Dietary intake of pregnant women and its effect on the birth weight of newborns in rural area of Uttar Pradesh, India

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ABSTRACT

Background: Nutritional deficiency during pregnancy in rural India is common. The nutritional requirements during pregnancy are increased and on the other hand the dietary intake decreases because of symptoms related to pregnancy. This adversely affects the weight of newborn. In developing countries low birth weight is major problem. So this study concern to determine the nutritional status of pregnant women and its effect on birth weight of newborn. **Methods:** A cross section descriptive study was conducted from Oct 2011 to May 2012 at Sarojni Nagar PHC, Lucknow, Uttar Pradesh over 323 pregnant women. They were interviewed regarding their dietary intake (on the basis of 24 hours recall method) during pregnancy. Of these 323 pregnant women, 291 could be followed up and amongst these 287 pregnant women delivered a live baby. The birth weight was measured immediate after birth. **Results:** In this study mean energy, protein, iron and calcium intake during pregnancy were 2013.3 ± 327.6 cal/day, 57.8 ± 11.4 gm/day, 30.15 ± 5.57 mg/day and 910.7 ± 210.4 mg/day respectively, whereas the mean intake of vitamin A, thiamine, riboflavin, niacin, vitamin C and folic acid were 608.4 ± 161.2 μg, 1.2 ± 0.2mg, 1.6 ± 0.2mg, 11.9 ± 2.1mg, 113.3 ± 2.1mg and 196.2 ± 38.4μg respectively. Nutritional deficiency during pregnancy was positively related with low birth weight. **Conclusion:** In the rural setup of India majority of the pregnant women were having inadequate dietary intake. Hence, policies related to maternal nutrition should be made so as to decrease the prevalence of low birth weight.

Key words: Pregnant women, Third trimester, Dietary intake, Birth weight, Rural, India

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INTRODUCTION

Nutritional deficiency during pregnancy in rural India is common. The nutritional requirements during pregnancy are increased and on the other hand the dietary intake decreases because of symptoms related to pregnancy. This adversely affects the weight of newborn. According to studies carried out in past, maternal nutrition and health are most important regulators of human foetal growth. If women are inadequately nourished, they are more likely to give birth to weak babies, thereby resulting in high infant mortality.[1] Maternal nutrition is an important factor responsible not only for health of baby, but also for the baby's long term growth.[2] Therefore understanding maternal nutrition and foetal growth relationship is critical.[3]

In developing countries low birth weight was major problem. According to WHO low birth weight define as birth weight less than 2.5kg. Prevalence of Low birth weight in India since independence has not shown any significant decline, it remains high at 28.0 percent,[4] despite launching of successive interventional programmes by the Government of India for reducing the problem.

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Low birth weight leads to an impaired growth of the infant with its attendant risks of a higher mortality rate, increased morbidity,[5] impaired mental development,[6] and the risk of chronic adult disease.[7] Nutritional deficiency is a modifiable risk factor for low birth weight. So this study concern to determine the nutritional status of pregnant women in third trimester of pregnancy and its effect on birth weight of newborn.

MATERIALS AND METHODS

This cross section descriptive type of study was conducted in Sarojni Nagar, primary health centre, Lucknow, Uttar Pradesh. It was a community based descriptive study. The sample size was based on the prevalence of low birth weight in India which was 28%.[4] Based on this assumption, sample size came out to be 323 with relative precision of 20% and design effect of 1.25. A total of 323 pregnant women were registered in the present study. Out of the total registered pregnant women, 32 pregnant could not be followed up to the time of delivery. These women might had delivered at some other hospitals/health facilities or opted for home delivery. A total 291 pregnant women could be followed till the time of delivery. Out of these 291 deliveries, 287 were live births and four were still birth. The sample collection was started in October 2011 and it was completed in May 2012.

All the selected pregnant women were interviewed on predesigned schedule. At the time of registration in the study their biosocial correlates, obstetric history, anthropometric measurement, clinical examination, laboratory examination and dietary intake were recorded. Each subject was questioned in detail about her dietary intake on the basis of 24-h dietary recall method for the previous day. The consumption of daily diet was calculated in terms of the following food groups (in grams) cereals, pulses, meat/fish poultry, green leafy vegetables, fruits, milk, oil and sugar. The daily intake of calories (Kcal), proteins (g), calcium (mg), iron (mg) and vitamins was calculated and compared with Recommended Dietary Allowance (RDA) tables provided by the Indian Council of Medical Research (ICMR)[8]. The birth weight was measured immediate after delivery. In 287 newborn, 82 were low birth weight (LBW) and 205 were normal birth weight (NBW).

Data was tabulated on Microsoft Excel Sheet and analyzed by using the software SPSS, version 17.0. Frequency distributions were calculated for all variables. One way ANOVA test was used for the comparing mean birth weight of babies. Univariate and multivariate analyses were performed to determine the influence of the dietary intake on the birth weight of a newborn. P values less than 0.05 were considered significant.

RESULTS

In the present study more than half (53.6%) of the pregnant women belonged to 20-24 years and majority (91.6%) were Hindus. 48.3 percent belonged to backward caste and a total, 59.1 percent of the study population were of IV socio-economic class.

Mean dietary intake of, cereals, pulses, GLV, root/tubers, oil & fat, milk & its products and sugar/jaggery were 344.0gms, 80.7gms, 81.7gms, 122.5gms, 24.8gms, 191.1gms and 20.0 gms respectively, in third trimester of pregnancy (Table-1).

In the current study mean energy, protein, iron and calcium intake during pregnancy were 2013.3 ± 327.6 kcal/day, 57.8 ± 11.4 gm/day, 30.15 ± 5.57 mg/day and 910.7 ± 210.4 mg/day respectively, whereas the mean intake of vitamin A, thiamine, riboflavin, niacin, vitamin C and folic acid were 608.4±161.2 µgm/day, 1.2±0.2 mg/day, 1.6±0.2 mg/day, 11.9±2.1 mg/day, 113.3 ±2.1 mg/day and 196.2±38.4 µgm/day respectively (Table-2).

Table 1: Dietary intake of pregnant in third trimester of pregnancy (n=323)

Food item	Mean intake during third trimester (gm)	RDA in pregnancy (gm)	Percentage adequacy intake
Cereals	344.0	445	77.3
Pulses	80.7	55	146.4
Green leafy vegetables (GLV)	81.7	100	81.7
Root/tubers & other veg.	100.0	100	100.0
Fruits	25.0	-	-
Oil & fat	24.8	20	124.0
Milk & milk product	191.1	200	95.6
Sugar & jaggery	20.0	35	57.1

Table 2: Nutrient intake of pregnant women in third trimester of pregnancy (n=323)

Nutrient intake	During third trimester of pregnancy		
	Mean±2SD	RDA	Percent adequacy of intake
Calories (kcal/day)	2013.3±327.6	2250.0	89.5
Protein (gm/day)	57.8±11.4	78.0	74.1
Iron (mg/day)	30.15±5.57	35.0	86.1
Calcium (mg/day)	910.7±210.4	1200.0	75.9
Vitamin A (µgm/day)	608.4±161.2	800.0	76.1
Thiamine (mg/day)	1.2±0.2	1.2	100.0
Riboflavin (mg/day)	1.6±0.2	1.4	114.3
Niacin (mg/day)	11.9±2.1	14.0	85.0
Vitamin C (mg/day)	113.3±2.1	60.0	188.8
Folic acid (µgm/day)	196.2±38.4	400.0	49.1

In anthropometric measurements, mean weight of pregnant women with LBW and NBW was 48.7±6.2kg and 50.7±7.2kg respectively, which was significantly associated with LBW. In lab investigation, haemoglobin level of mother during third trimester was significantly related with LBW. Mean haemoglobin level of LBW mothers was 9.6±1.4 gm%. In dietary intake of energy, protein, iron, calcium, vitamin A, vitamin B1, vitamin B2, vitamin B5, vitamin C and folic acid were significantly related with LBW (Table-3).

In multilogistic regression energy, riboflavin, folic acid and vitamin C had significant effect on birth weight. Pregnant women consuming energy less than 2025 calories (deficient >10% of RDA) were 2.918 time more prone to deliver LBW. Inadequate riboflavin, folic acid and vitamin C intake during pregnancy were associated with higher risk of LBW

with an adjusted prevalence ratio (aPR)=15.095, 8.190 and 9.092 respectively (Table-4).

DISCUSSION

In present study in nutrient intake, only thiamine, riboflavin and vitamin C were consumed in adequate amount by pregnant women during third trimester of pregnancy. Intake of energy, protein, iron, calcium, vitamin A, thiamine and folic acid were low with reference to ICMR recommendation (National Institute of Nutrition, 2009). A study of rural Orissa showed that only the intake of vitamins like vitamin C, niacin, and thiamine were satisfactory in third trimester of pregnancy. This indicates that the diet of pregnant women was not adequate to meet the requirements of nutrients during the course of pregnancy.[1] The finding of this study was also similar with other study in urban and rural India. The result of these studies was that consumption of energy and nutrient during pregnancy were inadequate as compared to recommended RDA.[9,10]

Pregnant women who delivered LBW babies were significantly low in weight and hemoglobin level than women who delivered normal birth weight babies. It was also observed that pregnant women who delivered NBW were consumed significantly higher amount of energy, protein, iron, calcium, vitamin A, vitamin B complex and vitamin C than those who delivered LBW babies. Similar results are seen in different studies.[2,9,11]

In current study, inadequate micronutrient intake like riboflavin, vitamin C and folic acid were significantly associated with low birth weight babies. Ramkrishnan et al in his Meta analysis found similar association between vitamin C consumed by pregnant mothers and LBW babies.[12] De Onis et al also showed that folate supplementation reduces the risk of IUGR (OR 0.60, 95% CI 0.37, 0.97).[13] Similarly Scholl et al, reported that low folate intake (<240 μg/d) increases three fold risk for low birth weight.[14]

Table 3: Relation of LBW by anthropometric measurements and nutritional status of pregnant Women in third trimester (n=287)

Parameters	LBW (n=82) mean±SD	NBW (n=205) mean±SD	t-test p value
Weight at third trimester (kg)	48.7±6.2	50.7±7.2	0.03
Height (cm)	148.3±5.6	149.0±5.8	0.38
Haemoglobin (gm %)	9.6±1.4	10.3±1.1	<0.001
Energy (kcal/day)	1926.2±328.6	2038.3±340.0	0.02
Protein (gm/day)	54.6±11.1	58.8±11.8	0.01
Iron (gm/day)	26.9±5.3	31.1±5.2	<0.001
Calcium (mg/day)	858.8±245.0	932.0±192.5	0.01
Vitamin A (μgm/day)	541.1±174.3	636.0±148.7	<0.001
Thiamine (mg/day)	1.1±0.2	1.3±0.2	<0.001
Riboflavin (mg/day)	1.5±0.3	1.7±0.2	<0.001
Niacin (mg/day)	10.5±1.6	12.3±2.0	<0.001
Vitamin C (mg/day)	83.1±26.9	127.5±26.5	<0.001
Folic acid (μgm/day)	165.1±40.3	208.2±30.6	<0.001

Table 4: Logistic regression analysis of nutritional factors of low birth weight

Nutrients		ß coefficient	*aPR (CI)	P value
Energy (kcal/d)	≥2025		1	
	<2025	0.984	2.676 (1.230-5.822)	0.01
Protein (gm/d)	≥70.2		1	
	<70.2	0.810	2.249 (0.718-7.045)	0.22
Iron (mg/d)	≥31.5		1	
	<31.5	0.126	1.134 (0.534-2.407)	0.88
Calcium (mg/d)	≥1080		1	
	<1080	0.237	1.267 (0.516-3.113)	0.61
Vitamin A (μg/d)	≥720		1	
	<720	0.543	1.722 (0.711-4.168)	0.23
Thiamine (mg/d)	≥1.08		1	
	<1.08	0.637	1.890 (0.872-4.095)	0.11
Riboflavin (mg/d)	≥1.26		1	
	<1.26	2.714	15.095 (5.531-41.196)	<0.001
Folic acid (μg/d)	≥200		1	
	<200	2.103	8.190 (3.271-20.505)	<0.001
Vitamin C (mg/d)	>54		1	
	≤54	2.207	9.092 (0.985-83.967)	0.05

*Adjusted prevalence ratio, CI=confidence interval

CONCLUSION

In rural India majority of pregnant women were consuming inadequate amount of nutrition. Insufficient macronutrients and micronutrients intake especially during third trimester of pregnancy were associated with low birth weight. So the current maternal and child health (MCH) programmes should focus not only on energy supplementations but also on importance of micronutrients in prevention of LBW.

Ethical clearance
The study protocol was submitted to the institutional ethical committee and clearance was obtained.

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