



**Mortality predictors and early outcomes in very low birth weight infants:
A retrospective cross-sectional study.**

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Abstract

Background:

Very low birth weight (VLBW) infants, defined as those weighing under 1500 g, are highly vulnerable to morbidity and mortality, particularly in low-resource settings. Despite advances in neonatal care, outcomes remain inconsistent, with respiratory distress syndrome (RDS), sepsis, and prematurity as major contributors to mortality.

Aim:

To evaluate short-term outcomes and identify mortality predictors among VLBW infants admitted to the NICU of Katihar Medical College, Bihar.

Methods:

This retrospective descriptive cross-sectional study was conducted over one year (November 2023–October 2024) and included 60 VLBW infants. Data on demographic characteristics, perinatal factors, complications, and outcomes were collected from hospital records and analyzed using SPSS version 23.0. The Chi-square and t-tests were used for univariate analysis, and logistic regression identified independent predictors of mortality.

Results:

The mean birth weight and gestational age were 1225 ± 180 g and 30.8 ± 2.4 weeks, respectively. Survival was achieved in 42 infants (70%), while 18 (30%) died during NICU stay. Mortality was higher among infants with birth weight <1000 g (66.7%), gestational age <32 weeks (38.9%), RDS (47.4%), and sepsis (54.5%) ($p < 0.05$). Logistic regression identified birth weight <1000 g (OR 4.3; $p = 0.007$), RDS (OR 3.9; $p = 0.012$), and sepsis (OR 3.1; $p = 0.031$) as independent mortality predictors.

Conclusion:

Extremely low birth weight, respiratory distress syndrome, and sepsis are key determinants of mortality among VLBW infants. Early recognition and targeted management of these risk factors, along with strengthened neonatal intensive care services, are essential to improve survival outcomes.

Recommendations:

Early identification of risk factors, timely surfactant therapy, strict infection control, and improved NICU infrastructure can help reduce mortality in VLBW infants.

Keywords: Very low birth weight, neonatal mortality, respiratory distress syndrome, sepsis, predictors.

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Background of the Study

VLBW infants, defined as those weighing less than 1500 grams at birth, constitute one of the most vulnerable groups in neonatal practice. Globally, preterm birth and low birth weight remain major contributors to neonatal morbidity and mortality, accounting for nearly 60–80% of

neonatal deaths in both developed and developing countries [1]. Despite advances in neonatal intensive care, survival outcomes in VLBW infants are still suboptimal, particularly in resource-limited settings.

The survival of VLBW infants is influenced by multiple factors, including gestational age, birth weight, sex,



perinatal complications, and the quality of neonatal intensive care facilities [2]. (RDS), sepsis, hypoglycemia, intraventricular hemorrhage, and necrotizing enterocolitis (NEC) are among the most common complications encountered, significantly impacting survival rates [3]. Furthermore, (VLBW) infants, defined as those weighing less than 1000 grams, have disproportionately higher mortality due to their physiological immaturity and susceptibility to infections [4].

In India, the burden of preterm and low birth weight deliveries is particularly high, with an estimated incidence of 20–30% in certain regions [5]. Socioeconomic constraints, lack of early antenatal care, limited access to advanced neonatal interventions, and high rates of perinatal infections further exacerbate outcomes [6]. Consequently, neonatal mortality remains an important indicator of healthcare delivery in such settings.

Identifying predictors of mortality in VLBW infants is essential for prioritizing care and implementing targeted interventions. Studies from developed countries have demonstrated substantial improvements in survival rates due to antenatal corticosteroid use, surfactant therapy, advanced ventilation strategies, and stringent infection control measures [7]. However, outcomes in resource-limited NICUs remain variable and less predictable, necessitating contextual research to address local challenges [8]. This study was therefore undertaken to assess the short-term outcomes of VLBW infants admitted to the neonatal intensive care unit of Katihar Medical College, Bihar, and to identify predictors of mortality in this high-risk group. Such findings are expected to guide clinicians in risk stratification and to optimize resource allocation for improved neonatal survival.

Methodology

Study Design

This was a retrospective descriptive cross-sectional study conducted at Katihar Medical College, Bihar.

Study Setting

The study was carried out at the Neonatal Intensive Care Unit (NICU) of Katihar Medical College, Katihar, Bihar, which serves as a tertiary referral center providing comprehensive neonatal care.

Study Duration

The study covered a period of one year, from November 2023 to October 2024, during which medical records of eligible infants were retrieved and analyzed.

Participants

A total of 60 very low birth weight infants (birth weight <1500 g) admitted to the NICU during the study period were included. Medical records were screened to ensure adherence to the study criteria.

Inclusion Criteria

- Infants with birth weight <1500 g were admitted to the NICU during the study period.
- Infants whose complete clinical records were available for review.
- Both inborn and outborn neonates meet the above criteria.

Exclusion Criteria

- Infants with major congenital anomalies incompatible with life.
- Records with incomplete or missing essential clinical data.
- Infants were discharged against medical advice before definitive outcome assessment.

Bias Control

To minimize selection bias, all eligible infants during the study period were included consecutively. Information bias was reduced by using predefined data extraction forms, ensuring uniformity in data retrieval. Observer bias was minimized by cross-checking data entries by two independent reviewers.

Data Collection

Data were collected retrospectively from NICU admission registers, patient case sheets, and discharge summaries. Variables such as demographic details, perinatal history, clinical features, interventions, complications, and outcomes were recorded systematically.

Procedure

All selected medical records were reviewed in detail. Key parameters, including gestational age, birth weight, Apgar scores, requirement for resuscitation, comorbidities, and interventions (ventilation, surfactant therapy, antibiotics, etc.) were noted. Outcomes were categorized as survival or mortality, and potential predictors were analyzed.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS software version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics such as mean, standard

deviation, and proportions were calculated. Categorical variables were compared using the Chi-square test, and continuous variables were analyzed using the t-test. Logistic regression analysis was performed to identify independent predictors of mortality. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Approval for the study was obtained from the Institutional Ethics Committee, Katihar Medical College. Patient confidentiality was maintained.

Results

A total of 60 (VLBW) infants were included in the study. The mean birth weight was 1225 ± 180 g (range: 840–1490 g), and the mean gestational age was 30.8 ± 2.4 weeks. Among them, 34 (56.7%) were males and 26 (43.3%) were females.

Most infants (36; 60%) were born preterm (<32 weeks), while the remaining 24 (40%) were late preterm (32–36 weeks). Outborn infants constituted 22 (36.7%), and inborn infants were 38 (63.3%).

Table 1. Baseline demographic and perinatal characteristics of study participants (N=60)

Characteristics	Frequency (n)	Percentage (%)
Sex		
Male	34	56.7
Female	26	43.3
Gestational Age		
<32 weeks	36	60.0
32–36 weeks	24	40.0
Birth Weight		
<1000 g (ELBW)	12	20.0
1000–1499 g	48	80.0
Place of Birth		
Inborn	38	63.3
Outborn	22	36.7

Table 1 shows that the majority of infants were preterm (<32 weeks), male, and had birth weights between 1000 and 1499 g. More than half were delivered within the study hospital (inborn).

The most common complications observed were RDS in 38 infants (63.3%), followed by sepsis in 22 infants (36.7%). Intraventricular hemorrhage (IVH) was documented in 8 infants (13.3%), and Necrotizing Enterocolitis (NEC) in 6 infants (10.0%).

Clinical Complications

Table 2. Major neonatal complications among study participants (N=60)

Complication	Frequency (n)	Percentage (%)
Respiratory Distress Syndrome (RDS)	38	63.3
Sepsis	22	36.7
Intraventricular Hemorrhage (IVH)	8	13.3
Necrotizing Enterocolitis (NEC)	6	10.0
Hypoglycemia	14	23.3

Table 2 highlights the predominance of RDS and sepsis as the most frequent complications in VLBW infants, which significantly influenced mortality outcomes.

Out of 60 infants, 42 (70%) survived, while 18 (30%) died during NICU stay. Mortality was higher among infants with birth weight <1000 g (66.7%), compared to those with 1000–1499 g (20.8%). Similarly, mortality was higher in gestational age <32 weeks (38.9%) compared to 32–36 weeks (16.7%).

Outcomes and Mortality Predictors

Table 3. Correlation of mortality with clinical predictors

Predictor	Survival (n=42)	Mortality (n=18)	p-value
Birth Weight			
<1000 g (n=12)	4	8	0.002*
1000–1499 g (n=48)	38	10	
Gestational Age			
<32 weeks (n=36)	22	14	0.048*
32–36 weeks (n=24)	20	4	
RDS (n=38)	20	18	0.001*
Sepsis (n=22)	10	12	0.004*

**Statistically significant Table 3 demonstrates that mortality was strongly correlated with lower birth weight, gestational age <32 weeks, presence of RDS, and sepsis, with p-values <0.05 indicating significant correlations. Statistical Analysis (Logistic Regression)*

Multivariate logistic regression identified the following independent predictors of mortality:

- **Birth weight <1000 g** (Odds Ratio [OR]: 4.3; 95% CI: 1.5–12.2; p=0.007)
- **RDS** (OR: 3.9; 95% CI: 1.3–11.8; p=0.012)
- **Sepsis** (OR: 3.1; 95% CI: 1.1–9.0; p=0.031)

Even after adjusting for confounders, extremely low birth weight, respiratory distress syndrome, and sepsis emerged as significant predictors of mortality in VLBW infants.

Discussion

In the present study, a total of 60 very low birth weight infants were analyzed, with a mean birth weight of 1225 ± 180 g and a mean gestational age of 30.8 ± 2.4 weeks. Males constituted a slight majority (56.7%), and most infants were born in the country (63.3%). The majority of cases (60%) were born before 32 weeks of gestation, highlighting the strong correlation between prematurity and very low birth weight status.

Respiratory distress syndrome (RDS) emerged as the most common neonatal complication, affecting nearly two-thirds of infants (63.3%), followed by sepsis (36.7%), hypoglycemia (23.3%), intraventricular hemorrhage (13.3%), and necrotizing enterocolitis (10%). These findings underline the vulnerability of VLBW infants to respiratory and infectious morbidities, which significantly impacted survival outcomes.

Overall survival among the cohort was 70%, with 30% mortality during NICU stay. Mortality was disproportionately higher among extremely low birth weight infants (<1000 g), where nearly two-thirds (66.7%) did not survive, compared to only 20.8% in the 1000–1499 g group. Similarly, infants born before 32 weeks demonstrated a higher mortality rate (38.9%) than those born after 32 weeks (16.7%). These results reinforce

the critical role of both gestational maturity and birth weight in determining survival.

Statistical analysis confirmed that lower birth weight, prematurity, RDS, and sepsis were significantly correlated with mortality ($p < 0.05$). Multivariate logistic regression further identified birth weight <1000 g, RDS, and sepsis as independent predictors of death. Infants with extremely low birth weight had 4.3 times higher odds of mortality, while those with RDS and sepsis had nearly 4-fold and 3-fold increased risks, respectively.

Taken together, these results demonstrate that despite advances in neonatal intensive care, very low birth weight infants continue to experience high mortality, particularly when compounded by prematurity, respiratory distress, and sepsis. Early recognition and aggressive management of these risk factors remain crucial to improving outcomes in this vulnerable group.

Recent studies since 2018 have continued to highlight the key predictors of mortality and outcomes in very low birth weight (VLBW) infants. A large cohort study from China demonstrated that lower gestational age, male sex, and severe complications such as intraventricular hemorrhage and sepsis were strong predictors of mortality among VLBW infants [9]. Similarly, multicenter data from China showed improved survival over time due to advances in neonatal care, though morbidity from conditions like bronchopulmonary dysplasia and retinopathy of prematurity remained high [10].

In South India, a prospective analysis emphasized the importance of maternal and delivery factors, reporting that antenatal corticosteroid use, mode of delivery, and maternal health status significantly influenced survival rates [11]. Evidence from Brazilian NICUs further underscored the role of neonatal intensive care practices, with survival strongly correlated with interventions such as surfactant therapy and mechanical ventilation, reflecting the importance of resource availability [12].



Meanwhile, in sub-Saharan Africa, late-onset sepsis emerged as the leading predictor of mortality in VLBW infants, particularly in resource-limited settings, indicating the disproportionate burden of infectious causes of death in these regions [13]. Collectively, these studies show that while mortality has declined in well-resourced settings due to improved neonatal care, disparities remain, with sepsis and other complications continuing to drive mortality in lower-resource environments.

Generalizability

The findings of this study are likely generalizable to similar tertiary-level NICUs in low- and middle-income countries. These settings often share comparable challenges, including limited resources, high infection rates, and restricted access to advanced neonatal interventions. Hence, the predictors identified here may help guide neonatal care strategies in similar healthcare environments.

Conclusion

Very low birth weight infants continue to face high mortality despite specialized neonatal care. Mortality was significantly correlated with extremely low birth weight, prematurity, respiratory distress syndrome, and sepsis, with the first three emerging as independent predictors. Focused strategies for early diagnosis, prevention, and aggressive management of these conditions are essential to improve survival outcomes in this vulnerable population.

Limitations

This study has certain limitations. Its retrospective design may have introduced information bias, and the small sample size limits statistical power. Being a single-center study, the findings may not represent all regional NICUs. Additionally, some maternal and socioeconomic factors could not be assessed due to incomplete records.

Recommendations

Based on the findings of this study, it is recommended that neonatal intensive care units prioritize early recognition and aggressive management of risk factors such as respiratory distress syndrome and neonatal sepsis in very low birth weight infants. The use of antenatal corticosteroids, early administration of surfactant, strict infection control practices, and provision of advanced ventilatory support can significantly reduce mortality. Strengthening referral systems, ensuring timely transport

of outborn infants, and improving maternal antenatal care services are also essential to improve survival outcomes.

Data Availability

The data supporting the conclusions of this study are available from the corresponding author upon reasonable request.

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List of Abbreviations

VLBW – Very Low Birth Weight
ELBW – Extremely Low Birth Weight
RDS – Respiratory Distress Syndrome
NEC – Necrotizing Enterocolitis
IVH – Intraventricular Hemorrhage
NICU – Neonatal Intensive Care Unit
OR – Odds Ratio
SPSS – Statistical Package for the Social Sciences

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Conflict of Interest

The authors declare that there is **no conflict of interest** regarding the publication of this study.

Author Contributions

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Original Article

Page | 6

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