

Prevalence, Predictors and Perinatal Outcomes of Low-Birth-Weight Newborns: A Retrospective Study

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Abstract:

Background: Low birth weight (LBW) is a major contributor to perinatal morbidity and mortality, particularly in low- and middle-income settings. Identifying its determinants and outcomes is essential for targeted interventions.

Aim: To determine the prevalence, predictors, and perinatal outcomes of low-birth-weight newborns over a five-year period.

Methodology: A descriptive retrospective study was conducted among 4,820 deliveries (≥ 28 weeks gestation) at a Nalanda Medical College, Patna, Bihar, India. Data were extracted from delivery registers and electronic records. Bivariate and multivariate logistic regression analyses were performed to identify predictors of LBW and its association with perinatal outcomes.

Results: LBW was more common among preterm births (43.6%) than term births (17.9%). Independent predictors of LBW included maternal age < 20 years (AOR 1.34), > 35 years (AOR 1.29), < 4 antenatal care visits (AOR 1.86), primigravida status (AOR 1.28), grand multiparity (AOR 1.41), and preterm delivery (AOR 3.62). LBW was strongly associated with stillbirth (AOR 6.84), low Apgar scores, and death within 24 hours (AOR 1.91).

Conclusion: Low birth weight remains prevalent and is driven by modifiable maternal and obstetric factors, with serious adverse perinatal outcomes. Strengthening antenatal care and preventing preterm birth are crucial to reducing LBW and improving neonatal survival.

Keywords: Low Birth Weight, Predictors, Perinatal Outcomes, Antenatal Care, Preterm Birth.

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Introduction

The issue of low birth weight (LBW) is a severe health problem in all countries of the world, and the World Health Organization (WHO) defines it as the weighing of a baby below 2,500 grams during the first hours of life, prior to the onset of sweating (or severe loss of weight) [1]. LBW has been commonly identified as a major cause of morbidity and mortality in neonates and infants, and health outcomes in the long term. The world estimates 14 percent prevalence of LBW where more than 96 percent of the infants who develop LBW are born in the developing countries. This imbalance highlights the disproportionate incidence of LBW in areas that have little healthcare facilities, nutrition difficulties and social economic disparities.

Studies carried out in Sub-Saharan Africa hospitals indicate that there is a significant difference in the prevalence of LBW across countries of as low as 9 percent in Rwanda [2] and as high as 31 percent in Sudan. The LBW prevalence trend in Tanzania has been decreasing over the last ten years even though

the population has increased significantly, 34.4 million to 44.9 million between the years 2002 and 2012 respectively, with the country LBW rates decreasing to 7% in 2010 as compared to 13% in 2000 [3]. These numbers, nevertheless, mask the differences in the country, on the regional level and stress the necessity of local research in order to evaluate the burden of LBW more precisely. These studies are needed to guide health policies and interventions of vulnerable groups.

LBW is highly linked to poor health lifelong outcomes. LBW is a risk factor that leads to a high morbidity and mortality rate during neonatal, infancy and even adulthood. This is a relationship that exists regardless of race and socioeconomic status [4]. As an example, an experiment in the United States on the racial disparities in birth outcomes showed that LBW is a significant predictor of stillbirths irrespective of racial. Besides, about one baby is dying every ten seconds in developing countries due to diseases associated with LBW, such as infections and other

diseases that are avoidable. These observations highlight the importance of making LBW one of the priorities of the primary public health variables and interventions.

LBW has long-term effects, which do not limit to early childhood. It has been known in epidemiological literature that LBW is associated with chronic medical illnesses like metabolic syndrome that comprise high blood pressure, elevated blood sugar, obesity of the abdomen, and dyslipidemia [5]. A meta-analysis also found out that LBW poses a risk of cardiovascular diseases, stroke, and diabetes in adulthood [6]. Such long-term outcomes lead to the rise of healthcare expenses and the decline of quality of life, which is why it is important to identify them at an earlier stage and prevent their occurrence.

A high level of risk of mortality occurs in the case of LBW infants as compared to normal weight infants. According to the reports made by WHO, LBW infants are at a 20 times risk of demise during infancy. Not only is LBW the cause of infant survival, but also childhood disability, educational achievement, and life expectancy [7] in general. Accordingly, LBW has been used as an overall indicator of the more general public health problems, such as malnutrition of the mother, poor prenatal care, socioeconomic disparities and exposure to poor environmental conditions.

A number of factors have been found to be predictors of LBW, and this includes both modifiable and non-modifiable factors. Such non-modifiable factors are female sex, first-born (primiparity), and multiple pregnancies where female newborns and first-borns tend to be lighter as compared to other babies. The modifiable predictors are mostly associated with maternal health and socioeconomic status, including nutritional deficiencies, poor maternal height, low socioeconomic status, poor antenatal care, maternal complications, and single parenthood [8]. Education has also been cited as an important determinant whereby increased maternal education is linked to less risk of LBW. Such results support the necessity of special intervention based on maternal health, nutrition, and the provision of prenatal services to avoid LBW.

Although LBW has been identified as a national health issue, the recent national statistics are scarce. The latest values are based on the Tanzania Demographic and Health Survey 2010 because the complete report of the 2015 survey is not available yet [9]. This is due to insufficient updated information, which is challenging health planning, resource allocation, and effective intervention implementation in healthcare facilities that handle LBW newborns. Local needs assessment and research is also needed to fill this knowledge gap, initiate evidence-based interventions, and make Sustainable Development Goals (SDGs), and SDG 3, which is to achieve a

reduction in the rate of neonatal and under-five mortality, possible [10].

Considering these concerns, this paper aims at establishing the prevalence, predictors and immediate perinatal outcomes of LBW in NMCH situated in Dares Salaem. It is hoped that the study will result in better policies regarding maternal and neonatal health, clinical care of LBW newborns, and the overall objective of the greater public health of lowering neonatal mortality in Tanzania and other similar environments by offering current and localized evidence.

Methodology

Study Design: A descriptive retrospective study was conducted to determine the prevalence, predictors, and perinatal outcomes of low-birthweight (LBW) newborns.

Study Area: Nalanda Medical College is a located in Patna, Bihar. The hospital provides comprehensive obstetric care, including emergency obstetric services and neonatal care. Birth records are maintained systematically in hospital delivery registers, which include maternal and neonatal variables, and are entered into an electronic database by trained staff.

Study Duration: The study covered six months from March 2025 to August 2025.

Sample Size: The total sample size was 4,820 deliveries, after applying inclusion and exclusion criteria.

Study Population: The study population comprised all live births and stillbirths ≥ 28 weeks gestational age delivered at NMCH during the study period, whose records were complete.

Data Collection: Data for the present study were collected retrospectively from the delivery registers and electronic obstetric records maintained at Nalanda Medical College, Patna. Trained hospital staff routinely record maternal and neonatal information at the time of delivery, which was subsequently retrieved for this study. The collected variables included maternal age, educational status, marital status, antenatal care attendance, parity, pregnancy and delivery-related complications, gestational age at delivery, and neonatal outcomes. Gestational age was estimated based on the last normal menstrual period and first-trimester ultrasonography where available. Birth weight was measured within the first hour of life using calibrated weighing scales and categorized according to World Health Organization criteria, with low birth weight defined as less than 2,500 grams. Perinatal outcomes such as stillbirth and neonatal status within the first 24 hours of life were also recorded.

Inclusion Criteria

- Newborns delivered at Nalanda Medical College during the study period
- Gestational age ≥ 28 weeks
- Complete maternal and neonatal records

Exclusion Criteria

- Births with gestational age < 28 weeks
- Incomplete or missing records

Procedure: Following delivery records corresponding to the study period were identified and reviewed. Records were screened for completeness, and those meeting the inclusion criteria were selected for analysis. Incomplete records and deliveries with gestational age less than 28 weeks were excluded. The eligible data were extracted using a structured data extraction format and entered into a computerized database. Data cleaning was performed to identify and correct inconsistencies or missing values prior to analysis. Variables were appropriately coded, and gestational age was dichotomized into preterm and term, while birth weight was classified into low birth weight and normal birth weight categories. Perinatal outcomes were classified as live birth, stillbirth, neonatal admission, or neonatal death within 24 hours.

Statistical Analysis: The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize maternal characteristics, neonatal parameters, and perinatal outcomes, with results presented as frequencies and percentages. Bivariate analysis

was conducted to assess the association between low birth weight and potential predictor variables using the chi-square test. Odds ratios with 95% confidence intervals were calculated to estimate the strength of these associations. Multivariate logistic regression analysis was performed to identify independent predictors of low birth weight while controlling for potential confounding factors, particularly gestational age. Statistical significance was set at a p-value of less than 0.05.”

Result

Table 1 shows the percentage distribution of maternal factors associated with low birth weight (LBW) among 4,820 births. Regarding maternal age, 612 women (12.7%) were < 20 years, 3,462 (71.8%) were 20–35 years, and 746 (15.5%) were > 35 years. Most women were ever married (4,514; 93.6%), while 306 (6.4%) were never married. Educational status varied, with 1,032 women (21.4%) having no formal education, 2,348 (48.7%) having primary education, and 1,440 (29.9%) having secondary education or higher. Antenatal care attendance showed that 1,742 women (36.1%) had fewer than 4 visits, while 3,078 (63.9%) had 4 or more visits. Regarding parity, 1,264 women (26.2%) were primigravida, 2,498 (51.8%) had 2–4 pregnancies, and 1,058 (22.0%) were grand multiparas (≥ 5 pregnancies). Overall, Table 1 highlights that a substantial proportion of women had risk factors for LBW, including young or advanced maternal age, low educational level, inadequate antenatal care, and high parity.

Variable	Category	Frequency (n)	Percentage (%)
Maternal age (years)	<20	612	12.7
	20–35	3,462	71.8
	>35	746	15.5
Marital status	Ever married	4,514	93.6
	Never married	306	6.4
Education level	No formal education	1,032	21.4
	Primary education	2,348	48.7
	Secondary & above	1,440	29.9
ANC visits	<4 visits	1,742	36.1
	≥ 4 visits	3,078	63.9
Parity	Primigravida	1,264	26.2
	2–4	2,498	51.8
	≥ 5	1,058	22

Table 2 presents the distribution of birth weight and gestational age in relation to perinatal outcomes among 4,820 births. Among term infants, 3,188 (82.1%) had normal birth weight and 696 (17.9%) were low birth weight (LBW), whereas among preterm infants, 528 (56.4%) were normal weight and 408 (43.6%) were LBW, showing a higher prevalence of LBW in preterm deliveries. Regarding stillbirths, 160 cases (61.1%) were LBW, compared to

102 (38.9%) with normal birth weight, indicating that LBW was more common in stillbirths. For 24-hour neonatal outcomes, 252 infants (51.2%) who died within 24 hours were LBW, whereas 852 (19.7%) of survivors were LBW, highlighting the strong association between low birth weight and early neonatal mortality. Overall, Table 2 demonstrates that low birth weight, particularly among preterm infants, is significantly linked to adverse

perinatal outcomes, including stillbirth and early neonatal death.

Variable	Category	Normal BW n (%)	LBW n (%)	Total
Gestational age	Term	3,188 (82.1)	696 (17.9)	3,884
	Preterm	528 (56.4)	408 (43.6)	936
Stillbirth	Yes	102 (38.9)	160 (61.1)	262
	No	3,614 (79.2)	944 (20.8)	4,558
24-hr outcome	Alive	3,478 (80.3)	852 (19.7)	4,330
	Died	238 (48.8)	252 (51.2)	490

Table 3 presents the bivariate analysis of factors associated with low birth weight (LBW) among 4,820 births. Maternal age <20 years was associated with a significantly higher risk of LBW (186 cases, 30.4%; OR: 1.72, 95% CI: 1.42–2.08, $p < 0.001$), as was maternal age >35 years (296 cases, 39.7%; OR: 1.48, 95% CI: 1.22–1.80, $p < 0.001$) compared to the reference group of 20–35 years (18.0%). Inadequate antenatal care (<4 visits) markedly increased the risk of LBW (564 cases, 32.4%; OR: 2.01, 95% CI: 1.73–2.33, $p < 0.001$) compared to ≥ 4 visits

(17.5%). Parity also showed a significant association: primigravida women had 364 LBW cases (28.8%; OR: 1.56, 95% CI: 1.32–1.84, $p < 0.001$), and grand multiparas (≥ 5) had 368 LBW cases (34.8%; OR: 1.62, 95% CI: 1.37–1.92, $p < 0.001$) compared to women with 2–4 previous pregnancies (14.9%). Overall, Table 3 indicates that maternal age extremes, inadequate antenatal care, and parity are strongly associated with the risk of delivering low birth weight infants.

Variable	Category	LBW n (%)	OR	95% CI	p-value
Maternal age	<20	186 (30.4)	1.72	1.42–2.08	<0.001
	20–35	622 (18.0)	1	Reference	—
	>35	296 (39.7)	1.48	1.22–1.80	<0.001
ANC visits	<4	564 (32.4)	2.01	1.73–2.33	<0.001
	≥ 4	540 (17.5)	1	Reference	—
Parity	Primigravida	364 (28.8)	1.56	1.32–1.84	<0.001
	2–4	372 (14.9)	1	Reference	—
	≥ 5	368 (34.8)	1.62	1.37–1.92	<0.001

Table 4 presents the multivariate logistic regression analysis identifying predictors of low birth weight among 4,820 births. Maternal age <20 years (adjusted OR: 1.34; 95% CI: 1.12–1.61, $p = 0.002$) and age >35 years (adjusted OR: 1.29; 95% CI: 1.08–1.54, $p = 0.004$) were both associated with increased risk. Inadequate antenatal care, defined as fewer than 4 visits, significantly increased the odds of low birth weight (OR: 1.86; 95% CI: 1.61–2.15, $p < 0.001$). Obstetric factors, including primigravida

status (OR: 1.28; 95% CI: 1.09–1.50, $p = 0.003$) and grand multiparity (≥ 5 pregnancies; OR: 1.41; 95% CI: 1.18–1.68, $p < 0.001$), were significant predictors. Preterm delivery had the strongest effect, with an OR of 3.62 (95% CI: 3.02–4.35, $p < 0.001$). Overall, Table 4 highlights that maternal age extremes, insufficient antenatal care, parity, and preterm birth are independent risk factors for delivering low birth weight infants.

Predictor	Adjusted OR	95% CI	p-value
Maternal age <20 yrs	1.34	1.12–1.61	0.002
Maternal age >35 yrs	1.29	1.08–1.54	0.004
<4 ANC visits	1.86	1.61–2.15	<0.001
Primigravida	1.28	1.09–1.50	0.003
Grand multiparity (≥ 5)	1.41	1.18–1.68	<0.001
Preterm delivery	3.62	3.02–4.35	<0.001

Table 5 presents the effect of low birth weight on adverse perinatal outcomes among 4,820 births. Low birth weight was strongly associated with increased risk of stillbirth, with an adjusted odds ratio

(OR) of 6.84 (95% CI: 5.62–8.32, $p < 0.001$). It was also linked to low Apgar scores, with ORs of 3.26 (95% CI: 2.74–3.88, $p < 0.001$) at 1 minute and 2.94 (95% CI: 2.45–3.52, $p < 0.001$) at 5 minutes.

Additionally, low birth weight increased the risk of neonatal death within 24 hours (OR: 1.91; 95% CI: 1.58–2.31, $p < 0.001$). Overall, Table 5 indicates that

low birth weight is a significant predictor of multiple adverse perinatal outcomes.

Outcome	Adjusted OR	95% CI	p-value
Stillbirth	6.84	5.62–8.32	<0.001
Apgar <7 (1 min)	3.26	2.74–3.88	<0.001
Apgar <7 (5 min)	2.94	2.45–3.52	<0.001
Death within 24 hrs	1.91	1.58–2.31	<0.001

Discussion

The current five-year research proves that low birth weight is a significant issue in the sphere of public health, almost a fifth of babies are born with it, and shows significant relationships between LBW, maternal factors, and poor or detrimental perinatal outcomes. This is more than the global predict of around 15 percent and 16.5 percent in developing countries, which implies increased load in referral and tertiary care that harbors complicated pregnancies (Valero de Bernabá et al., 2004) [11]. Hospital-based studies in sub-Saharan Africa have similarly reported similarly high rates because referral bias and high-risk obstetric profiles are prevalent (Zelege et al., 2012) [12]. This larger proportion of LBW in this study could hence indicate factors inherent in the mothers, risk factors, as well as the care delivered in the higher-level facilities.”

The maternal age was found to be a significant predictor and mothers who were below the age of 20 and above the age of 35 were found to have increased odds of LBW. The result is in line with previous research in Tanzania and other African contexts which have found a U-shaped association between maternal age and birth weight (Muganyizi & Kidanto, 2009; Oladeinde et al., 2015) [13,14]. Teen mothers are biologically and socially at risk with usually the competition between maternal growth and fetal needs to access nutrients, being in low socioeconomic status and having limited access to health information (Domenico and Jones, 2007) [26] [27]. Older maternal age, in its turn, is often related to chronic diseases and obstetric complications that could deteriorate placental functioning and fetal development thus posing a risk of LBW.

The patterns of educational level and use of antenatal care in the study were similar to those reported by the previous literature. Mothers who had less or no formal education and those who had less than four antenatal care visits had a significantly high likelihood of giving birth to LBW infants. Similar results have been reported in Ethiopia, Uganda and Nigeria where poor ANC attendance was associated with poor identification and management of nutritional deficiency, infections, and pregnancy related complications (Zelege et al., 2012; Oladeinde et al., 2015 [12,14]. The current study demonstrates that

the risk of LBW is almost doubled in women who had less than four ANC visits providing further evidence that targeted and timely ANC is a significant variable that can be modified to achieve better birth outcomes especially in low-resource areas (Lincetto et al., 2010) [24].

The parity was also significantly linked to the LBW as both the primigravada and the women with grand parity were at higher risks than the multiparous women. This trend is consistent with claims that the initial pregnancies can be deemed to be linked to uteroplacental immaturity and high parity could be a manifestation of maternal nutritional depletion and obstetric hazards (Amosu et al., 2011; Valero de Bernabé et al., 2004 [17,11]). Tanzanian and Nigerian studies have also reported similar associations, which implicates that the risks associated with parity are similar across the African populations (Muganyizi & Kidanto, 2009; Oladeinde et al., 2015) [13,14].

The strongest independent predictor of LBW in this study was preterm delivery with preterm infants having more than three times the likelihood of being born with low birth weight. The existing evidence supports this finding quite well wherein prematurity and intrauterine growth restriction are the two main pathways to LBW (Kramer, 1987) [18]. Other East African studies have also shown that low gestational age is strongly linked with LBW risk but a large percentage of LBW babies are delivered in term meaning growth restriction is involved (Zelege et al., 2012; Muganyizi & Kidanto, 2009) [12,13]. The presence of preterm births and IUGR will highlight the necessity of interventions that would bridge the health of the mothers and the delivery timing.

The correlation in the present study between LBW and negative perinatal outcomes was impressive. Infants with LBW were found to be significantly more likely to die at birth, at 1- and 5-minutes Apgar and at 24 hours of life in general. The results are in line with several studies that found LBW compromising neonatal adaptation and survival (Valero de Bernabé et al., 2004; Kidanto et al., 2006 [11,19]. The elevated rate of stillbirth in LBW infants in this case is consistent with that observed in referral hospitals in Tanzania where LBW has been pointed out as a leading cause of perinatal death (Kidanto et al., 2006) [19]. The low Apgar scores in LBW babies

are probably associated with physiological immaturity, lack of energy, and increased predisposition to hypoxia in labor and childbirth.

The mortality of LBW infants at early neonatal stages was also more frequent, which is consistent with the prior data collected in low-resource environments where respiratory distress, hypothermia, and infections are the most frequent causes of early death (Perlman et al., 2015; Wyatt, 2008) [20,21]. Even in resource-constrained settings, interventions like antenatal corticosteroids, better thermal care and early neonatal resuscitation have been found to decrease the mortality rate in LBW and preterm babies (Msemo et al., 2013) [22]. The close correlation between LBW and bad outcomes in the current study thus points to the biological susceptibility of such infants and the lack of preventive and supportive healthcare.

On the whole, the results of the current research are more or less in line with the existing literature on the topic, as they prove that maternal age extremes, insufficient antenatal healthcare, parity-related factors, and preterm birth are the significant predictors of LBW, whereas LBW per se is the significant risk factor that predisposes adverse perinatal outcomes. The risky nature of the population under study may indicate the higher level of some associations than those of community-based studies. These findings highlight the importance of enhancing the antenatal services, providing high-risk mothers with specific support, and enhancing the quality of perinatal and neonatal care in order to decrease the burden of low birth weight and its effects.

Conclusion

This study shows that low birth weight is a major area of concern in terms of public health, and a number of maternal and obstetric variables were found to be a major predictor. The maternal age at time of conception, that is the younger and older maternal age were independently related with the elevated risk of low birth weight whereas preterm delivery became the best predictor. Moreover, low birth weight was closely associated with unfavorable perinatal results, such as increased risks of stillbirth and low Apgar scores and early neonatal death. These results emphasize the need to implement specific maternal care interventions, timely antenatal visits, and preventive strategies to enhance newborn health outcomes through preterm birth prevention.

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