) which recognized that violence against women in the family and society was pervasive and cut across lines of income, class and culture and had to be matched by urgent and effective steps to eliminate its incidence and also focuses on the Economic and Social Council resolution (1991) which recommended the development of a framework for an international instrument that would address explicitly the issue of violence against women. The Declaration consists of six Articles, of which 1 and 2 set out a definition for violence, 3 discusses the rights of women and Articles 4 and 5 deal with State and UN obligations to eliminate violence respectively.

Article 1 states that; For the purposes of this Declaration, the term "violence against women" means any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life. This provision is thus a reiteration of the recognition of domestic violence as an issue requiring state intervention.

Article 2(a) further defines violence in the private sphere as follows; Violence against women shall be understood to encompass, but not be limited to, the following: Physical, sexual and psychological violence occurring in the family, including battering, sexual abuse of female children in the household, dowry-related violence, marital rape, female genital mutilation and other traditional practices harmful to women, non-spousal violence and violence related to exploitation;'. It is noteworthy that the Article does not seek to provide a comprehensive definition, by only 'encompassing' but not 'being limited to' the given description.

The above 2 articles clearly identify three major forms of violence in the private sphere and thereby domestic violence, namely, physical, sexual and psychological. (Subsequent developments have led to the current definition broadening to include economic violence). However the exact acts, which may constitute such abuse, have not been defined and one needs to examine the various international instruments to gain some perspective regarding the scope of these forms of violence. The women's rights set out in Article 3 i.e. rights to life, equality, liberty and security, highest standard possible of physical and mental health, and freedom from discrimination,

torture and all forms of cruel, inhuman and degrading treatment or punishment, are an echo of the provisions in the UDHR, ICESCR, ICCPR and CEDAW.

Clear indication of the state's role and the intention to bring domestic violence out of the private sphere is seen in Article 4, which declares that 'States should condemn violence against women and should not invoke any custom, tradition or religious consideration to avoid their obligations with respect to its elimination'. This Article provides 17 guidelines states may adopt, in working towards elimination of violence against women in its many forms and in adopting national policies regarding it. These guidelines include enacting domestic legislation, providing effective mechanisms of access to justice, punishment of perpetrators and providing effective remedies for those subjected to violence including, 'rehabilitation, assistance in child care and maintenance, treatment, counselling, and health and social services, … as well as support structures, and … measures to promote their safety and physical and psychological rehabilitation.' Article 4 also focuses on the need to sensitize law enforcement and other public officers regarding gender issues and to ensure that laws do not 're-victimize' those subjected to violence by gender insensitive laws, enforcement practices and other interventions. Further, Article 4 J, reiterates State obligations set out in Article 5 of CEDAW discussed above. Thus, Article 4 is a strong indicator of a move away from treating domestic violence as a private matter, and towards one requiring state intervention.

The Beijing Declaration and Platform for Action

Commitment to the UDHR, CEDAW and the 1993 Declaration was reiterated at the fourth World Conference on Women, held in Beijing China in September 1995. The Beijing Declaration in its 'Platform for Action' deals with violence against women in section D, which adopts the same definitions of violence and sets out similar state obligations as the 1993 Declaration discussed above.

Additionally several articles encompass domestic violence. Article 21 emphasizes the need for prevention and elimination of all forms of violence against women and girls. Article 117 recognizes that acts or threats of violence in the home can create fear and insecurity in women, prevent achievement of equality, and limit women's access to resources. The Article recognizes violence as a 'crucial social mechanism' to put women into a subordinate position to men (which is an echo of the preamble to CEDAW) and continues; '…In many cases, violence against women and girls occurs in the family or

within the home, where violence is often tolerated. The neglect, physical and sexual abuse, and rape of girl children and women by family members and other members of the household, as well as incidences of spousal and non-spousal abuse, often go unreported and are thus difficult to detect. Even when such violence is reported, there is often a failure to protect victims or punish perpetrators.' Article 117 thus indicates awareness that violence in a domestic setting is viewed as a matter within the private sphere.

Further, Article 18 reiterates the feminist theory regarding violence and continues thus, '...Violence against women throughout the life cycle derives essentially from cultural patterns, in particular the harmful effects of certain traditional or customary practices and all acts of extremism linked to race, sex, language or religion that perpetuate the lower status accorded to women in the family, the workplace, the community and society. Violence against women is exacerbated by social pressures, notably the shame of denouncing certain acts that have been perpetrated against women; women's lack of access to legal information, aid or protection; the lack of laws that effectively prohibit violence against women; failure to reform existing laws; inadequate efforts on the part of public authorities to promote awareness of and enforce existing laws; and the absence of educational and other means to address the causes and consequences of violence. Images in the media of violence against women, in particular those that depict rape or sexual slavery as well as the use of women and girls as sex objects, including pornography, are factors contributing to the continued prevalence of such violence...' This Article too recognizes the pressures to maintain domestic violence within the private sphere and the difficulty to combat such violence in the absence of state intervention.

The declaration then goes on to identify measures that could be taken to prevent violence by addressing the issues highlighted above. Article 119 recommends a 'holistic and multidisciplinary approach' in eliminating violence, including educational systems and socialization processes which focus on equality, respect and mutual cooperation between the sexes.

The Beijing Platform of Action contains strategies to address the issues regarding violence, many in line with the 1993 Declaration. Additionally Article 124 (d) recommends 'access to just and effective remedies including compensation and indemnification and healing to victims and rehabilitation of perpetrators'. Article 125 (a)

recommends governments to provide ‘ well-funded shelters and relief support for girls and women subjected to violence, as well as medical, psychological and other counseling services and free or low-cost legal aid, …(and) appropriate assistance to enable them to find a means of subsistence’ while Article 125 (i) recommends that the States, ‘Provide, fund and encourage counseling and rehabilitation programmes for the perpetrators of violence and promote research to further efforts concerning such counseling and rehabilitation so as to prevent the recurrence of such violence’. All these recommendations are clearly aimed at promoting state intervention and bringing domestic violence out of the private sphere.

Commitment to the obligations undertaken at Beijing was reiterated in the Political Declaration and outcome document entitled, "further actions and initiatives to implement the Beijing Declaration and Platform for Action” (2000) and by the resolution adopted on the ‘Intensification of Efforts to Eliminate Violence against Women’ (2008), where obligations were undertaken by Article 16(k) to ‘ensure that effective legal assistance is available to all female victims of violence so that they can make informed decisions regarding, inter alia, legal proceedings and issues relating to family law, and also ensuring that victims have access to just and effective remedies for the harm that they have suffered …’

Conclusions Regarding International Conventions and Treaties

It is apparent that though there were no specific international documents dealing with domestic violence till the CEDAW Convention, many other documents existed which could have been used to uphold women’s rights to a life without violence. Subsequently there has been sustained international concern on the issue of violence against women in its many forms and with specific focus on domestic violence as well. Most of these documents not only reiterate obligations in previous documents, but continue to expand the nature of these obligations as a result of increased awareness of the forms of violence women are subjected to and as various remedies to combat it are recognized. Thus, while the original documents dealt with the core issues alone, later documents expanded to include counseling for victims and perpetrators as well as shelters, legal aid, awareness in family law and the role of the media. It could, therefore, be concluded that these international documents provide a fairly comprehensive coverage of the issues arising with regard to domestic violence.

Three key themes appear to unite the above instruments, *i.e.* that domestic violence is primarily a result of the attempt of the male to dominate the females; that cultural and traditional practices are used to maintain the status quo of male domination and retain it within the private sphere; that state intervention is mandatory to eradicate such violence and bring it into the public sphere.

Domestic violence is a predominantly female issue and is the perspective from which this issue is studied. However, it must be recognized that males too may be victims of such violence and that any legislation should, therefore, adopt a gender neutral stance.

Sri Lanka is a signatory to all the above conventions and therefore under an obligation to ensure attainment of these objectives within the country. Therefore, the author intends next to examine the Sri Lankan law in order to identify the extent to which this has been achieved.

The Sri Lankan Legal Regime

The development of legal provisions to combat domestic violence in Sri Lanka can be seen in the Women's Charter of 1993 and the Prevention of Domestic Violence Act of 2005.

The Women's Charter

In 1993 Sri Lanka formulated the Women's Charter setting out the state policy regarding women and reiterating obligations undertaken pursuant to international treaties. By Article 16, the State expressed its intention to take measures to prevent violence against women in the family in its many manifestations including rape, physical and mental abuse, and torture and cruel, inhuman or degrading treatment.The National Committee on Women (NWC) was established to monitor the progress in implementing the Charter. This may be seen as the first step towards recognizing the impact of allowing domestic violence to remain in the private sphere and bringing it into the public one. Subsequent to the Beijing Conference, the Ministry of Women's Affairs drew up a National Action Plan (NPA) for women in Sri Lanka on the lines of Platform of Action for Women, recommending actions to eliminate violence against women. However, no significant attempt was made to bring in legislative reform until the enactment of the Prevention of Domestic Violence Act.

The Prevention of Domestic Violence Act No 34 of 2005

Specific legislation dealing with domestic violence was not enacted in Sri Lanka until the Prevention of Domestic Violence Act No 34 of 2005. A study of the Act reveals that in reality no new offences were created under it and that the Act once again looks to the Penal Code to identify and punish domestic violence. Since the Act only provides civil remedies the offences identified and punished under criminal law before and after the Act remain unchanged.

What then has been achieved by the passage of the Prevention of Domestic Violence Act? Have the framers of the Act succeeded in bringing domestic violence into the public sphere and created a legal regime which effectively protects those subject to such violence? It is necessary to study the provisions of the act in order to find the answer to these questions. .

The Definition of Domestic Violence under the Act

Section 23, defines domestic violence as follows; "'domestic violence" means (*a*) an act which constitutes an offence specified in Schedule I (or) (*b)* any emotional abuse, (either of which is) committed or caused by a relevant person within the environment of the home or outside and arising out of the personal relationship between the aggrieved person and the relevant person'.

The offences identified by schedule 1 of the Act are, all offences contained in Chapter XVI of the Penal Code, extortion (Section 372 of the Penal Code), criminal intimidation (Section 483 of the Penal Code) and attempt to commit the above offences.

The offences set out in chapter XVI of the Penal code are offences affecting the human body, *i.e.* offences affecting life, causing hurt, wrongful restraint and confinement, criminal force and assault, kidnapping, abduction and slavery, rape and incest and publication of matters relating to certain offences. Each of these headings, deal with several offences.

Offences affecting life are culpable homicide and attempt; murder and attempt to murder; causing death by negligence; abetment to suicide; acts dealing with miscarriage and abandonment and cruelty to children.

Offences relating to causing hurt are; hurt; grievous hurt; hurt by use of weapons; to extort property or to constrain to an illegal act; to

extort confession or to compel restoration of property; to deter a public servant from his duty; causing hurt on provocation; and causing hurt by an act which endangers life or the personal safety of others.

The offences of wrongful restraint and confinement dealt with in the Penal code include separate offences for wrongful confinement for three or more days and ten or more days; wrongful confinement of a person for whose liberation a writ has been issued; wrongful confinement in secret; and wrongful confinement for the purpose of extorting property, constraining to an illegal act, to extort a confession or compel restoration of property.

Offences of criminal force and assault include sexual harassment; using criminal force to deter a public officer from discharge of his duty; use of assault and force on grave and sudden provocation and assault or force for the following purposes; with intent to dishonour a person without grave or sudden provocation, attempting to commit theft of property carried by a person, in attempting to wrongfully confine a person.

Kidnapping, abduction and slavery deal with the following offences; kidnapping from Sri Lanka and from lawful guardianship; debt bondage, serfdom, forced or compulsory labour, slavery and recruitment of children for use in armed conflict; wrongfully concealing or confining a kidnapped person; kidnapping a child under 10 years with intent to steal movable property from the person of the child; procuration; sexual exploitation of children; trafficking; offences relating to adoption; soliciting a child; cohabitation by inducing belief of a lawful marriage; bigamy; entering into a second marriage by concealing first marriage from second partner; performing a second marriage without intending to enter into lawful marriage; kidnapping or abduction for the following purposes- murder, with intent to secretly and wrongfully confine, to compel a woman to marriage, for subjection to grievous hurt or slavery.

Rape and incest include unnatural offences, acts of gross indecency between persons and grave sexual abuse. The above definition of domestic violence raises several issues. When one compares the Sri Lankan definition with the content of the international documents discussed above, it becomes clear that our law has not adopted a comprehensive approach to identifying and addressing domestic violence. The definition simply adopts wholesale several provisions in

the Penal Code and as the contents of these provisions indicate, several of these offences do not fit comfortably within the concept of domestic violence. The offences under the Penal Code have been drafted to cover a much broader spectrum of situations including the protection of public officers. Several of the later provisions such as procuration, sexual harassment and trafficking were included as a result of concerns arising at national level. Studies done in Sri Lanka (Gomez, 2006; Gunaratne, 2001; 2007, Hussain, 2000) reveal that the health sector, police and judiciary still do not view domestic violence as a serious issue and the author contends that dealing with this issue using the same provisions as applied in a more general context is likely to lead to the trivializing of the offences occurring in the domestic sphere.

It is also of concern that the Act simply states that 'all offences contained in Chapter XVI of the Penal Code' would constitute acts of domestic violence. Thus, both access to the Penal code and ability to read through this fairly extensive chapter are necessary to identify the scope of the Act. When one considers those to whom the Act is of most concern-the average citizen this seems to place the law outside his/her grasping, reserved for those better versed in the law. A simply expressed comprehensive document would appear to be more suitable for a law that needs wide dissemination and clear understanding.

It is also important to note that for purposes of the Act, rape must be defined as set out in chapter XVI of the Penal Code. The original provisions on rape contained in Sections 363 and 364 of the Penal Code were amended by Penal Code Amendment Act No 22 of 1995. Although this amendment was considered progressive to the extent that it introduced mandatory sentencing and stiffer penalties, the provisions regarding marital rape set out in Section 363 are fairly limited. According to section 363 (b), rape is committed where sexual intercourse occurs 'without her consent even where such woman is his wife and she is judicially separated from the man'. This means forcible intercourse with a woman who is still living with the man or who is 'de facto' as opposed to judicially separated from the man will not be considered as rape. Similarly, Section 363 (e) states that sexual intercourse is rape when done 'with or without her consent when she is under sixteen years of age, unless the woman is his wife who is over twelve years of age and is not judicially separated from the man'. As regards married women, this section will only apply to Muslim women since the minimum age of marriage under both the Kandyan law [by virtue of Section 6 of the Kandyan Marriage and Divorce Act as amended by Section 3 of Amendment No 19 of 1995]

and general law [by virtue of Section 15 of the Marriage Registration Ordinance 1907 as amended by Section 2 of the Amendment No 18 of 1995] is eighteen years. However there is no protection under the Penal Code or the Act for a Muslim wife even a day over twelve who is forced into sexual intercourse by her husband. It is noteworthy that the original Amendment had a broader definition which was narrowed due mainly to protests from the Muslim lobby and which appears to be in direct conflict with Article 4 of the 1993 Declaration. However, it is a serious deficit when an Act designed to prevent domestic violence defines marital rape in such a narrow manner. Such a definition denies married women relief for one of the commonest forms of domestic violence and reinforces the belief that such acts are retained within a private sphere beyond state intervention.

Section 23 of the Prevention of Domestic Violence Act defines emotional abuse as 'a pattern of cruel, inhuman, degrading or humiliating conduct of a serious nature directed towards an aggrieved person'. The use of the term 'conduct of a serious nature' gives rise to some concern. Issues arise as to who decides what is 'serious' and how it is decided. In addition, how is the word 'pattern' defined? Does this mean that emotional abuse can only take place if it is continuous and if so how many events are necessary to establish a 'pattern'? It is doubtful if applying the usual 'reasonable man' test would be acceptable, in the light of the prevailing attitudes among the law making and implementing authorities.

It is also noteworthy that financial or economic abuse is not encompassed within the definition of domestic violence. While some acts of economic abuse may arguably be brought within the definition of emotional abuse as 'a pattern of degrading and humiliating conduct', not all such acts would fall within this and it is also uncertain if such acts would be considered 'serious' or indicative of a 'pattern' as is required by the definition. As Radika Coomaraswamy has commented to Sathkunthanathan (2005) the definition for domestic violence in the Act has failed the test of 'broadest possible definition of acts of domestic violence' which is the recommended standard. Thus, a more comprehensive and clear definition for domestic violence should have been adopted in the Act. The author argues that the vagueness of the definition itself may act as an impediment in bringing to task persons who commit domestic violence and thus place such acts beyond state intervention.

Is Domestic Violence a Crime?

As stated earlier, although domestic violence has been defined in the Act, no new offence is created by the Act itself. The whole thrust of the Act is on the creation of Protection Orders. Section 23 of the Act states that aggrieved persons would continue to have the right to institute civil or criminal proceedings. In order to do so, one would have to access the normal civil and criminal laws. Thus, police may prosecute the abuser under the relevant provisions of the Penal Code cited above or any other applicable provisions of the Penal Code to obtain a conviction with fine or imprisonment; alternatively the abused person could bring civil action in order to obtain compensation. Thus, the only remedy a person is provided by the Act is a Protection Order against future violence and no means for obtaining relief or compensation for abuse already suffered is provided under it.

The author argues that the law should create a separate crime titled, 'domestic violence' so that perpetrators' can be prosecuted for 'domestic violence' itself instead of being prosecuted for an act committed in breach of the general provisions of the Penal Code. This is likely to be a more effective deterrent to perpetrators and place responsibility for its eradication more firmly on the state and in the public sphere.

Protection Orders

The Act contains comprehensive provisions regarding Protection Orders. A welcome feature of the Act is the gender neutrality of the provisions which therefore entitle not only women but also men to the protections afforded by the Act. The Act under Section 23 also recognises a wide range of persons against whom such protection maybe sought. These include the spouse, ex-spouse or co-habiting partner as well as the father, mother, grandfather, grandmother, stepfather, stepmother, son, daughter, grandson, granddaughter, stepson, stepdaughter, brother, sister, half-brother, half-sister, step brother, step-sister, siblings of a parent, child of a sibling, child of a sibling of a parent (of the aggrieved person, or his/herspouse, former spouse or cohabiting partner). Thus, the act protects against both marital and non marital partners and well as against a range of relatives of both the abused person and his or her partner or former partner.This broad definition is capable of covering most circumstances in which domestic violence occurs and is thus a salutary feature.

A number of persons are given 'standing' to apply for Protection Orders by virtue of Section 2 (2) of the Act. Therefore not only the aggrieved person, but also a police officer is entitled to file for such order. As regards a child, a guardian, parent, person with whom the child resides or officer of the National Child Protection Authority may also do so. This is a positive aspect of the Act, as it recognises that a person maybe caught up in the cycle of domestic violence and unable to escape it. It also recognizes that the state should play a role in protecting persons subject to violence in the private sphere and provides for proactive state intervention.

Speedy hearing of the application is contemplated by Section 4 of the Act which provides for the application to be heard within two weeks. However, Gomez (2006) argues that this time period is inadequate, especially when the whereabouts of the offender is unknown, as magistrates insist on a probation officer's report before issuing an order. Pending the hearing, the Magistrate's court also has jurisdiction to issue Interim Protection Orders if it is deemed necessary for the safety of the aggrieved person and this Order would remain in force till it is vacated or replaced with a Protection Order. The order could include prohibitions against committing acts of violence as well as the prohibitions and conditions included in a Protection Order. Further, the court could order the parties to attend counseling sessions with a social worker or family counselor and also appoint such persons as well as probation officers, family health workers or child's rights protection workers to monitor and report on the observance of the order.

After hearing the application, the court may issue a Protection Order preventing the person from committing acts of violence as well as setting out other prohibitions and supplementary orders. The prohibitions which may be imposed are contained in Section 11 and are as follows; prohibits entering or occupying a shared residence or a specified part of it; entering the aggrieved person's, residence, workplace, school, or place of shelter; prohibits prevention of the aggrieved person from entering or remaining in the shared residence; prohibits or lays down conditions with regard to contacting children; prohibits preventing use or access to shared resources; prohibits contact or attempt to contact aggrieved person; prohibits acts of violence against 'Other Persons' (relative, friend, social worker or medical officer) assisting the aggrieved person; prevents following the person or engaging in conduct detrimental to the safety, health or well being of the aggrieved or Other Person; prevents selling,

transferring, alienating or encumbering the matrimonial home thereby placing the aggrieved person in a destitute position.

Once a Protection Order is made, the court could also make the following orders as set out in Section 12 for the immediate safety, health and welfare of the aggrieved person; order the police to seize any weapons in the respondent's possession; order police to accompany the aggrieved person to any place to assist with the collection of personal property of such person and his/her children; order the two persons to attend mandatory counseling sessions, psychotherapy or other forms of rehabilitative therapy; order temporary accommodation/shelter for the aggrieved person while maintaining confidentiality as to location; order a social worker, family counselor, probation officer or family health worker to monitor the observance of Order and submit a report every three months; if the respondent owes a duty of support to the aggrieved person order to provide urgent monetary assistance or to pay and provide facilities for residence of aggrieved party depending on the resources and needs of the parties. The parties' rights under the Maintenance Act remain unaffected by these provisions and in the event of non-payment dues could be claimed direct from the respondent's employer.

As seen, above Sections 10-12 contain the relief available to a survivor of domestic violence. These are aimed at protecting the person from further abuse and providing for him/her. The Protection Order is issued for a maximum of one year and can on subsequent application be extended, varied or revoked. There is also provision to appeal from the order. Another salutary feature is that once an Order is made a copy of it is provided to the Officer in Charge of the police stations in the area where both the aggrieved person and respondent reside. This provision could be used to ensure a more proactive role by police in the protection of the aggrieved person.

However, Sathkunthanathan (2005) noted several shortcomings in this regard at the Bill stage of the Act which remained unaddressed in the final Act. These include the absence of provisions requiring medical service providers to report abuse, the absence of provisions dealing with the manner in which police should respond to complaints of violence and absence of services and treatment for victims including crisis centres and medical care. Gomez (2006) too noted shortcomings with regard to implementing the Act; magistrates' trivializing issues of domestic violence due to regularly handling more 'serious' offences like murder; absence of family counsellors in some courts, even though required by the Act,

absence of state shelters or temporary accommodation (only WIN, Welcome Home and the Salvation Army have such shelters and magistrate's are reluctant to refer women to these shelters due to reasons of accountability). Gomez suggested the following as requirements to ensure proper implementation of the Act; public awareness and training of state officers; active participation of all stake holders, *i.e.* police, medical personnel, social workers, probation officers, civil society groups, women's organisations, lawyers, judiciary, family counsellors and victims of domestic violence; and implementation of the National Action Plan prepared by the National Committee on Women.

The shortcomings highlighted above indicate that few of the guidelines in Article 4 of the 1993 Declaration and Article 18, 124 and 125 of the Beijing Declaration have been included in the Act and that there are difficulties to implement those few which are included in the Act, due to lack of basic infrastructure and facilities. It also raises questions as to how successful the Act has been in bringing domestic violence into the public domain.

Penal Sanctions

The only two penal sanctions in the entire Act are to be found in Sections 18 and 20. According to Section 18, failure to comply to an Order could lead to a fine not exceeding ten thousand rupees or imprisonment for up to one year or both fine and imprisonment. Section 20 lays down a fine, imprisonment of up to two years or both fine and imprisonment for anyone who prints or publishes the name or information enabling identification of any party to an application under the Act or who prints or publishes anything other than a judgment of the Supreme Court or Court of Appeal.

The above two provisions appear to be aimed at ensuring compliance of the Orders made under the Act and protecting the confidentiality of parties involved in such applications respectively. In practical terms enforcement of these sections could lead to a situation where a person who publishes details of a respondent maybe imprisoned for two years, while if that respondent fails to observe the order, he may be imprisoned for one year only. While a maximum fine has been set out under section 18, there is no such limitation under section 20. Another issue is the wide discretion provided in determining punishment, due, as Gomez (2006) has noted, to the absence of mandatory sentences. In a legal system where rapists have been handed down suspended sentences, it is arguably not in

the best interests of the person abused to leave discretion which may limit punishment to a maximum of ten thousand rupees.

Protection of the identity of someone subjected to violence maybe a salutary feature. However, it is difficult to comprehend a law by which a person who publishes information regarding an abuser, maybe subjected to more severe punishment than the abuser himself. Such protection could also place others who may unknowingly enter into intimate relationships with such persons in grave danger of violence.

Sathkunthanathan (2005) identified lack of enhanced penalties in cases of repeat offenders and in instances of aggravated assault and use of weapons as shortcomings of the Act while there were also suggestions that provision should be made for suspended warrants of arrest in case of violation of protection orders.

Therefore, the penal provisions in the Act appear to be drafted so as to minimize harm and protect the social image of an abuser - most likely a male. This seems to substantiate the feminist argument that patriarchal values underlie legal provisions.

Conclusions

The above analysis indicates that domestic violence, through the passage of time, has gradually come to be recognised as a matter requiring state intervention. International concern about this issue is seen by the various treaties and conventions which continue to reiterate and broaden obligations of member states towards elimination of domestic violence as well as helping those subjected to abuse and rehabilitating offenders. Thus, at international level, it is accepted that women are entitled to the gamut of recognised rights including a right to be free of violence. Recognition that male dominance as well as cultural and social practices perpetuate violence and need to be eliminated has also been emphasised. In the Sri Lankan context, while the Prevention of Domestic Violence Act must be hailed for introducing legal recognition regarding domestic violence and for the introduction of protection orders, the Act itself as discussed above, has many shortcomings commencing with the inadequate definition of domestic violence.

It is also significant that domestic violence has not been made a crime to date. The Prevention of Domestic Violence Act only affords protection to the abused person and no punishment except in the

case of violation of a protection order. The passage of the Act through Parliament was dogged by arguments that it was a western concept contrary to Sri Lankan culture and family values. These attitudes reflect provisions in CEDAW and the Beijing Declaration that tradition is used to perpetuate violence. It is also an affirmation that patriarchal values are deep rooted in society and that female subordination is viewed as a traditional value that needs to be protected. Attempts to allay fears about the Act led to emphasis being placed on the fact that the Act did not criminalize the perpetrators and was only meant to protect the victims. This, coupled with the fact that it is nevertheless possible to institute civil or criminal proceedings independent of the Act, seems to emphasise the intention of legislators to ensure that acts of violence cannot be punished as 'domestic violence'. This then enables legislation to leave violence which is 'domestic violence' within the private domain.

The deficiencies in mechanisms to effectively implement and enforce the protections provided in the Act too, raise concerns as to whether the Act has succeeded, in bringing domestic violence out of the private domain in its true sense. While putting in place relevant legislation is a key part of this process, the absence of effective mechanisms to implement the provisions, raise awareness and sensitize relevant authorities may lead to it having little value in a society still steeped in patriarchal values. Of what value is a protection order, if a battered woman has nowhere to hide and the police fail to take her complaints seriously? Therefore, it may be concluded that though laudable efforts have been made to bring the Sri Lankan woman subjected to domestic violence out of the private sphere, and give her story a public voice, much more state intervention is required to enable her voice to be heard forcefully and justifiably.

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Convocation Address 2015

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It is my honor and pleasure to be given this opportunity to deliver the Convocation Address at the 27th General Convocation ceremony 2015 of the Open University of Sri Lanka. I have structured my talk around the potential of distance education and its relevance to the current job market. I will rely heavily on my experience with the Virtual University of Pakistan, but the thrust of my discourse should be applicable to the broader distance learning arena.

Distance education, as you all know, is not a new phenomenon. Over the years, the specific delivery methods and pedagogy have evolved and changed but the basic premise has remained the same: the provision of learning opportunities for knowledge seekers who faced one or more impediments in accessing formal education at conventional campuses. This issue of access to learning is assuming a much higher degree of importance in the current era, the primary reason being the changing face of the job market.

In previous years, the norm was to complete one's education in a certain field and then start one's career. By and large the starting and ending fields in the career remained the same. All that changed was one's level of experience and seniority and, therefore, responsibility. However, the current job market is very different. By and large, human endeavors have become much more interlinked and interdependent and specializing in a single discipline is no longer a recipe for success. Some minimum exposure or understanding of associated areas is necessary to become an effective contributor to the economic landscape. In earlier years one underwent continuous professional development or CPD to stay abreast of new developments, but this CPD was usually restricted to one's original basic field. The current requirements are quite different: CPD can mean anything ranging from staying abreast of new discoveries and developments in one's field, to complete re-training in an associated or even, in exceptional circumstances, a completely new field.

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Conventional education systems are not geared to providing this type of education. They are usually limited by academic norms which are overly restrictive: age limits for induction into programs, the assumption of full time availability of students, workloads that cannot be managed while pursuing a career etc. However, distance education systems were designed ab-initio, to be flexible in nature and this is where their relevance to the current job market comes in.

Let us take a simple mono-disciplinary example. An essential component in architectural and engineering design is drafting. These professions have used skilled drafts-people for decades to create and present their design concepts. However, with the advent of computerized drafting tools, the productivity of drafts-people could be enhanced manifold through a simple re-training exercise. Along comes your university, the Open University of Sri Lanka which offers a Certificate in Computer Aided Drafting and Modeling using AutoCAD – the acknowledged king of the hill when it comes to Computer Aided Drafting. The very simple requirements for induction into the program read as follows:

1. Working knowledge of basic operation of a computer
2. Working knowledge of Draftsmanship / Drafting

How much simpler could it get?

While it is true that a conventional university could also offer this course (and many do), there are practical implications that only distance learning systems can address. One simple example of the limitations faced by institutions has to do with student numbers. A conventional institution will usually withdraw a course if the enrolment in the course is very low. Distance education does not suffer from this limitation. Since the course materials are pre-developed, the quantum of effort involved in offering a course is very small. Plus, a collection of learners from geographically disparate areas may still constitute a viable class cohort. This implies convenience for all learners who do not have to suffer dislocation, and convenience for the institution, that gets a reasonable class size.

The examples of re-training and lifelong learning opportunities that distance learning affords are innumerable and I will come back to this topic later.

Let me now switch gears and address an aspect of distance learning that is very close to my heart – quality. When we started the Virtual University of Pakistan in 2002, one immediate obstacle that we had to face was the negative perception about distance learning. This was not restricted to Pakistan alone. People in general somehow thought that distance learning was not quite as good as conventional education. When we analyzed the issue, there were two objections that were voiced most frequently:

1. Courses in distance education are offered by nameless, faceless professors
2. One does not know who actually does the assignments and homework that constitute a significant fraction of the grade.
3. One does not know the identity of students appearing in an on-line examination.

The first issue was the easiest to tackle. The Virtual University of Pakistan had decided on a pedagogy that would be a mix of video lectures with online mentoring and support through a Learning Management System. We invited top-tier academics and professionals with well-known and recognizable names and faces, to develop our video lectures with the courses being designed with pain staking detail. These courses were then broadcast over free-to-air television and were viewable by the general public, not just the University's students. The top quality courses were quickly identified as the new face of distance learning and were very often cited by lay-people as exemplars of what a university course should look like. The first obstacle had been overcome. In a way, it was the "openness" of our contents that had won the day.

In the distance learning community, we are very aware of the effort that goes into the development of a new course and its associated materials. What the general public does not realize is that these courses are properly designed and developed, and in general, are far superior to the lectures delivered in conventional classrooms behind closed doors! We all need to get together and deliver this message vociferously.

As far as the second objection regarding the authorship of assignments is concerned, it is as applicable to a conventional institution as an institute of distance learning. However, it is more difficult to address for the general public. At the Virtual University of Pakistan, we have adopted a policy that ensures that no more than 15% of the grade for a course is determined by assignments and

other semester work. 85% of the grade is determined through examinations.

This brings me to the third point. The Virtual University of Pakistan was designed as a technology based university with extensive reliance on Information and Communications Technologies or ICT. However, we decided that our examinations would be conducted in as conventional a manner as possible. Students have to appear for their examinations at designated exam centers, prove their identities to a University appointed invigilator and then sit for the exams under strict supervision. This system effectively removed the third objection.

The point I am trying to make is that graduates from distance learning institutions like the Open University of Sri Lanka, or the Virtual University of Pakistan are generally exposed to much higher quality courseware and assessed with as much rigor as any conventional institution. Add to this the fact that students in a distance environment are, in general, independent learners who are self-motivated and have to manage their time very carefully, and one concludes that their preparation for professional careers is actually much better than that of their counterparts from conventional institutions.

Coming back to the issue of life-long learning that now seems to be the requirement for the workforce of the future; we have new kids on the block in the form of Open Education Resources or OER and Massive Open Online Courses or MOOCs as they are popularly known.

As you all know, humankind's knowledge has now come to reside on the Internet. We no longer need physical access to knowledge repositories like libraries to obtain the information we need. Even the way we acquire information is changing and evolving as I speak. The search engines of the previous decade used to provide us links to thousands, if not millions, of pages that had some relationship to the term or terms we were searching for. It was our responsibility to sort out the search results and extract meaningful information from them. The search engines have themselves evolved over time.

For example, if we typed the question "Who killed Abraham Lincoln?" into Google, in previous years, it would come up with millions of pages that had references to Abraham Lincoln, and

killing. Now it still returns 8.9 million results (correct as on May 2015) but it prefaces the results with a simple highlighted box that states "John Wilkes Booth". A much more sophisticated search engine, Wolfram Alpha, shows you how it interprets your query, and then provides the result which is "John Wilkes Booth", followed by some basic information such as his date and place of birth and date and place of death followed by an image, a timeline and some notable facts along with familial relationships! How is that for an answer from a computerized search engine!

But the story does not end here. When I visited University of Bradford in the UK several years ago, the Vice Chancellor pointed out that the familiar Google home page that used to be the starting point for browsers on student computers, had slowly but surely been replaced by Youtube! Why read when you can see? I put Youtube to the test all the way from Falafel recipes to changing the headlights on my car, and so far it has never failed me.

These examples simply illustrate how unstructured data can be mined to obtain useful information. When the data itself is structured and designed for a purpose, the value of such queries is multiplied manifold. This is the realm of OER. As the Internet, especially YouTube, has amply demonstrated, people like to share knowledge. Open Education Resources are no different: they are simply a means for domain experts to share their expertise with knowledge seekers across the globe. Since they are designed as knowledge objects, their worth in a continuously changing education and training landscape is very high. Learners can quickly access specific topics of their interest and quickly acquire skills that would otherwise not have been possible. An academic use of OER is the re-purposing and re-combination of OER into larger knowledge offerings, typically in the form of new courses. The domain is very rich and a considerable amount of work is happening in this area. This re-purposing and re-combination of OER is particularly relevant to distance learning systems, especially systems that have a strong reliance on modern ICT channels.

When juxtaposed against the requirements of lifelong learning, the value of OER immediately become apparent. Knowledge seekers no longer have to dive into a mountain of data to find the nuggets they need. Someone somewhere has already created the nuggets and placed them ready for easy access in the form of OER or in the case

of distance learning universities, created a full-fledged course using OER that carries formal academic credit.

The other major intervention that is being seen and experienced in the on-line learning landscape is the advent of Massive Open Online Courses or MOOCs. Started as an experiment in collaborative learning, MOOCs have made rapid progress since then and a huge amount of learning has happened in the process. One of the early realizations was the fact that students had very limited attention spans when exposed to video lectures. The analysis of video offerings indicated that student attention spans were limited to about 4 to 6 minutes after which they closed the video. This number was independent of the length of the original video recording.

We have taken this lesson to heart at the Virtual University of Pakistan. Our current format for courses that are now being developed reflects this finding. Courses no longer comprise a series of 1-hour video lectures; they now consist of a collection of video topics with each topic being limited to about five minutes each. Needless to say, this limit is not absolute, but offering short, concise coverage of topics seem more in consonance with today's learners with a short attention span.

A side benefit of this new format is that instead of wondering in which lecture a particular topic is covered, students can directly locate the topic in the course and study or review it as the case may be. The topic based format also allows flexibility in the way in which students traverse a particular course and is especially relevant for non-formal life-long learners. Of course, the fact that the Virtual University of Pakistan subscribes to the openness concept helps: all of our courses are published in the form of open courseware or OCW and available completely free of cost to all visitors to the University's OCW site.

Distance Learning is assuming a position of great importance for tertiary education, primarily because of the changing nature of the job market. Even major, top-tier conventional institutions such as MIT and Stanford have ventured into distance education by their contributions in the form of Open Courseware and MOOCs both of which fall into the general category of OER. The transformation of MOOCs into for-credit courses that are acceptable to the wider academic community is a major step forward and the possibility of these efforts becoming part of the educational mainstream does not

seem too far-fetched. In fact, envisioning a future of tertiary education and training that is not impacted by the advent of OER and MOOCs seems more and more unlikely.

I hope this talk has not been too boring. The important lessons that I would like you to carry with you as you graduate are as follows: you are the beneficiaries of a very high quality education system and the learning acquired here at the Open University of Sri Lanka shall stand you in good stead in the days to come. Of course, you have acquired skills other than your course contents as well: you are independent learners; you manage your time effectively; you are able to seek knowledge and information as and when you need it, and most of all, you have benefited from a system that expands access to higher education and by keeping it affordable, makes this access equitable as well.

Let me end by my talk with the same words that I used at our recent convocation at the Virtual University: Let your future actions be founded on honesty, integrity, dedication and a sense of purpose. Be true to yourself and pursue careers of your liking and interest. I am confident that the knowledge and training gained here at the Open University of Sri Lanka will hold you in good stead wherever the future leads you. Remember: attaining a degree is not the end of your learning pathways. You should continuously be learning and adding to your knowledge and skills. You should have the courage to follow your heart and give your best to everything that you do.

Congratulations & Thank you!

Notes for contributors

The OUSL Journal provides a forum for previously unpublished articles on theory, research and pedagogy relating to teaching at university level and in particular to Distance Education. It also provides a platform to publish research and review articles related to topics in Education, Engineering, Health, Natural and Social Sciences.

01. Length

Articles should be between 3000 and 6000 words or 15-20 typewritten pages. An abstract of not more than 250 words should be supplied.

02. Organization

The general organization of research papers should be as follows; the nature and scope of the study should be stated first, then the theoretical framework, followed by methodology including methods, materials, tools/equipment used, and procedures; findings, discussion and conclusion. Appendices may be used to amplify details where necessary.

03. Submission Requirements

a. All articles should be typed double spaced with wide margins. All sheets must be numbered.

b. Authors should include a cover page with the title of the paper, the author(s) name(s), affiliation and address of institution, contact phone numbers, and if available, fax number and e-mail address. Author's name should not appear **elsewhere** in the article.

c. Reference in the text should be cited using the last name of the author(s) with the year of publication in parentheses: Marton (1976).

If several papers by the same author and from the same year are cited, a, b. c. *etc*. should be put after the year of publication: Marton (1976a, 1976b, 1976c)

Multiple citations should be given alphabetically rather than chronologically: (Campbell, 1990; Marton, 1976; Naidu (2003).

If a work has two authors, cite both names in the text throughout: Marton & Saljo (1976)

In the case of reference to three or more authors, use all names on the first mention and *et al*. thereafter, except in the reference list.

If quotations are used, they should be included in the text within inverted commas ("…") and should be appropriately cited with page numbers.

d. Full bibliographic information about references should be organized alphabetically according to the last name/s of the author/s of the work. List of references should be annexed at the end of the paper.

Give the **last name** of each author, use a comma after each last name and after each set of initials except the final one(s). Use an ampersand **(&)** rather than the word **'and'**.

For books

Calder, J. (1994). *Programme Evaluation and Quality*, Open and Distance Learning Series. London: Kogan page.

For articles

Weerasinghe, B (1999). Project for Enhancement of Distance Education of the Open and Distance Education of the Open University of Sri Lanka with British Overseas Development Assistance – An Overview. OUSL Journal, 2, 3-25.

For chapters within books:

Campbell, C. (1990). Writing with other's words: using background reading text in academic compositions. B. Kroll (Ed.), Second Language Writing (pp.211-230). Cambridge, England; Cambridge University Press.

For Conference Papers:

Gunawardena, C., Menon, M., & Naidu, S. (2004). The making of teacher educator, Paper presented at the 3rd Pan-Commonwealth Forum, Dunedin, New Zealand, June 4-9.

For Online Documents:

Collis, B. (1998). Implementing innovative teaching across the faculty *via* the www. Paper for the conference "SITE 98", March 1998, Washington, DC. Available Online at: http://education2.edte.utwente.nl/teletophomepage.nsf/papersUKViewform?readform (accessed 19 January 2006).

04. Tables and Figures

Tables and Figures should be numbered with Arabic numerals in the order in which they are cited in the text. Each table/figure should be titled. Titled should be brief and precise.

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