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Original Research

Maternal Determinants and Perinatal Outcomes of Low Birth Weight Babies in a Tertiary Care Centre: An Observational Study.

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Abstract

Background: Low birth weight remains an important indicator of maternal health, fetal growth, neonatal morbidity, and survival. Identification of maternal determinants and early perinatal complications is essential for strengthening antenatal and neonatal care in tertiary care settings. **Objectives:** To evaluate maternal determinants associated with low birth weight babies and to describe their perinatal outcomes in a tertiary care centre. **Methods:** This hospital-based observational study included 100 low birth weight babies and their mothers at Chamarajanagar Institute of Medical Sciences, Chamaraja Nagar, Karnataka, India, from February 2024 to January 2025. Maternal demographic variables, antenatal factors, obstetric profile, neonatal characteristics, and early perinatal outcomes were recorded. Data were analysed using descriptive statistics. **Results:** The mean maternal age was 24.8 ± 4.2 years, and 54% were multigravida. Maternal anemia was observed in 58% of mothers, followed by inadequate antenatal care in 42%, low maternal BMI in 31%, pregnancy-induced hypertension in 28%, and poor gestational weight gain in 25%. Preterm delivery was present in 61% of cases. The mean gestational age was 35.8 ± 2.4 weeks, and the mean birth weight was 2.12 ± 0.31 kg. Very low birth weight was observed in 16% of neonates. NICU admission was required in 38% of babies. Respiratory distress, neonatal jaundice, hypoglycaemia, sepsis, and feeding difficulty were the common complications. Early neonatal mortality was 6%, while 94% were discharged alive. **Conclusion:** Maternal anemia, inadequate antenatal care, low maternal BMI, poor gestational weight gain, hypertensive disorders, and prematurity were the major determinants observed among mothers delivering low birth weight babies. Strengthening antenatal risk detection and early neonatal support can improve outcomes.

Keywords: Low birth weight; Maternal determinants; Anemia; Antenatal care; Preterm birth; Perinatal outcome; NICU admission.

Introduction

Low birth weight (LBW), defined as birth weight below 2500 g irrespective of gestational age, continues to be a major public health concern because it reflects the combined influence of maternal nutrition, obstetric health, placental function, fetal growth, and quality of antenatal care. Recent global estimates indicate that LBW remains highly prevalent despite improvements in institutional delivery and neonatal care, with a disproportionate burden in low- and middle-income countries [1,2]. LBW is clinically important because it increases vulnerability to respiratory distress, hypothermia, hypoglycaemia, sepsis, feeding difficulty, prolonged hospital stay, and early neonatal death. The Lancet small vulnerable newborn framework further emphasizes that babies who are preterm, small for gestational age, or low birth weight represent an overlapping group with increased mortality risk and long-term developmental consequences [3].

The etiological pathway of LBW is complex. Some neonates are low birth weight because of preterm birth, while others are term babies with intrauterine growth restriction. Preterm birth itself remains a leading contributor to neonatal mortality worldwide [4]. Maternal determinants of LBW include young maternal age, poor socioeconomic background, inadequate antenatal care, low body mass index, poor gestational weight gain, anemia, hypertensive disorders of pregnancy, infection, antepartum hemorrhage, multiple pregnancy, and previous adverse obstetric history. Kramer's classical meta-analysis highlighted the methodological importance of separating fetal growth restriction from prematurity while evaluating determinants of LBW [5].

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Indian studies have consistently shown that maternal nutritional status, inadequate antenatal care, poor pregnancy weight gain, anemia, and hypertensive disorders are closely linked to LBW [6,7]. Maternal anemia reduces oxygen-carrying capacity and is often accompanied by nutritional deficiency, while low maternal BMI and poor weight gain reflect inadequate energy and micronutrient reserves. A systematic review reported a significant association between maternal anemia and LBW [8]. Similarly, pregnancy-induced hypertension affects uteroplacental perfusion and contributes to fetal growth restriction and indicated preterm delivery [9]. Socioeconomic and nutritional disadvantage also remain important in India, where household living conditions, maternal education, dietary access, and antenatal service utilization influence fetal growth [10,11].

Evaluation of maternal determinants and perinatal outcomes in a tertiary care centre is useful because such hospitals receive both routine obstetric cases and high-risk referrals. Local data help identify preventable determinants, prioritize antenatal screening, and strengthen early neonatal care pathways. The present study was conducted with the objective of assessing maternal determinants associated with low birth weight babies and describing the perinatal outcomes of these babies delivered at Chamarajanagar Institute of Medical Sciences, Chamaraja Nagar, Karnataka, India.

Materials and Methods

Study design and setting

This hospital-based observational study was conducted in the Department of Obstetrics and Gynaecology and the neonatal care unit of Chamarajanagar Institute of Medical Sciences, Chamaraja Nagar, Karnataka, India. The institution is a tertiary care teaching centre providing antenatal, intrapartum, emergency obstetric, neonatal, and referral services to the surrounding urban and rural population.

Study period and sample size

The study was carried out from February 2024 to January 2025. A total of 100 low birth weight babies and their mothers were included. Consecutive eligible mother-baby pairs were enrolled until the required sample size was achieved.

Study population

The study population consisted of mothers who delivered live-born babies with birth weight below 2500 g during the study period. Low birth weight was classified as very low birth weight when birth weight was below 1.5 kg and as low birth weight when birth weight was 1.5-2.49 kg. Gestational age was assessed from the last menstrual period, early pregnancy ultrasonography where available, and obstetric records. This approach is consistent with standard birth weight and gestational age-based assessment used in epidemiological studies of LBW [1,6].

Inclusion and exclusion criteria

Mothers delivering live-born babies with birth weight less than 2500 g and having adequate maternal and neonatal records were included. Babies with major congenital anomalies, stillbirths, and cases with incomplete maternal or neonatal documentation were excluded. Mothers who were referred after delivery without reliable antenatal or intrapartum data were also excluded.

Data collection

Data were collected using a structured proforma. Maternal variables included age, parity, residence, socioeconomic status, antenatal care adequacy, hemoglobin status, body mass index, gestational weight gain, pregnancy-induced hypertension, maternal infections, antepartum hemorrhage, gestational diabetes mellitus, and previous history of LBW or preterm delivery. Obstetric variables included gestational age at delivery, type of pregnancy, and mode of delivery. Neonatal variables included birth weight, sex, Apgar score at 5 minutes, NICU admission, respiratory distress, neonatal jaundice, hypoglycaemia, sepsis, feeding difficulty, birth asphyxia, discharge status, and early neonatal death. Similar maternal and neonatal domains have been used in previous studies assessing determinants and outcomes of LBW babies [7,12,13].

Outcome measures and statistical analysis

The primary maternal determinants assessed were anemia, inadequate antenatal care, low maternal BMI, pregnancy-induced hypertension, poor gestational weight gain, maternal infection, antepartum hemorrhage, and previous adverse obstetric history. The main perinatal outcomes assessed were NICU admission, respiratory distress, neonatal jaundice, hypoglycaemia, sepsis, feeding difficulty, birth asphyxia, early neonatal death, and discharge status. Data were entered into a spreadsheet and analysed using descriptive statistics. Categorical variables were expressed as frequencies and percentages. Continuous variables were expressed as mean and standard deviation. No inferential comparison was performed because the study was descriptive in design.

Ethical considerations

The study was conducted after approval from the Institutional Ethics Committee of Chamarajanagar Institute of Medical Sciences. Confidentiality of maternal and neonatal information was maintained throughout the study. Identifiable patient information was not included in the analysis or manuscript.

Results

A total of 100 low birth weight babies and their mothers were included in the study. The mean maternal age was 24.8 ± 4.2 years. Most mothers were aged 21-25 years. Multigravida mothers constituted 54% of the study population, while 46% were primigravida. Rural residence and lower socioeconomic status were commonly observed among the mothers (Table 1).

Table 1. Baseline maternal characteristics

Variable	Number of mothers	Percentage
Age group		
<20 years	14	14.0%
21-25 years	42	42.0%
26-30 years	31	31.0%
>30 years	13	13.0%
Parity		
Primigravida	46	46.0%
Multigravida	54	54.0%
Residence		
Rural	62	62.0%
Urban	38	38.0%
Socioeconomic status		
Lower	48	48.0%
Lower middle	39	39.0%
Upper middle	13	13.0%

Maternal anemia was the most common determinant, observed in 58% of mothers. Inadequate antenatal care was documented in 42% of cases. Low maternal BMI, pregnancy-induced hypertension, and poor gestational weight gain were also frequently noted. Previous history of LBW or preterm baby was recorded in 18% of mothers, while maternal infection during pregnancy and antepartum hemorrhage were noted in 15% and 9% of cases, respectively (Table 2).

Table 2. Maternal determinants associated with low birth weight

Maternal determinant	Number of mothers	Percentage
Maternal anemia	58	58.0%
Inadequate antenatal care	42	42.0%
Low maternal BMI	31	31.0%
Pregnancy-induced hypertension	28	28.0%
Poor gestational weight gain	25	25.0%
Previous history of LBW/preterm baby	18	18.0%
Maternal infection during pregnancy	15	15.0%
Antepartum hemorrhage	9	9.0%
Gestational diabetes mellitus	7	7.0%

Preterm delivery was observed in 61% of cases, while 39% were term low birth weight babies. Singleton pregnancy was present in 88% of cases. Vaginal delivery was the most common mode of delivery. The mean gestational age at delivery was 35.8 ± 2.4 weeks. The mean birth weight of the babies was 2.12 ± 0.31 kg. Half of the babies had a birth weight between 2.0 and 2.49 kg, while very low birth weight was observed in 16% of neonates. Male babies constituted 52% and female babies constituted 48% of the study population. A 5-minute Apgar score below 7 was recorded in 21% of babies (Table 3).

Table 3. Obstetric and neonatal profile

Variable	Number of cases/babies	Percentage
Gestational age at delivery		
<34 weeks	24	24.0%
34-36 weeks	37	37.0%
≥ 37 weeks	39	39.0%
Type of pregnancy		
Singleton	88	88.0%
Twin pregnancy	12	12.0%
Mode of delivery		
Vaginal delivery	57	57.0%
Caesarean section	43	43.0%
Birth weight category		
<1.5 kg	16	16.0%
1.5-1.99 kg	34	34.0%
2.0-2.49 kg	50	50.0%
Sex of baby		
Male	52	52.0%
Female	48	48.0%
APGAR score at 5 minutes		
<7	21	21.0%
≥ 7	79	79.0%

NICU admission was required in 38% of low birth weight babies. Respiratory distress was the most common perinatal complication, followed by neonatal jaundice, hypoglycaemia, sepsis, and feeding difficulty. Birth asphyxia was documented in 8% of babies. Early neonatal mortality was observed in 6% of babies, while 94% were discharged alive (Table 4).

Table 4. Perinatal outcomes among low birth weight babies

Perinatal outcome	Number of babies	Percentage
NICU admission	38	38.0%
Respiratory distress	24	24.0%
Neonatal jaundice	22	22.0%
Hypoglycaemia	16	16.0%
Neonatal sepsis	13	13.0%
Feeding difficulty	12	12.0%
Birth asphyxia	8	8.0%
Early neonatal death	6	6.0%
Discharged alive	94	94.0%

Overall, maternal anemia, inadequate antenatal care, low maternal BMI, poor gestational weight gain, hypertensive disorders of pregnancy, and prematurity were the major determinants observed among mothers delivering low birth weight babies. Most neonates were discharged alive, although NICU admission and early neonatal complications were relatively frequent.

Discussion

The present observational study evaluated 100 mother-baby pairs with low birth weight deliveries in a tertiary care centre. The findings showed that LBW was closely associated with a cluster of maternal nutritional, antenatal, and obstetric determinants. Maternal anemia was the most common determinant, affecting 58% of mothers. This finding is consistent with previous evidence that maternal anemia is associated with impaired fetal growth and low birth weight, particularly when accompanied by nutritional deficiency and limited antenatal correction [8]. Anemia during pregnancy can reduce oxygen delivery to the fetus and is frequently linked with poor dietary intake, inadequate iron supplementation, infections, and socioeconomic disadvantage.

Inadequate antenatal care was observed in 42% of cases. This is clinically important because antenatal visits provide opportunities for early detection and management of anemia, hypertensive disorders, nutritional deficiency, infections, inadequate weight gain, and fetal growth restriction. Mumbare et al. reported inadequate antenatal care, maternal malnutrition, and poor pregnancy weight gain as significant predictors of LBW among term neonates [6]. Similar findings were reported by Singh et al., who identified unbooked status, low prepregnancy BMI, preeclampsia, and bad obstetric history as important maternal factors [7]. In the present study, low BMI and poor gestational weight gain were noted in 31% and 25% of mothers, respectively, supporting the role of maternal nutritional reserve in fetal growth.

Pregnancy-induced hypertension was documented in 28% of mothers. Hypertensive disorders are strongly linked to uteroplacental insufficiency, fetal growth restriction, indicated preterm delivery, and adverse neonatal outcomes. A systematic review and meta-analysis by Getaneh et al. also demonstrated an increased risk of LBW among women with pregnancy-induced hypertension [9]. The present study further observed that 61% of LBW babies were preterm, indicating that prematurity contributed substantially to the LBW burden. This finding is aligned

with global evidence that preterm birth remains a major contributor to neonatal morbidity and mortality [4].

Very low birth weight was observed in 16% of babies. Indian NFHS-based evidence has shown that maternal socioeconomic disadvantage, nutritional factors, and antenatal care indicators influence both LBW and very low birth weight patterns [11,12]. In the present study, NICU admission was required in 38% of babies, and the main neonatal complications were respiratory distress, jaundice, hypoglycaemia, sepsis, and feeding difficulty. These findings are comparable with reports describing higher morbidity among LBW neonates, particularly respiratory problems, jaundice, infection, and metabolic complications [13,14]. Early neonatal mortality was 6%, while 94% were discharged alive, suggesting that timely neonatal care in a tertiary setting contributed to favourable short-term survival. Overall, the study highlights the need for stronger antenatal risk screening, nutritional correction, hypertension surveillance, and early neonatal preparedness.

Limitations

This study was conducted at a single tertiary care centre with a sample size of 100, limiting wider generalisability. The descriptive design did not include a normal birth weight comparison group, so independent risk estimation was not performed. Long-term neurodevelopmental and growth outcomes were not assessed after discharge.

Conclusion

This observational study identified maternal anemia, inadequate antenatal care, low maternal BMI, poor gestational weight gain, pregnancy-induced hypertension, and prematurity as the major determinants observed among mothers delivering low birth weight babies. Preterm birth contributed substantially to the burden of LBW in this tertiary care setting. Although most neonates were discharged alive, NICU admission and early complications such as respiratory distress, jaundice, hypoglycaemia, sepsis, and feeding difficulty were frequent. These findings underline the need for improved antenatal surveillance, nutritional intervention, timely management of hypertensive disorders, early identification of fetal growth restriction, and preparedness for neonatal complications to reduce morbidity among low birth weight babies.

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