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Original Article

Paediatrics Section

Effect of Maternal Nutritional Status, Socioeconomic Class and Literacy Level on Birth Weight of Babies

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ABSTRACT

Introduction: The prevalence of Low Birth Weight (LBW) is higher in Asia than elsewhere predominantly because of undernutrition and poor socioeconomic status of mothers. Nearly half of the pregnant women still suffer from varying degrees of anaemia with the highest prevalence in India. Optimal weight gain during pregnancy and a desirable foetal outcome in terms of normal birth weight of the baby may be a result of synergistic effect of literacy, knowledge, improved food intake, and higher level of socioeconomic status of the pregnant women and their family.

Aim: To observe the influence of maternal nutritional, socioeconomic status and literacy level on birth weight of babies.

Materials and Methods: Total 250 mothers who delivered babies and admitted to the post natal ward of B.S.T. Rural Hospital, Talegaon Dabhade, District Pune, Maharashtra, India, were randomly selected and the relevant information was recorded in self prepared and pre validated questionnaire. Dietary history was collected by 24 hours recall method.

Results: A total of 250 mothers and their babies were included. The average birth weight of babies was 2.65 Kg with the lowest birth weight of 1.2 Kg while the highest birth weight of 4 Kg. The prevalence of LBW babies was 27.6%. Most of the women (77.2%) had caloric intake less than 1800 Kcal, 80% of mothers had protein intake of less than 45 gm. Nearly, 31.60% of women who were taking daily intake of calories less than 1800 Kcal delivered LBW babies. About 30.50% of the women with protein intake less than 45 gm/day delivered LBW babies. In all 34.86% of the women with hemoglobin level below 11 gm% delivered LBW babies. These findings were statistically significant.

Conclusion: Maternal caloric and protein deficiencies including anaemia during pregnancy had direct effect on the birth weight of newborns, as less nourished mothers were found to deliver higher percentage of LBW babies as compared to the mothers who were better nourished. Mother's educational level and socioeconomic class also had influence on the birth weight of babies.

Keywords: Anaemia, Haemoglobin, Maternal dietary intake

INTRODUCTION

Birth weight of a neonate is the single most predictive factor of mortality in the first few months of life [1] and it is an important indicator of a baby's health. The World Health Organization (WHO) defined LBW as that below 2500 gm [2]. Developing countries account for majority share of LBW. Half of the children with a LBW were born in South Asia and among these countries India and Bangladesh has the highest prevalence of LBW (30%) [3]. The immediate consequences are higher mortality and morbidity rates in the perinatal and neonatal period. Moreover, previous research highlights strong associations between LBW and increased risk of infections, malnutrition and poor academic performance during childhood [4,5]. LBW babies are prone for chronic diseases like metabolic syndrome, diabetes, hypertension, ischaemic heart disease, stroke, malignancies, dementia, and osteoarthritis [6].

Although, poor socioeconomic status is an underlying cause, it is necessary to understand the factors of maternal environment especially nutritional factors, socioeconomic, demographic and clinical variables which influence birth weight of babies [7]. Maternal nutritional status is often inter-related to the socioeconomic status, social taboos and cultural practices in family which in turn directly affects the availability of nutritious food and the birth weight of babies. This study was hence conducted to study the effect of maternal nutritional and socioeconomic status on the birth weight of babies born in the teaching rural hospital in Talegaon-Dabhade, Pune, Maharashtra.

MATERIALS AND METHODS

This hospital based cross-sectional descriptive study was carried out in the Department of Paediatrics, MIMER Medical College, Dr. Bhausaheb Sardesai Talegaon Rural Hospital (BSTRH) Talegaon Dabhade, District Pune, Maharashtra, India between the period of January 2017 to June 2017. Institutional Ethics Committee approval was taken prior to study.

Total 250 mothers who delivered babies and were admitted in post-natal ward were considered in the study. As per NFHS-3 reports, prevalence of LBW babies is 21.5%. At Type I error alpha=0.10 and power of test 80% (Beta=0.2), the estimated sample size is 246. Thus, out of all 300 mothers who delivered during the study period 250 mothers who satisfied the inclusion and exclusion criteria were selected using simple random sampling.

Clinically, stable mothers were included in the study after obtaining their oral consent as it was a questionnaire based study. Sick mothers and mothers who delivered twins, preterm and very LBW babies were excluded from the study.

Maternal socioeconomic and demographic information was collected from each enrolled mother using a self prepared and pre validated questionnaire. It comprised of monthly family income, education and occupation of the family head and of the mother. Obstetric information on variables like parity, previous obstetric history, total maternal weight gain, consumption of drugs, medical history percentage obstetric complications if any and habits were recorded.

Maternal dietary intake was assessed by 24 hour recall method and recorded as foods consumed in different meals and their frequency in last month. Amount of food intake was measured in terms of number of rotis and in terms of serving spoons of standard size (5 mL/15 mL) or bowl of standard size of 120 mL for other foods. Frequency of consumption in terms of once, twice or more in a day/week or month was also noted. Finally, records were tabulated to calculate average daily caloric and protein intake. Haemoglobin level was determined in hospital laboratory as a part of routine antenatal investigation. Maternal weight gain and birth weight was derived from the hospital records. All neonates with birth weight below 2500 gm were labeled as LBW babies.

STATISTICAL ANALYSIS

Statistical analysis of data thus collected was done using SPSS 19.0 version. Analysis was carried out using descriptive statistics. Association of the risk factors under study was assessed by applying Chi-square test/ 'z' test taking a level of significance. The p-value <0.05 was considered as significant.

RESULTS

In the present study 250 mothers with their babies kept in post-natal ward were included. Among them 69 delivered LBW (LBW) babies and six delivered babies weighing more than 3.5 Kg. Thus, the incidence of LBW was 27.60% in our study. The average birth weight of babies was 2.65 Kg. The lowest birth weight recorded was 1.2 Kg, eight babies had weight <1.5 Kg, 16 babies weighed between 1.5 and 2 Kg and 45 newborns weight was between 2 and 2.5 Kg. Most of the women 208 (83.2%) belonged to the maternal age group of 21-30 years followed by 31 (12.4%) women who were between 18-20 years of age. About 66 (26.4%) of the women were Illiterate or had low literacy level and 28.4% belonged to socioeconomic class I and II.

About 9 (29%) women less than 20 years delivered LBW babies, 59 (28.36%) babies of total LBW were born to mothers aged between 21 and 30 years, remaining 1 baby was born to mother >30 years of age.

Majority of the women had caloric and protein intake less than the recommended dietary allowances during pregnancy. Most of the women reported caloric intake between 1401-1800 Kcal 193 (77.2%) followed by 57 (22.8%) women had calorie intake more than 1800 Kcal. Total 200 (80%) of mothers were having

Parameters	Number (%)	LBW (Wt. <2.5 Kg) n=69	Percentage (%)	Babies with Wt. >2.5 Kg n=181	Percentage (%)	z
Calorie Consumption						
<1800 Kcal/day	193 (77.2%)	61	31.60	132	68.40	3.0 p <0.05
>1800 Kcal/day	57 (22.8%)	08	14	49	86	
Protein Intake						
<45 gm/day	200 (80%)	61	30.50	139	69.50	2.45 p <0.05
>45 gm/day	50 (20%)	08	16	42	84	
Hemoglobin Level						
<11 gm/dL	109 (43.6%)	38	34.86	71	65.14	2.24 p <0.05
>11 gm/dL	141 (56.4%)	31	21.98	110	78.02	

[Table/Fig-1]: Nutritional parameters of mother and correlation with baby weight.

protein intake of less than 45 gm per day followed by 50 (20%) women had daily protein intake more than 45 gm. In all 61 (31.60%) of women who were taking daily intake of calories less than 1800 Kcal delivered LBW and 61 (30.50%) of the women with protein intake less than 45 gm/day delivered LBW babies [Table/Fig-1].

The lowest recorded haemoglobin (Hb) was 7.4 gm%, while the highest was 15 gm/dL. In all 109 (43.6%) women had anaemia, 30 (27.52%) mothers fell under the category of moderate anaemia, while 79 (72.48%) mothers had mild anaemia.

The average birth weight of babies born to mothers with no anaemia (haemoglobin >11 gm/dL) was 2.7 Kg with mild anaemia it was 2.64 Kg and with moderate anaemia it was 2.5 Kg. The average weight of babies of mothers with moderate anaemia (haemoglobin <10 gm/dL) was the lowest.

The weight of babies born to mothers with lower educational level and from lower socioeconomic class was on the lower side [Table/Fig-2].

Parameters	Total n=250	LBW/ Wt. <2.5 Kg n=69	Percent-age %	Babies with Wt. >2.5 Kg n=181	Percent-age %
Modified Kuppu Swamy Scale					
1	11	00	----	11	100
2	60	16	26.67	44	73.33
3	133	38	28.57	95	71.43
4	42	13	30.95	29	69. 05
5	04	02	50	02	50
Literacy Level					
Illiterate	10	04	40	06	60
Primary	56	17	30.35	39	69.65
Secondary	125	36	28.80	89	71.20
Graduation	59	12	20.33	47	79.67

[Table/Fig-2]: Socioeconomic class and literacy level of mothers and its correlation with birth weight of babies.

DISCUSSION

The present study was done to find the association between maternal socioeconomic/nutritional status and literacy level on birth weight of babies. Nutritional deficiencies including calories, proteins and micronutrients are associated with LBW babies. Neonatal morbidity and mortality are directly related to birth weight and less or excess weight at birth is associated with an increased risk of morbidity and mortality. The various factors responsible for LBW range from maternal age, parity, nutrition, weight gain during pregnancy to socioeconomic status and maternal literacy, illustrating a wide spectrum of underlying causes. Several demographic, obstetric, dietary and socioeconomic factors have been shown to contribute in the occurrence of LBW babies.

Nutritional risk factors have been shown to contribute for LBW babies. A nutritional deficiency is modifiable risk factor. Therefore, if adequate diet in terms of calorie and protein intake during pregnancy is ensured it may bring down the incidence of LBW babies.

Proportion of LBW babies in our study was 27.6%, which is more than the prevalence of LBW (21.5%) observed in National Family Health Survey (NFHS-3) [8]. Previous studies have also shown similar results by Gururaj MS et al., and Mumbare SS et al., [9,10]. The higher proportion is expected as the study was done in teaching hospital in rural part of Pune where many of the pregnant women were referred from the peripheral health facilities. Our observations highlight that maternal diet during pregnancy is a major factor of maternal environment show a significant association with risk of LBW. It has been observed that the 193 (77.2%) women who had caloric intake less than 1800 Kcal and the proportionof LBW delivered by these women was 61 (31.6%). It was higher comparing with the women who had caloric intake more than 1800 Kcal per day. About 80% of mothers had protein intake of less than 45 gm. It has been observed that the women whose daily intake of protein less than 45 gm delivered higher proportion (30.5%) of LBW comparing with the women who had protein intake more than 45 gm per day.

Results from this study have shown that maternal nutritional parameters have significantly influenced the birth weight of babies. It is consistent with previous studies [9-13]. In a study conducted by Som S et al., the strong association between low Body Mass Index (BMI), short stature, anaemia and/or other micronutrient deficiencies with increase the risk of giving birth to a baby with LBW has been reported [14].

It has been recognised that moderate to severe anaemia is major nutritional problem in poor and rural segments of the population. As seen in this study, there is a significant relationship between mother's haemoglobin level and LBW of the babies born to them. It is also supported by Amosu AM et al., Mumbare SS et al., and Sharma M et al., [6,10,12]. Low socioeconomic status and low educational status leads to low health awareness, lower nutritional status, leading to the increased risk of LBW babies [15]. In our study lower maternal education was found to be associated with increase proportion of LBW babies; though the difference was not statistically significant. It has been reported in some previous studies by Anand K et al., and Joshi HS et al., [16,17]. It has been reported in a study carried out by Khatun et al., that maternal education emerged as a determinant for LBW. Women with 'no education' had the greatest odds of giving birth to an infant with LBW followed by women with "primary education" [18].This may be explained by the increased awareness amongst educated women regarding available health services leading to change in health seeking behaviour and

intake of adequate nutrition. Therefore, interventions to improve the education level of women and female children are important to reduce prevalence LBW in India.

Our observation of association of socioeconomic status and LBW babies is consistent with previous studies [8,10,13,19]. The confounding effect of maternal education was probably due to its association with low socioeconomic status. Thus, findings of this study emphasises the need for improving the quality and utilisation of antenatal care, nutritional education to improve the weight gain during pregnancy, spacing, avoidance of tobacco, and prevention and proper management of risk factors like anaemia and hypertension.

Our study had prevalence of LBW babies of 27.6% which was somewhat higher compared to other relevant studies. The Maternal risk factors were almost the same in all studies [Table/Fig-3].

Study	Present Study	Kadar M et al., [20] (India)	Yadav DK et al., [21] (Nepal)	Monawar GM et al., [22] (Bangladesh)
Prevalence of LBW %	27.6	20	21.56	24
Attributable Risk Factors	*Maternal nutritional status *Anaemia	*Maternal nutritional status *Socio-economic status	*Anaemia *Socio-economic status *Maternal Education	*Maternal nutritional status *Anaemia

[Table/Fig-3]: Comparison with other relevant studies.

LIMITATION

Present study was conducted in our hospital attached to a teaching Institute and we often get high risk mothers. Nearby Government run health centers provide obstetric facility at free of cost and many patients prefer to go there for care. Hence, the study population does not represent all sections of the community. Precise information regarding pre pregnancy weight, total weight gain and dietary intake of the women could not be obtained as majority women were from rural area and illiterate and not aware about the significance of weight records and nutrition.

CONCLUSION

This study has established that there is direct cause and effect relationship between the maternal nutritional status and the birth weight of the babies. Maternal caloric and protein deficiencies including anaemia during pregnancy had direct effect on the birth weight of newborns, as less nourished mothers were found to deliver higher percentage of LBW babies as compared to the mothers who were better nourished. Mother's educational level and socioeconomic class also had influence on the birth weight of babies. Hence, we conclude by saying that there should be a shift in paradigm from the Pediatricians to the Obstetricians responsibility regarding improved antenatal care, nutritional counseling with special emphasis on the caloric and protein values of food and also maternal education so as to improve their nutritional status for a better and healthy sized newborns.

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AUTHORS CONTRIBUTION

Conception and Design: DA and AA, Planning and Conduction of Study: SP and DA, Data Collection and Supervision: AK, and DA, Analysis and Interpretation: SP and AA.

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