

Risk Factors for Low Birth Weight Infants: A Study in Tertiary Level Hospital of Bangladesh

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Original Research Article Abstract:

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This descriptive study focused on low-birth-weight (LBW) newborns' hospitalization during their first three days of life, with the aim of investigating common complications in these infants. The study was conducted at Rajshahi Medical College Hospital, Bangladesh, encompassing the period from July 2019 to June 2021. Written informed consent was obtained from the participants, and data were collected using a pre-designed proforma and analyzed using SPSS 26. Out of 1511 deliveries at the hospital, 565 newborns were identified as LBW, resulting in a prevalence of 37.4%. Among the LBW babies, 55.8% were male and 44.2% were female. During their initial hospitalization, 41.9% (237 out of 565) of LBW newborns experienced various immediate problems, either alone or in combination. The most prevalent complications among these admitted LBW newborns were jaundice (40.1%), birth asphyxia (25.7%), respiratory distress syndrome (RDS) (21.1%), hypothermia (19.8%), hypoglycemia (19.0%), congenital malformations (6.3%), necrotizing enterocolitis (NEC) (5.1%), and intraventricular hemorrhage (IVH) (4.2%). The study highlighted that major complications faced by these LBW infants were jaundice, birth asphyxia, hypothermia, hypoglycemia, RDS, and sepsis. These findings contribute to a better understanding of the health challenges faced by LBW newborns during their initial hospitalization, and they emphasize the importance of early detection and management of these complications to improve outcomes for these vulnerable infants.

Key Words: Prevalence, Low birth weight, complications, problems.

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INTRODUCTION

Moreover, 20 million newborns are born with low birth weight yearly, for 15.5% of all births globally. Newborn babies with low birth weight make up more than 96% of all low-birth-weight infants, and the incidence of low birth weight in developing countries (16.5 %) is more than twice as high as in developed countries (7.0 %).^{1,2} 25% of neonates born in Pakistan are low birth weight.³

Premature births are connected with a 40% mortality rate compared to those with normal birth weights.⁴ Major problems and causes of mortality (91%) in them are attributed to neonatal sepsis, birth asphyxia and respiratory distress syndrome. Low birth weight is the most common risk factor for Hypoglycemia (47.47%).⁵ Prematurity and its associated consequences account for 35% of all infant deaths, followed by congenital malformations (23%), sepsis (19%), and delivery asphyxia (16%) in newborns weighing 1000-2000 g.⁶ Low birth weight newborns are more likely to suffer from intra- or peri-ventricular haemorrhage, which is inversely proportional to both birth weight and gestational age. i.e. 75% in babies weighing <2000gms and <34 weeks gestation.⁷ Necrotizing enterocolitis, a condition that affects one to 1-7 percent of premature low-birth-weight newborns, is also more common in these infants. i.e. 10% in < 1500gms.⁸ Incidence of Jaundice in low birth weight babies is higher (35.6%) as compared to normal birth weight babies (16.9%). Hypothermia (34.8%) is also a significant problem in low birth weight babies.⁹ This study aimed to determine the prevalence of issues in low-birth-weight infants during the first three days of life to design preventative measures for low birth weight and related complications.

METHODS

Study Setting and Participants

This descriptive case series study was conducted at the department of Gynecology & Obstetrics and Pediatrics department at Rajshahi Medical College Hospital, Bangladesh. The study included all newborns born at the hospital throughout the research period who met the criteria of low birth weight (LBW), defined as infants born with birth weights less than 2500 grams. A total of 237 LBW infants were enrolled and admitted to the Pediatric department during the study period.

Data Collection and Variables

Upon birth, all eligible newborns were entered into the hospital's birth registry. Data on various clinical parameters were collected using a pre-coded proforma. The following clinical parameters were assessed:

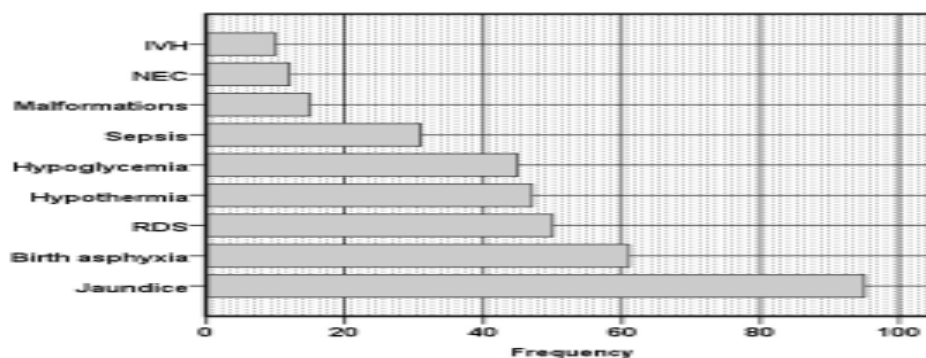
- **Low Birth Weight (LBW):** Infants with birth weight less than 2500 g or 5.5 lbs were considered to have LBW.
- **Hypoglycemia:** Blood sugar levels were measured on bedside Glucometers using sticks. Hypoglycemia was defined as blood sugar levels less than 45mg/dl and was further confirmed by measuring blood glucose levels.
- **Sepsis:** Sepsis was diagnosed based on the presence of three or more of the following criteria: lethargy, refusal to feed, vomiting, seizures, temperature less than 35°C or greater than 38.5°C, or complete blood count (CBC) showing white blood cell (WBC) count greater than 20,000cmm or less than 5000/cm, along with a positive blood culture.
- **Birth Asphyxia:** Birth asphyxia was identified in newborns that did not cry or failed to initiate respiratory effort within one minute of birth and had an APGAR score of 0-3 for more than 5 minutes.
- **Hypothermia:** Hypothermia was defined as newborns having a cold body to touch and a rectal temperature below 35°C.
- **Intraventricular Hemorrhage:** The diagnosis of intraventricular hemorrhage was based on the presence of two or more of the following symptoms: lethargy, bulging fontanel, apnea (cessation of breathing for more than 20 seconds with bradycardia, i.e., heart rate less than 100 beats per minute), seizures, and ultrasound brain showing germinal matrix hemorrhage with or without ventricular enlargement and/or bleeding in brain tissue surrounding ventricles appearing as anechoic areas on ultrasound.
- **Necrotizing Enterocolitis (NEC):** NEC was diagnosed when newborns presented with two or more of the following symptoms: feeding intolerance, abdominal distension, gross bloody stools, and x-ray abdomen showing intramural gas (pneumatosis intestinalis).
- **Respiratory Distress Syndrome (RDS):** RDS was identified based on the presence of two or more of the following symptoms: tachypnea (respiratory rate > 60 breaths per minute), expiratory grunting, chest retractions, cyanosis, and x-ray chest showing a uniform reticulogranular pattern and air bronchogram.
- **Jaundice:** Jaundice was diagnosed by observing yellowish discoloration of the skin and mucous membranes, and serum bilirubin concentration was measured to confirm levels above 5mg/dl.
- **Congenital Malformations:** Any visible structural defect present in newborns was recorded as a congenital malformation.

Data Analysis

The collected data were analyzed using SPSS-26 software. Since this study was descriptive in nature, no statistical tests were applied. Frequencies of all variables, including sepsis, respiratory problems (such as respiratory distress syndrome), hypoglycemia, intraventricular hemorrhage, necrotizing enterocolitis, jaundice, hypothermia, and congenital malformations, were calculated as percentages and presented in tabulated and graphical forms. To control for potential effect modifiers or confounding variables such as sex and day of life, the data were stratified and presented in tabulated and graphical formats.

RESULTS

During the study period, the total number of deliveries in Rajshahi Medical College Hospital was 1511, and the total number of Low birth weight (LBW) babies was 565 (37.4%) of total deliveries. Out of 565 LBW, 237 (41.9%) LBW babies with one or more problems were admitted to the pediatric department nursery and evaluated for immediate complications.



Graph- 1: Frequency distribution of admitted low birth weight by immediate problems (n=237)

IVH- intraventricular haemorrhage; NEC- necrotizing enterocolitis; RDS- respiratory distress syndrome

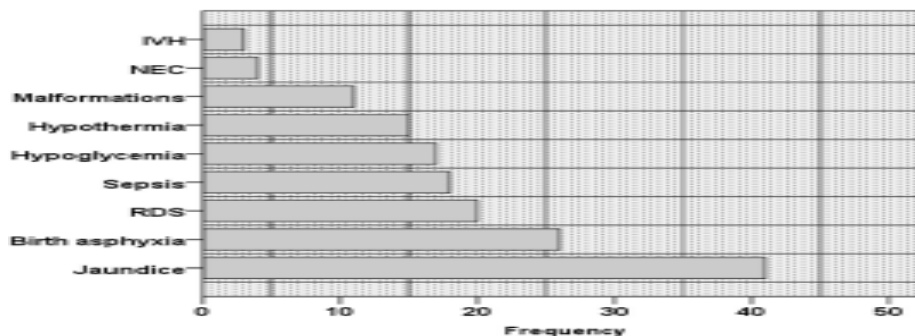
Graph 1: shows immediate problems among 237 admitted LBW babies. Jaundice, birth asphyxia, RDS, hypothermia and Hypoglycemia were diagnosed in 95 (40.1%), 61 (25.7%), 50 (21.1%), 47 (19.8%) and 45 (19.0%), respectively. Other problems diagnosed included culture-positive sepsis in 31 (13.1%), congenital malformations in 15 (6.35%) and NEC and IVH were diagnosed in 12 (5.1%) and 10 (4.2%), respectively.

Table 1: Frequency distribution of diagnosed problems in admitted low birth weight babies according to today of life (n=237)

Problems	Frequency by day of life			Total
	1 st Day	2 nd Day	3 rd day	
Jaundice	23(9.7%)	31 (13.1%)	41(17.3%)	95(40.1%)
Birth asphyxia	61(25.7%)	-	-	61(25.7%)
RDS	50(21.1%)	-	-	50(21.1%)
Hypothermia	31(13.1%)	11(4.6%)	5(2.1%)	47(19.8%)
Hypoglycemia	33(13.9%)	9(3.8%)	3(1.3%)	45(19.0%)
Sepsis	-	23(9.7%)	10(4.2%)	31(13.1%)
Malformations	15(6.3%)	-	-	15(6.3%)
NEC	-	4(1.7%)	8(3.4%)	12(5.1%)
IVH	2(0.8%)	3(1.3%)	5(2.1%)	10(4.2%)

RDS- respiratory distress syndrome; NEC- necrotizing enterocolitis; IVH- intraventricular Hemorrhage

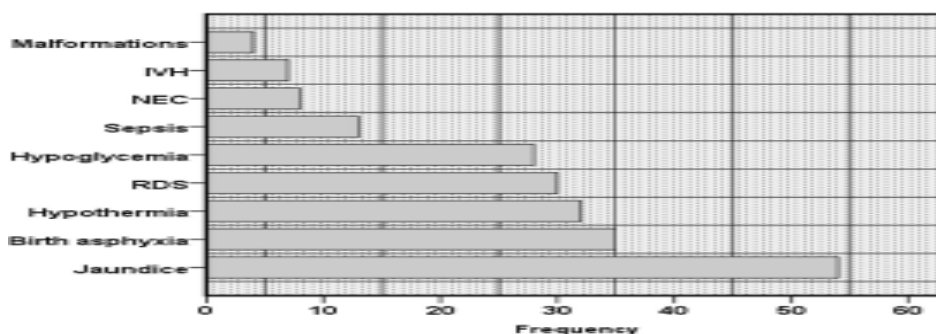
Table 1 shows the frequency of problems in 237 admitted LBW babies by day of life. Major problems diagnosed on the first day of life included Birth asphyxia in 61 (25.7%), RDS in 50 (21.1), hypoglycemia in 33 (13.9%), hypothermia in 31 (13.1%), jaundice in 23 (9.7%) and congenital malformation in 15 (6.35%) babies and IVH was diagnosed in only 2 (0.8%) babies on the first day of life. Problems faced by admitted LBW babies on the second day of life included in decreasing frequency: jaundice in 31 (13.1%), sepsis in 23 (9.7%), hypothermia in 11 (4.6%), hypoglycemia in 9 (3.8%), NEC in 4 (1.7%) and IVH in 3 (1.3%). The frequency of Jaundice and sepsis diagnosed on the third day of life was 41 (17.3%) and 10 (4.2%), respectively, followed by NEC in 8 (3.4%), hypothermia 5 (2.1%) and IVH in 5 (2.1%) babies.



Graph-2: Frequency distribution of admitted full-term low birth weight according to immediate problems (n=148)

IVH- intraventricular haemorrhage; NEC- necrotizing enterocolitis; RDS- respiratory distress syndrome

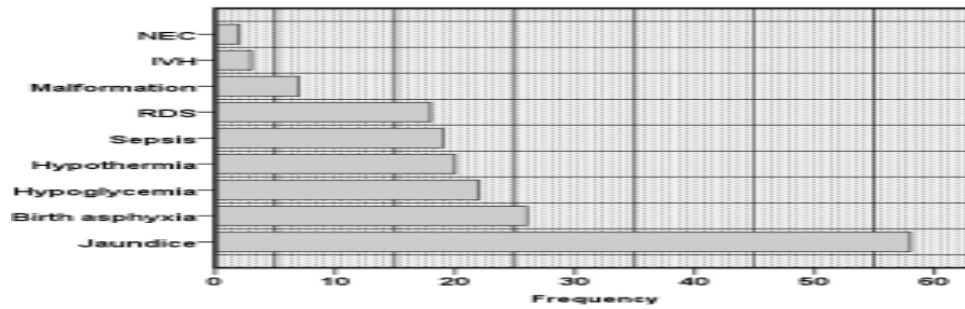
Graph 2 shows the distribution of immediate problems in 148 full-term newborns out of 237 admitted LBW babies. Out of these 148 full-term LBW babies, Jaundice was diagnosed in 41 (27.7%) babies, birth asphyxia in 26 (17.6%), RDS in 20 (13.5%), culture-positive sepsis in 18 (12.1%), Hypoglycemia in 17 (11.5%), hypothermia in 15 (10.1%) while congenital malformations, NEC and IVH were problems diagnosed in 11 (7.4%), 4 (2.7%) and 3 (2.0%) respectively.



Graph-3: Frequency distribution of admitted preterm low birth weight according to immediate problems (n=89)

IVH- intraventricular haemorrhage; NEC- necrotizing enterocolitis; RDS- respiratory distress syndrome

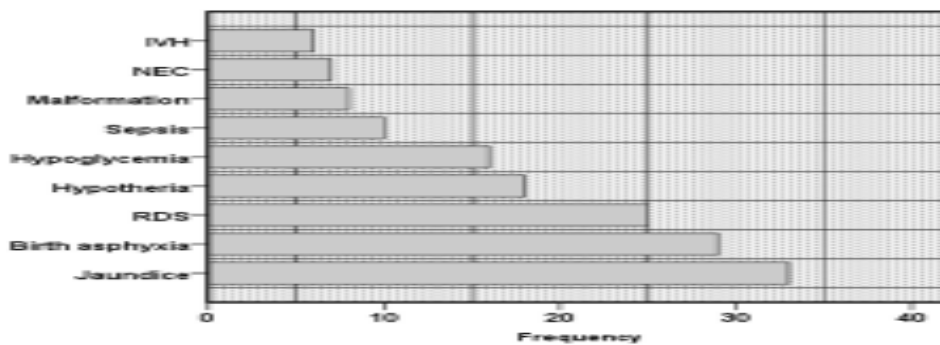
Graph 3 shows the distribution of immediate problems in 89 preterm newborns out of 237 admitted LBW babies. Jaundice was the most common problem occurring in 54 (60.7%) newborns, followed by birth asphyxia in 35 (39.3%), hypothermia in 32 (36.0%), RDS in 30 (33.7%), Hypoglycemia in 28 (31.5%), sepsis in 13 (14.6%), NEC in 8 (9.7%), IVH in 7 (7.9%) and congenital malformations in 4 (4.5%) preterm LBW babies.



Graph-4: Frequency distribution of admitted newborn with birth weight 2500-1500 g according to immediate problems (n=133)

NEC-necrotizing enterocolitis; IVH- intraventricular haemorrhage; RDS- respiratory distress syndrome.

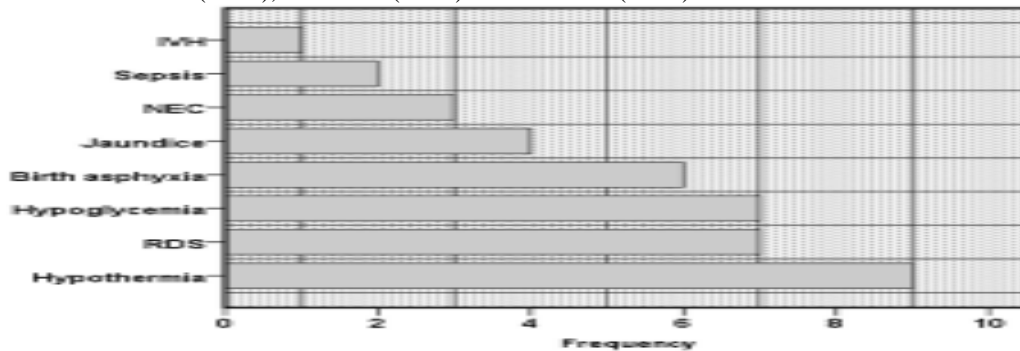
Graph 4 shows the distribution of problems in 133 out of 237 admitted babies having a weight of 2500- 1500 g. Jaundice was the most common problem occurring in 58 (43.6%) newborns, followed by birth asphyxia in 26 (19.5%), Hypoglycemia in 22 (16.5%), hypothermia in 20 (15.0%), sepsis in 19 (14.3%), respiratory distress syndrome in 18 (13.5%), congenital malformations in 7 (5.3%), IVH in 3 (2.3%) and NEC in 2 (1.5%) newborn babies.



Graph-5: Frequency distribution of admitted newborn with birth weight 1000-1499 g according to immediate problems (n=94)

IVH- intraventricular hemorrhage; NEC-necrotizing enterocolitis; RDS- respiratory distress syndrome.

Graph 5 shows the distribution of problems in 94 out of 237 admitted babies with a weight of 1499- 1000 g. Jaundice was the most common problem occurring in 33 (35.1%) newborns, followed by birth asphyxia in 29 (30.9%), respiratory distress syndrome in 25 (13.5%), hypothermia in 18 (19.1%), hypoglycemia in 16 (17.0%), sepsis in 10 (10.6%), congenital malformations in 8 (8.5%), NEC in 7 (7.4%) and IVH in 6 (6.4%) newborn babies.



Graph-6: Frequency distribution of admitted newborn with birth weight 999-750 g according to immediate problems (n=10)

IVH- Intraventricular hemorrhage; NEC-necrotizing enterocolitis; RDS- respiratory distress syndrome.

Graph 6 shows the distribution of problems in 10 out of 237 admitted babies and having weights 999- 750 g. Hypothermia was the most common problem occurring in 9 (90.0%) newborns, followed by respiratory distress syndrome in 7 (70.0%), Hypoglycemia in 7 (70.0%), birth asphyxia in 6 (60.0%), Jaundice in 4 (40.0%), NEC in 3 (30.0%), sepsis in 2 (20.0%), IVH in 1 (10.0%) and no congenital malformation was noted in these children.

DISCUSSION

We conducted this study at Rajshahi Medical College Hospital, Bangladesh, to determine immediate problems associated with LBW babies during 1st three days of life. Differences in incidence and characteristics of LBW reflect multiple risk factors and may be due to maternal malnutrition, maternal medical illnesses, poverty, inadequate knowledge about antenatal care and/or no antenatal care, educational, ethnic and racial backgrounds and may be male baby preference society where male babies are delivered at health set-ups.

Regarding problems of LBW babies (n=237) in our study, Jaundice (40.1%), birth asphyxia (25.7%), respiratory distress syndrome (21.1%), hypothermia (19.8%), Hypoglycemia (19.0%) and sepsis (13.1%) were leading problems of LBW babies followed by congenital malformations in 6.3%, necrotizing enterocolitis (NEC) in 5.1% and intraventricular haemorrhage (IVH) in 4.2% babies. The frequency of the problems in LBW babies increased with decreasing gestational age and birth weight.

Many studies have been conducted regarding morbidities and mortality in LBW babies showing increased mortality and the same patterns of problems in LBW babies with decreasing gestational age and birth weight.¹⁰ Study conducted in Peshawar reported 52.52% mortality in LBW babies with neonatal sepsis, birth asphyxia and respiratory distress syndrome contributing to 91% mortality in them.¹¹ Khan *et al.* study from Peshawar reported that Hypoglycemia was seen in 34% of SGA babies and 32.3% preterm babies. SGA babies are at increased risk of Hypoglycemia compared to AGA newborns (34% vs 3%) with symptomatic Hypoglycemia more common in preterm babies vs term babies (32.3% vs 28.9%).¹² De Kumar *et al.* study from Kolkata, India, on blood glucose levels in normal and low birth weight newborns and the impact of early breastfeeding in tertiary care hospitals reported an overall incidence of Hypoglycemia in 49 (32.67%) out of 150 newborns. The study reported that the incidence of Hypoglycemia was greater in LBW babies than in normal birth weight babies (64% vs 14% respectively), SGA than AGA (64% vs 26% respectively; $P < 0.01$) and preterm than term counterparts (77.77% vs 22.95% respectively; $P < 0.01$). A study from Bangladesh, along with other problems in preterm babies, reported sepsis in 32%, perinatal asphyxia in 20%, Jaundice in 24%, Hypoglycemia in 8%, temperature instability in 6%, RDS in 6%, NEC in 4%, congenital malformations in 4% and IVH in 2% babies.¹³

Miller *et al.* study on hypothermia in very low birth weight infants reported hypothermia in 56.2% of VLBW babies.¹⁴ Ismail *et al.* study on premature and low birth weight neonates and their management at Shaikh Zayed Hospital, Lahore, reported that the proportion of preterm and LBW with congenital malformations was 7.3% as compared to 5.4% among remaining deliveries.¹⁵ Study from Allama Iqbal Medical College/Jinnah Hospital, Lahore, on the frequency of intraventricular haemorrhage in preterm neonates reported that out of 100 patients, 12% of patients developed IVH. Gestational age was followed for these showing that 63% presented were from 30 to 35 completed weeks of gestation. Most of the neonates were VLBW (41%). 37% were LBW, 13% were ELBW, and 09% were incredibly low birth weight. The study also reported that 11% of these babies developed IVH during the first 24 hours of life; out of total, 09% had grade-I IVH, 3% had grade-II IVH, and 01% had grade-III IVH and 02% developed grade-IV IVH. Study concluded that IVH is major problem of preterm infants and is inversely related to birth weight of neonate.¹⁶ We recommend further studies analyzing risk factors and mechanisms behind this varying prevalence, characteristics and problems of LBW with large sample sizes and multiple settings to reach firm conclusions.

CONCLUSION

Our study also showed that LBW is a significant risk factor for various complications, including Jaundice, birth asphyxia, RDS, Hypoglycemia, hypothermia, sepsis, IVH, NEC and congenital malformations. The frequency of these problems increased with decreasing gestational age and birth weight. We recommend health education of mothers and strengthening of health care facilities at both community and facility levels to overcome the burden of LBW. Strategies and interventions should be identified for the timely recognition and management of problems in LBW babies.

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