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Short Communication

Assessment of Nutritional Status of Pregnant Women in a Rural Area in Sri Lanka

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ABSTRACT: *Maternal nutritional problems remain as one of the public health problems in Sri Lanka. This study was designed to assess the nutritional status of pregnant women in a rural area. A total of 133 pregnant women in their second trimester was recruited from Maternal and Child Health clinics. A pre-tested general assessment questionnaire, validated food frequency questionnaire and anthropometric measurements were used to collect information. Nutritional status was determined using Body Mass Index (BMI), weight-gain and haemoglobin levels. Nutrient intake data were compared with Recommended Dietary Allowance (RDA) for pregnancy. The mean age of the study sample was 26.86±4.16 years. According to the pre-pregnancy BMI at the first visit to the clinic, 15, 44.4, 35.3 and 5.3 were underweight, normal, overweight and obese, respectively. Their mean weight gain during the second trimester was 2.71±2.23 kg that was below the recommended weight gain (4.84 kg). Out of the total, 24.57% had anaemia (<11 gdL^{-1}). Mean daily intake of energy was 2472 kcal and percentages of energy from carbohydrate, protein and fat were 61.5, 12.2 and 26.3, respectively. Although mean daily dietary intake of protein (74.19±13.64 g) was above the RDA of 59 g/day, mean intakes of Ca; 844.9 mg, Fe; 16.5 mg, and folate; 420.9 mg were below the RDA. The study concluded that underweight, overweight and low dietary nutrient intakes were nutritional problems of the study sample. Therefore, effective nutrition intervention should be directed towards pregnant women to improve maternal nutritional status.*

Keywords*: Nutrient intake, Nutritional status, Pregnancy, Weight gain*

INTRODUCTION

Pregnancy is an anabolic process and a woman's normal nutritional requirement increases during pregnancy to meet the needs of the growing fetus and the maternal tissues associated with pregnancy. Since the nutritional status of the expectant mother is one of the most important determinants affecting pregnancy outcomes (Ramakrishnan, 2004), good maternal nutrition is important for the health and reproductive performance of women and the health, survival, and development of their children (Mora and Nestel, 2000). The study by Mora and Nestel showed that out of 200 million pregnant women each year, many pregnant women in developing countries suffer from nutritional deficiencies and these nutritional problems

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affect a woman's and her newborn infant's quality of lives. Therefore to have optimal maternal as well as perinatal outcome, nutrition in pregnancy should be well-maintained. A study on dietary intake of expectant mother revealed that proper dietary balance of mother's diet is necessary to ensure sufficient energy and nutrient intake for adequate growth of the fetus without depleting maternal stores and damaging mother's own tissues to maintain her pregnancy (Mridula *et al*., 2003). Sufficient nutrition intake during pregnancy has enormous potential for promoting the nutritional status of the mother and her child.

Malnutrition resulting from inadequate dietary intake is associated with growth failure and development of protein-energy malnutrition, especially during the gestation (Kathleen and Drora, 2010). It was recognized that poor growth results not only from a deficiency of protein and energy but also from inadequate intake of micronutrients that are vital during pregnancy. Pregnant women need additional protein for initial deposition of pregnancy-related tissue and to maintain new tissue (Kathleen and Drora, 2010). Maternal iron requirements are higher than average absorbable iron intakes. If a woman's diet does not contain enough iron to meet these needs, the body can meet fetal requirements only by drawing upon maternal iron stores. The demands of the developing fetus may cause the mother to develop nutritional iron deficiency anaemia. The World Health Organization indicates that, on average, 56% of pregnant women in developing countries is anaemic (Allen, 2000) and it is estimated that 82% of all pregnant women in the world suffers from zinc deficiency (Ma *et al*., 2004).

In Sri Lanka, despite of number of nutrition interventions maternal mortality rate was 29 per 100,000 live births (WHO, 2013), infant mortality rate was 11 per 1000 live births (UNICEF, 2010), neonatal mortality rate was 11 per 1000 live births and low birth weight prevalence was 16.6% (DHS, 2009). The finding of the nutrition and food security survey showed that underweight among pregnant women was 13.4% (Jayatissa and Hossaine, 2010). Further, the prevalence of iron deficiency anaemia among pregnant women was 34% in Sri Lanka (DHS, 2009). Since maternal nutritional problems are public health problems in Sri Lanka, assessment of nutritional status of pregnant women is important to identify the nutritional problems and to design appropriate nutritional interventions. This study was to identify the nutritional status of pregnant women in Pannala, a rural area in Sri Lanka.

MATERIALS AND METHODS

A cross sectional study was conducted at Maternal and Child Health (MCH) clinics in Pannala Medical Officer of Health (MOH) area, a rural area located in the Kurunegala District, North- Western Province of Sri Lanka.

Pregnant women, who were in their second trimester, not taking therapeutic diets and supplements other than iron, folic acid, vitamin C and calcium supplements given at the clinic, free from non-communicable diseases, attending the Ante-Natal Clinics (ANC) during the data collection period and willing to participate were recruited for this study. The sample size was determined on the assumption that 15% of the pregnant mothers are underweight with 5% marginal error and 95% confidence interval (CI) and a none response rate of 10%. Based on this assumption, the actual sample size for the study was determined using the formula, $n = Z^2pq / E^2$. The ethical clearance was obtained from the Ethical Review Committee, Faculty of Medicine, University of Peradeniya, Sri Lanka (2014/EC/08) and permission was obtained from relevant health authorities in Pannala MOH office to conduct

this survey. The purpose of the study was explained to the pregnant women and written consents were obtained.

A pre-tested interviewer administrated socio-demographic, lifestyle and health questionnaire, anthropometric information, Maternal and Child Health (MCH) records and validated Food Frequency Questionnaire (FFQ) were used as data collection tools. Anthropometric information such as pre-pregnancy weight, weight and Body Mass Index (BMI) at the time of first visit to the clinic, gestational week and blood haemoglobin level of the pregnant mothers were collected from the general questionnaire and MCH records. Based on their pre-pregnancy BMI, nutritional status was calculated and categorized them according to the cut-off values (IMNRCNA, 2009). Based on the current weight and weight at the first visit to the MCH clinic, their weight gain was calculated and those values were compared with recommended value for pregnant women in each nutritional status (IMNRCNA, 2009). The study followed the standard of heamoglobin level below 11 g/dL during pregnancy as an indication of anaemia.

Consumption foods in FFQ were entered in household portions (table spoon, tea spoon and cups), converted into grams and the nutrient intake was analyzed by using FoodBase 2000 (The Institute of Brain Chemistry and Human Nutrition, University of North London) modified with Sri Lankan food. Adequacy of nutrient and energy intake was compared with recommended dietary intake (Food and Nutrition Board, 2011) for pregnancy.

Statistical analysis included descriptive statistics: percentage, mean and standard deviation (SD). The binary logistic analysis was done to test the relationship between socio-demographic characteristics and nutritional status of pregnant women. Statistical analysis was done by using SPSS, version 16.0.

RESULTS

One hundred and thirty-three pregnant women participated in the study.

Socio-demographic characteristics

Socio-demographic characteristics of the study participants are shown in Table 1.

Table 1. Socio-demographic characteristics of pregnant women

Characteristic	Number (n)	Percentage (%)
Age (in years)		
<20	4	3.00
20 – 29	99	74.44
>30	30	22.56
Education level		
No schooling	0	0.00
Year 1 to 5	3	2.56
Year 6 to O/L (Ordinary Level)	60	45.11
A/L and above (Advance Level)	70	52.63
Occupation level		
Employed	22	16.54
Not employed	111	83.46
Monthly family income (Rupees)		
<10000	4	3.01
10000 – 14999	13	9.77
15000 – 25000	33	24.81
>25000	83	62.41

The age of the study sample ranged from 18 to 39 years and the majority (74.4%) of the pregnant women was in the age range of 20 to 29 years. The mean age of the study sample was 26.86 ± 4.16 years.

Obstetric history

Obstetric history of the study participants is shown in Table 2.

Table 2. Descriptive analysis of obstetric history of pregnant women

Variables	Number (n)	Percentage (%)	Mean (±SD)
Marriage at age			22.2 ± 3.58
< 20 years	4	3.01	
20 to 29 years	99	74.44	
≥ 30 years	30	22.56	
Age at first pregnancy			23.7 ± 3.74
< 20 years	19	14.29	
20 to 29 years	107	80.45	
≥ 30 years	7	5.26	
Parity			1.8 ± 0.77
First	51	38.35	
Second	56	42.11	
Third	24	18.05	
Forth or more	2	1.50	
Pre pregnancy risk factors			
Abortion/Still birth	11	8.27	
Hypertension	2	1.50	
Ante partum/Post-partum Hemorrhage	3	2.56	
Delivery complication/s	17	12.78	
Present risk factors			
<18 years	2	1.50	
>35 years	8	6.02	
Hypertension	3	2.26	
Short structure	5	3.76	

The sample mean age of the marriage was 22.2 years and the mean age of first pregnancy was 23.7 years. Only 12.8% of them had previous pregnancy-related risk factors such as hypertension, delivery complications and out of them 8.3% had an abortion or still birth in their previous pregnancies. Only 13% of the sample presently had pregnancy related risk factors; the age of 6% of them was above 35 years and 2.3% had hypertension. Daily intake of supplements among pregnant women was more than 90%.

Anthropometric characteristics

The mean weight and BMI of the pregnant mothers were 52.9 (SD 9) kg and 22.1 (SD 3) kgm^{-2} respectively. Mean gestational age (weeks) of the sample (second trimester) was 20.3 ±2.9 weeks and mean fundal height was 19.6 ±2.8 cm. Further, the study showed that the mean height of the subjects was 154.7±5.48 cm and 37.6% of women's height was above

156 cm. According to the pre-pregnancy BMI, 15.0%, 44.4%, 35.3% and 5.3% were underweight, normal, overweight and obese, respectively. The mean weight gain of the study sample was 2.7 kg.

Table 3. shows the mean weight gain of the pregnant women in each group of nutritional status together with the recommended weight gain for each category.

Table 3. Distribution of the sample according their nutritional status and weight gain

Nutritional status based on pre-pregnancy BMI (BMI kg/m^2)	Number (%)	Weight gain (kg) Mean± S.D	**Recommended weight gain (kg) Mean± S.D	P value
Under weight (<18.50)	20 (15.04)	4.05 ± 2.91	6.38 ± 1.32	*0.000
Normal (18.5-22.99)	59 (44.36)	2.28 ± 1.91	4.84 ± 1.29	*0.000
Over weight (23.00-27.49)	47 (35.34)	2.84 ± 2.46	3.23 ± 0.91	0.203
Obese (≥ 27.50)	7 (5.26)	1.87 ± 1.61	3.43 ± 1.19	*0.040

P value from paired sample t-test (*P<0.05)
** Source: Institute of Medicine and National Research Council (2009)

Biochemical characteristics

The distribution of participants according to their haemoglobin levels showed that one-quarter (25%) of the pregnant women had less than 11 gdL^{-1} haemoglobin level with 2.5 % of them having moderate anaemia (7-9.9 gdL^{-1}) condition. However, the mean value of the haemoglobin (11.7 gdL^{-1}) of the sample was within the normal range (>11 gdL^{-1}).

Food and dietary nutrient intake

Food intake

FFQ information revealed that mean daily intake of cereals, pulses, meat and fish, vegetables, fruits and milk and milk products was 729±152 g, 95± 42 g, 79± 32 g, 162 ± 53.5 g, 101.5±45.5 g and 119± 91 g respectively. Based on food groups their food consumption was more from plant sources than animal sources.

Dietary nutrient intake

Table 4 shows the mean dietary nutrient intake and RDA of the study participants.

Table 4. The mean dietary energy, macronutrient and micronutrient intake, RDA values and distribution of the sample according to the intake of RDA

Nutrients (units)	Intake from diet Mean (±SD)	RDA*	Above RDA % (n)	Below RDA % (n)
Energy (kcal)	2472.02 (366.85)	2360	66.92 (89)	33.08 (44)
Protein (g)	74.19 (13.64)	59	87.97 (117)	12.03 (16)
Iron (mg)	16.52 (3.54)	33	0 (0)	100 (133)
Calcium (mg)	844.95 (239.58)	1000	24.06 (32)	75.94 (101)
Folic acid (µg)	420.90 (132.42)	600	9.02 (12)	90.98 (121)
Vitamin C(mg)	71.44 (32.26)	55	68.42 (91)	31.58 (42)
Vitamin A(µg)	525.77 (154.86)	800	3.76 (5)	96.24 (128)

(*Source: Food and Nutrition Board, Institute of Medicine, National Academies, 2011)

The mean daily dietary intake of energy was 2472 kcal and the energy from carbohydrate, protein and fat was 61.45, 12.02 and 26.13% respectively. Only mean dietary intake of energy, protein and vitamin C met RDA of 2360 kcal, 59 g and 55 mg respectively. Although mothers consume an adequate amount of protein, their iron intake was below the RDA of 33 mg.

DISCUSSION

Although the concepts of mother's health and nutritional status have become a major concern, not enough studies have been conducted in this alarmed area on identifying of maternal nutritional problems. This study was carried out to identify the nutritional status of pregnant women in a rural area in the North-Western Province in Sri Lanka. Several studies have reported that teenage pregnancies are strongly associated with numerous negative consequences of pregnancy (Chen *et al*., 2013). However, in this study only 3% of the pregnant women was at the age below 20 years and nearly 75% of them was between 20 to 29 years. Low educational attainment is one of the potential risk factors associated with poor nutritional status in pregnancy. When considering the educational level, more than half of the sample (52.6%) had studied up to the A/L. However, a study done in the Northern Province revealed that only 34.4% of pregnant women completed their education up to the grade 10 and around 20% completed their studies up to A/L or above (Sivakaneshan and Senarath, 2009). The education level is important to acquire the knowledge about nutritional requirements and to have adequate nutrients during pregnancy. It improves the house-hold food consumption and food security level of the families.

The results of this study showed that pre-pregnancy risk factors like abortion, hypertension, haemorrhage and delivery complication were 8.3, 1.5, 2.6 and 12.8% respectively. According to Sivakanesan and Senarath study (2009) abortion, hypertension, haemorrhage and delivery complication were 19.3, 2.4, 0.8 and 8.0% respectively in the Northern Province in 2009. Further, in the Northern Province pregnancy risk factors: <18 years, >35 years, hypertension and short structure were 9.7, 14.3, 13 and 1.5% respectively whereas in the Pannala MOH area they were 1.5, 6, 2.3 and 3.8% respectively. Health status of the pregnant women and the effectiveness of the services of MCH clinics in the Pannala MOH area showed improvement compared to the previous study. More than 90% of the pregnant women consumed supplements that are provided by MCH clinics. It may be the reason for lower pregnancy related complications among the study sample. The study showed a positive relationship between parity and over-nutrition (overweight and obese) among mothers. The reason for the increasing trend of overweight and obesity may be due to deposition of fat during the pregnancy that remains after the pregnancy leading to higher weight and BMI than normal.

Further, this study found that the study sample's mean weight and BMI at the first visit to the clinic were 52.89 kg and 22.1kgm^{-2} respectively. The mean values of the gestational age, fundal height, height and weight gain were 20.3 weeks, 19.6 cm, 154.7 cm and 2.7 kg respectively. A study done in Sri Lanka reported that cut-off values for minimum weight, height and BMI for a mother to prevent low birth weight were 50.3 kg, 154 cm and 21.1 kgm^{-2} respectively (Jananthan *et al*., 2009). In the present study, mean weight, BMI and height were higher than those cut-off values. According to the research finding of Haque (Haque *et al*., 2014), most of the women (45.26%) fall in to the category of height between 148 cm to 152 cm whereas in this study, 37.59% women was above 156cm. Mean weight gain of pregnant women in the second trimester was 2.71±2.23 kg that was below the recommended weight gain (4.45 kg).

The result of this study showed that 44.36% of the women had normal-nutritional status while only 15% was underweight. According to the WHO report (WHO, 2013), nearly 39% of pregnant women in Sri Lanka had normal nutritional status. Higher percentage of pregnant women in normal nutritional status in the study area may be due to regular attendance at MCH clinics, receiving antenatal care during pregnancy, participation in nutritional education programs which were conducted at clinics and regular consumption of supplements. Other possible reason could be that adult mothers were more aware of pregnancy complications and health of the baby as well as had adequate education and knowledge than teenage mothers.

A positive correlation between mean weight gain and recommended weight gain of the mothers who are categorised under underweight, normal and obese was evident. However, there were no relationship between mean weight gain and recommended weight gain of the pregnant women in the overweight category. Some literature showed that pregnancy under-nutrition (low BMI) and low weight gain during pregnancy lead to increase risk of delivery complication, tissue depletion in mothers and Intra Uterus Growth Retardation (IUGR), still birth and LBW in baby (Mendes *et al*., 2014).

The present study revealed that 24.6% of mothers had anaemia and among them, 22.03% had mild anaemia and 2.54% had moderate anaemia. These figures were lower when comparing with the national prevalence of anaemia among pregnant women (DHS, 2009) and higher than the findings (14.1%) of a study in the Anuradhapura District (Chathurani *et al*., 2012). The low prevalence of anaemia among the study sample may be due to regular intake of iron supplements.

Dietary nutrients intake of the study sample showed that only intake of energy, protein and vitamin C met the RDA values. The other nutrients like calcium, iron, folic acid and vitamin A from diets did not meet the RDA values. When looking at the iron intake through the diet, no one met the RDA value in the iron intake. However, the mean protein intake was higher than RDA value and most of the protein rich foods contain high amount of iron. Low consumption of iron may be due to higher consumption of plant based protein (rice, pulses and legume) than animal protein (fish and meat). Their vitamin A consumption was also lower than RDA and only 3.76% met the RDA value. The reason for the low consumption of vitamin A may be due to low intake of green leafy vegetables and animal based foods that are high in vitamin A. Although the dietary nutrients intake was low, the majority had normal range of haemoglobin. The reason may regular daily intakes of supplements.

The study found positive relationships between nutritional status and monthly family income ($p= 0.04$) and age of the pregnant women ($p=0.046$). However, educational levels ($p=0.73$) of the pregnant women did not have any influence on their nutritional status and were no any relationship between nutritional status and other factors like occupation, pre-pregnancy weight, energy intake and protein intake of the pregnant women. Poor cooperation for providing dietary intake information and the incomplete information in the MCH records such as pre-pregnancy weight and BMI data were some limitations of this study.

CONCLUSION

The study concluded that underweight, overweight and low dietary nutrient intakes were nutritional problems of the study sample. Therefore, effective nutrition intervention should be directed towards pregnant women to improve maternal nutritional status.

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