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Original Research Article

Low Birth Weight Babies and Their Association with Maternal Risk Factors: A Hospital-Based Study

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Abstract:

Objectives: The present study was to evaluate the prevalence of low birth weight babies and their association with various maternal risk factors at tertiary care hospital.

Methods: A detail assessment of neonates were performed. A detail assessment of mother health during pregnancy and sociodemographic profile were recorded from hospital records. All the babies were weighed within one hour after birth and birth weight was measured to the nearest 10 grams using a baby weighing scale. All the data about maternal exposure to different risk factors were recorded using a prescribed preformed questionnaire.

Results: 100 neonates were included. The prevalence of low-birth-weight neonates was 27%. The mean birth weight of the population was 2.65kilograms. 54% were male babies. Illiterate mothers (p=0.0173), pregnancy induced hypertension (p=0.0020), multigravida (p=0.0418), oligohydramnios (p=0.0039) and mothers who gained less than 6kgs during pregnancy (p<0.0013) are the major significant maternal risk factors associated with low-birth-weight babies.

Conclusions: Low birth weight newborns is associated with various maternal risk factors such as illiteracy, rural residence, PIH, irregular antenatal checkup, oligohydramnios, and weight gain less than 6 kg during pregnancy. Hence, the identification of factors involved in the repetition of LBW is an attempt to understand the causal links that increase the chance of some women to be more susceptible to give birth to an LBW child. A longitudinal study should be done from the period prior to conception through pregnancy to after deliver. To allow for a close follow-up of the subjects and evaluate the factors contributing to low birth weight in a cause-effect model for development of specific interventions. Awareness of the importance of education might help drive investment in education and improvements in education and educational policy.

Keywords: Low Birth Weight Babies, Maternal risk factors, PIH, Illiteracy, Oligohydramnios.

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Introduction

The birth weight of a newborn is a major public health problem, which affects an estimated 20 million babies born annually and is more common in low-middle-income countries (LMICs) [1]. Of these, 28% are born in South Africa, 13% in Sub-Saharan Africa, and 9% in Latin America [1]. A recent study by Sathi et al. showed that, in comparison to other LMICs in South Asia, the prevalence of LBW recorded in Afghanistan, Bangladesh, Nepal, and Pakistan was 15.13%, 14.93%, 11.73%, and 19.18%, respectively [2]. LBW is assumed to be caused by intrauterine growth retardation (IUGR) and preterm delivery; the etiology of LBW is uncertain [4]. IUGR is caused by insufficient uterine-placental perfusion and poor fetal nutrition, which affect the fetus's overall anthropometric characteristics [3].

Low birth weight (LBW), defined as birth weight below 2,500 g, is considered a major health problem for newborns (World Health Organization, 2014) [4]. It is the leading cause of 40%–60% of neonatal deaths worldwide (UNICEF and United Nations Children's Fund (UNICEF), 2008) [5].

LBW infants are at a disproportionately higher risk of mortality, morbidity, poor growth, and impaired psychomotor, and cognitive development [4, 5]. These LBW infants are also disadvantaged when

they become adults, as they are more susceptible to type 2 diabetes, hypertension, and coronary heart disease. LBW is related not only to basic maternal characteristics during pre-pregnancy, but also to potential risk factors during pregnancy, including maternal age, educational attainment, lifestyle, health status, and diseases [4], of which maternal age, educational attainment, and marital status are more closely associated with LBW. In addition, most current studies of LBW risk factors have focused on environmental, psychosocial, behavioral, and medical factors [6, 7]. Many medical factors and basic diseases are also reported to be related to LBW, including diabetes, preeclampsia, and oligohydramnios [8]. Many studies address different risk factors for mothers, like maternal age, bad obstetric history, anemia, and hypertension, which have a strong association with the LBW of neonates [30]. Objective of the present study was to evaluate the low birth weight babies and their association with maternal risk factors at tertiary care center.

Material & Methods

The present study was conducted in the Department of Paediatrics, Government Medical College, Haridwar, Uttarakhand, India during a period from October 2025 to January 2026**.**

A total of 100 term newborn babies delivered in GMC, Haridwar were enrolled during the study period.

Data collection technique and tools: All the data about maternal exposure to different risk factors were recorded using a preformed questionnaire.

The information included a socio-demographic profile of the mother and her family, obstetric history of the mother especially about previous births, abortions, pre-pregnancy weight, height, weight gain during pregnancy, antenatal services obtained by the mother including antenatal visits, TT prophylaxis, Iron and Folic acid prophylaxis and presence of any systemic illness like hypertension, cardiovascular disease, chronic renal disease.

Adequate antenatal care was considered when the pregnant women were registered at any time, had at least 3 antenatal checkups, was adequately vaccinated against tetanus, had consumed at least 100 tablets of Iron and Folic acid, was not involved in hard work, and had adequate rest during pregnancy [minimum 2 hours sleep during the day and 8 hours sleep during the night]. Weight gain was calculated by subtracting the weight of the mother at 12 weeks or before from the weight of the mother at term considering negligible weight gain up to 12 weeks of gestation. All the babies were weighed within one hour after birth and birth weight was measured to the nearest 10 grams using a baby weighing scale.

Statistical Analysis: Data was analysed with the help of IBM SPSS version 26 software. All the data was tabulated and percentages were calculated. Chi-squared test was applied. P-value was taken less than or equal to 0.05 ($p \leq 0.05$) for significant differences.

Results

A total of 100 neonates were studied during the study period. The mean birth weight of the population was 2.65 kilograms. Out of 100 newborns, 46 were female babies and 54 were male babies. Out of 100 newborns, 27 newborns were of low birth weight i.e., the prevalence of low birth weight was 27%. The prevalence of low birth weight was more in female babies 15(32.61%) when compared to male babies 12(22.22%).

Table 1: Distribution of the study population by residence (N=100).

Residence	Total no. of babies	LBW babies	NBW babies	P-value
Rural	41(41%)	15(39.02%)	26(60.98%)	0.048
Urban	59(59%)	12(23.73%)	47(76.27%)	<0.0001
P-value		0.1025	0.1025	<0.0001

The prevalence of low birth weight was higher in mothers from rural areas 15(39.02%) as compared to mothers from urban areas 24 (21.43%). But, it was not statistically significant differenced (p=0.1025).

Table 2: Distribution of the study population by maternal education (N=100).

Maternal education	Total no. of babies	LBW babies	NBW babies	P-value
Literate	66(66%)	12(16.67%)	54(83.33%)	<0.0001
Illiterate	34(34%)	15(38.23%)	19(61.76%)	0.0541
P-value		0.0173		

The prevalence of low birth weight was significantly (p=0.0173) greater in illiterate mothers (38.23%) as compared to literate mothers (16.67%).

Table 3: Distribution of the study population by maternal PIH (N=100).

PIH	Total no. of babies	LBW babies	NBW babies	P-value
Yes	32(32%)	14(53.12%)	18(46.87%)	0.6198
No	68(68%)	13(22.06%)	55(77.94%)	<0.0001
P-value		0.0020	0.0020	

Prevalence of low birth weight was significantly higher (p=0.0002) in mothers who had pregnancy induced hypertension (53.12%) as compared to mothers who had normal blood pressure. (22.06%).

Table 4: Distribution of the study population by primi/non-primi (N=100).

Primi/Non Primi	Total no. of babies	LBW babies	NBW babies	P-value
Primi	59(59%)	12(20.34%)	47(79.66%)	<0.0001
Non-Primi	41(41%)	15(39.02%)	26(60.97%)	<0.0514
P-value		0.0418		

The prevalence of low birth weight was significantly (p=0.0418) higher in multigravida mothers (39.02%) as compared to primi-mothers (20.34%).

Table 5: Distribution of the study population by ANC`S (N=100).

ANC	Total no. of babies	LBW babies	NBW babies	P-value
Regular	84(84%)	18(21.43%)	66(78.57%)	<0.0001
Irregular	16(16%)	9(41.17%)	7(58.82%)	0.3257
P-value		0.0945		

The prevalence of low birth weight was higher in mothers who had irregular antenatal checkups (47.36%) when compared to mothers who had regular antenatal check-ups (23.46%). But, it was not statistically significant differenced (p=0.0945).

Table 6: Distribution of the study population according to parity (N=100).

Parity	Total no. of babies	LBW babies	NBW babies	P-value
First	62(62%)	11(17.74%)	51(82.26%)	<0.0001
Second	32(32%)	12(37.5%)	20(62.5%)	0.0472
Third & More	6(6%)	4(66.67%)	2(33.33%)	0.2688
Total	100(100%)	27(27%)	73(73%)	<0.0001

The prevalence of low birth weight was more in mothers who had parity first (17.74%) and second (37.5%).

Table 7: Distribution of the study population by oligohydramnios.

Oligohydramnios	Total no. of babies	LBW babies	NBW babies	P-value
Yes	11(11%)	7(63.63%)	4(36.37%)	0.2116
No	89(89%)	20(22.47%)	69(77.53%)	<0.0001
P-value		0.0039		

The prevalence of low birth weight was significantly (p=0.0039) higher in mothers who had oligohydramnios (63.63%) as compared to mothers who had adequate liquor (22.47%).

The mode of delivery did not show any significant effect on birth weight in our study.

Table 8: Distribution of the study population by maternal weight gain.

Weight gain	Total no. of babies	LBW babies	NBW babies	P-value
<6Kgs	10	7(70%)	3(30%)	0.0812
>6Kgs	90	20(22.22%)	70(77.78%)	<0.0001
p-value		0.0013		

The prevalence of low birth weight was significantly (p=0.0013) higher in mothers who gained less than 6kgs during pregnancy (70%) as compared to mothers who gained more than 6 kgs (22.22%).

Discussions

Maternal health conditions, including the environment provided to the mother, are essential

factors in determining an infant's birth weight. Factors that do not allow the proper placental circulation and may prohibit the supply of oxygen and nutrients to the fetus could result in fetal growth restriction. There are various other maternal factors like hypertension, pre eclampsia, febrile illness during pregnancy, oligohydramnios, primiparity, LBW delivery in the past, placental abruption, age of mother, lifestyle, underweight during pregnancy, underprivileged family status, as potential risk factors to cause LBW[9].

The present study examined maternal risk factors associated with low birth weight (LBW) in Department of Paediatrics, Government Medical College, Haridwar, Uttarakhand, India. The mothers who were delivered LBW infants (<2500 gm) and of normal birth weight infants (≥2,500 g). The analysis revealed several maternal characteristics significantly linked with LBW [10].

A total of 100 neonates were studied in this study. The prevalence of low birth weight was 27%. The mean birth weight of the population was 2.65 kilograms. The prevalence of low birth weight was more in female babies 32.61% when compared to male babies 22.22%.

In a prospective hospital-based study, Raman TR, Devgan A et al newborns were studied for the incidence of low birth weight neonates and to evaluate the associated risk factors. A significant number of low birth weight neonates were born to mothers with significant obstetrical problems such as pregnancy-induced hypertension, bad obstetrical history, and premature rupture of membranes. The incidence of 32.7% of low birth weight babies is high enough to ring alarm bells [11].

Mondal B. did a hospital-based study on Tangsa tribe from Arunachal Pradesh on Low birth weight to the sex of baby, maternal age, and parity. The occurrence of low birth weight was 28.48% and only 4.64% of newborns weighed 2000 g or less. The mean birth weight was found to be 2806.95±39.32 g. Female babies had a significantly higher incidence of low birth weight than male babies. Parity was found to be a significant influence on the incidence of low birth weight. An increase of low birth weight babies was noticed after the 4th parity and the best outcome was also observed at this parity. The higher incidence of low birth weight was found in the 5+ parity. Young mothers (< 20 years) had also a higher incidence of low birth weight and mother's age had no significant effect on the incidence of low birth weight [12].

De Bernabé JV et al did a review and concluded that low birth weight (LBW) is one of the main predictors of infant mortality. LBW is generally associated with situations in which uterine malnutrition is produced due to alterations in placental circulation. There are many known risk factors, the most important of which are socio-economic factors, medical risks before or during gestation, and maternal lifestyles [13]. Agarwal K et al concluded that the 40.0% of mothers delivered LBW babies. They indicate that gestational age less than 37 weeks (76.5%), maternal age less than 20 years (58.5%), irregular antenatal checkup (70.5%), mother's height less than 150 cm (68.5%), mother's weight less than 50 kg (76.1%), hemoglobin less than 10 gm/dl (60.5%), severe physical work (78%), and tobacco chewing (58.5%) are significant determinants of LBW. Prevalence of LBW can be reduced by increasing the gestational age, regular antenatal checkup, balanced diet during the antenatal period, adequate rest during the antenatal period, and avoiding tobacco chewing [14].

In the present study, the prevalence of low birth weight was more in mothers who had irregular antenatal checkups (41.17%) when compared to mothers who had regular antenatal check-ups (21.43%).

The impact of maternal nutritional status on birth outcomes, particularly the association with LBW babies, was a crucial aspect of maternal and child health. This finding underscores the significance of adequate maternal nutrition for optimal fetal development. Our study provides significant evidence that inadequate nutritional status among cases was strongly associated with LBW babies. A study conducted in Nepal proposed a link between poor nutritional intake and LBW. Mothers who took food less than two times had a 2 times higher chance of delivering LBW babies [15]. In another study, the nutritional status of pregnant women revealed that mothers who had experienced malnutrition during their pregnancies were more likely to give birth to underweight children [16].

Lasker JN et al assessed risk factors for low birth weight deliveries. Results of the multivariate analysis indicate key variables that contribute to LBW: in particular, racial/ethnic background and specific medical problems during pregnancy, including preeclampsia, incompetent cervix, bleeding, low BMI, and lack of adequate weight gain. Results were incorporated into training in best practices for prenatal care in the city's prenatal clinics [17].

In the present study, the prevalence of low birth weight was statistically (p=0.0173) higher in illiterate mothers (38.23%) when compared to literate mothers (16.67%).

The impact of maternal education on birth outcomes, particularly the association between illiteracy and the occurrence of LBW, was a critical aspect of maternal risk factors. One study shows a strong correlation between maternal illiteracy and the

likelihood of having a LBW baby. An Indian study conducted that shows low birth outcomes were significantly correlated with mothers' education. Illiterate mothers frequently lack optimum antenatal and nutrition, which stunts fetal growth and increases the risk of LBW and preterm birth in babies. These findings provide a body of evidence supporting the impact of maternal illiteracy on LBW [18].

Bansal P et al did a study intending to find out the prevalence of low birth weight babies among institutional deliveries and its association with socio cultural and maternal risk factors. The low birth weight (LBW) is considered a sensitive index of a nation's health and development. Socio-cultural and maternal risk factors like rest received in the afternoon during pregnancy, dietary intake, and period of gestation were found to be significantly associated with low birth weight babies. The problem of low birth weight babies can be lessened down as most of these factors can be tackled easily by providing adequate and effective antenatal care services with its maximum utilization as well as home care by emphasizing upon the education of mothers and family members, hence decreasing infant and child mortality rates [19].

Mavalankar DV et al conducted a hospital-based case-control study that showed that low maternal weight. poor obstetric history, lack of antenatal care, clinical anemia, and hypertension were significant independent risk factors for both term and preterm LBW. The short interpregnancy interval was associated with an increased risk of preterm LBW birth while primiparous women had an increased risk of term LBW. This analysis suggested that a substantial proportion of term and preterm LBW births may be averted by improving maternal nutritional status, anemia, and antenatal care [20]. Wachamo TM et al did a case-control study and found that low birth weight at birth is an important underlying contributor for neonatal and infant mortality. It accounts for nearly half of all perinatal deaths. Identifying predictors of low birth weight is the first essential step in designing appropriate management strategies. Maternal weight during pregnancy, paternal education, previous obstetric complication, and place of antenatal follow-up were associated with low birth weight. The risk factors identified in this study are preventable. Thus, nutritional counselling, health education on the improvement of lifestyle, and early recognition and treatment of complications were the recommended interventions [21]. A matched pair case-control study was done by Mumbare SS et al on maternal risk factors associated with term low birth weight neonates. Maternal malnutrition, inadequate antenatal care, and poor weight gain during pregnancy are significant predictors for the delivery of a low birth weight neonate [22].

Rafati et al studied maternal determinants of giving birth to low-birth-weight neonates which are universally used as an indicator of health status and is an important subject of national concern and a focus of health policy. Similar studies were done by Sharma M, Mishra S et al, Poudel P et al in whom LBW is associated with a higher risk for childhood mortality and morbidity. After these studies, it was concluded that the majority of factors that lead to the delivery of LBW neonates are preventable [23,24,25]. Singh G, Anjum F et al also studied the maternal factors which adversely affect the fetus in utero and their impact on the fetus. Maternal factors like age, parity, pre-pregnancy body mass index, hemoglobin levels, bad obstetric history (history of stillbirth/neonatal death in previous pregnancies, three or more spontaneous consecutive abortions), pre-eclampsia, fetal distress, mode of deliveries were studied. It was concluded that pre-pregnancy maternal body mass index, unbooked status, pre-eclampsia, and bad obstetric history are significant maternal factors resulting in low birth weight babies. Teen-age, illiteracy, poor antenatal care, maternal anemia, and pregnancy-induced medical ailments have a strong association with low birth weight. To overcome these problems, the mother and child health care services in the country should receive special attention. Darmstadt GL et al did work on evidence-based, cost-effective A combination of universal—i.e. for all settings—outreach and family-community care at 90% coverage averts 18–37% of neonatal deaths. Most of this benefit is derived from family community care, and a greater effect is seen in settings with very high neonatal mortality. Reductions in neonatal mortality that exceed 50% can be achieved with an integrated, high-coverage program of universal outreach and family community care, consisting of 12% and 26%, respectively, of total running costs, plus universal facility-based clinical services, which make up 62% of the total cost early success in averting neonatal deaths is possible in settings with high mortality and weak health systems through outreach and family-community care, including health education to improve home care practices, to create demand for skilled care, and to improve care-seeking. Simultaneous expansion of clinical care for babies and mothers is essential to achieve the reduction in neonatal deaths needed to meet the Millennium Development Goal for child survival [26,27].

The socioeconomic position of households and how income affects birth outcomes were essential to comprehending the maternal risk factors linked to LBW babies. A hospital-based cross-sectional study in India provides compelling evidence for the high correlation between a lower household income and a higher chance of having LBW children. The study sheds insight into the differences in socioeconomic status that affect the health of mothers and children

[28]. Identical results were also shown by a case-control study conducted in India [29].

Conclusions

The present study concluded that the low birth weight newborns is associated with various maternal risk factors such as illiteracy, rural residence, PIH, irregular antenatal checkup, oligohydramnios, and weight gain less than 6 kg during pregnancy. Hence, the identification of factors involved in the repetition of LBW is an attempt to understand the causal links that increase the chance of some women to be more susceptible to give birth to an LBW child. A longitudinal study should be done from the period prior to conception through pregnancy to after deliver. To allow for a close follow-up of the subjects and evaluate the factors contributing to low birth weight in a cause-effect model for development of specific interventions. Awareness of the importance of education might help drive investment in education and improvements in education and educational policy.

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