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Original Research Article

Prevalence of low birth weight infants and their association with maternal risk factors: a cross-sectional study

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ABSTRACT

Background: Low birth weight (LBW) remains a major public health issue in developing countries, contributing to neonatal morbidity, mortality, and long-term complications. Identifying maternal risk factors for LBW is essential for preventive strategies. This study aimed to assess the prevalence of LBW and its association with maternal factors in a tertiary care hospital.

Methods: A hospital-based cross-sectional study was conducted over three months, including 125 mother-infant pairs. Newborns weighing <2500 grams were classified as LBW. Data were collected through a semi-structured questionnaire covering maternal demographics, antenatal care, health status, and pregnancy complications. Statistical analysis identified associations between maternal factors and LBW.

Results: The prevalence of LBW was 33%. Inadequate antenatal visits (<4) were significantly associated with LBW (p=0.0002). Pregnancy complications - anemia, oligohydramnios, and pre-eclampsia - were also strongly linked to LBW (p=0.002). Preterm delivery was a major contributor to LBW (p=0.00001), and poor maternal nutrition was a critical risk factor (p=0.00007). Maternal age (p=0.4), education (p=0.12), and fetal gender (p=0.65) were not significantly associated with LBW.

Conclusions: Maternal health, nutrition, and antenatal care significantly influence birth weight. Strengthening prenatal services, early detection of complications, and improving maternal nutrition can reduce LBW prevalence. These findings support the need for targeted maternal and child health interventions to improve neonatal outcomes.

Keywords: Low birth weight, Antenatal care, Maternal health, Pregnancy complications, Neonatal

INTRODUCTION

Low birth weight (LBW) is a major public health problem, particularly prevalent in developing countries. The incidence of LBW is estimated to be 16% worldwide, 19% in least developed & developing countries and 7% in developed countries.[1] Birth weight refers to a newborn's first weight, which is often obtained shortly after birth. The World Health Organisation (WHO) defines LBW as a weight at birth of less than 2500 grammes or 5.5 pounds, regardless of gestational age.[2] India has a significant burden of childhood malnutrition and death.[3,4] There is significant variation in the incidence of LBW across regions. South Asia has the highest incidence with 21-28% of LBW.[5] In India disparity has ranged from a prevalence of 10% among high socioeconomic status to 56% in poor slum areas. Prevalence of LBW in Orissa is 40%, being the highest in

India.[6] LBW accounts for 60-80% of newborn fatalities globally. Every year, around 20.5 million newborns are born with LBW, accounting for 14.6% of all infants worldwide. 96.5% of low-birth-weight children are born in poor countries.[2,7] LBW babies has contribution in high perinatal mortality and morbidity. This high risk is due to fact that these babies are at high risk of infectious diseases, growth failure, malnutrition and are also more likely to have abnormal cognitive development, neurological impairment and poor school performance, increased risk of acute diarrhoea, obstructive lung disease, cholesterol, renal disease, impaired immune response. In adult life they are at greater risk of diseases like hypertension, diabetes, cardiovascular diseases. Across the world neonatal mortality is 20 times more likely for LBW babies as compared to babies heavier than 2.5 kg. It is estimated that 72% of LBW infants in developing countries are born in asia.[8] LBW infants are 40 times are more likely to die within first four weeks of life than normal birth weight infants. LBW infants are also 3 times more likely than normal birth weight infants to have neuro developmental complications and congenital abnormalities.[9] WHO estimated that annually about 25 million LBW babies are born, almost 90% of them in developing countries.[10] India alone accounts for 40% of LBWs in developing world.

There are nearly 8 million LBW infants born in India, which accounts for about 28% of all live births in India. The infant mortality rate in India is 37% and in Telangana state, it stands at 34%. The principal case of IMR in India is LBW, which measures 57% of all cases.

Among the several factors that result in LBW, major factors that include preterm birth, IUGR, or combination of both pathological and physiological conditions. In India, about 2/3rd of LBW babies are born at term.[11]

Weight at birth is directly influenced by general level of health status of the mother. Maternal environment is most important determinant of birth weight and factors that prevent the normal circulation across the placenta cause poor nutrient and O_2 supply to the fetus, restricting the growth of fetus. The maternal risk factors are biologically and socially interrelated, most are however modifiable. The mortality of LBW can be reduced if the maternal risk factors are detected early and managed by simple techniques. Thus, it is necessary to identify the factors prevailing in a particular area responsible for LBW. It is not essential that all factors should be present in given area. The factors vary from one area to another, depending on geographic, socioeconomic and cultural factors.[12]

Birth weight is a good indicator of reproductive and general health status of population. It is not only about the baby's health and nutritional status but also the physical and psychological growth and development of babies and their chances of survival. Despite the increasing incidence of LBW there is lack of knowledge which is necessary prerequisite for development of prevention strategies by the national health systems and awareness initiatives among the public and health professionals.[13] There are numerous factors contributing to LBW, both maternal and fetal.[14] Some of the adverse factors responsible are maternal malnutrition, anemia, inadequate prenatal care, drug abuse, birth order, maternal medical problem, example pregnancy induced hypertension, diabetes mellitus, cardiac diseases and chronic infections.[15] Infants with LBW have higher rates of morbidity and mortality from infectious diseases, malnutrition, growth failure and are also more likely to have abnormal cognitive development, neurological impairment and poor school performance, increased risk of acute diarrhea, obstructive lung disease, cholesterol, renal damage, impaired immune function. These babies are at greater risk of cardiovascular diseases, hypertension and diabetes mellitus.[16-20] The death rate from LBW can be lowered if maternal risk factors are identified early and controlled using simple procedures. As a result, it is vital to identify the characteristics prevalent in a specific area that contribute to LBW.

With this background, the present study aimed to determine the prevalence of LBW infants and evaluate its association with various maternal risk factors at Government Medical College, Srikakulam.[21]

The objective of this study was to identify and analyze key maternal determinants contributing to LBW in the local population, thereby providing evidence to support targeted maternal and neonatal healthcare interventions.

METHODS

Study design

A hospital-based cross-sectional study was conducted.

Study setting

The study was carried out at Government Medical College, Srikakulam, a tertiary care hospital in Andhra Pradesh, India.

Study population

The study population comprised mothers whose child's birth weight was less than 2500 grams.

Study period

The study was conducted over a period of three months, from September to November 2024.

Sample size

A total sample size of 125 was determined based on a prevalence (p) of 26.9% of newborns with LBW, with an

absolute error (L) of 8%, as derived from a previous study.

Inclusion criteria

The study included all live-born infants delivered at the hospital with a gestational age ranging between 37 completed weeks and 41 weeks. An essential requirement for inclusion was the accurate determination of gestational age, which was ensured by confirming the exact date of the last menstrual period (amenorrhoea).

Exclusion criteria

The study excluded stillborn infants and those with major congenital anomalies. These criteria were applied to eliminate confounding factors that could affect birth outcomes and neonatal health independent of the maternal risk factors being assessed.

Study tools

Data collection was carried out using a pretested semi-structured questionnaire specifically designed to evaluate maternal risk factors associated with LBW. This instrument captured detailed demographic information, including maternal age, educational background, occupation, and marital status, in order to assess the socioeconomic influences on maternal and infant health. Maternal health was evaluated through the assessment of pre-pregnancy Body Mass Index (BMI), which was categorized into underweight, normal weight, overweight, and obese to reflect the nutritional status of the mother.

The questionnaire also documented prenatal care by recording the frequency of antenatal visits, a critical determinant of fetal and maternal health monitoring. Information on pregnancy complications, including hypertension, diabetes, anemia, infections, pre-eclampsia, and other relevant conditions, was obtained to identify health risks encountered during gestation. Chronic health conditions existing before pregnancy were also noted. The maternal use of substances such as tobacco, alcohol, and illicit drugs during pregnancy was recorded to understand potential teratogenic and growth-restricting exposures.

Furthermore, the questionnaire gathered obstetric history, including the number of previous pregnancies, the outcome of those pregnancies, and any complications experienced in the current gestation. Details concerning delivery and neonatal health, such as gestational age at birth, birth weight, mode of delivery (vaginal or cesarean), and the necessity for neonatal intensive care unit (NICU) admission, were also captured. Environmental factors were explored by evaluating access to adequate nutrition, living conditions, presence or absence of support systems, and exposure to psychological or physical stressors during pregnancy.

Altogether, this comprehensive questionnaire provided a holistic view of the maternal experience, integrating biological, environmental, and behavioral dimensions to understand factors influencing pregnancy outcomes and neonatal health.

Study procedure

A hospital-based survey was conducted among mothers of LBW infants. After obtaining informed consent, data were collected using the semi-structured questionnaire, which was administered in the local language (Telugu) to ensure clarity and comprehension.

Data analysis

Data were analyzed using Microsoft Excel and SPSS version 25.0. Descriptive and inferential statistical methods were applied to interpret the findings accurately.

Ethical considerations

Ethical approval was obtained prior to the commencement of the study. Informed written consent was secured from all participants. Confidentiality was strictly maintained, and personal details of the study population were not disclosed.

RESULTS

Among the total study population (n=130), 33% of newborns had LBW (<2.5 kg), and 67% had normal birth weight (≥2.5 kg). This illustrates the prevalence of LBW in the study sample.

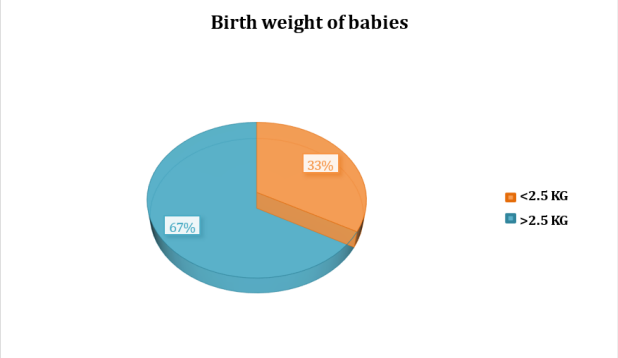

Figure 1: Distribution of study participants according to the birth weight of their babies.

The majority of the participants (73%) had a normal BMI, while 26.1% were underweight and 0.7% were overweight/obese. Maternal BMI is a critical indicator of nutritional status, which may influence fetal growth.

97% of participants reported receiving antenatal care (ANC), while 3% did not. Lack of ANC is a known risk factor for adverse pregnancy outcomes, including LBW.

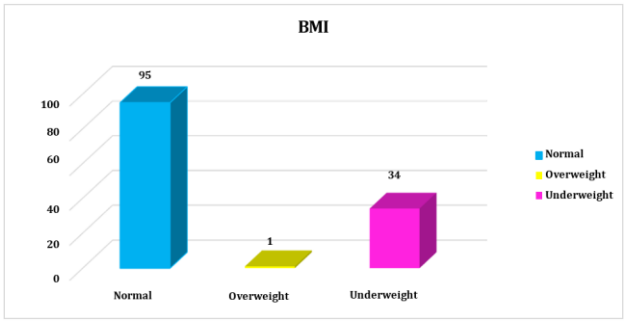

Figure 2: Distribution of study participants according to their BMI.

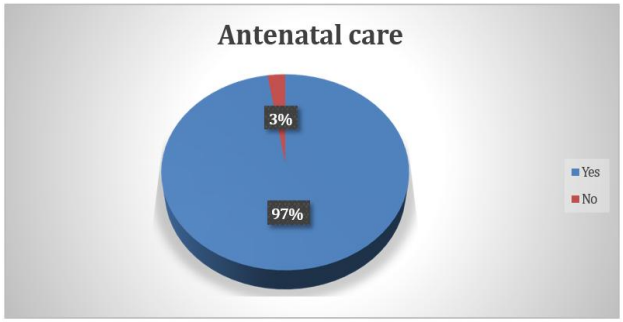

Figure 3: Distribution of study participants according to their antenatal care.

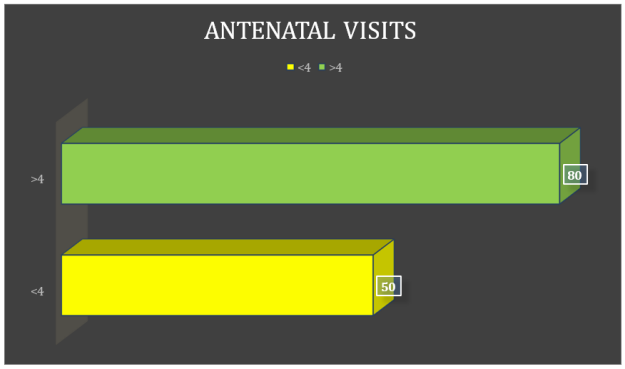

Figure 4: Distribution of study participants according to their antenatal visits.

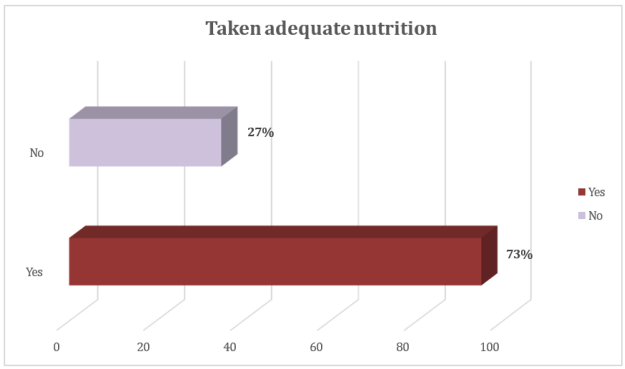

Figure 5: Distribution of study participants according to intake of adequate nutrition.

Among the participants, 61.5% had ≥4 antenatal visits, and 38.5% had fewer than 4 visits. Inadequate ANC (<4 visits) was significantly associated with increased incidence of LBW (p=0.0002).

73% of mothers reported adequate nutritional intake during pregnancy, while 27% did not. Inadequate maternal nutrition showed a statistically significant association with LBW (p=0.00007).

Pregnancy complications such as anemia, oligohydramnios, and pre-eclampsia were significantly associated with LBW (p=0.002). Mothers with these complications were more likely to deliver LBW infants compared to those without complications.

Although the majority of LBW babies were born to mothers aged 21–30 years and literate mothers, no statistically significant association was observed between maternal age (p=0.4) or education level (p=0.12) and LBW.

LBW was significantly more common among mothers with 2–3 previous pregnancies (p=0.0015) and in preterm deliveries (p=0.00001), indicating parity and gestational age as important contributors to LBW.

Table 1: Pregnancy complications and association with LBW.

Complications	Frequency (N)	LBW (N)	Normal (N)	Chi-square	P value
Anemia	5	4	1		
Oligohydramnios	28	18	10		
Pre-eclampsia	3	2	1		
Polyhydramnios	7	1	6		
Infections	2	1	1		
Antepartum hemorrhage	2	1	1		
No significant complications	76	17	59		
Other (UTIs, PCOD, etc.)	7	3	4		
Total	130	43	87	9.4	0.002

Table 2: Maternal demographics and association with LBW.

Characteristic	Category	LBW (N)	Normal (N)	Total (N)	Chi-square	P value
Age (in years)	<20	5	10	15		
	21–30	36	76	112		
	>30	2	1	3	1.57	0.4
Education	Literate	38	67	105		
	Illiterate	5	20	25	2.3	0.12

Table 3: Obstetric history and gestational age vs. LBW.

Variable	Category	LBW (N)	Normal (N)	Total (N)	Chi-square	P value
Previous pregnancies	1	13	52	65		
	2–3	30	35	65	10.04	0.0015
Gestational age	Preterm	26	6	32		
	Term	17	81	98	44.1	0.00001

Table 4. Antenatal visits and maternal nutrition vs. LBW.

Variable	Category	LBW (N)	Normal (N)	Total (N)	Chi-square	P value
Antenatal visits	<4	26	24	50		
	>4	17	63	80	13.1	0.0002
Adequate nutrition	No	21	14	35		
	Yes	22	73	95	15.6	0.00007

Table 5. Type of delivery and fetal gender vs. LBW.

Variable	Category	LBW (N)	Normal (N)	Total (N)	Chi-square	P value
Type of delivery	NVD	18	49	67		0.003
	LSCS	25	38	63		
Fetal gender	Male	25	47	72	0.19	0.65
	Female	18	40	58		

A significantly higher proportion of LBW cases was observed in mothers with fewer than 4 antenatal visits (p=0.0002) and those with inadequate nutrition (p=0.00007), underscoring the importance of proper prenatal care and maternal diet.

A significant association was found between the mode of delivery and LBW (p=0.003), with more LBW infants delivered by LSCS. However, fetal gender did not show a significant association with LBW (p=0.65).

DISCUSSION

This study aimed to investigate the prevalence and maternal risk factors associated with LBW among newborns. The findings indicate that 33% of the study participants' babies belonged to the LBW category. The prevalence of LBW in this study (33%; 43/130) aligns with previous studies by Laura et al and Louangpradith et al.[35,36]

Socio-demographic factors

Maternal age

The study suggests that mothers aged 21-30 years had a higher percentage of LBW babies, consistent with prior research by Aras et al and Louangpradith et al.[12,36] However, no statistically significant association was found between maternal age and LBW (p=0.4), contrasting with studies that reported significant associations by Laura et al and Bendhari et al.[12,35] Differences in study populations or sample sizes may explain this discrepancy.

Maternal education

The study found that literate mothers had a higher percentage of LBW babies (36.2%), which aligns with previous research by Anjum et al and Louangpradith et al.[36,39] However, maternal education was not significantly associated with LBW (p=0.12), contradicting findings that reported significant associations by Laura et al and

Bendhari et al.[12,35] This suggests that education alone may not be a strong predictor of LBW in this population.

Maternal occupation

The study found that housewives had a higher percentage of LBW babies (97.7%), consistent with prior studies by Laura et al and Louangpradith et al.[35,36] The physical demands of household work and lack of employment-related health benefits could contribute to this trend. Working women, particularly those in strenuous occupations, may also be at increased risk by Mainous et al.[49] Previous studies support this observation, with Anjum et al reporting 58.1% of mothers of LBW babies as housewives and 21.7% engaged in manual labor.[39] Similarly, Louangpradith et al found 58.9% of mothers of LBW babies engaged in manual labor, highlighting the need for targeted maternal support during pregnancy.[36]

Reproductive and medical history

Anemia

The study observed that anemia was prevalent among mothers of LBW babies (3.8%), supporting previous research by Syafiqoh et al and Anjum et al.[39,46] Anemia likely contributes to LBW by reducing maternal oxygen delivery to the fetus.

Antenatal visits

A significant association was found between inadequate antenatal visits and LBW (p=0.0002), reinforcing previous findings by Patel et al and Andayasari et al.[45,46] Regular antenatal care helps identify and manage LBW risk factors. Laura et al reported that 72.4% of mothers of LBW babies had fewer than four antenatal visits, while Louangpradith et al reported 63.2%.[35,36] The WHO recommends a minimum of four antenatal visits, emphasizing their importance (WHO, 2016).

Complications during pregnancy

The study found a significant association between pregnancy complications and LBW (p=0.002), supporting previous studies by Patel et al and Andayasari et al.[45,46] Common complications included anemia (3.8%), oligohydramnios (21.5%), and pre-eclampsia (2.3%). Syafiqoh et al reported that 34.8% of mothers of LBW babies had complications, while Bendhari et al found 43.8%.[12,46]

Fetal and gestational factors

Parity

A significant association was found between the number of previous pregnancies and LBW (p=0.0015), consistent with prior research by Patel et al and Andayasari et al.[45,46] Multiparity appears to increase the risk of LBW.

Gestational age

Preterm birth was significantly associated with LBW (p=0.00001), aligning with previous studies by Aras et al and Louangpradith et al.[32,36] Preterm birth remains a key predictor of LBW.

Fetal gender

No significant association was found between fetal gender and LBW (p=0.65), consistent with prior studies by Laura et al and Louangpradith et al.[35,36] However, male babies had a slightly higher LBW percentage (34.7%) compared to female babies (31%). Similar trends were observed by Syafiqoh et al and Anjum et al.[39,46]

Type of delivery

A significant association was found between delivery type and LBW (p=0.003), supporting prior findings by Patel et al and Andayasari et al.[45,46] Cesarean section (CS) deliveries had a higher LBW percentage (50%) compared to vaginal deliveries (22.5%). Emergency CS had the highest LBW risk (60%) versus elective CS (40%). Similar trends were observed by Syafiqoh et al and Bendhari et al.[12,46]

Nutritional factors

Nutrition

A significant association was found between inadequate nutrition and LBW (p=0.00007), consistent with previous studies by Syafiqoh et al and Anjum et al.[39,46] Adequate maternal nutrition is crucial for fetal growth.

Substance use

While not investigated in this study, previous research has linked substance use to LBW by Bendhari et al and Mainous et al.[12,49] Future studies should explore this factor.

Possible explanations for variations in results

Differences in LBW incidence across studies may arise from variations in maternal health programs, socioeconomic conditions, and public health infrastructure. Countries with robust maternal health programs, like China, report lower LBW rates than resource-limited settings like Uganda. Cultural practices, teenage pregnancies, and healthcare access also contribute to these variations.

Significance of results and practical implications

The findings support the hypothesis that maternal age, education, income, antenatal care, and nutrition significantly affect birth weight. Practical implications highlight the need for improved maternal healthcare,

especially in high-LBW regions. Promoting maternal education, ensuring adequate antenatal care, and addressing nutritional deficits could help mitigate LBW risks.

Strengths and weaknesses

Strengths include a comprehensive dataset covering socioeconomic, health, and demographic factors, enhancing the study's validity. However, limitations include its focus on a specific population, potential recall bias in self-reported data, and the exclusion of genetic factors, which may also influence LBW.

CONCLUSION

The findings of this study highlight several critical factors associated with LBW among newborns. A substantial proportion (33%) of neonates were classified as LBW, underscoring the need for targeted maternal and child health interventions. While the majority of mothers were aged 21–30 years and literate, no significant association was observed between these factors and LBW, suggesting that other determinants play a more influential role. However, multiparity (2–3 previous pregnancies) was significantly associated with LBW, indicating the need for enhanced monitoring and care among multiparous women. Pregnancy complications, including anemia, oligohydramnios, and pre-eclampsia, were also significantly linked to LBW, reinforcing the importance of early detection and management of maternal health conditions. Furthermore, inadequate antenatal care, particularly fewer than four visits, was strongly correlated with an increased prevalence of LBW, highlighting the essential role of regular maternal health monitoring. Preterm deliveries were another significant contributor to LBW, emphasizing the need for strategies to prevent preterm labor. Additionally, inadequate maternal nutrition emerged as a critical risk factor, underscoring the importance of nutritional counseling and interventions during pregnancy. Although male neonates exhibited a higher prevalence of LBW compared to females, this association was not statistically significant. These findings collectively underscore the need for comprehensive maternal health programs focusing on nutrition, antenatal care, and the prevention of pregnancy-related complications to improve birth outcomes.

Recommendations

The findings of this study highlight the need for improved antenatal care, nutritional counseling, and maternal education to reduce the prevalence of LBW. Regular monitoring of maternal health, addressing maternal anemia, and promoting institutional deliveries are essential. Further multicentric studies with larger sample sizes and longer durations are recommended to explore causal relationships and regional variations in risk factors.

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