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Factors associated with prolonged NICU in Low-birth-weight Neonates Admitted at Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh: Hospital-based observational analytical study

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ABSTRACT

Background: Prolonged neonatal intensive care unit (NICU) stay is associated with increased healthcare expenditure, greater resource utilization, and increased risk of hospital-acquired complications. Understanding factors associated with prolonged hospitalization may assist clinicians in improving neonatal outcomes. Low-birth-weight (LBW) neonates are at increased risk of neonatal morbidity, mortality, and prolonged neonatal intensive care unit (NICU) stay.

Objective: To evaluate factors associated with prolonged NICU stay among low-birth-weight neonates, including prematurity, birth weight, respiratory distress syndrome, neonatal sepsis, and mechanical ventilation."

Methods: Hospital-based observational analytical study was conducted among 200 neonates admitted to the NICU all enrolled neonates had birth weight <2500 g. Variables analysed included sex, gestational age, birth weight, mode of delivery, RDS, sepsis, ventilator requirement, duration of hospitalization, and outcome. Prolonged stay was defined as hospitalization exceeding 35 days. *A "prolonged" stay in the NICU for a Low Birth Weight (LBW) baby is generally defined as any hospitalization exceeding **four to six weeks**, or extending past the infant's original due date. Considering these data of 4 to 6 week its average duration being taken for study that was 35 days*. Stay duration heavily depends on birth weight, gestational age, and complications Descriptive statistics and chi-square testing were used for analysis.

Results: Among 200 neonates, 140 (70%) were preterm and 60 (30%) were term. Very low birth weight (<1500 g) was observed in 70 (35%) neonates. Respiratory distress syndrome (RDS) was present in 150 (75%), neonatal sepsis in 40 (20%), and mechanical ventilation was required in 70 (35%). Sixty neonates (30%) experienced prolonged hospitalization. Prematurity (OR=2.78), male sex (OR=4.64), and very low birth weight (OR=7.33) demonstrated strong associations with prolonged NICU stay.

Conclusion : Prematurity, very low birth weight, respiratory distress syndrome, sepsis, and requirement for mechanical

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ventilation were major contributors to prolonged NICU stay among low-birth-weight neonates.

Keywords: NICU, Prematurity, Low Birth Weight, Neonatal Sepsis, Respiratory Distress Syndrome, Mechanical Ventilation, Prolonged Hospital Stay

Introduction

Low birth weight remains one of the leading contributors to neonatal morbidity and mortality worldwide. According to the World Health Organization, approximately 15–20% of all births globally are low birth weight. Advances in neonatal intensive care have improved survival among LBW infants; however, prolonged NICU hospitalization remains a significant challenge.

Prematurity, respiratory distress syndrome, sepsis, feeding difficulties, and need for respiratory support frequently prolong hospital stay. Identification of factors associated with extended hospitalization may assist clinicians in optimizing neonatal care and reducing healthcare burden.

Extended hospitalization increases healthcare costs, places emotional and financial burdens on families, and exposes neonates to hospital-acquired complications.

Several studies have reported that birth weight, gestational age, sepsis, respiratory distress syndrome, and the need for respiratory support influence the duration of NICU stay. However, regional data from Central India are limited. Therefore, this study was undertaken to evaluate the clinical profile of low-birth-weight neonates and identify factors associated with prolonged NICU stay in a tertiary care teaching hospital.

Aim

Factors associated with prolonged NICU in Low-birth-weight Neonates

Objectives

1. To describe the demographic and clinical characteristics of low-birth-weight neonates.
2. To determine the frequency of prolonged NICU stay.
3. To assess the association between neonatal and maternal factors and duration of hospitalization prolonged NICU stay among low-birth-weight neonates.

Materials and Methods

Study Design

Hospital-based observational analytical study

Study Setting

The study was conducted in the Neonatal Intensive Care Unit (NICU), Department of Paediatrics, Sri Aurobindo Institute of Medical Sciences (SAIMS), Indore, Madhya Pradesh, India.

Study Duration

1 April 2025 to 30 June 2026.

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Study Population

All low-birth-weight (LBW) neonates admitted to the NICU during the study period were screened for eligibility..

Sample Size

The formula is:

$$n = \frac{Z^2 pq}{d^2}$$

Using:

- $Z = 1.96$
- $p = 50\% = 0.5$
- $q = 0.5$ Where:

If precision = 7%

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.07)^2}$$

$$n = \frac{3.84 \times 0.25}{0.0049}$$

$$n = 195.9$$

$$n \approx 196$$

Assuming prevalence = 50%, precision = 7%, confidence level = 95%, calculated sample size was 196, rounded to 200.

After rounding and allowing for a few incomplete records: $\boldsymbol{n = 200}$

200 neonates.

Inclusion Criteria

- Birth weight <2500 g.
- Admission to NICU during the study period.

Exclusion Criteria

- Major congenital anomalies.
- Incomplete medical records.

Data Collection

Information regarding neonatal characteristics, maternal risk factors, clinical morbidities, and outcomes was recorded from hospital records along with I attend patient in OPD. Data were collected from NICU medical records and hospital electronic records using a predesigned data collection form."

RESULTS

Table 1. Baseline Characteristics of the Study Population (N=200)

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Variable	Number (%)
Male	100 (50.0)
Female	100 (50.0)
Preterm	140 (70.0)
Term	60 (30.0)
Prolonged Stay (>35 days)	60 (30.0)

Table 2. Birth Weight Distribution

Birth Weight	Number (%)
<1500 g	70 (35.0)
≥1500 g	130 (65.0)

Table 3. Clinical Morbidities

Variable		Percentage (%)
RDS		75
Sepsis		20
Mechanical Ventilation		35

Table 4. Maternal Characteristics

Variable	Number (%)

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Age 24–28 years	120 (60.0)
Age 30–32 years	50 (25.0)
Age 33–35 years	20 (10.0)
Age 36–37 years	10 (5.0)
PIH	50 (25.0)
Gestational Diabetes	50 (25.0)
PIH + GDM	30 (15.0)
PROM	56 (28.0)
Antenatal Steroids Received	60 (30.0)

Table 5. Characteristics of Neonates with Prolonged Stay (>35 Days) (n=60)

Variable	Number (n)	Percentage (%)
Male	45	75.0
Female	15	25.0
Preterm	50	83.3
Term	10	16.7
VLBW (<1500 g)	40	66.7
≥1500 g	20	33.3
RDS	50	83.3
Sepsis	30	50.0
Mechanical Ventilation	30	50.0

DISCUSSION

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In the present study, 30% of low-birth-weight neonates experienced prolonged hospitalization exceeding 35 days. Prematurity emerged as a major determinant of prolonged NICU stay, with preterm neonates demonstrating nearly threefold increased odds of extended hospitalization. This finding is biologically plausible because preterm infants frequently require prolonged respiratory support, nutritional management, and infection surveillance.

Very low birth weight showed the strongest association with prolonged hospitalization. Neonates weighing less than 1500 g had more than sevenfold increased odds of prolonged NICU stay. Similar observations have been reported in studies evaluating neonatal outcomes among very low birth weight infants, where immature organ systems, feeding difficulties, and respiratory complications contribute to extended hospitalization.

Respiratory distress syndrome represented the most common neonatal morbidity in the study population. The high burden of RDS reflects the predominance of preterm neonates. Mechanical ventilation was frequently required among neonates experiencing prolonged hospitalization, highlighting the role of respiratory disease severity in determining length of stay.

Neonatal sepsis was another important contributor to prolonged hospitalization.

Infection necessitates prolonged antibiotic therapy, monitoring, and supportive care, thereby increasing NICU duration.

Maternal factors such as pregnancy-induced hypertension, gestational diabetes, PROM, and lack of antenatal steroid exposure were common among mothers of LBW neonates. These factors are recognized contributors to prematurity and low birth weight and may indirectly influence duration of hospitalization.

The findings emphasize the importance of antenatal care, prevention of prematurity, early recognition of maternal risk factors, and optimization of neonatal respiratory management.

CONCLUSION

Prematurity, very low birth weight, male sex, respiratory distress syndrome, neonatal sepsis, and requirement for mechanical ventilation were important factors associated with prolonged NICU stay among low-birth-weight neonates. Early identification of high-risk neonates and improved perinatal care may reduce hospitalization duration and improve neonatal outcomes.

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