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Weight Gain of Mother, Birth Weight of Infant and Maternal Knowledge Regarding   Nutrition in Sri Lanka

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Abstract:

Birth weight of an infant is an indicator to a healthy future generation. This study was designed to find out the association between weight gain and level of knowledge about nutrition of pregnant mothers and the association between weight gain of mother to the birth weight of the child.
Healthy mothers (n=201) were selected from the antenatal wards of Colombo South Teaching Hospital, Sri Lanka. Those who fulfilled the inclusion criteria were given a self-administrated questionnaire and their weight at initial registration was noted and weight before delivery was measured. After delivery, birth weights of infants were taken.
Weight gain during the course of the pregnancy (mean 12.78 ± 4.09 kg) had a significant association with birth weight of infants (Mean 2963.18 ± 421.41 g). More than 70% of the study participants were found to have satisfactory or good knowledge on nutrition. Furthermore, majority of pregnant mothers avoid certain foods during pregnancy due to myths associated with pregnancy outcome and the food type. Thus further health education regarding nutrition should be conducted in antenatal clinics for the benefit of pregnant mothers.

Keywords: Maternal weight gain, birth weight, nutrition, knowledge

Introduction:

Neonatal deaths contribute greatly to childhood mortality in developing countries, and these contribute the majority of deaths of children under the age of 5 (1). In Sri Lanka, neonatal mortality accounted for more than half of all deaths in children under the age of 5 years (Annual health statistics, 2011). Low birth weight babies are at higher risk of mortality than those of normal birth weight (2) and are also at risk of postnatal growth retardation, with possible adverse long term

effects on their physical and cognitive development. One of the major causes of low birth weight in developing countries is the poor nutritional status of the mother before and during pregnancy, and this may result in neonatal deaths as well as stunting in the first two years among survivors (3).

Poor quality diet and inadequate intake along with increased nutrient requirements for placental and fetal growth, leads to multiple micronutrient deficiencies in pregnancy and contribute to higher rates of low birth weight .Although some aspects of fetal and new born health are beyond control a women's conscious decisions about social, health and nutritional factors affect her infant's health and future. Pregnancy is a period when under nutrition poses the greatest health risk. A pregnant mother needs extra nutrients to meet both her own needs and those of her developing fetus. Nourishing the fetus may deplete stores of maternal nutrients. Maternal iron deficiency anemia is one possible consequence. The fetus faces major health risks from under nutrition during gestation (4).

The consequences of preterm birth include reduced lung function and a weakened immune system. These conditions not only compromise health but also increase the likely hood of premature death. Long term problems in growth and development can result, if the infant survives. In extreme cases, low birth weight (<2.5kg) infants are at 5 to 10 times the risk of dying before the age of 1 year, compared to children with normal birth weight, primarily because of reduced lung development. When low birth weight is accompanied by other physical abnormalities, medical intervention can cost more intervention (5).

Knowledge about nutrition is a major factor associated with well being in any population. This will help relevant individuals in obtaining the necessary nutritional requirements as and when needed. Nutritional level of a pregnant woman and her knowledge about nutrition is important to the infant as well as for the pregnant mothers own health and wellbeing. Lack of knowledge regarding nutrition in pregnancy could lead to poor pregnancy outcome especially in countries like Sri Lanka.

Thus this study was carried out to determine the relationship between the knowledge regarding nutrition among pregnant mothers, their weight gain during pregnancy and the birth weight of the newborn.

Materials and Methods:

This study was a descriptive cross sectional study conducted in Sri Lanka.

Setting and Study participants:

A sample of 201 pregnant mothers presenting to Colombo South Teaching Hospital were recruited for this study. Pregnant mothers who are with complicated pregnancy i.e. gestational diabetes, pregnancy induced hypertension, preeclampsia and those suffering from chronic disorders were excluded from the study.

Methods:

The study used several variables to determine relationship between weight gain and the birth weight of the infant and the knowledge on nutrition among the study sample. Level of knowledge of pregnant mothers about nutrition during pregnancy was assessed by a pre formed validated self-administered questionnaire.

Maternal weight gain was calculated by using the antenatal card (a mandatory document for all pregnant mothers which gives details on the pregnancy including the weight from booking visit onwards used in Sri Lanka) and the final weight measured in kilograms at the time the mother was admitted for delivery. Birth weight of the infant was obtained from the records of the labour room, measured in grams.

Statistical Analysis:

Date analyzing was done using a computer based statistical package, EPIDATA (version 3.1) and SPSS (version 15). Descriptive statistical methods were used to described and summarize the sample characteristics. Chi square test and student t-test was used as significant tests as and when required. A p-value of <0.05 was taken as the significant probability level.

Ethics Statement:

Ethical clearance for the study was obtained from Ethics Review Committee, Faculty of Medical Sciences, University of Sri Jayewardenepura, and the study protocol was conducted according to the guidelines of the declaration of Helsinki.

The participants were fully explained about the nature of the study and informed written consent was obtained. Data was collected without interfering the patients' activities or treatments.

A consent form along with an information sheet giving details of the study (nature of the study, what will be expected from the participants, and expected risks and benefits) were provided to all pregnant mothers who were randomly selected to the sample. The details were also explained verbally to the potential participants. Afterwards, pregnant mothers who provided written consent were included in the study.

Results: The mean age at pregnancy for the study subjects was 28.82 (±5.26) years. Most of the study sample (88.8%) has had secondary education. Total family income of each subject was recorded and most of them (38.3%) were having a family income range of Rs. 10001-20000 (US$ 70-140), while 8.5% of pregnant mothers had a monthly family income below Rs. 5000 (US$ 35). More than 80 % of the pregnant mothers were within the ideal age category for conceiving (21-35 years). More than 75% of the pregnant mothers were in their first or second pregnancy and 80% of the pregnant mothers have studied up to secondary education. Only 2% of the study sample was unmarried. Majority (80%) of the pregnancies were planed pregnancies (Table1).

Table 1: Socio-demographic variables in the study sample:

Characteristics		Frequency (n=201)	%
Ethnicity	Sinhala	189	94.0
	Tamil	6	3.0
	Muslim	5	2.5
	Burgher	1	0.5
Religion	Buddhist	179	89.1
	Catholic	10	5.0
	Islam	6	3.0
	Hindu	4	2.0
	Other	2	1.0
Number of living children	One	95	47.3
	Two	27	13.4
	Three	14	7.0
	Four or more	4	2.0
	No children	61	30.3
Level of education	Not gone to school	3	1.5
	Up to grade 5	15	7.5
	Up to O/L	89	44.3
	Up to A/L	89	44.3
	University education	5	2.5
Civil status	Married	197	98.0
	Unmarried	4	2.0
Preparation for the pregnancy	Planned pregnancy	162	80.6
	Unplanned pregnancy	39	19.4
Total			100.0

There was a statistically significant association between the level of knowledge on nutrition during pregnancy and the level of education of the pregnant mothers (p<0.01). The relationship between weight gain and the birth weight of the infant was also statistically significant (p=0.015). The mean weight gain of mothers during the course of the pregnancy was 12.78 (±4.09) kg.

Nearly 50% of the subjects have reached the accepted level of weight gain during pregnancy. The mean birth weight of infants among the study participants was 2963.18 (±421.41 g) and most were in the weight range 2500-3500 grams and 75% of the subjects gave birth to an infant within the normal birth weight range (Table 2).

Table 2: Weight gain during pregnancy and the birth weight of infants in the study sample

Characteristic	Frequency (n=201)	%
Weight gain (in kilograms)		
0-5	2	1.0
6-10	62	30.8
11-16	100	49.8
17 -20	37	18.4
Birth weight (in grams)		
<2500	28	13.9
2500 ≤ 3500	148	73.6
>3500	25	12.4

The pregnant mothers reported their knowledge on nutrition and more than 70% of them were found to have satisfactory or good knowledge on nutrition. Only a minority (31%) of pregnant mothers who had gained a weight within the accepted range (11-16 kg) had a good knowledge on nutrition. There was no significant association between the weight gain and knowledge on nutrition (Table 3).

Table 3: Association of weight gain and the level of knowledge on nutrition among the study sample

Characteristic (Knowledge)	Weight gain (in kg)									
	0-5		6-10		11-16		17-20		Total	
	N	%	N	%	N	%	N	%	N	%
Not satisfactory	0	(0.0)	17	(27.4)	21	(21.0)	14	(37.8)	52	(25.9)
Satisfactory	0	(0.0)	28	(45.2)	48	(48.0)	13	(35.1)	89	(44.3)
Good	2	(100.0)	17	(27.4)	31	(31.0)	10	(27.0)	60	(29.9)
Total	2	(100.0)	62	(100.0)	100	(100.0)	37	(100.0)	201	(100.0)

On X^2 analysis p=0.17

Majority of the pregnant mothers avoid certain foods during pregnancy. Most of them think pineapple (35.8%), prawns (11.4%), banana inflorescence or "kehelmuwa" (9.0%), and unripe papaya (7.0%) are not good to eat during pregnancy. Their myths regarding avoiding these foods included that they would lead to miscarriage (14.9%), not good for the fetus (10.0%), and can give rise to antepartum bleeding (0.5%) while 18.4% of them avoid certain foods without having a specific reason.

Furthermore 50% of the study population who have gained weight within the accepted range (11-16 kg) had given birth to infants with birth weight within the normal range(2500≤3500) and there was a statistically significant association (p=0.015) between the weight gain of the mother and the birth weight of the infant (Table 4).

Table 4: Distribution of the weight gain of the pregnant mothers and the birth weight of the infant

Characteristic	Birth weight (in grams)							
Weight gain (in kg)	<2500		2500≤3500		>3500		Total	
	N	%	N	%	N	%	N	%
0-5	1	(3.6)	1	(0.7)	0	(0.0)	2	(1.0)
6-10	11	(39.3)	48	(32.4)	3	(12.0)	62	(30.8)
11-16	15	(53.6)	73	(49.3)	12	(48.0)	100	(49.8)
17-20	1	(3.6)	26	(17.6)	10	(40.0)	37	(18.4)
Total	28	(100.0)	148	(100.0)	25	(100.0)	201	(100.0)

On X^2 analysis p=0.015

On comparison of knowledge and the birth weight 30% of the study sample who had good knowledge on nutrition has given birth to infants with a birth weight within the accepted range (2500 ≤ 3500 kg). There was no significant association (p= 0.795) between the knowledge on nutrition of the mother and infants birth weight (Table 5).

Table 5: Comparing level of knowledge on nutrition in pregnant mothers and the birth weight of the infant

Characteristic	Birth weight (in grams)							
Level of knowledge	<2500		2500≤3500		>3500		Total	
	N	%	N	%	N	%	N	%
Not satisfactory	8	(28.6)	38	(25.7)	6	(24.0)	52	(25.9)
Satisfactory	13	(46.4)	67	(45.3)	9	(36.0)	89	(44.3)
Good	7	(25.0)	43	(29.1)	10	(40.0)	60	(29.9)
Total	28	(100.0)	148	(100.0)	25	(100.0)	201	(100.0)

On X^2 analysis p=0.795

More than 95% of the study sample was aware about proteins and most of the sample identified animal sources as protein rich foods (meat 31%, fish 30%, and egg 27%). Most of the subjects of the study sample have identified non-heme containing food as iron dense food [spinach 60%, gotukola (Centella asiatica) 30%)] and 66% of the pregnant mothers knew that iron deficiency leads to anemia and most of them (66%) were aware about low hemoglobin being the indicator for anemia.

Nearly 90% of the sample was aware about calcium and out of them 8% hadn't identified calcium rich foods. Nearly 90% of the population knew about the mineral iodine, among them 68.2% had identified iodized salt as the main source of iodine.

Discussion:

The study sample consisted of pregnant mothers aged 16 -43 years and more than 80 % of the pregnant mothers were within the ideal age this is accepted to conceive (21-35 years). More than 75% of the pregnant mothers were in their first or second pregnancy and 80% of the pregnant mothers have studied up to the secondary education. Only 2% of study sample were unmarried and the majority (80%) of the pregnancies were planned. In contrast Ramuseen and Yaktine 2009, have found that in the in United States, childbearing by unmarried mothers sharply increased in the past 15-year period to a record high of 36.9 percent. More mothers attained high levels of education; in 2005, more than one-quarter of mothers had 16 years or more of education. The proportion of births for mothers 35 years and older also increased substantially in this interval (6).

Food habits during pregnancy:

Nearly 66% of the study sample were avoiding some foods during the pregnancy which is higher than the 37% observed in Nigeria (7)but lower compared to Mahamood et al, where 84% of pregnant women have avoided some foods during pregnancy and lactation (Mahmood et al 1997). Most of them do not eat Pineapple, Kehelmuwa (banana inflorescence), Papaya, Prawns, Cuttle fish, Bread fruit, Taro, Crab, Kohila (Lasia spinosa). The foods pregnant mothers avoid are different from the findings of other research carried out in India and Vietnam The difference may be due to the obvious cultural differences in the three countries. Reasons given for avoiding these foods were possibility of having a miscarriage, bleeding during pregnancy, not being good for the fetus and allergy. Nearly 20% of the population avoids certain foods without having any idea as to why they are avoiding these foods.

Knowledge on nutrition:

More than 75% of the study sample had a good or satisfactory knowledge on nutrition. And the educational level of the pregnant mother was associated with the level of knowledge on nutrition. The reason of having a good knowledge among a majority of the study sample may be related to the high literacy rate among the female population in Sri Lanka (Department of census and statistics Sri Lanka 2011).

 According to this study the knowledge on nutrition among pregnant mothers was not affected by their parity or age. (p=0.173). More than 90% of the study sample knew about the nutritional supplements during pregnancy. Most of the pregnant women attended antenatal clinics in their home area and they may have been educated about the nutritional supplements from the maternal clinics.

It was noted that the knowledge about the Anemia is relatively high among the study sample; the reason may be the health education given by their maternal clinics.

Weight gain during pregnancy:

Almost half of the study sample has reached the accepted level of weight gain during pregnancy of 11.5 kg – 16 kg (8) .The present study did not find that the weight gain of the pregnant mother is affected by her knowledge on nutrition. This result may be due to Sri Lankan pregnant mothers are well looked after by their family members. Another study has showed that 60% of low educated subjects were recognized with abnormal weight gain, but they could not find any significant difference between weight gain and educational level which is reemphasized in the present study. Although level of education did not influence weight gain significantly, illiterate subjects were at higher risk for poor weight gain. This is perhaps explained by patient compliance and access to nutritional counseling and resources as well.

Birth weight of the infants:

Majority of the study subjects gave birth to infants with normal birth weight range of 2500 ≤ 3500 grams according to the World Health Organization reference range (WHO 2011). The low birth weight percentage of this study was 13.9% but according to the estimates of Sri Lanka in 2005 the estimated low birth weight percentage is 11.5% for single live births. As recognized by Jaruratanasirikul et al 2009 infant birth weight positively correlates with weight gain during pregnancy. In this study only 50% of the study population who have a weight gain within the accepted range 11-16 kg) had given birth to infants whose birth weight was within the normal range (2500≤3500) (9).

Only 30% of the study sample having a good knowledge on nutrition has given birth to infants whose birth weight was within the accepted range (2500≤3500 kg) although no significant difference was observed between knowledge on nutrition & infant birth weight in the present study.

It is suggested that as the amount of total weight gain is widely variable among women with good pregnancy outcomes, and the perinatal outcomes of interest are of multifactorial origin, weight gain alone should not be expected to be utilized as a perfect diagnostic or screening tool for perinatal outcome. Studies suggests that deviation in maternal weight gain can act as a useful marker of newborn weight at birth and, also pre-pregnancy BMI can predict fetal weight especially in women with BMI < 19.8 kg/m^2. Lumbanraja et al has mentioned that normal BMI and ideal weight gain in pregnancy is associated with decreased perinatal complications and an optimum birth weight (10)Another study showed that being moderately underweight was not associated with increased risk of adverse pregnancy outcomes, but being severely underweight was an important risk factor for reduced fetal growth (11)

Heyat et al 2013 have identified more maternal factors affecting birth weight of their infants such as pre pregnancy BMI, maternal age, nutritional status of the mother, (12) but assessing the relationship between these factors was beyond the scope of this study which also is one of the limitations of the present study and the fetal factors affecting the birth weight of the infant such as intrauterine growth status, gestational age (WHO 2011) was also not analyzed in the present study.

Conclusion:

This study highlights the impact of proper knowledge on nutrition during pregnancy. Subjects avoid certain foods during pregnancy, because of the unnecessary fears, myths and cultural believes which should be corrected at primary care level. The importance of adequate weight gain during pregnancy to ensure a good pregnancy outcome and a healthy infant at birth was also reemphasized by the findings of this study.

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