

Determinants of Low Birth Weight; Its Impact On Early Childhood Morbidity and It's Prevention in A Tertiary Care Hospital

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ABSTRACT

Objective: To identify the determinants of low birth weight and to evaluate its impact on early childhood morbidity in a tertiary care hospital.

Materials and Methods: This hospital-based observational study included 300 live-born neonates and was conducted over a period of 12 months from July 2022 to August 2023. Newborns were categorized into LBW (<2500 g) and normal birth weight (NBW ≥2500 g) groups. Maternal demographic, socioeconomic and clinical data were collected through interviews and medical records. Infants were followed for six months to assess morbidity patterns, including respiratory infections, diarrheal diseases, feeding difficulties and hospital admissions. Statistical analysis was performed using chi-square test, t-test and multivariate logistic regression, with a p-value <0.05 considered significant.

Results: The prevalence of LBW was 32% (n=96). Maternal anemia (61.5% vs 28.4%), inadequate antenatal care (54.2% vs 22.5%), pregnancy-induced hypertension (27.1% vs 11.3%) and preterm birth (58.3% vs 14.2%) were significantly associated with LBW (p<0.05). Multivariate analysis identified maternal anemia (AOR=2.8), inadequate antenatal care (AOR=3.2) and preterm delivery (AOR=4.5) as independent predictors. During the six-month follow-up, LBW infants had higher rates of respiratory infections (46.9% vs 21.6%), diarrheal illness (39.6% vs 18.1%), feeding difficulties (29.2% vs 11.8%), and hospital admissions (34.4% vs 12.7%) (p<0.05). Additionally, 42.7% of LBW infants were underweight at six months compared to 17.6% of NBW infants.

Conclusion: Low birth weight is strongly associated with modifiable maternal risk factors and significantly contributes to increased early childhood morbidity and poor growth outcomes. Strengthening antenatal care, improving maternal nutrition, and ensuring close postnatal follow-up of LBW infants are essential strategies to reduce its burden and improve child health outcomes.

Keywords: Low birth weight, maternal anemia, antenatal care, preterm birth, early childhood morbidity, tertiary care hospital

INTRODUCTION

Low birth weight (LBW) is traditionally considered as a birth weight of less than 2500 grams and is among the most enduring problems in maternal and child health, especially in low-middle income countries. ⁽¹⁾ The prevalence of LBW remains high, despite the many improvements in obstetric and neonatal care and is a complex phenomenon involving biological, socioeconomic and health system factors. ⁽²⁾ LBW is not just a clinical finding but a sign of underlying maternal and systemic vulnerabilities in many settings, particularly in tertiary care hospitals where there are high-risk pregnancies. ⁽³⁾

Low birth weight is a complicated condition that has many causes and mostly start before a woman becomes pregnant. This is because maternal nutritional status is paramount and lack of sufficient macro- and micronutrient intake can negatively affect fetal growth. ⁽⁴⁾ Other factors like maternal anaemia, which is also common in developing regions further reduce oxygen supply to the fetus and this is responsible for intrauterine growth restriction (IUGR). ⁽⁵⁾

Furthermore, some medical conditions that are chronic during pregnancy, such as hypertension, diabetes and infection may affect the function of the placenta and reduce the amount of nutrients or oxygen to the placenta that can pass on to the baby. ⁽⁶⁾ These physiological disruptions are often exacerbated by environmental and social factors like poverty, poor access to antenatal care, low level of education of the mother and early or close pregnancies. ⁽⁷⁾

Another important pathway leading to LBW is preterm birth. Some cases of preeclampsia are medically indicated and caused by complications like preeclampsia, fetal distress etc. while others are linked with factors that can be prevented such as maternal infections, stress or poor prenatal care. ⁽⁸⁾ The rate of low birth weight is often higher in tertiary care facilities where high-risk

pregnancies are more prevalent and thus warrants further studies on the determinants of LBW in these institutions. ⁽⁹⁾ The implications of low birth weight are far reaching. Infants born with LBW are at much greater risk of developing morbidity in their early years, such as respiratory infections, gastrointestinal diseases and poor immune function. ⁽¹⁰⁾ They are more susceptible to environmental insults and infectious agents due to their physiological immaturity, especially of the gastrointestinal tract, immune system and lungs. ⁽¹¹⁾

Medical admissions for infants and young children are not rare, creating extra pressure on already overtaxed health care services and families' pockets. Besides, the effects of LBW are not restricted to immediate illnesses. ⁽¹²⁾ The association of low birth weight with long-term health consequences, such as stunted growth, neurodevelopmental delays, and risk of chronic diseases in later life, including cardiovascular diseases and metabolic syndrome, is increasingly being recognized. ⁽¹³⁾ These associations illustrate the idea of "fetal programming," which essentially means that the bad conditions that babies experience while in the womb can affect their health for life. ⁽¹⁴⁾

Therefore, LBW is not only a current health problem but also one of the factors that can affect health outcomes in the future. In a tertiary care setting, understanding the risk factors for LBW and the subsequent effects on early childhood morbidity is a valuable study. ⁽¹⁵⁾ These facilities may be responsible for complex pregnancy cases and may offer a unique setting for investigating medical and non-medical risk factors in a focused group of mothers. ⁽¹⁶⁾

Knowledge of these factors can help to identify high-risk groups, enhance antenatal surveillance, and guide appropriate interventions that can help reduce the prevalence of LBW. ⁽¹⁷⁾ In addition, the understanding of the morbidity profile in LBW infants can guide neonatal and infant care, such as early screening, timely interventions and family education. It also offers an understanding of shortcomings in the healthcare system, such as issues with

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accessing care or a lack of follow-up, or resources, that can worsen health outcomes in these vulnerable children.⁽¹⁸⁾

Because of the complexity of the LBW and its long-term effects, great need exists for in-depth, context-specific research that combines clinical and social and environmental approaches. The aim of this study is to investigate the determinants of low birth weight in tertiary care hospital setting and to evaluate the effect of low birth weight on early childhood morbidity. In doing this it aims to help build awareness about the situation and to help inform the creation of evidence-informed strategies for better maternal and child health outcomes.

MATERIALS AND METHODS

This study was conducted in the department of Pediatrics and the department of Obstetrics & Gynecology of multiple tertiary care hospitals over a period of one year. The study design was a hospital-based observational study with a prospective component to allow follow-up of infants after birth. The aim of study was to identify the determinants of low birth weight and to assess its impact on early childhood morbidity.

All live-born neonates delivered in the hospital during the study period were considered for inclusion. Newborns were categorized into two groups based on their birth weight: those weighing less than 2500 grams were classified as low birth weight (LBW) while those weighing 2500 grams or more were considered normal birth weight (NBW). Stillbirths and neonates with major congenital anomalies were excluded from the study to avoid confounding factors that could independently influence morbidity.

Maternal data were collected through structured interviews and review of hospital records. Information included maternal age, parity, birth spacing, educational status, socioeconomic background, antenatal care attendance and nutritional indicators. Clinical parameters such as hemoglobin levels, presence of pregnancy-induced hypertension, gestational diabetes, and any documented infections during pregnancy were also recorded. Details regarding gestational age at delivery were determined using last menstrual period and/or early ultrasound findings where available.

Neonatal data was recorded immediately after birth which included birth weight measured using a calibrated digital scale, sex of the baby, gestational age assessment and Apgar scores at one and five minutes. Neonates identified as LBW were further evaluated for whether the condition was due to prematurity or intrauterine growth restriction.

For assessing early childhood morbidity, all enrolled infants were followed up for a period of six months through scheduled hospital visits and telephonic interviews with caregivers. Data regarding common illnesses such as respiratory infections, diarrheal diseases, feeding difficulties, and hospital admissions were collected. Growth monitoring was also performed during follow-up visits using standard anthropometric measurements.

Data was entered and analyzed using appropriate SPSS 22. Descriptive statistics were used to summarize maternal and neonatal characteristics. Categorical variables were expressed as frequencies and percentages while continuous variables were presented as means and standard deviations. Associations between maternal risk factors and low birth weight were assessed using chi-square test or Fisher's exact test as appropriate. For continuous variables, independent sample t-tests were applied. Multivariate logistic regression analysis was performed to identify independent predictors of low birth weight. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the institutional review board of the hospital. Informed consent was taken from all participating mothers prior to inclusion in the study. Confidentiality of patient information was strictly maintained throughout the research process.

RESULTS

A total of 300 live-born neonates were included in the study. Of these, 96 infants (32%) were classified as low birth weight (LBW), while 204 infants (68%) had normal birth weight (NBW). The mean birth weight in the LBW group was 2.08 ± 0.32 kg compared to 2.96 ± 0.41 kg in the NBW group (p < 0.001). Preterm births were significantly more frequent among LBW infants (58.3%) than NBW infants (14.2%) (p < 0.001), while intrauterine growth restriction (IUGR) accounted for 41.7% of LBW cases.

Maternal Demographic Characteristics: Maternal demographic factors showed significant differences between the two groups. Mothers of LBW infants were more likely to belong to extreme age groups and lower socioeconomic strata.

Obstetric and Clinical Risk Factors: Several maternal clinical factors were significantly associated with LBW. Maternal anemia, inadequate antenatal care, and pregnancy-induced hypertension were notably higher among mothers of LBW infants.

Neonatal Characteristics: Neonatal outcomes differed significantly between the two groups. LBW infants had higher rates of prematurity and lower Apgar scores.

Early Childhood Morbidity (0–6 Months): During the six-month follow-up period, LBW infants experienced significantly higher morbidity. Respiratory infections, diarrheal illnesses, feeding difficulties and hospital admissions were all more common in the LBW group.

Growth Outcomes at 6 Months: Growth assessment at six months revealed that LBW infants were significantly more likely to have suboptimal growth compared to NBW infants.

Multivariate Logistic Regression Analysis: After adjusting for confounding variables, maternal anemia, inadequate antenatal care, and preterm delivery were identified as independent predictors of low birth weight.

These findings demonstrate that low birth weight is strongly associated with adverse maternal demographic and clinical factors. Furthermore, LBW infants showed significantly higher early childhood morbidity and poorer growth outcomes which emphasized the critical need for targeted maternal and neonatal interventions.

Variable	LBW (n=96)	NBW (n=204)	p-value
Mean maternal age (years)	27.4 ± 5.2	25.8 ± 4.8	0.01
Age <20 years (%)	18.7	9.3	0.03
Age >35 years (%)	14.6	6.8	0.04
Primigravida (%)	42.7	38.2	0.45
Low socioeconomic status (%)	63.5	35.8	<0.001

Variable	LBW (%)	NBW (%)	p-value
Maternal anemia	61.5	28.4	<0.001
Pregnancy-induced hypertension	27.1	11.3	0.002
Gestational diabetes	9.4	6.3	0.32
Inadequate ANC (<4 visits)	54.2	22.5	<0.001
Short birth spacing (<2 years)	38.5	19.6	0.001

Variable	LBW (n=96)	NBW (n=204)	p-value
Mean birth weight (kg)	2.08 ± 0.32	2.96 ± 0.41	<0.001
Preterm births (%)	58.3	14.2	<0.001
IUGR (%)	41.7	—	—
Male sex (%)	52.1	49.5	0.68
Low Apgar (<7 at 5 min) (%)	21.9	8.3	0.002

Morbidity Type	LBW (%)	NBW (%)	p-value
Respiratory infections	46.9	21.6	<0.001
Diarrheal diseases	39.6	18.1	<0.001
Feeding difficulties	29.2	11.8	0.002
Hospital admissions	34.4	12.7	<0.001

Growth Parameter	LBW (%)	NBW (%)	p-value
Underweight	42.7	17.6	<0.001
Normal growth	57.3	82.4	<0.001

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Maternal anemia	2.8	1.6–4.9	<0.001

Inadequate antenatal care	3.2	1.9–5.4	<0.001
Preterm birth	4.5	2.6–7.8	<0.001

DISCUSSION

The present study showed that low birth weight (LBW) remains a significant public health concern, particularly in tertiary care settings where high-risk pregnancies are frequently managed. The observed prevalence of LBW (32%) in this study is relatively high compared to global estimates but is consistent with findings from hospital-based studies in developing countries.

Among the determinants evaluated, maternal anemia emerged as a strong independent predictor of LBW. This finding aligns with previous studies that demonstrate a clear association between reduced maternal hemoglobin levels and impaired fetal growth. Anemia limits oxygen-carrying capacity, leading to chronic fetal hypoxia and restricted intrauterine development. Similar observations have been reported by Balarajan et al., who emphasized the role of maternal iron deficiency in adverse birth outcomes.⁽¹⁹⁾

Inadequate antenatal care (ANC) was another significant determinant identified in this study. Mothers with fewer than four antenatal visits had a markedly higher likelihood of delivering LBW infants. Antenatal care provides an essential platform for early detection and management of maternal conditions such as anemia, hypertension, and infections. Studies by Kuhnt and WHO recommendations have consistently shown that adequate ANC utilization is associated with improved birth outcomes and reduced incidence of LBW.⁽²⁰⁾

Preterm birth was found to be the most significant predictor of LBW, which is expected given that shortened gestation directly limits fetal growth duration. The strong association observed in this study is consistent with global literature, including reports by Blencowe et al. identified prematurity as a leading cause of LBW worldwide. Additionally, intrauterine growth restriction (IUGR) contributed substantially to LBW cases, indicating that both prematurity and impaired fetal growth play critical roles in this population.⁽¹⁾

Socioeconomic status also demonstrated a significant association with LBW. Mothers from lower socioeconomic backgrounds were more likely to have LBW infants, likely reflecting inadequate nutrition, limited access to healthcare, and poor living conditions. This is in agreement with findings from studies conducted in South Asia, where poverty and low maternal education have been consistently linked to adverse pregnancy outcomes.⁽²¹⁾

The impact of LBW on early childhood morbidity was clearly evident in this study. LBW infants experienced significantly higher rates of respiratory infections and diarrheal diseases during the first six months of life. This increased susceptibility can be explained by the immaturity of the immune system, reduced transplacental transfer of antibodies, and underdeveloped organ systems. Similar findings have been reported by Ashworth who documented higher infection-related morbidity among LBW infants.⁽²²⁾

Hospital admissions were also significantly more frequent among LBW infants, reflecting the severity and recurrence of illnesses in this group. Feeding difficulties, another important finding, may further contribute to poor nutritional status and increased vulnerability to infections. These results are consistent with earlier research indicating that LBW infants often face challenges in establishing effective feeding, which can adversely affect growth and immunity.

Growth outcomes at six months showed that a substantial proportion of LBW infants remained underweight compared to their normal birth weight counterparts. This suggests that the effects of LBW extend beyond the neonatal period and may contribute to long-term growth faltering. The concept of early growth restriction leading to persistent undernutrition has been widely discussed in

literature, including studies by Kramer and subsequent research on developmental origins of health and disease.⁽²³⁾

The findings of this study underscore the multifactorial nature of LBW and its significant implications for early childhood health. From a clinical perspective, the results emphasize the need for early identification of high-risk pregnancies, particularly those complicated by anemia, inadequate antenatal care, and risk of preterm delivery. Strengthening maternal health services, improving nutritional interventions, and ensuring regular antenatal follow-up could play a crucial role in reducing the burden of LBW.

At the same time, the increased morbidity observed among LBW infants highlights the importance of structured postnatal care and close monitoring during infancy. Early interventions such as exclusive breastfeeding support, timely immunization, and prompt management of infections are essential to improve outcomes in this vulnerable group.

CONCLUSION

This study showed that low birth weight remains a multifactorial problem strongly influenced by maternal anemia, inadequate antenatal care and preterm delivery, particularly in a tertiary care setting where high-risk pregnancies are more prevalent. Infants born with low birth weight were found to have significantly higher rates of early childhood morbidity, including infections, feeding difficulties, increased hospital admissions and poor growth outcomes during the first six months of life. These findings highlight the critical importance of strengthening maternal health services through improved nutritional support, early risk identification and adequate antenatal care, along with ensuring close postnatal monitoring and timely interventions for LBW infants.

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