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Research Article

FACTORS ASSOCIATED WITH LOW BIRTH WEIGHT BABY: A CROSS-SECTIONAL STUDY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objectives: Low birth weight (LBW) is a challenging multifaceted public health problem due to its association with increased risk of morbidity and mortality of infants. Both community and institution-based studies are needed to find out the lacunae regarding the occurrence of LBW babies so that effective strategies which are relevant to the local conditions can be adopted for its prevention. We conducted this study to estimate the prevalence and determine the factors associated with LBW in the live-born infants delivered in a tertiary care hospital.

Methods: This was an observational and cross-sectional questionnaire-based study done in the Department of Pharmacology and Department of Gynecology and Obstetrics in this tertiary care hospital. Mothers who gave birth to their baby in the Obstetrics Ward were included in the study. The subjects underwent a face-to-face interview using a suitably designed and validated questionnaire and the data were collected.

Results: A total of 360 subjects were interviewed. About 34.7% of mothers were below 20 years of age. The majority of the mothers had education up to secondary level (58.33%) and were housewife (82.22%). About 58.2% of mothers belonged to a family size of 5–10 members. Among the 104 LBW infants, 63.46% were small for date and 36.54% were pre-term. The mean weight of the newborn was 2.54 kg. Maternal age, number of family members, number of anti-natal care visits, anemia and maternal weight gain during pregnancy were associated with LBW ($p<0.05$). No significant differences were found among the newborns with and without LBW regarding variables such as religion, family type, maternal addiction, previous abortion, and tetanus toxoid taken by the mother.

Conclusion: As LBW is the major cause of perinatal morbidity and mortality, every step should be taken for its prevention. In this regard, proper maternal education for antenatal care and regular visits to antenatal care clinics should be done. Field workers may help to impart correct knowledge of diet through proper health education besides providing other advices such as delaying the age of the first child, birth spacing, and family planning services utilization.

Keywords: Low birth weight, Infants, Prevalence, Cross-sectional.

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INTRODUCTION

Low birth weight (LBW) has been defined as a birth weight of <2.5 kg (up to and including 2499 g). Preferably, this measurement should be taken within 1st h of life, before any weight loss has occurred significantly [1].

LBW infants are classified into two categories:

a. Pre-term babies: Those who are born before 37 weeks of gestation. They may show normal intrauterine growth. About two-third of all babies of LBW in developed countries are estimated to be pre-term.
b. Small for date (SFD) babies: These may be term or pre-term. They weigh less than the tenth percentile for the gestational age. These babies are a result of intrauterine growth retardation.

It is estimated that 15–20% of newborns in the world present with LBW, which would represent more than 20 million births a year. There are variations in the proportions of LBW among the regions, for example, 28% in South Asia, and 13% in Sub-Saharan Africa. This is 9% in the case of Latin America [2]. India contributes about 15.8% of the incidence of LBW [3].

LBW is a challenging health issue, as it is associated with a higher risk of infant mortality and morbidity. This may be ascribed to numerous factors, for example, its high incidence, increased risk of perinatal and infant mortality, morbidity, and disabilities, its association with mental retardation, high expenditure of treatment in intensive care units, and its association with poor socioeconomic condition [4]. Evidences also suggest that LBW neonates are susceptible to various non-communicate diseases such as hypertension, diabetes mellitus, and coronary artery disease in future life [5].

Birth weight is determined by the complex interplay of numerous factors such as genetic, reproductive, obstetric, social, and environmental [6]. However, the etiology of LBW is maximally related to maternal factors such as early marriage with teenage pregnancies, frequent and too many pregnancies, maternal malnutrition, anemia, and infections [7]. Poor health and education of female children along with low status and empowerment of women in society are the important contributory factors. The mother's socioeconomic characteristics are directly linked to the child's health and well-being. Studies have shown that mother's education, knowledge, and media exposure are significantly linked to reducing LBW in low and middle-income countries, including India [8-10].

In spite of huge advances in the medical science of pregnancy and delivery, the proportion of LBW births has changed little in the world during the past 30 years due to failure to tackle the root causes such as too early, too close, too many pregnancies, too little food, too much work, and lack of antenatal care including iron-folic acid supplementation, etc.; are still unsatisfactory [11]. Both community and institution-based studies are needed to find out the lacunae of occurrence of LBW babies so that effective strategies which are relevant to the local conditions can be adopted for the prevention of LBW. With the above background,

we conducted this study to estimate the prevalence and determine the factors associated with LBW in the live-born infants delivered in Medical College, Kolkata.

METHODS

This was an observational, cross-sectional, and questionnaire-based study done in the Department of Pharmacology and Department of Gynecology and Obstetrics in Medical College, Kolkata. Mothers who gave birth to their baby in Obstetrics Ward, Medical College Kolkata, from July to August 2019 were included in the study. Mothers of stillborn and infants with birth defects were excluded from the study. An informed consent written in a language the study participants could best understand was taken before their enrolment.

Assuming that LBW babies constitute 28% of all live births in India [12] and allowing 5% error, the minimum sample size became 322. However, to assure this minimum sample size, in case of any incompleteness of data, the envisaged sample size was 360.

After obtaining consent to participate in the study, the subjects underwent a face-to-face interview conducted by the investigator using a suitably designed and validated questionnaire which was an adapted and modified form developed from different works of the literature. Data were collected from the obstetrics ward in 3 days a week, namely, Monday, Wednesday, and Friday.

Statistical analysis

For data analysis, the Statistical Package for the Social Sciences version 20.0 was used. Qualitative and quantitative data were presented as frequency with percentage and mean±standard deviation (SD) respectively. Chi-square test was applied to compare the differences between categorical variables.

RESULTS

A total of 360 subjects were interviewed. About 34.7% of mothers were below 20 years of age. And the majority was in the 20–24 years of age group. Most of the mothers were Muslims (51.9%), lived in urban areas (40.3%), and belonged almost equally at joint (50.6%) and nuclear families (49.4%). The majority of the mothers had education up to secondary level (58.33%) and was housewife (82.22%). Most of the mothers belonged to class 4-upper-lower class (38.3%) and class 3-lower-middle class (38.1%) according to Modified Kuppuswamy Scale. About 58.2% of mothers belonged to a family size of 5–10 members. Most of them (84.35%) did not have any addiction (Table 1).

Among the 104 LBW infants, 66 (63.46%) were SFD and 38 (36.54%) were pre-term. The weight of the newborn varied from 1.0 kg to 3.2 kg, with a mean of 2.54 kg (SD of 0.64 kg). The majority of mothers (51.67%) was primipara and had a history of weight gain of 10–15 kg during pregnancy (59.2%). Most of the mothers (83.7%) were at term during delivery (Table 2).

We found statistically significant associations of the following variables between the newborns with and without LBW: Maternal age, education, modified Kuppuswamy scale, number of family members, and number of anti-natal care (ANC) visits. Besides, statistically significant associations were also found among the mothers who took extra meals during pregnancy and who did not, who were anemic and who were not, and maternal weight gain during pregnancy comparing between newborns with and without LBW. However, no significant differences were found among the newborns with and without LBW regarding variables such as religion, family type, maternal addiction, previous abortion, and tetanus toxoid taken by the mother (Tables 1 and 2).

Table 1: Demographic profile of the subjects

Variables	Birth weight (kg)			
	Total	<2.5	≥2.5	p-value
Age of pregnant women (years)				
<20 years	125 (34.7)	50	75	0.001
20–24 years	165 (45.8)	32	133	
25–29 years	56 (15.6)	18	38	
30–35 years	14 (3.9)	4	10	
Religion				
Christian	1 (0.3)	0	1	0.46
Hindu	163 (45.3)	36	127	
Muslim	187 (51.9)	66	121	
Others	9 (2.5)	2	7	
Residence				
Rural	127 (35.3)	30	97	0.000
Urban	145 (40.3)	30	115	
Urban slum	88 (24.4)	44	44	
Education				
Illiterate	55 (15.27)	40	15	0.000
Below primary level	70 (19.44)	30	40	
Up to secondary level	210 (58.33)	20	190	
Above secondary level	25 (6.94)	14	11	
Profession				
Housewife	296 (82.22)	80	216	0.004
Self-employed	40 (11.11)	20	20	
Service	24 (6.66)	4	20	
Type of family				
Joint	182 (50.6)	48	134	0.287
Nuclear	178 (49.4)	56	122	
Modified kuppuswamy scale				
2	85 (23.6)	10	75	0.000
3	137 (38.1)	34	103	
4	138 (38.3)	60	78	
Number of family members				
<5	144 (40)	36	108	0.008
5–10	210 (58.2)	66	144	
>10	6 (1.8)	2	4	
Parity				
1	186 (51.67)	52	134	0.001
2	106 (29.44)	24	82	
3	60 (16.67)	22	38	
>3	8 (2.22)	6	2	
Addiction of mother				
Alcohol	5 (1.3)	2	3	0.12
Gutkha	5 (1.3)	2	3	
None	303 (84.35)	80	223	
Betel leaf	47 (13.05)	20	27	

DISCUSSION

The low birth baby is a real challenge of modern obstetrics and taxes a lot to both obstetricians and neonatologists as the problem is regarded as a major cause of high perinatal mortality and morbidity. To have an achievement in reduction of LBW babies, an attempt was made in this study to draw a comprehensive picture of the prevailing situation vis-à-vis birth in a major teaching hospital in Kolkata. This study aimed to assess the extent of LBW babies in total births to identify the possible maternal and sociobiological factors affecting birth weight and to find out the perinatal morbidity and mortality among LBW babies in contrast to their normal counterparts.

Incidence of LBW babies in India is 15.8% [3]. We found 104 LBW babies among 360 babies, that is, 28.9%. This is higher compared to the current incidence of LBW in India. However, this finding is supported by a previous study [12]. The incidence of LBW among pre-term and term babies was 90.5% and 20.1%, respectively. This high percentage of the incidence obtained in this study may be due to the fact that it is a referral hospital where complicated cases are referred from surrounding areas and also from districts. Khatua *et al*. in 1977 reported an incidence of 49.2% LBW from Eden Hospital, Medical College, Kolkata [13].

The present study supports the hypothesis of existing variation in birth weight among different religious groups. It revealed the highest incidence of LBW babies among Muslim mothers (35.3%) as compared to Hindu (22.1%) and Christian mothers (0%). However, this difference

Table 2: Characteristics of pregnancy-related factors, history of pregnant women, and newborns

Variables	Birth weight (kg)			
	Total	<2.5	≥2.5	p-value
Number of antenatal care visit				
1	25 (6.9)	4	21	0.000
2	96 (26.7)	52	44	
3	229 (63.6)	42	187	
None	10 (2.8)	6	4	
Extra meal during pregnancy				
Not taken	146 (40.6)	28	186	0.000
Taken	214 (59.4)	76	70	
Anaemia				
Absent	90 (25.0)	4	86	0.000
Present	270 (75.0)	100	170	
Weight gain during pregnancy				
<10 kg	115 (32)	68	47	0.000
10–15 kg	213 (59.2)	30	183	
>15 kg	32 (8.8)	2	16	
TT doses taken by mother				
0	10 (2.77)	6	4	0.073
1	37 (10.27)	12	25	
2	313 (86.94)	86	227	
Number of pervious abortion				
0	334 (92.77)	98	236	0.60
1	24 (6.66)	6	18	
2	2 (0.5)	0	2	
Toxemia				
Absent	340	88	252	0.000
Present	20	16	4	
Fetal distress				
Absent	318 (88.33)	84	234	0.004
Present	42 (11.66)	20	22	
Fetal malnutrition				
Absent	334 (92.77)	82	252	0.000
Present	26 (7.22)	22	4	
Gestational age				
Post-term	17 (4.72)	0	17	0.000
Pre-term	42 (11.66)	38	4	
Term	301 (83.61)	66	235	
Sex of the newborn				
Twin females	4 (1.1)	4	0	0.001
Twin males	2 (0.55)	2	0	
Female	168 (46.66)	42	126	
Male	186 (51.66)	56	130	

was not found to be statistically significant. Due to the fact that certain cultural taboos particular to the Muslim religion, that is, early age at marriage and childbirth, low level of literacy, absence of family planning practices, and inadequate antenatal care may be the influencing factors. However, in a study done by Dandapat *et al*., found little differences in LBW among Hindus (21.44%) and Muslims (21.15%) [14].

The socioeconomic status of mothers was worked out as per Modified Kuppuswamy'sclassification [15]. Majority of mothers belong to upper-lower Class 4 (38.3%) and lower-middle Class 3 (38.1%). The study showed that social class had a significant relationship with birth weight of newborns. It showed that 43.5% of upper lower-class mothers gave birth to LBW babies, whereas 24.8% and 11.8% of babies were LBW born to mothers of lower middle and upper middle class, respectively. Bagchi and Bose showed that the condition of offspring was not significantly different in lower and higher socioeconomic strata [16].

The results of the present study suggested that birth weight and maternal age have a significant association. It showed a high incidence of LBW babies among the mothers of the age group below 20 years (40%) as compared to that of 20–24 years of age (19.4%). This is supported by a study that found mothers below 20 years and above 30 years of age gave births to more number of LBW babies [17].

This study revealed that maternal parity had a significant relationship with birth weight as the proportion of LBW babies was highest (100%) among multiparous women (parity >3) as compared to that of primiparous women (29.2%). This is supported by a study done by Dasa *et al*., where the risk of LBW was found to be higher in grand multiparous compared to multiparous women [18].

The present study supports the relation between maternal nutrition and the birth weight of newborns. It revealed that 84.6% of LBW babies were born to malnourished mothers whereas 24.6% of LBW babies born to well-nourished mothers. Several previous studies have shown that maternal undernutrition is associated with LBW [19].

In normal pregnancy, certain physiological adjustment regularly takes place to meet the increased metabolic demands. Under unfavorable circumstances however, these changes may not only deplete the maternal reserve but also predispose to precipitate anemia. Our study revealed about 75% of mothers was anemic. There is statistical significance between maternal anemia and LBW babies. It showed the highest incidence of LBW babies (37%) among the anemic mothers in comparison with that of non-anemic mothers (4.4%). In a study conducted in Nepal, it was found that the risk of LBW was 6.8 times higher among anemic mothers [20]. Proper antenatal care can definitely improve the birth weight of infants as shown in the present study where about 60.6% of births were of LBW in mothers who received no antenatal care whereas the proportion of LBW was only 18.3% in booked cases (>3 antenatal visits). This is supported by a study conducted in China by Zhou *et al*. [21].

Our study suggested that LBW was more common among mothers who smoke (66.7%) compared to non-smoking mothers (26.4%). Smoking causes placental insufficiency that will lead to LBW. The association of maternal habit of smoking with LBW was found in another study by Zheng *et al*. [22].

Although there is no relation between birth weight and sex of newborn, the present study showed that 100% LBW was found in twin males and females. On the other hand, 30.1% and 25% LBW were found in male and female newborns, respectively, and the value is significant. In a study by Voskamp *et al*., average birth weight in males was found to be higher than in females [23].

CONCLUSION

As LBW is the major cause of perinatal morbidity and mortality, every step should be taken to prevent these LBW babies. In this regard, proper maternal education for antenatal care and regular visit to ANC clinic should be done. Field workers may help to impart correct knowledge of diet through proper health education besides providing other advices such as delaying the age of the first child, birth spacing, and family planning services utilization.

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AUTHORS' CONTRIBUTIONS

Preparation of the protocol was done by Mayukh Mukherjee and Sayanti Ghatak. The collection of data was done by Alak Kumar Das. Statistical analysis was done by Jinia Ghosh and Alak Kumar Das. Preparation of the manuscript was done by Jinia Ghosh, Mayukh Mukherjee, and Alak Kumar Das.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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