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Food frequency Patterns during pregnancy is associated with increased infant size at birth

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Abstract
In India, teenage pregnancy is an important public-health problem. It is defined as an underage girl (age < 19 years) becoming pregnant. The most common cause of teenage pregnancy is early marriages and lack of contraceptive use, adolescent sexual behaviour, sexual abuse and indirect causes like poverty and low education. The present study therefore planned with the objective to assess the nutritional status and food frequency pattern among pregnant mothers to determine maternal food consumption patterns and its risk of low birth weight. Hundred adolescent mothers aged between 17-19 years in Jaipur were included. Dietary consumption pattern was assessed using semi quantitative food frequency pattern and 24 hour recall method. Respondents were undernourished (Mean BMI 19.53+/-2.42 kg/m^2) in their 2nd and 3rd trimester. This clearly showed that these adolescent girls had a very low BMI prior to pregnancy. Maternal diets were predominantly cereal based, lacked variety and deficit, when compared to RDA. Significantly high risk for LBW was seen in families, family size > 5, those with low income (< Rs. 5000/-). Additionally, significantly risk for LBW was seen for lower consumption pattern and no consumption of milk. Birth weight of the baby was also associated with consumption milk p=0.1, which provide best quality protein. Findings clearly show that the entire health and nutritional factors are inter-related. Good maternal nutrition coupled with regular ANCs, practicing the health and nutrition advice, good weight gain during pregnancy and institutional delivery, in a way can lead to healthy pregnancy and a healthy baby.

Keywords: teenage pregnancy, maternal nutrition, bmi, ante natal care. maternal mortality rate, low birth weight

Introduction
The girls in the age of 11-18 years have been included in the national adolescent girl's scheme under integrated child development scheme (ICDS). Adolescent girls are future mothers of a nation. Female adolescents constitute 12percent of the total population in India and as such quality of health of this group is of considerable importance in the context of national development. So it is also very essential to invest in adolescents, as they are the future of the country. However, unfortunately studies on nutritional status of adolescents reveal need for improvement regarding health and diet for all strata of population like rural, urban, tribal, low income group, high income group etc. Growth and prosperity of a nation depends heavily on the nutritional status and development of adolescent girls as they influence the growth of the remaining population. Adolescent's problems constitute a bulk of morbidities which are generally unrecognized and uncared furthering the disease burden. RTIs/STDs/HIV/AIDS have already appeared as serious problems. Neeru Gupta, 2007 pointed out that the adolescent pregnancy accounts for 18.8percent of fertility in our country. These young girls face considerable health risk during pregnancy and child birth [1]. Further, poor nutrition intake makes the pregnancy very unsafe. Teenage pregnancies with complications, unsafe abortion, etc., also exist considerably. Early motherhood can affect the psychosocial development of the infant. The occurrence of development disabilities and behavioural issue are increased in children born to teen mothers [2]. Preterm birth is the most significant problem in current obstetric practice. Low birth weight remains an unresolved important national concern in India. A teenage pregnancy represents a high risk group in reproductive terms because of the double burden of reproduction and growth. Complications of pregnancy are child births are the leading cause of mortality among girl aged 15-19 years in developing countries. The major reason for high incidences of intra uterine growth retardation is indicated to be low body mass index prevalent among fertile women in India. Birth weight is one of the most important and reliable parameters in the evaluation of foetal and neonatal well-being. Birth weight below 2.5 kg has been found to be very closely associated with poor growth, not just in infancy throughout the childhood. Adolescents are at an age of transitioning from parental supervision to independent decision making and are developing food patterns that will affect their future, it is a period of dynamic growth necessitating optimum nutritional requirements. Maternal nutrition is complex being influenced by many factors, in addition to diet, genetic, environmental, social and economic factors and any infection or other disease can also affect the foetal development. Dietary practices during pregnancy affect birth weight of infant. Proper dietary balance is necessary to ensure sufficient energy intake for adequate growth of foetus without drawing on mother's own tissues to maintain her pregnancy. A pregnant women needs to consume more of each type of nutrient during pregnancy. The outcome of pregnancy is directly influenced by the diet pattern of the pregnant mother [3]. If women are not well nourished, they are more likely to give birth to weak babies resulting in high infant mortality rate. The present study therefore planned with the objective to assess of the nutritional status and food frequency pattern among pregnant mothers to determine maternal food consumption patterns and its risk of low birth weight.

Objectives
1. To assess of the nutritional status and food frequency pattern among adolescent mothers.

2. To ascertain the association between foods consumption pattern in pregnant mothers and birth weight of their new born.

Methodology

Locale of the Study: The hospital is at Sanganeri gate, caters to the patients living within the walled city of Jaipur and outside the walled city. For the present study, the hospital located at Sanganeri gate was selected, as majority of the hospital patients represent heterogeneous groups.

Selection of the respondents

Inclusive criteria: 17-19 years of age group.

Exclusive criteria: Girls suffering from chronic diseases like coronary heart disease, renal disease, chronic hypertension, diabetes, multiple gestations, were excluded from the study. Considering the inclusive criteria, a total of 100 girls formed the final respondent. The lady doctor (gynecologist and obstetrician) was contacted and her O.P.D. days were attended by the researcher for the data collection. The selected doctor had O.P.D. for one day per week. The researcher attended the O.P.D. once in a week for a period of 10 months. On an average 2-3 teenage pregnancies per week attended the O.P.D. Thus, the respondents were 8-9 per month and a total of 100 respondents formed the study group.

Tools for the data collection

Table 1: Details of the selected variables

S. No.	Variable	Tools used to measure variable
1.	Nutritional assessment	
	a. Height	Microtoise heightometer
	b. Weight	Calibrated libra bathroom scale
	c. BMI	Standard formula
	d. Dietary survey	
	▪ Food frequency pattern	Schedule constructed for the study
	▪ Dietary recall	24 hour dietary recall for one day
2.	Outcome of the pregnancy in terms of birth weight of new born	Hospital records

Procedure to Measure the Variables

Nutritional Assessment

(a) Height: Microtoise heightometer with the sensitivity of 0.1 cm was used to record height. The subject was made to stand below the instrument with heels, buttocks, shoulders and back of head touching the wall and arms hanging at the sides. The head of the subject was positioned at the Frankfurt plane. The head piece was lowered till it made contact with the head, and the height was recorded directly to the nearest completed unit [4].

(b) Weight: Calibrated libra bathroom scale with 500 grams sensitivity was used to record the weight. The subject was weighed with minimum clothing. The subject was made to stand bare feet straight in the centre of the machine platform without any support and weight was recorded to the nearest completed unit [4].

(c) BMI: BMI was calculated by using the following formula: Weight (kg) / Height $(mt)^2$ Weight in kg divided by height $(mt)^2$. [4].

(d) Dietary survey: Individual food consumption was determined by one day dietary recall method and food consumption pattern was assessed using pretested food frequency to record consumption of various foods and their frequency in last one month. To facilitate recall, standardized sets of utensils were used. To obtain the amount of raw ingredient used in food items, standardization was done both in the field and in the laboratory. Nutrient intake (protein and calories) was calculated and was compared to RDA.

Result and Discussions

Research on maternal nutrition primarily attempts to identify factors associated with birth weight. These issues have different implications because compared to improvement in birth weight; reduction in prevalence of LBW will have multifactorial effect. Therefore, it was observed in this study that apart from maternal nutritional status and maternal demographic factors, maternal consumption of certain foods like roti, and milk is significantly inversely associated with risk of LBW.

Maternal socio-economic and demographic profile: Maternal characteristics related to socioeconomic, demographic variable are shown in table 2. It can be seen that most families 50% had family size <5; only 17% of mothers had education only up to 10^{th} standard and above. Almost all had low monthly income. Among the study population 73% of the respondents were primigravidae. It shows that larger family size and lower monthly income were associated with lower birth weight. The prevalence of LBW in fact showed significant inverse association with income and age at registration. Although most of the studies identify that the income as one of the determinant factor for LBW. Mothers having age less than 20 years at registration had almost 2.2 times higher risk of delivering a LBW baby [5]. Early age at marriage is a social norm in rural India and considerable proportion of girls get married before that legal age at marriage i.e. 18 years. Adolescent pregnancy in case of rural Indian under nourished girls shows devastating effects of early conception in terms of increased risk for pregnancy wastage (still birth and abortion) and premature delivery [6]. Demographic studies show that factors such as early age at marriage and consequently early age at conception are major contributors to poor reproductive health [7]. Knowledge related to reproductive health among adolescent girls found to be less [8, 9]. Further ignorance or misinformation on sex related matters can put sexually active youth at higher risk of sexually transmitted diseases including HIV/AIDS [10].

Table 2: Socio-economic, demographic, characters of mothers and birth weight of newborn

Variables	N	P value	Birth weight of new born (grams)
Family size			
<5	50		2449 +/-281
5-7	18	0.50	2653 +/-376
>7	32		2286 +/-329
Education			
Upto7th standard	48		2414+/-271
7^{th}-10^{th} standard	35	0.64	2546 +/265
High school & above	17		2695+/298
Monthly Income			
<5000	36		2396+/-221
5000-10,000	29	0.05	2490+/-288
>= 10,000	35		2597+/-351
Parity			
Primigravidae	73	0.05	2512+/-351
Multigravidae	27		2498+/-288
Religion			
Hindu	38		2.48+/-244
Muslim	60	0.23	2.61+/-388
Sikh	2		2.98+/-292

* Significant positive correlation

The usual cause of nutritional deficiencies is a poor diet that lacks essential nutrients. The body stores nutrients, so a deficiency is usually caught after it's been without the nutrient for some time [11]. All meals should include at least three different food groups. Each food group has something to offer our body. Grains are a good source of energy. Fruits and vegetables are packed with antioxidants, fiber and water soluble and fat soluble vitamins.

Table 3: Neonatal birth weight by maternal frequency pattern of various food items

Food items	Frequency	N	P value	Birth weight of new born (grams)
Milk	Never	22		2396 +/-316
	<1 g/day	34	0.01	2489 +/-288
	>= 1g/day	44		2596 +/-398
Roti	<2/d	8		2487 +/-244
	2-3/d	74	0.04	2519 +/-279
	>2/d	18		2609 +/-282
Rice	1 k/d	52		2509 +/-282
	<2 -3k/d	23	0.50	2598 +/-244
	>2 k/d	25		2601 +/-298
Dal & Legumes	Daily	21		2607 +/-388
	Twice in a week	48	0.007	2698 +/-354
	Weekly	12		2433 +/-282
	monthly	19		2209 +/-241
Vegetables (GLV's)	Daily	79		2608 +/-244
	Twice in a week	14	0.56	2598 +/-288
	Weekly	7		2498 +/-301
	monthly	-		-
Fruits	Daily	52		2698 +/-325
	Twice in a week	17	0.36	2603 +/-228
	Weekly	10		2588 +/-281
	monthly	21		2221 +/-332
Non-vegetarian items (N=62)	Daily	11		2689 +/-321
	Twice in a week	14	0.40	2595 +/-223
	Weekly	12		2486 +/-241
	monthly	25		2438 +/-308

*Significant positive correlation **k= katori g = glass

Maternal foods frequency pattern: Amount of food intake was measured in terms of numbers of roti and of serving spoons of standard size for other foods. Frequency of consumption in terms of once, twice or more in a day / week or month was also needed. Separate information was noted for the foods avoided or preferred during pregnancy to understand food taboos.

The diets were predominantly cereal based. Roti, made up from wheat, was consumed at all the three meals. Rice was mostly included only in dinner. The diets clearly lacked variety. GLVs being more perishable than other vegetables were less preferred. Majority of mothers were non-vegetarian but the frequency of consumption of such foods was very low, only 21% mothers

consumed dal daily probably because of its high cost. Intake of milk was very low almost half of the mother 44% never drank milk. Only few believed it to be beneficial during pregnancy and started taking it after conception. Nearly 52% mothers had fruits in their daily diets, which included tomato, cucumber also. Juice of sweet lime (mausmi), pomegranate, and pineapple was most preferred and other commonly available seasonal fruits like orange, guava, grapes and apple were also consumed. Papaya, coconut and banana dates (khajoor) were mostly avoided as food taboo. It can be seen from table 3 that higher the frequency of consumption of staple food like roti that contributed major portion of days calorie intake, higher was the birth weight, (p= 0.01), this was also true with regard to the consumption of daal birth weight (p=0.007) which was the only source of protein in the vegetarian diets. Similarly, birth weight of the baby was also associated with consumption of milk p=0.1, that provide best quality protein. However, prevalence of low birth weight decreased significantly only with increase in milk consumption. Most importantly low consumption of certain foods also indicated risk of LBW. Low milk consumption (less than 250 ml/day) is shown to be associated with low birth weights [12]. The present observation not only supports these findings but also indicates that providing one cup of milk per day to undernourished mother from rural. Nutritional deficiency diseases among low-income group's girls were more pronounced as compared to middle and high-income groups. There was a marked deficiency in nutritional levels among different categories, regardless of the income group. Variation in the extent of under-nutrition among adolescent girls could be attributed to differences in socio-cultural practices, level of socioeconomic development, value attached to girl child and prevailing dietary practices in different settings [13]. Nutrition education with special reference to fruits and its health benefits need to be given to adolescents [14].

Table 4: Neonatal birth weight by maternal nutritional status (3rd trimester)

Nutritional Status	Variable	N	P value	Birth weight of newborn (grams)
Anthropometry	Height (cms)			
	1.50 $^{+}$- 1.60	28	0.001	2.54 +/-289
	1.60^{+}- 1.70	72		2.79 +/-324
	Weight (kgs)			
	<50	37	0.001	2.12 +/-288
	>=50	63		2.64 +/-314
Nutrients	Energy (kcal)			
	1500 - 2000	25		2.32 +/-241
	2000^{+} - 2500	51	0.008	2.66 +/-288
	>2500	24		3.34 +/-314
	Protein (grams)			
	<30	22		1.95 +/- 201
	30^{+} - 50	48	0.003	2.66 +/- 254
	>50	30		3.30 /- 321

* Significant positive correlation

Maternal nutrient intake

The nutritional status of the mothers at registration was poor. Their mean weight was 50.31+/- 8.70 kg. While mean height was 1.55 +/- 3.24 cm. Mean BMI was 19.53 +/- 2.42 in their 2nd/3rd trimester. This clearly shows that these adolescent girls had a very low BMI prior to pregnancy. Thus the respondents in the present study had chronic energy deficiency and higher prevalence of nutritional deficiencies.

It was possible to estimate nutrient intakes of mothers with the help of semi-quantitative FFQ. It can be seen that maternal intakes were largely inadequate and calories was the most limiting nutrient when compared to RDA. Table 4, shows a positive co-relation between energy and protein intake and birth weight of the new born (p<0.05). Low intakes of calories and proteins in rural Indian mothers are reported by other studies also. High risk of delivering a LBW baby was indicated when nutrient intakes are less than 50% of the RDA [15].

Conclusion

Good nutrition generally can improve the spirit and quality of life, can speed recovery from illness and prolong life. Education can certainly help to get rid of undesirable practices. Simple health education interventions aimed to create nutritional awareness and motivate rural mothers for consuming extra quantity of their usual staple food like roti and dal to satisfy increased requirements or taking milk daily during pregnancy would be beneficial. Similarly, in populations where it is unlikely to increase age at marriage due to social-cultural factors, alternative approaches for postponing the first pregnancy would yield health benefits and programs must be planned to motivate adolescent girls accordingly. Thus the findings show that the entire health and nutritional factors are inter-related. Good maternal nutrition coupled with regular ANC's, practicing the health and nutritional advice, good weight gain during pregnancy and institutional delivery, in a way can lead to healthy pregnancy and a healthy baby.

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