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Risk factors of children's low birth weight and infant mortality in Bangladesh: Evidence from binary logistic regression and Cox PH models

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Abstract

Background: Low birth weight is recognized as a pivotal risk factor affecting child survival and growth. Although Bangladesh has made commendable progress in public health, an infant mortality rate of 38 per 1000 live births and a 16% prevalence of low birth weight remain significant concerns compared to other developing countries. This situation poses a significant challenge for the formulation of future health policies in Bangladesh. As a result, this study aims to identify potential risk factors contributing to low birth weight and infant mortality among children in Bangladesh.

Methods: The data is extracted from the 2014 Bangladesh Demographic and Health Survey. The response variables are infant mortality and low birth weight. In the bivariate analysis, Log-rank tests and Chi-square tests of independence were conducted. Cox proportional hazards and binary logistic regression models were utilized to determine the impact of risk factors on infant mortality and low birth weight.

Results: This study identified several significant factors associated with children's low birth weight, including wealth index, parental education, birth order, twin births, mother's body mass index, and child sex. Additionally, wealth index, parental education, twin status, media exposure, birth order, antenatal care visits, prenatal care assistance, and low birth weight were identified as potential risk factors for infant mortality in Bangladesh.

Conclusion: This study revealed that maternal and child characteristics, along with knowledge about child health care during pregnancy, can potentially reduce the risk of low birth weight and infant mortality among children in Bangladesh. To improve child health and survival, policymakers should prioritize community-based health education programs, and encourage parents to seek healthcare information from institutional medical facilities during pregnancy and after birth.

KEYWORDS

Bangladesh, child health, Cox model, infant mortality, low birth weight, maternal health

1 | INTRODUCTION

Child size at birth is considered a key component of childhood development. Low birth weight (LBW) can lead to serious vulnerability to illness, increased infant mortality rate (IMR), and impaired growth during childhood. The high IMR is also regarded as a major health problem. The rates of LBW and IMR serve as an indicator of the overall quality of the healthcare and nutrition programs for children and their mothers in any country.[1–5] The high prevalence of LBW and IMR negatively impacts a country's economic and health situation.[6]

In general, infants with a birth weight less than 2.5 kg are classified as having LBW.[7] LBW is a leading cause of infant mortality in the developing world.[8] LBW has both short-term and long-term consequences, including infections, malnourishment, mental growth deficiencies, and disabilities during and after childhood. Moreover, LBW increases the risk of non-communicable diseases such as diabetes, and cardiovascular disease in later life.[9,10] Each year, LBW is responsible for approximately 60%–80% of neonatal deaths worldwide.[11] The incidence of LBW varies widely across regions, and it is more prevalent in low and middle-income nations, particularly among the most vulnerable populations.[12,13] It has been found that 15% of babies' worldwide experiences LBW and more than half of them born with LBW in Asia. In Bangladesh, the LBW rate has remained relatively constant in recent decades, with rates of 17.7% in 2011, 20% in 2014, and 16% in 2017–2018.[7] Although the LBW rate has decreased in Bangladesh between 2011 and 2017, it remains higher compared to most developing countries.

The IMR refers to the probability of a child dying before their first birthday. The World Health Organization (2018) reported that approximately 4 million deaths occurred globally before infants reached their first birthday. The main causes of infant mortality include birth defects, birth asphyxia, pneumonia, protracted labor, diarrhea, malaria, measles, malnutrition, congenital disorders, LBW, and smoking during pregnancy.[14,15] The Bureau of Economic Research reported that in Bangladesh, although the IMR is declining, it remained at 23 per 1000 live births in 2022.

The topic of LBW and infant mortality in developing countries has been a priority in various national and international discussions. Sustainable development goal (SDG) indicator 3.2.1 aims to reduce the child mortality rate to fewer than 25 deaths per 1000 live births annually across all countries by 2030,[16] emphasizing the importance of addressing infant health outcomes in this research. The eighth 5-year plan of Bangladesh revolves around six core themes, one of which (number six) is closely linked to infant mortality and LBW. In the perspective plan, the government is committed to achieving universal health care by 2030, aligning with the SDGs and their relationship with infant mortality and LBW. In this regard, maintaining a low prevalence of IMR and LBW is indispensable, not only for infants and their mothers but also for addressing new health challenges in Bangladesh.

Several studies have explored the risk factors of infant mortality[1–6,17–20] and children's LBW[8,17,21–30] using different DHS surveys across developing countries, including Bangladesh. These studies primarily investigated various socioeconomic and demographic variables as potential risk factors for infant mortality and LBW among children. However, the impact of maternal and child health-related variables on IMR and LBW among children remains unexplored. The current study aims to address this research gap in this context.

In Bangladesh, the current IMR stands at 38 per 1000 live births, and the prevalence of LBW (16%)[31] remains high compared to other developing countries. This difference poses a significant concern for the formulation of future health policies in Bangladesh. Therefore, comprehensive research is essential to improve children's health and achieve health-related SDGs within 2025. The primary objective of this study is to provide an overview and identify the impact of various contributing factors on children's LBW and infant mortality using statistical methods and regression models. The expected outcomes of this study will provide valuable insights to policymakers, not only in Bangladesh but also in other developing countries, in addressing future challenges related to children's survival and growth.

2 | MATERIALS AND METHODS

2.1 | Data source

This study utilizes data from the 2014 Bangladesh Demographic and Health Survey (BDHS), the seventh nationally representative survey designed to evaluate and monitor health programs across the country. This data set provides a comprehensive record of mother's health status during and after pregnancy, sociodemographic characteristics, and the survival status of their children under-5 years old.

2.2 | Study design

The 2014 BDHS employs a two-stage stratified random sampling design to select households. The sampling frame of the 2014 BDHS is based on the enumeration areas (EAs) listed in the 2011 Bangladesh census. Each EA, referred to as a primary sampling unit, consists of 120 households. In the first stage of sampling, 600 EA's are proportionally selected from both rural and urban areas. In the second stage, 30 households are randomly chosen from each selected EA for interviews. The sample consists of women who gave birth within 3 years before the 2014 BDHS.

2.3 | Study population

This study uses the “Kids recode (KR) file” of the BDHS 2014 data set. The original data set consists of 7,886 observations containing information on children's demographic, socioeconomic, and maternal health-related characteristics. However, one of the response variables, child size at birth, has 3447 missing responses. After discarding

all the missing cases, the final data set contains 4439 observations for analyzing the determinants of child size at birth in Bangladesh.

To examine the factors associated with infant mortality in Bangladesh, we created two subpopulations from the original data set based on demographic and health-related characteristics. The demographic and socioeconomic predictor variables have fewer missing observations compared to the maternal and child health-related predictors. After discarding all the missing cases from both subpopulations, the resulting datasets contain 7869 and 4481 observations, respectively, for analyzing the risk factors of infant mortality in Bangladesh. Supporting Information: Tables S1 and S2 provide summary descriptions of the study population.

2.4 | Response variables

The response variables in our study are child size at birth and infant mortality. In the 2014 BDHS, actual birth weights of children were not measured; instead, mothers reported their perception of the baby's birth size using categories such as "smaller than average," "very small," "larger than average," "average," and "very large." While these reports are subjective, they are regarded as valuable indicators for assessing LBW.[7] Childbirth size is categorized into two groups: babies reported as "smaller than average" or "very small" are classified as LBW, while those reported as "larger than average," "average," and "very large" are considered normal birth weight. Another response variable is the time to death or survival status within the first year of a child's birth. A censoring indicator is created for each child after observing their survival or death status at the end of first year. Survival time is calculated as the differences between date of birth and the event time (death event), while for censored observations, survival time is obtained by calculating difference between the current age of the child (in the day of interview) and date of birth. In this analysis, among 7886 children, 290 child deaths (event) were reported before reaching their first birthday.

2.5 | Predictor variables

This research considers a range of demographic, cultural, socioeconomic, fertility, maternal and child health-related predictor variables. The socioeconomic and cultural characteristics include: wealth index (poorest, poorer, middle, richer, and richest); religion (Muslim, non-Muslim); division (Dhaka, Khulna, Chattogram, Rangpur, Sylhet, Barisal, and Rajshahi); residence (rural and urban), parents education level (illiterate, primary, secondary, and higher-level) and media exposure (yes and no). Demographic variable includes: mother's age (15–19, 20–34, and 35–49 years); age at first marriage (18 years or less, 19 or more); childbearing age: (14 years or less, 15–19, and 20 years or more); employment status (yes and no). Maternal and child health variable includes: child's birth order (first order, second order, and third to higher order birth); twin status (single birth and multiple birth); antenatal care (ANC) visits (no visits, 1 visit, and 2 or more visits); body mass index (BMI) (underweight: BMI < 18.5, normal BMI: 18.5–24.9, and overweight: BMI > 25); cesarean section delivery (yes, no); delivery assistance and prenatal care after delivery (non-health professional, health professional), postnatal checkup within 2 months (yes or no) and preceding birth interval (first birth, 2 years or less, and more than 2 years).

2.6 | Statistical methods and models

The response variable is the time to death (infant mortality) within 1 year of a child. The log-rank test is used in bivariate analysis to examine the association between infant mortality and predictors. The Cox proportional hazard (PH) model is suitable for analyzing time to event data (infants survival time). The model for the life time variable T is defined as[32]

$$h(t) = h_0(t)C(x, \beta)$$

where, $C(x, \beta) = e^{\beta' x}$ and $h_0(t)$ is an arbitrary function. Another response variable, child size at birth is dichotomous. The chi-square test of independence is employed in bivariate analysis to investigate the association between risk factors and child size at birth. The binary logistic regression model is applied to examine the net effect of each category of the predictors holding other variables constant. The general form of the logit linear model is:

$$\log it(\pi_i) = \ln\left(\frac{\pi_i}{1 - \pi_i}\right) = \beta_0 + \beta_1 X_{1i} + \ldots\ldots\ldots + \beta_m X_{mi}.$$

The maximum likelihood estimates of the parameters are as follows:

$$\hat{\pi}_i = \frac{\exp(\hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \ldots\ldots\ldots + \hat{\beta}_m X_{mi})}{(1 + \hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \ldots\ldots\ldots + \hat{\beta}_m X_{mi})}.$$

All statistical analyses for this study were performed using SPSS version 20.

3 | RESULTS

3.1 | Bivariate analysis: Association between child size at birth and predictors

Supporting Information: Table S3 examines the association between respondent's child size at birth and predictor variables with the chi-square test of independence. The bivariate analysis reveals a decreasing trend in the percentage of children born with LBW as the respondent's wealth index increases from poorest to richest. The Rajshahi division shows the lowest percentage of children's LBW, whereas the highest percentage is observed among children's in the Sylhet division. Additionally, LBW percentages tend to increase from urban to rural areas. Mothers classified as underweight have a higher incidence of LBW children compared with those with normal or

overweight BMI. Children of highly educated parents exhibit a lower proportion of LBW, while mothers without access to media are more likely to have LBW children. Furthermore, twins and female children exhibit a higher incidence of LBW. The significant variables include wealth index, division, parent's education, media exposure, twin status, frequency of ANC visits, BMI, and child sex (p-value < 0.05). In contrast, variables such as respondent's age group, religion, age at first marriage, current employment, age at first birth, and preceding birth interval are not found to be significantly associated with child size at birth (p-value > 0.05). The significant variables used as predictors in a binary logistic regression model for analyzing child size at birth in Bangladesh.

3.2 | Binary logistic regression model: Child size at birth and predictors

Table 1 presents the parameter estimates, p-values, odds ratios (OR), and 95% confidence intervals (CI) of OR for each category of predictor variables obtained by the binary logistic model. The results indicate that the mother's education, mother's BMI, wealth index, birth order, twin status, and sex have significant effects on children's LBW.

Mothers who have completed higher, secondary and primary education are 38%, 26%, and 25% less likely to have LBW children compared to those whose mothers have no education (p-value < 0.05). Children's birth order also shows a significant association with child size at birth. The coefficient for third to 13th and second birth order children indicates a 27% and 20% lower chances of LBW compared with first birth order children (p-value < 0.05). Mothers with a healthy BMI are less likely to have children with LBW compared to underweight mothers (p-value = 0.00). Female children are 1.22 times more likely to have LBW compared with male children (p-value < 0.05). Children of richer and richest households have a 25% and 33% lower likelihood of being born with LBW compared to children of the poorest households. Among divisions, children of mothers from Barisal, Khulna, Rajshahi, and Rangpur division show a 38%, 24%, 48%, and 46% lower likelihood of having LBW compared to children of Dhaka division mother's (p-value < 0.05). The coefficients for the father's education, residence, ANC visits, and media access results are not statistically significant (p-value > 0.05).

3.3 | Bivariate analysis: Association between infant mortality and covariates

Figure 1 illustrates that children born in the poorest wealth quintile exhibit the highest mortality hazard rate compared to other wealth indices. Figure 2 demonstrates that children born with LBW experience the highest mortality hazard rate. Figure 3 indicates that children of uneducated mothers have a higher mortality rate compared to other education groups. Supporting Information: Figure S1 presents the survival curves of infants for each covariate.

TABLE 1 Parameters estimates of binary logistic regression model (4439 observations).

Predictors	Categories	β	p-Value	OR	95% CI of OR
Wealth index	Poorest (ref)				
	Poorer	−0.16	0.18	0.85	[0.67–1.07]
	Middle	−0.10	0.44	0.90	[0.70–1.16]
	Richer	−0.27	0.05	0.75	[0.57–1.00]
	Richest	−0.38	0.02	0.67	[0.48–0.95]
Division	Dhaka (ref)				
	Chittagong	−0.11	0.35	0.89	[0.70–1.13]
	Barisal	−0.46	0.00	0.62	[0.46–0.84]
	Khulna	−0.26	0.06	0.76	[0.57–1.01]
	Rajshahi	−0.63	0.00	0.52	[0.39–0.71]
	Rangpur	−0.61	0.00	0.54	[0.40–0.73]
	Sylhet	0.09	0.48	1.09	[0.85–1.40]
Residence	Urban (ref)				
	Rural	0.02	0.78	1.02	[0.85–1.23]
Mothers education	No education (ref)				
	Primary	−0.28	0.02	0.75	[0.5–0.95]
	Secondary	−0.29	0.02	0.74	[0.57–0.96]
	Higher	−0.46	0.02	0.62	[0.41–0.94]
Media exposure	No (ref)				
	Yes	0.01	0.89	1.01	[0.83–1.23]
Fathers education	No education (ref)				
	Primary	−0.09	0.36	0.90	[0.73–1.12]
	Secondary	−0.20	0.09	0.81	[0.63–1.03]
	Higher	−0.16	0.33	0.84	[0.59–1.19]
Birth order	First (ref)				
	Second	−0.22	0.02	0.80	[0.66–0.96]
	Third −13th	−0.31	0.00	0.73	[0.59–0.89]
Birth status	Single birth (ref)				
	Multiple	1.43	0.00	4.20	[1.19–9.07]
Mothers BMI	Underweight (ref)				
	Normal	−0.24	0.00	0.78	[0.65–0.93]
	Overweight	−0.28	0.03	0.74	[0.57–0.97]
ANC visits	No visit (ref)				
	One visit	−0.07	0.53	0.92	[0.72–1.18]
	Two or more	−0.15	0.13	0.85	[0.69–1.05]
Child sex	Male (ref)				
	Female	0.20	0.01	1.22	[1.05–1.42]
Intercept		−0.32	0.09	0.72	[0.49–1.05]

Note: Ref indicates reference category.

Abbreviations: ANC, antenatal care; BMI, body mass index; CI, confidence interval; OR, odds ratio.

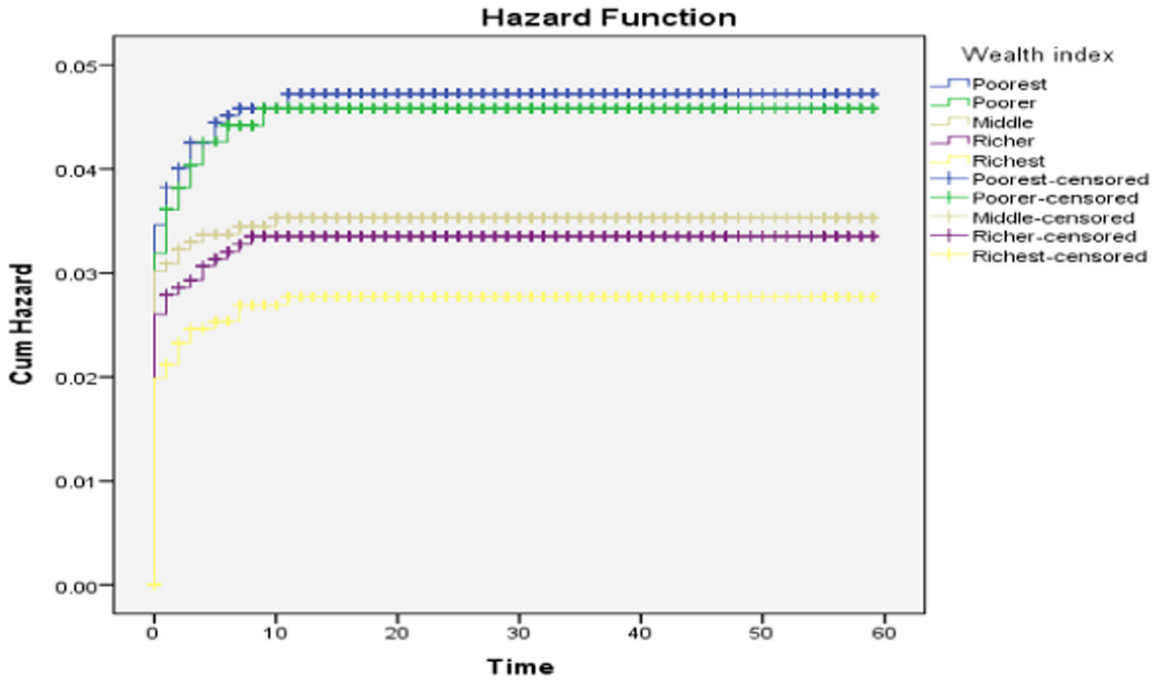

FIGURE 1 Wealth index.

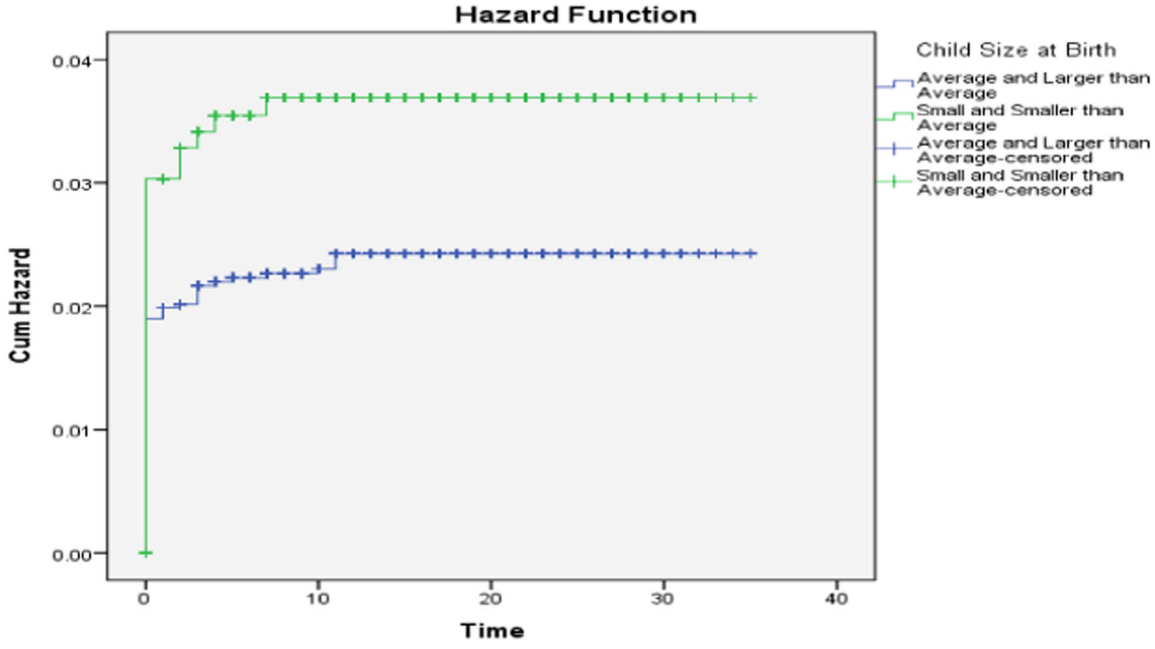

FIGURE 2 Child size at birth.

Supporting Information: Table S4 illustrates the association between infant mortality and covariates using the Mantel-Cox log-rank test. This test shows: wealth index, division, parent's education, media exposure, twin child, ANC visit, PNC assistance, postnatal check-up, and child size at birth are significantly associated with child survival in Bangladesh.

3.4 | Cox PH results for Model 1 covariates

Table 2 presents the results of the Cox PH model, including hazard ratios (HR) and 95% CI for HR. The analysis indicates that children from poorer, middle, richer, and richest family have a lower hazard (4%, 25%, 29%, and 42%, respectively) of dying

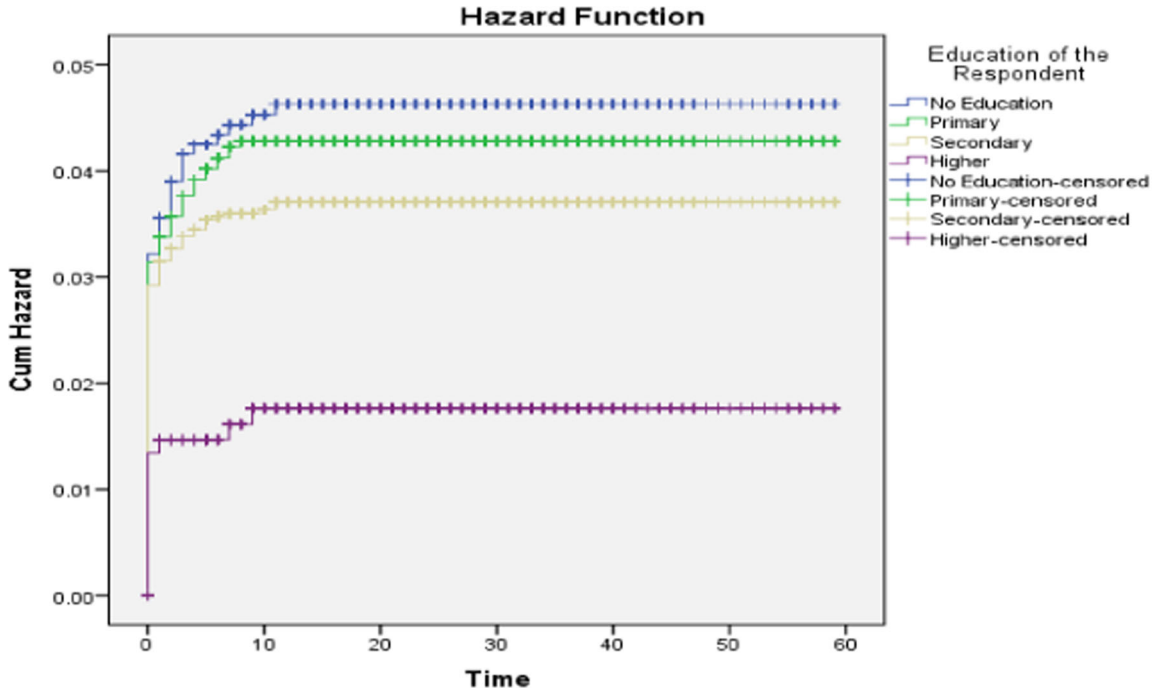

FIGURE 3 Mothers education.

before their first birthday compared with children from the poorest families.

Among divisions, children from Rajshahi, Chittagong, Rangpur, Khulna, and Sylhet divisions have 1.19, 1.20, 1.22, 1.41, and 1.75 times higher likelihood of experiencing infant mortality compared to children from Dhaka division. Only the coefficient for the Sylhet division shows significant results (p-value = 0.00). Children born to mothers with higher education have a 62% lower risk of dying before their first birthday compared to children of uneducated mothers (p-value < 0.05). Media access also has a significant impact, with mothers who have such access experiencing a 23% lower risk of infant mortality compared to their counterparts (p-value < 0.05). Second-order births show a lower risk of infant mortality compared with first births. Children born as multiples are 8.23 times more likely to experience infant death (p-value = 0.00). Children born after a preceding birth interval of more than 2 years have a 23% lower risk of infant mortality compared to first-born children (p-value < 0.05).

3.5 | Cox PH results for Model 2 covariates

Table 3 presents the results of health-related predictors using the Cox PH model. It indicates that mothers with 1 ANC visit have a 10% lower risk of infant mortality, whereas those with 2 or more visits have a 45% lower risk compared to those with no ANC visits during pregnancy (p-value = 0.00).

Children born to mothers who receive prenatal care assistance from health professionals experience a 38% lower risk of infant mortality compared to their counterparts (p-value = 0.00). Postnatal checkup for babies is another key factor, with mothers who receive them having a 47% lower chance of infant mortality (p-value = 0.00). Children born with LBW are 1.53 times more likely to experience infant mortality than normal birthweight babies (p-value = 0.00).

4 | DISCUSSION

This study examines the impact of respondent's demographic, socioeconomic, and health-related characteristics on children's LBW in Bangladesh applying a logistic regression model. The analysis of regional impacts showed that respondents from the Rangpur, Rajshahi, Khulna, and Barisal divisions are at a lower risk of having LBW children compared to respondents from the Dhaka division.

The study's findings indicate that maternal educational status and economic situation are key risk factors for children's LBW in Bangladesh. Educated parents generally seek out better maternal healthcare services during pregnancy and utilize the facilities provided by institutional healthcare providers. In contrast, mothers with poor economic conditions often cannot afford essential and emergency healthcare services. The study reveals that mothers with higher educational attainment and good economic condition were less likely to deliver an LBW baby than mothers with lower level of education and income. This result aligns with earlier investigations,[25,28,33] which similarly identified maternal education and wealth status as significant risk factors of children's LBW.

Evidence has shown that multiple pregnancies increases the risk of LBW in children. The findings indicate that children born from

TABLE 2 Parameters estimates of Cox PH Model 1 (7869 observations).

Predictors	Categories	β	*p*-Value	HR	95% CI of HR
Wealth index	Poorest (ref)				
	Poorer	−0.03	0.85	0.96	[0.69–1.34]
	Middle	−0.28	0.11	0.75	[0.53–1.07]
	Richer	−0.33	0.05	0.71	[0.50–1.01]
	Richest	−0.53	0.00	0.58	[0.40–0.85]
Division	Dhaka (ref)				
	Chittagong	0.18	0.37	1.20	[0.79–1.80]
	Barisal	−0.20	0.44	0.81	[0.48–1.37]
	Khulna	0.34	0.13	1.41	[0.90–2.20]
	Rajshahi	0.17	0.44	1.19	[0.75–1.87]
	Rangpur	0.20	0.37	1.22	[0.78–1.92]
	Sylhet	0.56	0.00	1.75	[1.19–2.58]
Mothers education	No education (ref)				
	Primary	−0.07	0.66	0.92	[0.66–1.29]
	Secondary	−0.21	0.18	0.80	[0.58–1.10]
	Higher	−0.96	0.00	0.38	[0.21–0.68]
Media exposure	No (ref)				
	Yes	−0.25	0.03	0.77	[0.61–0.98]
Fathers education	No education (ref)				
	Primary	−0.18	0.20	0.82	[0.62–1.10]
	Secondary	−0.25	0.08	0.77	[0.57–1.03]
	Higher	−1.03	0.00	0.35	[0.21–0.58]
Childbirth order	First birth (ref)				
	Second birth	−0.33	0.02	0.71	[0.53–0.95]
	Third–13th birth	−0.07	0.60	0.93	[0.71–1.21]
Twin child	Single birth (ref)				
	Multiple birth	2.10	0.00	8.23	[5.67–11.9]
Preceding birth interval	First birth (ref)				
	10–23 (months)	−0.38	0.14	0.68	[0.40–1.14]
	24 months or more	−0.25	0.03	0.77	[0.61–0.98]

Abbreviations: CI, confidence interval; HR, hazard ratio; PH, proportional hazard; OR, odds ratio.

multiple pregnancies are more likely to have LBW compared to those from single births. This result coincides with those of previous studies.[33,34] Underweight mothers are more likely to deliver LBW babies compared to mothers with other BMI indicators. A number of studies have confirmed that LBW is more prevalent among children whose mothers have a low BMI. Inadequate nutritional intake by mothers during pregnancy can hamper fetal development, contributing to their children's LBW.

The analysis reveals that children born to first-time mothers are more likely to have LBW compared to those born to women who have previously given birth. This result is consistent with the findings reported by Singh et al.[33] and Chhea et al.[35] One potential reason is that first-time mothers may be less familiar with maternal healthcare practices during pregnancy, such as iron supplements, tetanus injections, and ANC visits to the institutional healthcare provider. This study identifies that female children are more susceptible to LBW than male infants. The results are consistent with the other studies.[33,34,36] A study confirms that female fetuses may be more sensitive to maternal glucose levels and the intrauterine environment compared to the male fetuses, potentially influencing of LBW in female infants.[37]

This study also investigates the influence of various risk factors on infant mortality in Bangladesh using the Cox PH model. Among various factors, education is often considered an important determinant of child survival and growth. Educated parents are more likely to be informed about maternal and child healthcare practices during and after pregnancy. They utilize the knowledge gained from institutional healthcare providers to benefit their children's health. The analysis highlights that parents with higher levels of education were less likely to experience infant mortality than those with less education. This result aligns with the other studies.[17,19,20,38] Media access is recognized as a protective factor for child survival. Mothers with media access often seek essential healthcare information for their children through newspaper, TV, or internet. The findings indicate that children born into households with media access have a lower risk of experiencing infant mortality compared to those without media exposure. This result aligns with findings from other studies.[1,17]

The results indicated that first-time mothers face higher IMRs compared to those with previous childbirth experience. This may be due to first-time mothers either not seeking essential medical support from institutional healthcare providers or experiencing complications during pregnancy. Preceding birth interval is another crucial risk factor for infant mortality. Generally, infants born with short delivery intervals experience more labor complications than those born with longer intervals, which can lead to increased mortality risks. The results show that children born with intervals exceeding 2 years have a lower risk of mortality compared to those born with intervals of 2 years or shorter. This finding is consistent with those of previous studies.[4,19] The current study highlights that multiple births (twins, triplets, or other) pose a potential risk factor for infant mortality in Bangladesh. This could be due to the higher likelihood of multiple birth children being born prematurely and with LBW.

This research identifies children's LBW as a potential determinant for infant mortality. The results show that children born with LBW experience a higher risk of mortality to those born with normal birth weights. This association can be attributed to the impact of birth weight on the child's immune system and nutritional status.[39] This finding aligns with some previous studies.[4,19,38] Maternal healthcare practices are crucial for child survival. Mothers who use these

TABLE 3 Parameters estimates of Cox PH model 2 (4481 observations).

Predictors	Categories	β	*p*-Value	HR	95% CI of HR
ANC visits	No visit (ref)				
	One visit	−0.09	0.70	0.90	[0.53–1.52]
	Two or more visit	−0.59	0.00	0.55	[0.36–0.84]
Prenatal care assistance	Nonhealth professional (ref)				
	Health professional	−0.46	0.02	0.62	[0.42–0.93]
Baby postnatal check	No (ref)				
	Yes	−0.63	0.00	0.53	[0.36–0.76]
Child size at birth	Normal birth weight (ref)				
	Low birth weight	0.43	0.04	1.53	[1.01–2.32]

Abbreviations: ANC, antenatal care; CI, confidence interval; HR, hazard ratio; PH, proportional hazard.

services from institutional providers are better informed about recognizing early signs of illness, ensuring immunizations, and securing essential nutrients during pregnancy. This positively impacts both their own health and their children's overall well-being. This study examines the impact of maternal healthcare practices on infant mortality. The analysis reveals that mothers who have access to ANC services, prenatal care assistance, and postnatal checkups for their children experience a significantly lower risk of infant mortality. This result supports findings from previous research.[19,20]

5 | CONCLUSION

This research highlights risk factors contributing to children's LBW and infant mortality in Bangladesh. The study emphasizes that increasing parental education, improving maternal health, and enhancing healthcare utilization are key measures to reduce the incidence of LBW among children. Additionally, this study underscores the importance of longer intervals between births, sufficient ANC visits and postnatal check-ups by medical professionals, specialized care for multiple births, and attention to LBW infants in decreasing IMRs. Given these findings, policymakers should focus on improving parent's interactions with medical institutions during pregnancy and after childbirth. This will ensure better health outcomes for both children and mothers.

AUTHOR CONTRIBUTIONS

Md. Johurul Islam: Conceptualization; literature review; data curation; formal analysis; methodology; writing-original draft. **Mashfiqul Huq Chowdhury**: Conceptualization; methodology; supervision; validation; writing-review and editing. **Mohammad Mafiz Rahman**: Literature review; methodology; review and editing. **Zubaidur Rahman**: Conceptual and methodological development; review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data are available at https://dhsprogram.com/.

ETHICS STATEMENT

The study does not require ethical approval as the BDHS 2014 survey was approved by the local Ethics Committee of Bangladesh and the ICF Macro at Calverton, New York, USA. Permission to use and analyse the data set was obtained by registering the study on the DHS website.

TRANSPARENCY STATEMENT

The lead author Mashfiqul Huq Chowdhury affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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