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Short-term outcomes and predictors of mortality among very low birth weight infants: A retrospective descriptive study.

Kashifa Khan[1], Saba Nahid Ali[2], Mohammad Akram[2]*
[1]*Senior Resident, Department of Neonatology, AIIMS Raipur.*
[2]*Senior Resident, Department of Paediatrics, Era's Medical College, Lucknow, U.P., India.*

Abstract

Background

Very low birth weight (VLBW) infants (<1500 g) account for a disproportionate share of neonatal morbidity and mortality, particularly in low-resource settings [1].

Objective: To assess short-term outcomes and identify predictors of mortality among VLBW infants admitted to a tertiary care neonatal intensive care unit (NICU).

Methods

This retrospective descriptive study was conducted at Era's Lucknow Medical College and Hospital from January 2023 to December 2024**.** Medical records of 90 VLBW infants were analyzed. Demographic variables, neonatal morbidities, and outcomes were recorded. Associations with mortality were assessed using the chi-square test, odds ratios (OR), and 95% confidence intervals (CI).

Results

Overall mortality was 28.9% (26/90)**.** Respiratory distress syndrome (RDS) **was** the leading cause of mortality, followed by **sepsis**. RDS (OR 3.8; 95% CI 1.6–9.2; p=0.002), Sepsis (OR 2.9; 95% CI 1.2–7.1; p=0.01), necrotizing enterocolitis (OR 3.2; 95% CI 1.1–9.4; p=0.03), and intraventricular hemorrhage (OR 2.6; 95% CI 1.0–6.8; p=0.04) were significant predictors of mortality.

Conclusion

Mortality among very low birth weight infants remains high, with respiratory distress syndrome and sepsis being the leading contributors to mortality.

Recommendation

Strengthening antenatal corticosteroid coverage, timely referral systems, and strict infection-prevention practices in neonatal intensive care units may improve survival among VLBW infants.

Keywords: *Very low birth weight, Neonatal mortality, Respiratory distress syndrome, Sepsis, Neonatal Intensive Care Unit*
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Corresponding author: *Saba Nahid Ali**
Email: ***alisaba015@gmail.com***
Senior Resident, Department of Paediatrics, Era's Lucknow Medical College and Hospital, Lucknow, U.P., India

Introduction

Very low birth weight infants represent a vulnerable neonatal population with a markedly increased risk of mortality worldwide [1]. Despite improvements in neonatal intensive care, survival of VLBW infants remains a challenge, especially in developing countries [2]. Prematurity-related complications contribute to nearly one-third of neonatal deaths globally [3].

Common morbidities such as respiratory distress syndrome (RDS), sepsis, intraventricular hemorrhage (IVH), and necrotizing enterocolitis (NEC) significantly affect short-term outcomes in VLBW infants [4,5]. In low- and middle-income countries, inadequate antenatal care, delayed referrals, and limited neonatal facilities further worsen outcomes [6,7].

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Identification of early predictors of mortality allows timely intervention and optimization of neonatal care [8–10]. However, data from tertiary care centers in North India remain limited. This study was undertaken to evaluate short-term outcomes and predictors of mortality among VLBW infants admitted to a tertiary care NICU.

Materials and methods

Study design

Retrospective descriptive study.

Study methodology

Medical records of eligible VLBW infants admitted during the study period were reviewed retrospectively. Data regarding demographic profile, birth characteristics, neonatal morbidities, treatment details, and outcomes were extracted using a structured data collection sheet. Mortality during hospital stay was considered the primary outcome variable.

Study setting

The study was conducted in the Neonatal Intensive Care Unit of Era's Lucknow Medical College and Hospital, Lucknow, Uttar Pradesh, India, a tertiary-care teaching hospital providing advanced neonatal services, including mechanical ventilation, surfactant therapy, neonatal resuscitation, and management of high-risk neonates. The Department of Neonatology and the Department of Pediatrics were involved in patient care and data collection.

Study duration

The study was carried out from January 2023 to December 2024.

Sample size

Ninety (90) VLBW infants.

Inclusion criteria

- Birth weight <1500 g
- Admission to NICU within 24 hours of birth
- Complete medical records available

Exclusion criteria

- Major congenital anomalies
- Chromosomal abnormalities
- Incomplete records

Data collection

Data regarding birth weight, gestational age, sex, place of delivery, neonatal morbidities, and outcomes were extracted from hospital records.

Statistical analysis

Data were analyzed using SPSS version 25. Categorical variables were expressed as frequencies and percentages. Associations between predictors and mortality were analyzed using the chi-square test. Odds ratios with 95% confidence intervals were calculated. A p-value <0.05 was considered statistically significant.

Ethical consideration

The study was approved by the Institutional Ethics Committee of Era's Lucknow Medical College and Hospital, Lucknow, Uttar Pradesh, India. Written waiver of informed consent was obtained due to the retrospective nature of the study. Patient confidentiality and anonymity were maintained throughout the study in accordance with the Declaration of Helsinki.

Results

A total of **90 very low birth weight (VLBW) infants** were included in the study during the study period. Of these, **64 infants (71.1%) survived**, while **26 infants (28.9%) expired**, resulting in an overall mortality rate of **28.9%**.

Baseline characteristics of the study population

The baseline demographic and clinical characteristics of survivors and non-survivors are summarized in **Table 1**. Infants who did not survive had a significantly **lower mean birth weight** and **lower gestational age** compared to survivors. The mean birth weight among non-survivors was **980 ± 190 g**, whereas survivors had a mean birth weight of **1180 ± 210 g**. Similarly, the mean gestational age was significantly lower in the non-survivor group (**28.4 ± 1.9 weeks**) compared to survivors (**30.2 ± 2.1 weeks**). There was no statistically significant difference in sex distribution between the two groups.

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Table 1: Baseline characteristics of study population

Characteristic	Survivors (n = 64)	Non-survivors (n = 26)	p-value
Mean birth weight (g)	1180 ± 210	980 ± 190	0.001
Gestational age (weeks)	30.2 ± 2.1	28.4 ± 1.9	0.003
Male sex (%)	56.3	61.5	0.64

Short-term morbidities observed in VLBW infants

The major short-term morbidities observed among the study population included **respiratory distress syndrome (RDS)**, **sepsis**, **necrotizing enterocolitis (NEC)**, and **intraventricular hemorrhage (IVH)**. These complications were more frequently observed among non-survivors compared to survivors.

Predictors of mortality

The association between major neonatal morbidities and mortality is presented in **Table 2**. **Respiratory distress syndrome (RDS)** was identified as the **most common cause of mortality**, followed by **sepsis**.

RDS was present in **61.5% of non-survivors** and was significantly associated with mortality (OR 3.8; 95% CI 1.6–9.2; p = 0.002). Sepsis was observed in **57.7% of expired infants** and emerged as a strong independent predictor of mortality (OR 2.9; 95% CI 1.2–7.1; p = 0.01).

Necrotizing enterocolitis and intraventricular hemorrhage were also significantly associated with mortality. NEC was present in **34.6%** of non-survivors (OR 3.2; 95% CI 1.1–9.4; p = 0.03), while IVH was noted in **30.8%** of expired infants (OR 2.6; 95% CI 1.0–6.8; p = 0.04).

Table 2: Predictors of mortality among VLBW infants

Predictor	Mortality (%)	Odds Ratio (95% CI)	p-value
Respiratory distress syndrome	61.5	3.8 (1.6–9.2)	0.002
Sepsis	57.7	2.9 (1.2–7.1)	0.01
Necrotizing enterocolitis	34.6	3.2 (1.1–9.4)	0.03
Intraventricular hemorrhage	30.8	2.6 (1.0–6.8)	0.04

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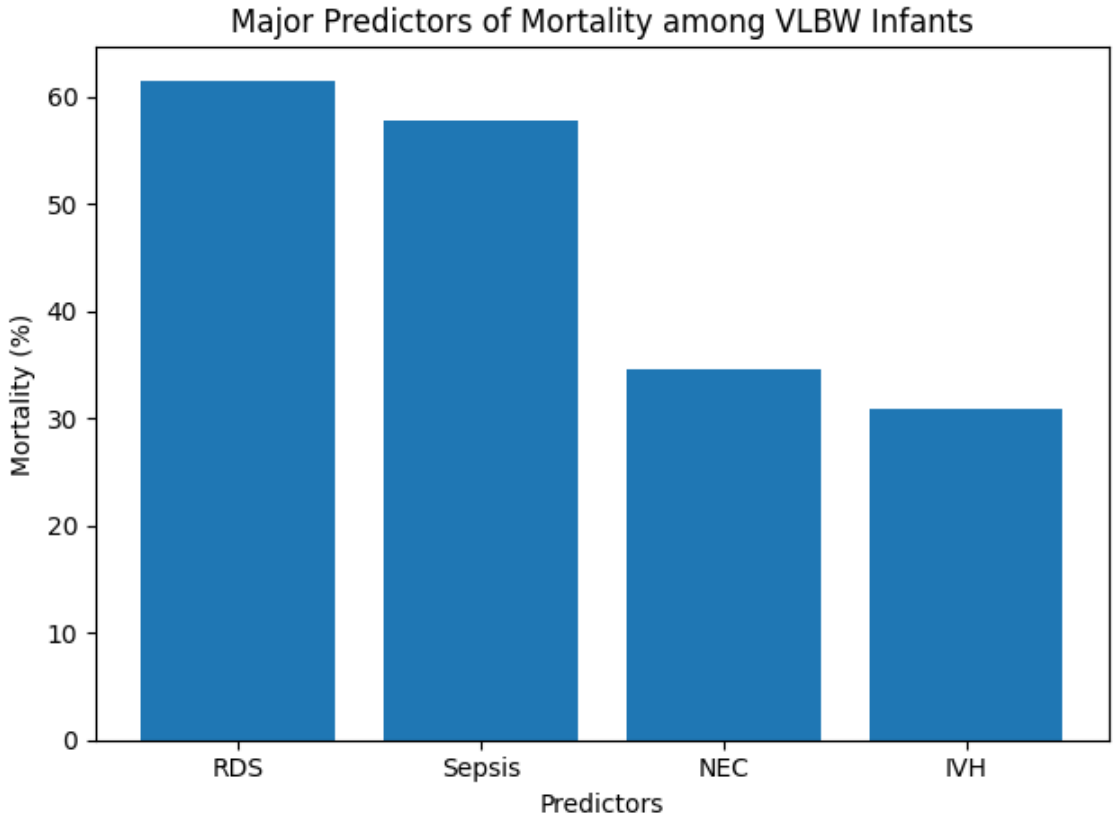

Figure 1: Major predictors of mortality among VLBW infants

Figure 1 illustrates the relative contribution of major neonatal morbidities to mortality among very low birth weight infants. Respiratory distress syndrome contributes the highest proportion of mortality, followed by sepsis, necrotizing enterocolitis, and intraventricular hemorrhage.

Early-onset and late-onset sepsis

Among infants diagnosed with sepsis, **early-onset neonatal sepsis (EONS)** was more commonly observed among **outborn neonates**, whereas **late-onset neonatal sepsis (LONS)** was predominantly seen in infants with prolonged NICU stay. A higher proportion of EONS cases were referred from **outside hospitals**, suggesting suboptimal perinatal care and delayed referral.

Discussion

The present study reported a mortality rate of 28.9% among VLBW infants, comparable to other tertiary care centers in developing countries [11–13]. Lower birth weight and gestational age were significantly associated with mortality, consistent with previous reports [14,15].

Respiratory distress syndrome emerged as the leading cause of mortality. A large proportion of affected infants were outborn and lacked adequate antenatal steroid coverage, predisposing them to severe RDS [16]. Early-onset neonatal sepsis (EONS) was predominantly observed among outborn infants referred from peripheral and outside hospitals, reflecting suboptimal perinatal care and delayed referrals [17].

Sepsis was identified as the **second leading cause of mortality** and a strong independent predictor. These findings are consistent with global data identifying neonatal sepsis as a major cause of death in VLBW infants [18]. NEC and IVH also significantly contributed to mortality, reflecting the fragility of immature organ systems [19,20].

Preventive strategies such as timely antenatal corticosteroid administration, strict infection-control practices, and standardized NICU protocols have been shown to improve

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survival [21–23]. The retrospective design and single-center setting are limitations; however, the study provides valuable insight into preventable risk factors [24,25].

Generalizability

The findings of this study may apply to tertiary care neonatal intensive care settings in other low- and middle-income countries where similar neonatal risk factors and healthcare challenges exist.

Conclusion

Mortality among VLBW infants remains high. **Respiratory distress syndrome is the leading cause of death, followed by sepsis**, particularly among outborn infants without adequate antenatal steroid exposure. Strengthening antenatal care, early referral systems, and infection-prevention strategies may significantly improve outcomes.

Limitations

The study was limited by its retrospective design and relatively small sample size. Being a single-center study, the findings may not represent outcomes across all healthcare settings. Long-term neurodevelopmental outcomes of survivors could not be assessed.

Recommendation

Improvement in antenatal care services, timely administration of antenatal corticosteroids, early referral of high-risk pregnancies, and implementation of strict infection-control protocols in neonatal intensive care units are recommended to reduce mortality among VLBW infants.

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List of abbreviations

VLBW – Very Low Birth Weight
RDS – Respiratory Distress Syndrome
NEC – Necrotizing Enterocolitis
IVH – Intraventricular Hemorrhage
NICU – Neonatal Intensive Care Unit
EONS – Early-Onset Neonatal Sepsis
LONS – Late-Onset Neonatal Sepsis

Source of funding

No external funding was received for this study.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

Kashifa Khan: Conceptualization, data collection, manuscript drafting
Saba Nahid Ali: Statistical analysis, manuscript editing, corresponding author responsibilities
Mohammad Akram: Literature review, data interpretation, final manuscript review

Author biography

Dr. Kashifa Khan is a Senior Resident in the Department of Neonatology at AIIMS Raipur with an interest in neonatal intensive care and neonatal outcome research.
Dr. Saba Nahid Ali is a Senior Resident in the Department of Pediatrics at Era's Lucknow Medical College and Hospital with research interests in neonatology and pediatric infectious diseases.
Dr. Mohammad Akram is a Senior Resident in the Department of Pediatrics at Era's Lucknow Medical College and Hospital with an academic interest in neonatal and pediatric critical care.

Data availability

The data used and analyzed during the current study are available from the corresponding author upon request.

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