

Correlation of Maternal Factors with Low Birth Weight in Neonates: A Study among Healthy Singleton Pregnancies

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Abstract:

Background: Birth weight is a useful indicator of mother health, nutrition, and quality of life in addition to being a crucial factor in determining the survival, growth, and development of children. A strong correlation exists between low birth weights (LBW) and prenatal and fetal morbidity and death. Numerous research studies conducted in India have examined the different risk variables associated with term LBW.

Objective: The present study has been undertaken to study the maternal risk factors associated with term LBW neonates.

Materials and Methods: Present study was retrospective, hospital-based, cross-sectional study in which medical records of 236 healthy singleton live births with gestational age between 37 to 41 weeks were analyzed. Multiple gestation or still born babies and babies with major congenital anomalies were excluded. The data was collected using the extraction matrix and then analyze statistically to derive association of maternal factors with LBW.

Results: The prevalence of LBW was 37.3% and the mean birth weight in LBW category was 1.54 ± 0.25 Kg. The major factor associated with the LBW was older maternal age (34.10%), low body weight (87.50%), anemia (89.77%), and hypertension (72.27%). Maternal factors including the height of mother and maternal nutrition supplements were not found to be significantly associated with LBW.

Conclusion: Present study recommended the regular screening of maternal health status to improve the overall health status of the mother to reduce the LBW.

Key words: Birth weight, maternal, anemia, hypertension.

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Introduction

The weight of a baby or fetus immediately after birth is known as birth weight. According to the World Health Organization (WHO), the birth weight should be assessed within the first hour of life for live deliveries before considerable weight loss occurs. The WHO defines low birth weight (LBW) as a birth weight of less than 2.5 kg, regardless of gestational age [1]. According to WHO estimates, of the 139 million live births worldwide, more than 20 million are LBW newborns, or 15.5% of all live births, with roughly 95.6% of these births occurring in developing countries. Low birth weight rates are more than twice as high in developing nations (16.5%) as they are in developed nations (7%) [2].

UNICEF estimates that thirty percent of newborns in India are LBW. According to the National Family Health Survey (NFHS)-3, LBW affected 21.5% of all children [3]. India has one of the highest rates of LBW. The largest frequency of LBW is found in South Asia. Indeed, according to

the most recent estimates, South Asia is the birthplace of almost half of all LBW newborns worldwide. In India, over 28% of live births are babies weighing less than 2.5 kg at birth, and the majority of these babies are born at term [4].

Human intrauterine growth and development is a process that is vulnerable to abnormalities, which can have a significant and long-lasting impact on later life of a person. Birth weight has always been the standard method used to evaluate intrauterine development in developing nations. Birth weight is a useful indicator of mother health, nutrition, and quality of life in addition to being a crucial factor in determining the survival, growth, and development of children [4]. The intricate interplay between fetal, placental, and maternal factors contributes to the high prevalence of LBW in underdeveloped nations; nonetheless, maternal factors are likely the primary cause of LBW. LBW is the primary cause of infant morbidity and mortality, accounting for around 4 million fatalities annually (or 36% of all

newborn deaths under the age of five). Therefore, LBW is regarded as a sensitive indicator of the health and development of a country [5].

LBW is one of the most important issues facing by underdeveloped nations. Research on the epidemiological variables linked to LBW is crucial to resolving the existing institutional delivery problem and developing appropriate prevention strategies. The goal of this study is to investigate the maternal risk factors related to full-term neonates with LBW. The results of this study may be used to identify risk factors, which may then be improved upon or corrected to potentially reduce perinatal mortality and morbidity. This study will assist in identifying maternal risk factors that contribute to LBW in neonates born at term. As a result, present study will help in developing plans and regulations to lower the prevalence of LBW and its repercussions.

Methods and Materials

Study Design: Present study was a retrospective, hospital-based cross-sectional study in which the medical records of the patients visiting the Department of Pediatrics were analyzed. Healthy singleton live births with gestational age between 37 to 41 weeks were included in the study. Multiple gestation or still born babies and babies with major congenital anomalies were excluded. All the standard ethical standards regarding the

confidentiality of patients were followed. The data was collected using the extraction matrix.

Birth weight: As per WHO guidelines, neonates with ≤ 2.5 Kg were classified as LBW and neonates with birth weight > 2.5 Kg were classified as normal birth weight (NBW). Maternal factors including the age, weight, height, anemia status, hypertension, and need for nutritional supplements was associated with the birth weight.

Statistical analysis:

The data was first entered in the excel sheet and then was analysed using the SPSS software. For quantitative data, mean \pm SD was calculated whereas quantitative variables are described as number (%). The Chi-square test was used to establish the association between the birth weight and maternal characteristics. Appropriate graphs and tables were used to depict the data. All statistical test was carried out at a significance level of $p < 0.05$.

Results

Among total 236 neonates, there were 88 (37.3%) neonates with LBW and 148 (62.7%) neonates with normal birth weight. The mean birth weight in LBW category was 1.54 ± 0.25 Kg and in NBW category was 2.51 ± 0.29 Kg (Table 1 and Figure 1).

Table 1: Birth weight status of neonates

Birth weight status	Number (%)	Mean \pm SD
Low birth weight (LBW)	88 (37.3%)	1.72 ± 0.43 Kg
Normal birth weight (NBW)	148 (62.7%)	2.99 ± 0.29 Kg
Total	236 (100%)	2.52 ± 0.70 Kg

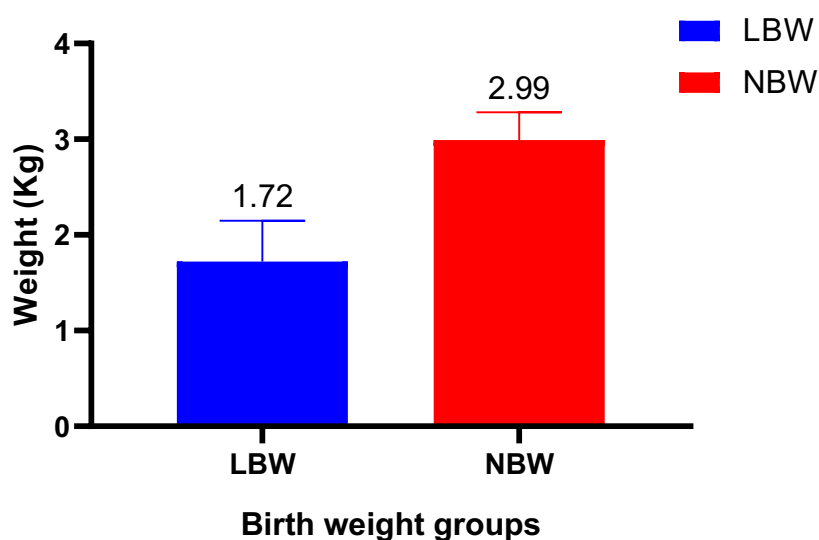


Figure 1: Birth weight status of neonates

Maternal age among 88 neonates with LBW was <20 years in 7 (7.95%) cases, 20-30 years in 51 (57.95%) and >30 years in 30 (34.10%). Maternal age among 148 neonates with NBW was <20 years in 48 (32.45%) cases, 20-30 years in 12 (8.10%) and >30 years in 88 (59.45%). Old maternal age found to be significantly associated with high frequency of LBW (Table 2 and Figure 2).

Table 2: Maternal age as a risk factor for LBW

Maternal age	Low Birth weight	Normal birth weight	P Value
<20 years	7 (7.95%)	48 (32.45%)	0.001*
20-30 years	51 (57.95%)	12 (8.10%)	$\chi^2=72.65$
>30 years	30 (34.10%)	88 (59.45%)	
Total	88 (100%)	148 (100%)	

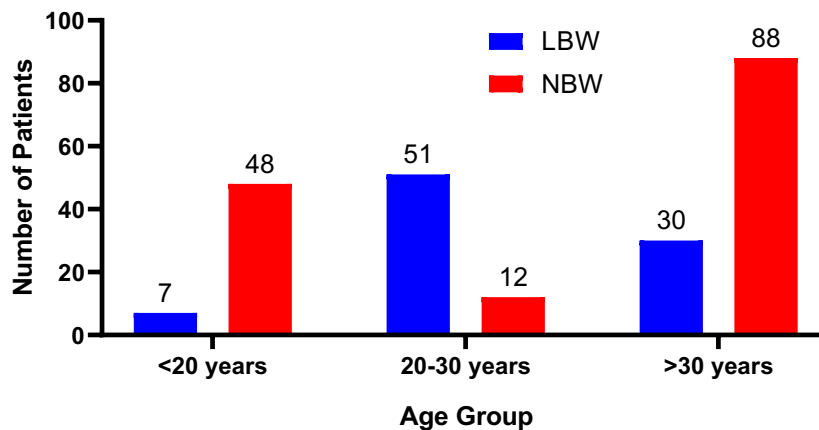


Figure 2: Maternal age as a risk factor for LBW

Maternal weight among 80 neonates with LBW was <45 Kg in 77 (87.50%) cases and ≥ 45 Kg in 11 (12.50%). Maternal weight among 148 neonates with NBW was <45 Kg in 13 (8.78%) cases and ≥ 45 Kg in 135 (91.22%). A low maternal weight was found to be significantly associated with the LBW (Table 3 and Figure 3).

Table 3: Maternal weight as a risk factor for LBW

Maternal weight	Low Birth weight	Normal birth weight	P Value
<45 Kg	77 (87.50%)	13 (8.78%)	0.001*
≥ 45 Kg	11 (12.50%)	135 (91.22%)	$\chi^2=144.94$
Total	88 (100%)	148 (100%)	

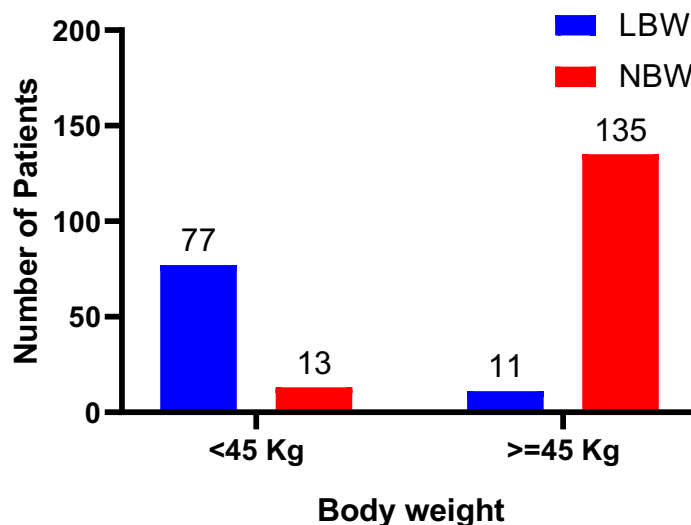


Figure 3: Maternal weight as a risk factor for LBW

Maternal height among 88 neonates with LBW was <145 cm in 30 (34.09%) cases and ≥145 cm in 58 (65.91%) cases. Maternal height among 148 neonates with NBW was <145 cm in 48 (32.43%) cases and ≥145 cm in 100 (67.57%) cases. Maternal height was not found to be associated with the LBW (Table 4 and Figure 4).

Table 4: Maternal height as a risk factor for LBW

Maternal height	Low Birth weight	Normal birth weight	P Value
<145 cm	30 (34.09%)	48 (32.43%)	0.793
≥145 cm	58 (65.91%)	100 (67.57%)	$\chi^2=0.068$
Total	88 (100%)	148 (100%)	

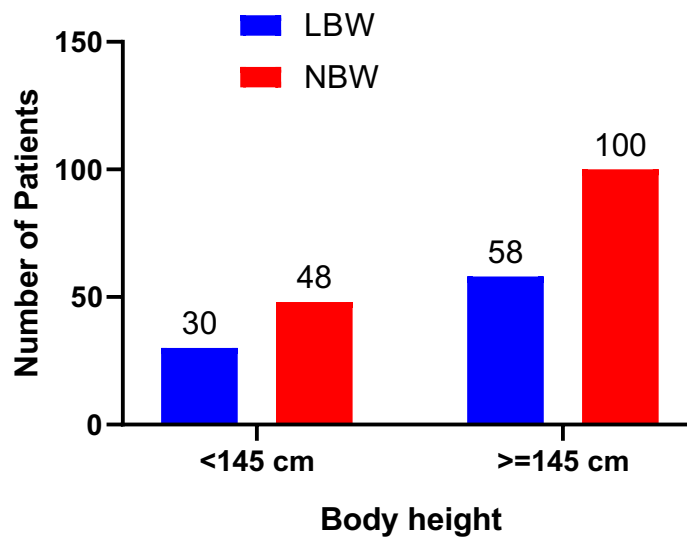


Figure 4: Maternal height as a risk factor for LBW

Among 88 cases with LBW, maternal anemia was present in 79 (89.77%) cases and among 148 cases of NBW, maternal anemia was occurred in 8 (5.41%) patients. Maternal anemia was found to be significantly associated with the LBW (Table 5 and Figure 5).

Table 5: Maternal anemia as a risk factor for LBW

Maternal anemia	Low Birth weight	Normal birth weight	P Value
Anemic	79 (89.77%)	8 (5.41%)	0.001*
Non-anemic	9 (10.23%)	140 (94.59%)	$\chi^2=168.72$
Total	88 (100%)	148 (100%)	

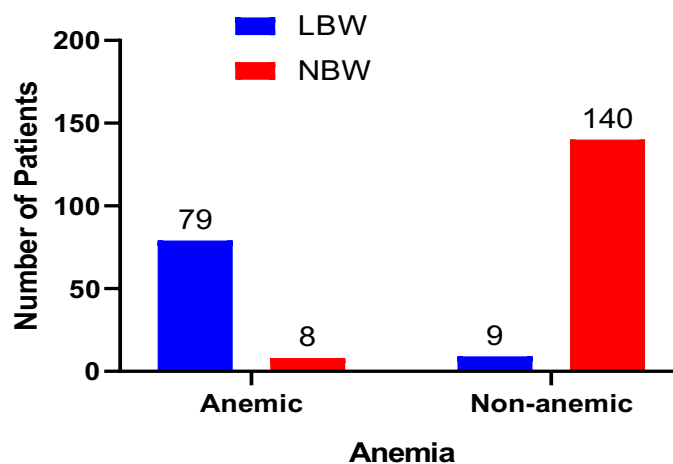


Figure 5: Maternal anemia as a risk factor for LBW

Among 88 LBW cases, maternal hypertension was encountered in 68 (72.27%) cases whereas in 148 cases of NBW, maternal hypertension was encountered in 15 (10.14%) patients. Maternal hypertension was found to be significantly associated with the LBW (Table 6 and Figure 6).

Table 6: Maternal hypertension as a risk factor for LBW

Maternal hypertension	Low Birth weight	Normal birth weight	P Value
Hypertensive	68 (72.27%)	15 (10.14%)	0.001*
Non-hypertensive	20 (22.73%)	133 (89.86%)	$\chi^2=109.09$
Total	88 (100%)	148 (100%)	

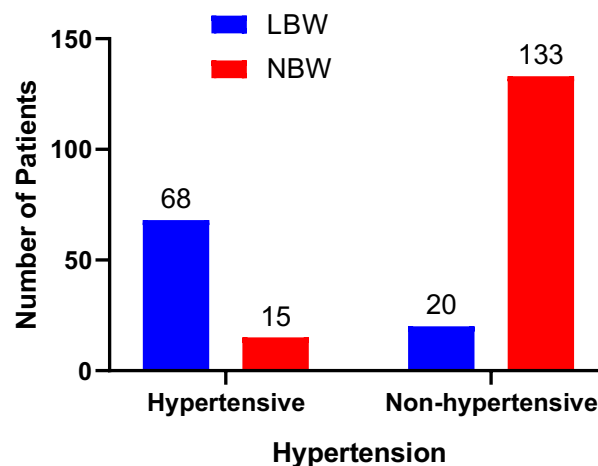


Figure 6: Maternal hypertension as a risk factor for LBW

Among 88 LBW cases, maternal nutritional supplement was taken by 34 (38.64%) cases whereas in 148 cases of NBW, nutritional supplement was taken by 68 (45.95%) patients. Requirement of nutritional supplements was not found to be associated with the LBW (Table 7 and Figure 7).

Table 7: Association of maternal nutrition supplements with birth weight

Nutrition supplements	Low Birth weight	Normal birth weight	P Value
Yes	34 (38.64%)	68 (45.95%)	0.273
No	54 (61.36%)	80 (54.05%)	$\chi^2=1.202$
Total	88 (100%)	148 (100%)	

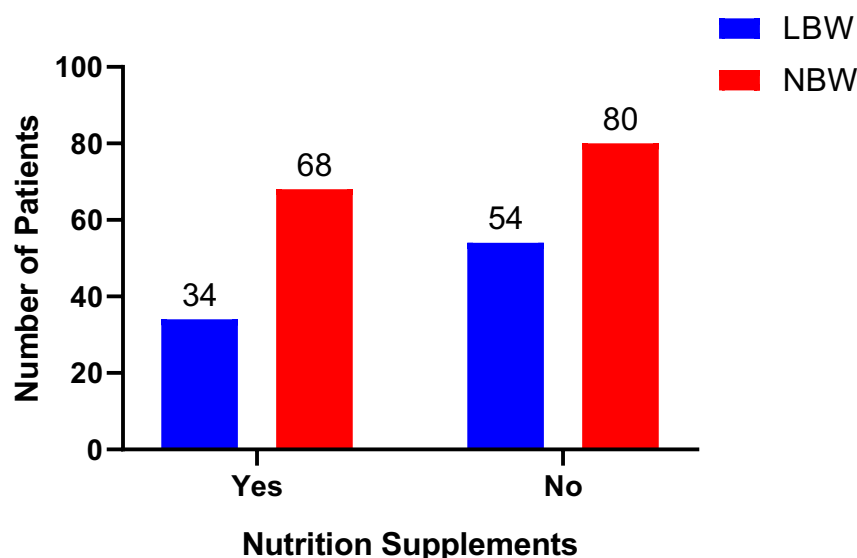


Figure 7: Association of maternal nutrition supplements with birth weight

Discussions

This study was planned to understand the association of different maternal factors with term LBW neonates. Total 236 postnatal mothers who delivered neonates at term gestation were studied. From our study, the prevalence of LBW was 37.3%. Similar prevalence of LBW has been reported in the study by Kathrani et al. in which prevalence of LBW was 22.36% at term [6]. In the study by Chaithra et al. the prevalence of LBW was 20% [7]. In a community based study conducted by Metgud et al., the prevalence of LBW was 22.9% [8]. A study done in North East Assam by Gogoi et al. the prevalence of LBW was 26% [9].

In present study, Old maternal age found to be significantly associated with high frequency of LBW. In our study, 30 (34.10%) women with age >30 years delivered the LBW neonates. Similar observations have been made by Deka et al., in which maternal age was significantly associated with LBW. Out of 63 mothers with more than >30 years age, 41.3 % delivered LBW babies [10].

In the study by Cam et al. study, the percentage of LBW in infants born from young mothers was higher than that of mothers who gave birth in middle and advanced age [11]. A low maternal weight was found to be significantly associated with the LBW in our study. The results of this study were supported by the Deka et al., who found that mothers with low weight produced a greater number of LBW babies in comparison to another group (10). In the study by Chaithra et al. no significant relation between maternal height and LBW was observed [7].

In current study, maternal height was not found to be associated with the LBW. The results of present study are in consistent with the findings of Deka et al. which found that there is no association between height of the mother and LBW [10]. Ghosh et al. documented that mothers who were less than 140 cm in height were more prone to have LBW [12]. In our study, maternal anemia was found to be significantly associated with the LBW.

Similar observations have been made by the Deka et al. which found that mothers with anaemia gave birth to a greater number of LBW babies in comparison to those without anaemia [10]. Kathrani et al. also reported anemia as a high-risk factor for LBW [6]. Deshmukh et al. found that anemia associated significantly with LBW [13].

We found in this study that the maternal hypertension is significantly associated with the LBW. Similar observations have been made by Kathrani et al. who observed that babies with LBW delivered at term were associated with maternal hypertension [6]. In this study, nutritional supplement was taken by 38.64% LBW cases and

45.95% NBW cases. Similar observations have been made by Kathrani et al. in which 51% of patients have irregular iron supplementation [6]. In a study conducted by Mary et al the infants born to the women with iron supplementation group were significantly heavier and less likely to have LBW compared to placebo group [14].

Another study shows that when mothers were provided balanced protein supplementation, there is 31% reduction in the risk of delivering SGA infant [15]. There are some limitations to this study. Firstly, there are too few factors such as other socio demographic characteristic such as paternal weight, maternal education level, smoking status of parents, drug ingestion and occupation that may have impact for LBW newborn children cannot be included in this study due to lacking of information.

Secondly, births outside the hospital were not included in the study, and therefore it was not possible to generalize the results to a particular population as compared to population-based studies.

Conclusion

In present study, the prevalence of LBW was 37.3%. The major factor associated with the LBW was older maternal age, low body weight, anemia, and hypertension. The problem of LBW being multi-dimensional, we need an integrated approach incorporating medical, social, economic and educational measures to deal with this issue. Present study recommended the regular screening of maternal health status to ensure the normal birth weight fetus.

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