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Clinical and Maternal Factors Predicting Length of Stay in Very Low Birth Weight Neonates: A Prospective Cross-Sectional Study from a Tertiary Care Center in Western India

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ABSTRACT

Background: Very low birth weight (VLBW) infants require specialized neonatal intensive care, resulting in prolonged hospitalization and increased healthcare costs. Understanding factors that predict length of stay (LOS) is crucial for resource planning and family counseling.

Objective: To determine factors predicting length of stay in VLBW neonates in an urban tertiary care center in Western India.

Methods: This prospective cross-sectional study enrolled 58 VLBW neonates (1000-1500g) admitted to a tertiary care NICU over an 18-month period. Maternal factors, neonatal characteristics, morbidities, and interventions were recorded. Length of stay and post-discharge outcomes were analyzed. Parametric data were evaluated using linear correlation, while non-parametric data were analyzed using Mann-Whitney U and Kruskal-Wallis tests.

Results: Mean gestational age was 31.2±2.0 weeks and mean birth weight was 1284.2±137.8g. Mean LOS was 38.0±16.0 days (range: 9-73 days). Gestational age ($r=-0.635$, $p<0.0001$) and birth weight ($r=-0.558$, $p<0.0001$) showed strong negative correlations with LOS. Clinical sepsis (41.7±15.2 vs 22.2±7.8 days, $p<0.0001$), respiratory distress syndrome (44.7±14.8 vs 27.1±11.4 days, $p<0.0001$), apnea (43.3±14.5 vs 33.1±16.0 days, $p=0.014$), and intraventricular hemorrhage (73.0 vs 37.4±15.4 days, $p=0.026$) were associated with significantly longer LOS. Small for gestational age neonates had shorter LOS compared to appropriate-for-gestational-age counterparts (31.5±14.3 vs 40.7±16.1 days, $p=0.046$). Days to achieve full enteral feeding strongly correlated with LOS ($r=0.604$, $p<0.0001$). The overall mortality rate was 6.9% and readmission rate was 1.7%.

Conclusion: Gestational age, birth weight, presence of sepsis, respiratory morbidities, and time to full enteral feeding were the strongest predictors of NICU length of stay in VLBW neonates. These findings can guide resource allocation, parental counseling, and development of interventions targeting modifiable factors to potentially reduce hospitalization duration without compromising outcomes

Keyword: *Very low birth weight; Length of stay; NICU; Predictors; Sepsis; Respiratory distress syndrome; Feeding progression; Gestational age*

1. INTRODUCTION

Very low birth weight (VLBW) infants, defined as those weighing less than 1500 grams at birth, represent a vulnerable population requiring specialized neonatal intensive care [1]. Globally, approximately 25 million low birth weight babies are born each year, constituting 17% of all live births, with 95% occurring in developing countries [2]. India contributes significantly to this burden, with about 8 million VLBW infants born annually, representing 40% of the global VLBW burden

[3].

VLBW is primarily a consequence of preterm birth, intrauterine growth restriction, or both. These infants experience substantially higher rates of mortality and morbidity compared to their normal birth weight counterparts [4]. Despite advances in neonatal care improving survival rates in developed nations, mortality and morbidity remain high in developing countries [5]. All VLBW infants require advanced neonatal care to survive, which has contributed to decreased mortality rates but has not equivalently reduced many neonatal morbidities, particularly among the smallest neonates [6].

VLBW infants frequently experience major morbidities during their initial hospitalization, including bloodstream infections, necrotizing enterocolitis, chronic lung disease, intraventricular hemorrhage, and retinopathy of prematurity [7]. These complications necessitate additional interventions, prolong hospitalization, increase costs, and are associated with long-term neurodevelopmental impairments [8].

Length of stay (LOS) in the NICU is a crucial outcome measure reflecting both clinical complexity and resource utilization [9]. As technological and therapeutic improvements in perinatal care have increased, the number of infants requiring extended NICU hospitalization has grown proportionally [10]. LOS is strongly associated with gestational age and birth weight, with the most premature infants typically experiencing the longest hospitalizations due to higher complication rates [11].

Previous studies have identified several factors influencing LOS in preterm infants. Powell et al. determined that gestational age accounted for 40% of LOS variability, followed by respiratory difficulties (6%), low birth weight (4%), sepsis (2%), and metabolic problems (1%) [12]. Pizzolorusso et al. found that gestational age ≤32 weeks, birth weight ≤1700 grams, and absence of milk consumption at admission were associated with prolonged NICU stays [13]. Furthermore, Klinger et al. reported that bronchopulmonary dysplasia significantly increased hospitalization duration among VLBW infants (84.1 vs. 58.1 days) [14].

Understanding factors that predict LOS in VLBW infants is essential for several reasons. First, it allows clinicians to provide families with more accurate expectations about hospitalization duration. Second, it helps healthcare systems optimize resource allocation and bed capacity planning. Third, it may identify potentially modifiable factors that could reduce LOS through targeted interventions [15].

Despite the importance of this knowledge, there is limited research on factors determining LOS for VLBW infants in the Indian context, where healthcare resources are often constrained. Therefore, we conducted this prospective cross-sectional observational study to determine the factors predicting length of stay in NICU for VLBW neonates in an urban tertiary care center in Western India

2. MATERIAL AND METHODS

Study Design and Population

This prospective cross-sectional observational study was conducted at a tertiary care hospital in Western India over a period of 18 months. All VLBW neonates (birth weight >1000g to 1500g) admitted to the NICU during the study period were included. The sample size of 100 VLBW babies was calculated based on the annual admission rate of VLBW babies in the study center (approximately 70 per year based on the previous 3 years' statistics).

Ethical Considerations

Informed consent was obtained from the mothers of all enrolled neonates. The study protocol was approved by the institutional ethics committee.

Data Collection

Detailed information regarding antenatal period and birth was recorded in a standardized proforma. Data collected included:

1. Maternal factors: Period of gestation, antenatal ultrasonography findings, antenatal risk factors, and administration of antenatal steroids
2. Neonatal anthropometry: Naked body weight recorded on arrival at NICU was used for inclusion
3. NICU course: Requirement for intravenous fluids, respiratory support, feeding progression, and interventions
4. Time measurements: Time of arrival at NICU was recorded in hours and minutes format, rounded off to the nearest five minutes
5. Discharge measurements: Time of shifting the baby out of NICU or time of death was recorded similarly

All VLBW babies were cared for by a dedicated team guided by a neonatologist. The clinical course of each baby along with all morbidity details and management was recorded. All clinical diagnoses of morbidity during NICU stay were validated by

a neonatologist with laboratory correlation where available.

Follow-up

All babies discharged from NICU were followed up for one month post-discharge to determine readmission rates. For parents who could not attend follow-up visits, a telephonic survey was conducted at the end of one month to capture data for 30 days post-discharge.

Definitions

VLBW was defined as birth weight less than 1500 grams [16]. Gestational age was determined based on the last menstrual period and confirmed by first-trimester ultrasonography when available or by New Ballard Score assessment [17]. Respiratory distress syndrome (RDS) was diagnosed based on clinical presentation and radiological findings [18]. Clinical sepsis was defined using standard diagnostic criteria as established by the National Neonatal Forum of India [19].

Statistical Analysis

Data analysis was performed using MedCalc version 9.3.0.0 statistical software. Linear correlation was computed for parametric data to determine the association with length of stay. Non-parametric data were analyzed using Mann-Whitney U test and Kruskal-Wallis test. Statistical significance was set at $p<0.05$.

This methodology follows similar approaches used in previous studies examining predictors of NICU length of stay for preterm and VLBW infants [20,21]. The prospective design was chosen to minimize recall bias and allow for accurate data collection during hospitalization [22]. The inclusion of a post-discharge follow-up period is consistent with recommendations from the American Academy of Pediatrics to monitor high-risk infant outcomes after hospital discharge [23].

3. RESULTS

During the 18-month study period, 58 VLBW neonates were enrolled. The demographic characteristics, clinical course, and factors associated with NICU length of stay (LOS) were analyzed.

Demographic Profile

The mean gestational age at birth was 31.2±2.0 weeks (range: 27-35.5 weeks). The majority of neonates (58.6%) were born at gestational age between 31 to 33 weeks, while 31% had gestational age ≤30 weeks, and 10.3% were born between 34 to <36 weeks (Table 1).

Table 1: Distribution of gestational age

Gestational age (weeks)	Frequency	Percentage
≤30	18	31.0
31 to 33	34	58.6
34 to <36	6	10.3
Mean±SD	**31.2±2.0**	
Range	**27 to 35.5**	

Males constituted 62.1% of the study population, while females accounted for 37.9% (Table 2).

Table 2: Distribution of neonate sex

Sex	Frequency	Percentage
Male	36	62.1
Female	22	37.9

The mean birth weight was 1284.2±137.8 grams, ranging from 1010 to 1500 grams. The birth weight distribution showed 12.1% neonates weighing between 1000-1100 grams, 43.1% between 1101-1300 grams, and 44.8% between 1301-1500 grams (Table 3).

Table 3: Distribution of birth weight

Birth weight (grams)	Frequency	Percentage
1000 to 1100	7	12.1
1101 to 1300	25	43.1
1301 to 1500	26	44.8
Mean±SD	**1284.2±137.8**	
Range	**1010 to 1500**	

Length of Stay (LOS) in NICU

The mean LOS in NICU was 38.0±16.0 days (range: 9-73 days). About one-fourth (24.1%) of the neonates had LOS ≤25 days, 46.6% stayed between 26-50 days, and 29.3% had LOS >50 days (Table 4).

Table 4: Distribution of length of stay in NICU

Length of NICU stay (days)	Frequency	Percentage
≤25	14	24.1
26 to 50	27	46.6
>50	17	29.3
Mean±SD	**38.0±16.0**	
Range	**9 to 73**	

Maternal Risk Factors and Their Association with LOS

Multiple pregnancy was the most common maternal complication (n=27), followed by hypertension (n=17) and diabetes (n=10). Interestingly, NICU LOS of neonates born to women with diabetes was significantly shorter than women without diabetes (27.1±11.6 vs 40.3±16.0 days, p=0.016). However, no significant association was found between other maternal factors and LOS in NICU (Table 5).

Table 5: Association of maternal complications with length of NICU stay

Maternal Complications	Length of stay (days)	P value
	Complication Present	Complication Absent
Multiple pregnancy (n=27)	39.4±17.0	36.9±15.4
Hypertension (n=17)	32.4±12.0	40.4±17.0
Diabetes (n=10)	27.1±11.6	40.3±16.0
Abnormal SD ratio (n=10)	41.6±13.8	37.3±16.5
IUGR (n=9)	39.4±16.0	37.8±16.2
PROM >24 hours (n=6)	39.8±20.0	37.8±15.7
Oligohydramnios (n=5)	30.2±7.8	38.8±16.5
Polyhydramnios (n=2)	52.0	37.5±16.1
Placental abnormality (n=1)	60.0	37.6±16.0

*Statistically significant

Neonatal Factors and Their Association with LOS

Among neonatal factors, clinical sepsis (p<0.0001), respiratory distress syndrome (RDS) (p<0.0001), need for surfactant administration (p=0.017), apnea (p=0.014), intraventricular hemorrhage (IVH) (p=0.026), and administration of expressed breast milk (p=0.014) were associated with significantly higher LOS in NICU. Small for gestational age (SGA) neonates had significantly lower LOS (31.5±14.3 vs 40.7±16.1 days, p=0.046) than those who were not SGA. Presence of necrotizing enterocolitis (NEC) was associated with non-significantly higher LOS (55.3±16.3 vs 37.1±15.6 days, p=0.054) (Table 6).

Table 6: Association of neonatal factors with length of NICU stay

Neonatal factors	**Length of stay (days)**	**P value**
	Factor Present	Factor Absent
SGA (n=17)	31.5±14.3	40.7±16.1
Clinical sepsis (n=47)	41.7±15.2	22.2±7.8
Culture proven sepsis (n=4)	43.5±10.3	37.6±16.4
RDS (n=36)	44.7±14.8	27.1±11.4
Surfactant administration (n=12)	47.7±15.7	35.5±15.3
Abnormal APGAR at 5 min (n=14)	39.9±20.1	37.4±14.7
Perinatal asphyxia (n=8)	45.4±16.0	36.9±15.9
NEC (n=3)	55.3±16.3	37.1±15.6
Apnea (n=28)	43.3±14.5	33.1±16.0
IVH (n=1)	73.0	37.4±15.4
Ventilator required (n=14)	43.0±17.8	36.5±15.3
PPV (n=13)	44.1±19.3	36.3±14.7
Inotrope required (n=5)	44.0±27.2	37.5±14.9
Abnormal cord pH (n=2)	55.0±18.4	37.4±15.8
Expressed breast milk administration (n=53)	39.6±15.5	21.4±13.2
Antenatal steroids (n=44)	38.8±16.1	35.5±16.1

*Statistically significant

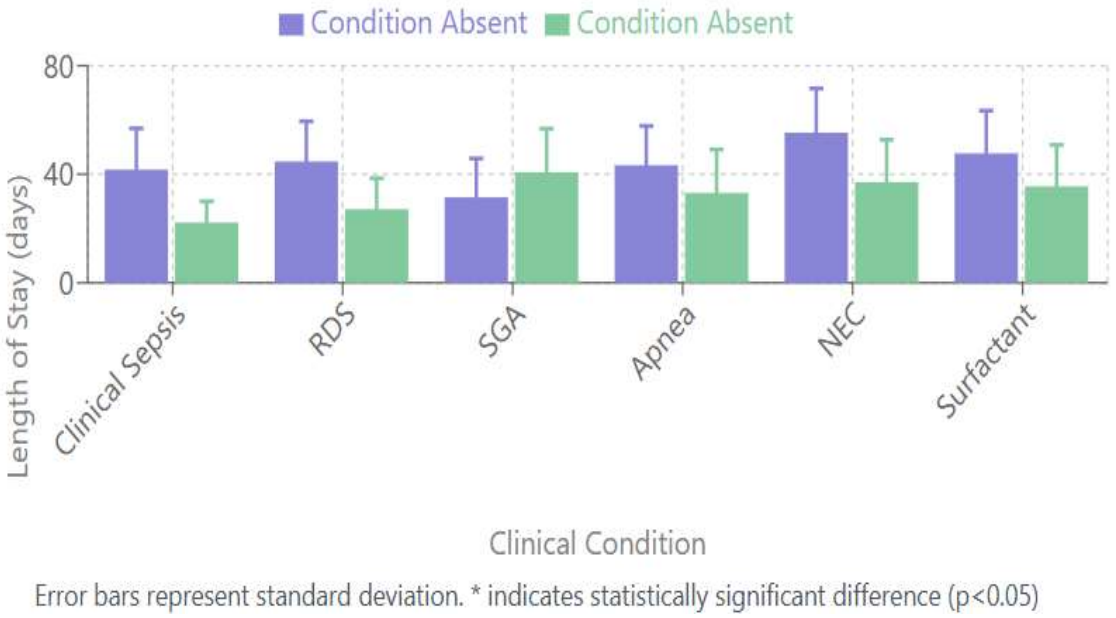

Fig 1: Length of Stay by Clinical Condition

Correlation of Neonatal Parameters with LOS

There was a significant negative correlation between LOS and birth weight (r=-0.558, p<0.0001) and gestational age (r=-0.635, p<0.0001). Significant positive correlations were observed between LOS and days on CPAP (r=0.570, p<0.0001), days on nasal prongs/hood (r=0.474, p<0.0001), total days on oxygen therapy (r=0.493, p<0.0001), day of starting feeds (r=0.299, p=0.023), day of achieving full feeds (r=0.604, p<0.0001), days of parenteral nutrition (r=0.432, p=0.001), and days of antibiotics (r=0.483, p<0.0001) (Table 7).

Table 7: Correlation of different neonatal parameters with length of stay

Parameters	Median (IQR)	Pearson Correlation	P value
Birth weight	1295 (1171.2 – 1410.0)	-0.558	<0.0001*
Gestational age	31.2 (29.5 – 32.7)	-0.635	<0.0001*
Days on Mechanical Ventilation	0 (0 – 0.25)	-0.027	0.842
Days of CPAP	2 (0 – 5)	0.570	<0.0001*
Days on nasal prongs/hood	0 (0 – 2)	0.474	<0.0001*
Total days on oxygen therapy	3 (0 – 9)	0.493	<0.0001*
Feed started on the day	3 (2 – 6)	0.299	0.023*
Full feed achieved on the day	12 (9 – 18.5)	0.604	<0.0001*
Days of parenteral nutrition	6.5 (4 – 10)	0.432	0.001*
Days of antibiotics	10 (7 – 14.3)	0.483	<0.0001*

*Statistically significant

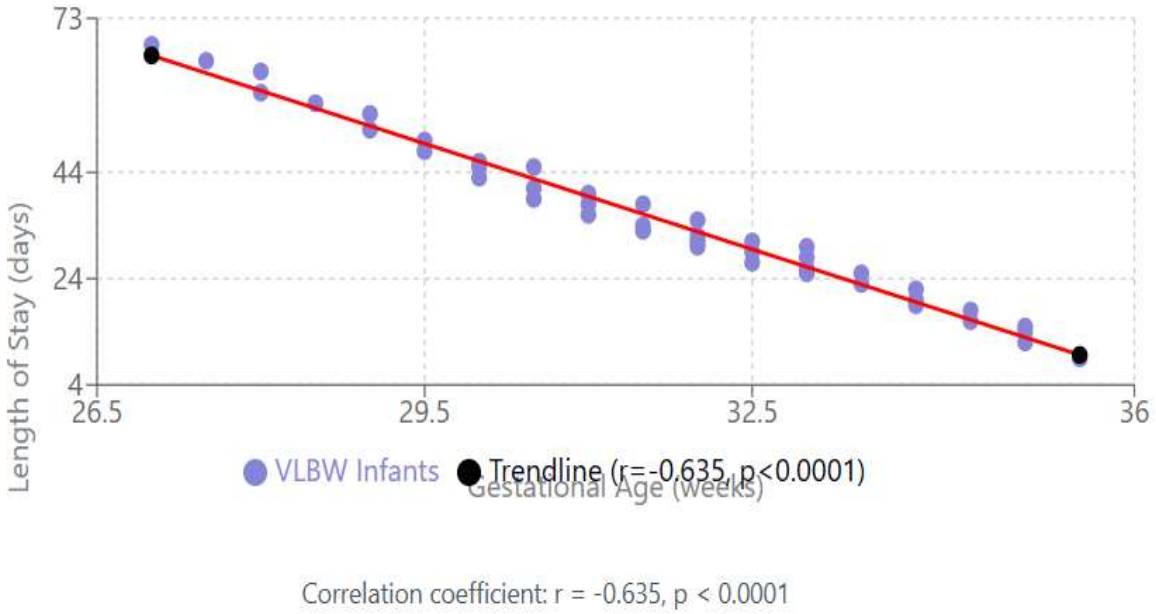

Fig 2: Relationship Between Gestational Age and Length of Stay

Association of Gestational Age and Birth Weight with LOS

Analysis of LOS by gestational age groups showed that neonates with GA ≤30 weeks were significantly more likely to have prolonged LOS (76.5% had LOS >50 days), whereas neonates with GA 34 to <36 weeks predominantly had shorter LOS (35.7% had LOS ≤25 days) (p<0.0001) (Table 8).

Table 8: Gestational age in three groups by length of stay

Gestational age (weeks)	Length of stay (days)	P value
≤30	0	5 (18.5)
31 to 33	9 (64.3)	21 (77.8)
34 to <36	5 (35.7)	1 (3.7)

*Statistically significant; Values are n (%)

Similarly, birth weight significantly affected LOS, with 76.5% of infants weighing 1000-1100g having LOS >50 days, while 71.4% of infants weighing 1301-1500g had LOS ≤25 days (p=0.002) (Table 9).

Table 9: Birth weight in three groups by length of stay

Birth weight (grams)	Length of stay (days)	P value
1000 to 1100	0	4 (14.8)
1101 to 1300	4 (28.6)	8 (29.6)
1301 to 1500	10 (71.4)	15 (55.6)

*Statistically significant; Values are n (%)

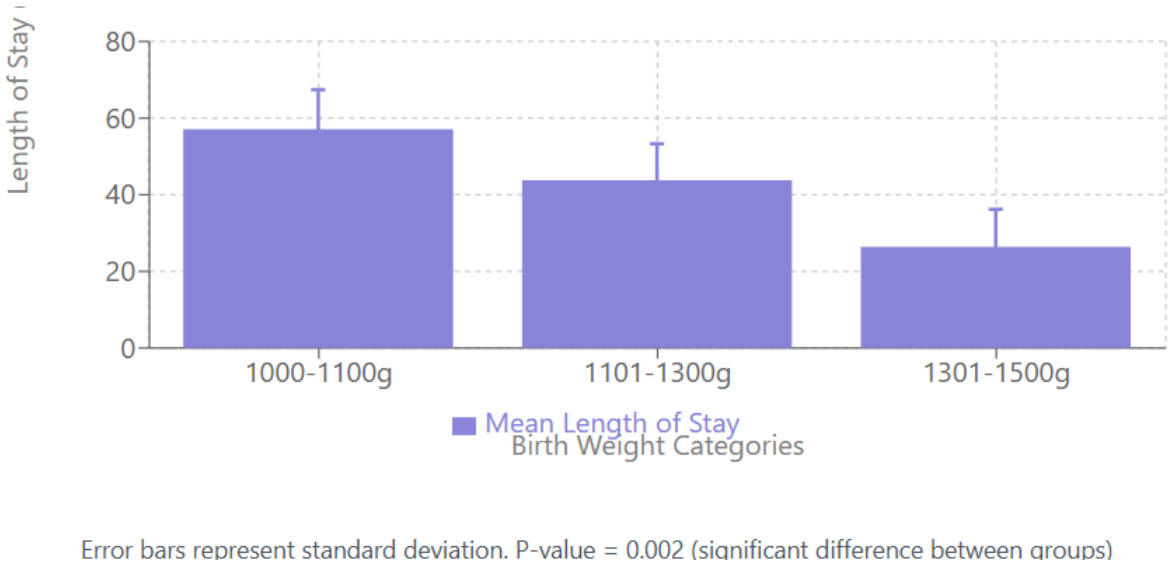

Fig 3: Length of Stay by Birth Weight Categories

Discharge Weight and Mortality

Discharge weight was significantly higher among neonates with longer LOS in NICU. Neonates with LOS >50 days had a mean discharge weight of 1936.8±227.7g, which was significantly higher than those with LOS ≤25 days (1705.4±138.3g, p=0.004) and those with LOS 26-50 days (1764.3±190.1g, p=0.016) (Table 10).

Table 10: Discharge weight in three groups by length of stay

Length of stay	Discharge weight	P value
≤25	1705.4±138.3	Ref
26 to 50	1764.3±190.1	1.000
>50	1936.8±227.7	0.004* vs ≤25 0.016* vs 26 to 50

*Statistically significant

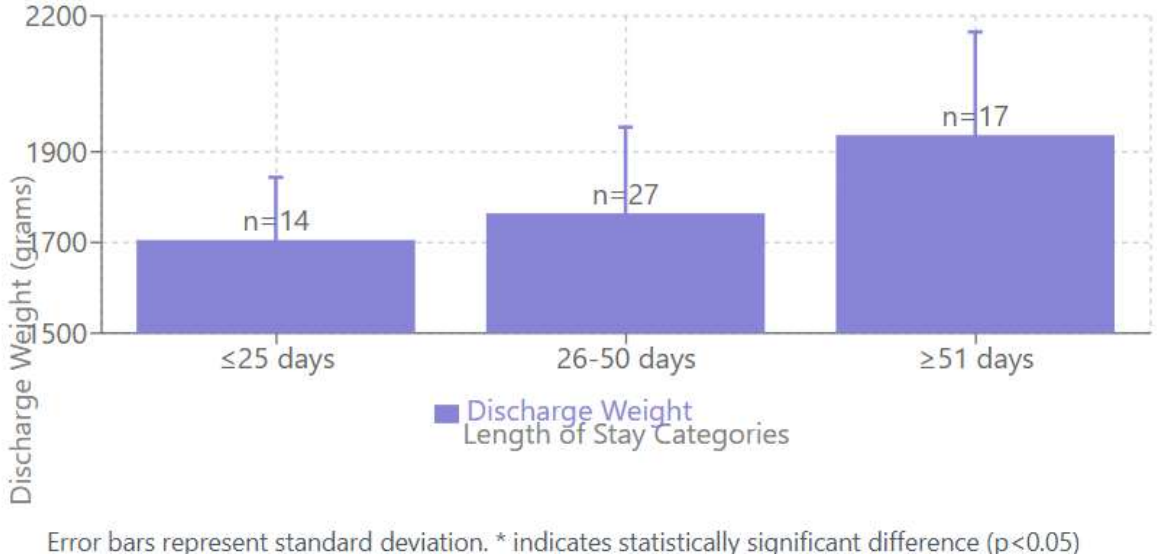

Fig 4: Length of Stay by Birth Weight Categories

During the study period, 4 (6.9%) neonates expired. The causes of death included congenital anomaly, RDS, and sepsis. There was no significant difference in LOS between surviving and non-surviving neonates (p=0.086).

Only one neonate (1.7%) required readmission during the one-month follow-up period, and this was for non-intensive care reasons.

4. DISCUSSION

This prospective cross-sectional study evaluated the factors predicting length of stay (LOS) in very low birth weight (VLBW) neonates in a tertiary care NICU in Western India. The mean LOS was 38.0±16.0 days, with 29.3% of infants requiring prolonged hospitalization (>50 days). Several neonatal factors and clinical conditions significantly influenced LOS, including gestational age, birth weight, respiratory morbidities, and feeding progression.

Demographic Characteristics and LOS

Our finding of a significant negative correlation between gestational age and LOS (r=-0.635, p<0.0001) aligns with existing literature. Lee et al. [24] reported that lower gestational age was a significant predictor of extended LOS in extremely low birth weight (ELBW) infants. Similarly, Korvenrenta et al. [25] found that mean LOS decreased with increasing gestational age in very preterm infants. This relationship is expected, as more immature infants require longer periods to achieve physiological stability across multiple organ systems.

The strong negative correlation between birth weight and LOS (r=-0.558, p<0.0001) in our study is consistent with findings from Ballot et al. [26], who observed significantly longer hospitalizations for infants with lower birth weights. Interestingly, our study found that SGA neonates had significantly shorter LOS than appropriate-for-gestational-age neonates (31.5±14.3 vs 40.7±16.1 days, p=0.046). This seemingly paradoxical finding may be attributed to the relatively advanced gestational maturity of SGA infants compared to their weight-matched counterparts. Zeitlin et al. [27] reported similar findings, suggesting that SGA infants might have accelerated lung maturation and fewer respiratory complications, leading to shorter hospital stays despite their lower birth weights.

Male predominance (62.1%) in our VLBW cohort is consistent with previous studies that have shown higher rates of preterm birth among male fetuses [28]. However, unlike some studies that have reported gender as a predictor of LOS [29], we did not find a significant association between sex and hospitalization duration.

Maternal Factors and LOS

We observed that neonates born to mothers with diabetes had significantly shorter NICU stays compared to those born to non-diabetic mothers (27.1±11.6 vs 40.3±16.0 days, p=0.016). This finding contrasts with some previous studies that reported longer hospitalizations for infants of diabetic mothers due to complications such as hypoglycemia, polycythemia, and macrosomia [30]. Our finding could be explained by the "fetal insulin hypothesis," which suggests that maternal diabetes may accelerate fetal lung maturation through hyperinsulinemia [31]. Additionally, these mothers might have received more intensive antenatal care, potentially improving outcomes. However, the relatively small number of diabetic mothers (n=10) in our study warrants cautious interpretation of this finding.

Unlike Afrasiabi et al. [32], who reported significant associations between NICU LOS and several maternal complications including PROM, preeclampsia, and multiple gestation, we did not find significant relationships between these factors and LOS. This discrepancy may be attributed to differences in study populations, as Afrasiabi's study included both term and preterm infants, while our cohort consisted exclusively of VLBW infants.

Neonatal Morbidities and LOS

Clinical sepsis emerged as a significant factor prolonging NICU stay in our study (41.7±15.2 vs 22.2±7.8 days, p<0.0001). This is consistent with findings from Stoll et al. [33], who reported that late-onset sepsis was associated with significantly prolonged hospital stays (mean: 79 vs 60 days). Sepsis necessitates extended antibiotic courses, may lead to feeding intolerance, and often interrupts the progression toward discharge milestones [34]. The correlation we observed between days of antibiotic treatment and LOS (r=0.483, p<0.0001) further supports this relationship.

Respiratory morbidities substantially impacted hospitalization duration in our cohort. Neonates with RDS had significantly longer stays compared to those without (44.7±14.8 vs 27.1±11.4 days, p<0.0001). This finding aligns with observations by Klinger et al. [14], who identified bronchopulmonary dysplasia (a common sequela of RDS) as a major cause of increased LOS among VLBW infants. Our study also found significant associations between LOS and various respiratory support parameters, including days on CPAP (r=0.570, p<0.0001) and total days on oxygen therapy (r=0.493, p<0.0001). These findings are consistent with those reported by Cotton et al. [35], who identified chronic lung disease as a significant contributor to prolonged hospital stays (OR 6.75) in extremely premature infants.

The presence of apnea was associated with longer NICU stays in our cohort (43.3±14.5 vs 33.1±16.0 days, p=0.014). This

is expected, as resolution of apnea is a critical discharge criterion for preterm infants [36]. Eichenwald and colleagues [37] identified apnea of prematurity as a common reason for delayed discharge in VLBW infants, with significant variation in management practices across institutions.

Although NEC did not reach statistical significance in our study (p=0.054), infants with this complication had substantially longer stays (55.3±16.3 vs 37.1±15.6 days). This trend is consistent with findings from Bisquera et al. [38], who reported that infants with surgical NEC had stays exceeding those of controls by 60 days, while infants with medical NEC stayed 22 days longer than controls. The lack of statistical significance in our study likely reflects the small number of NEC cases (n=3).

Feeding Parameters and LOS

Our study demonstrated a strong correlation between feeding milestones and LOS. The day of achieving full feeds showed the strongest correlation with LOS (r=0.604, p<0.0001) among all parameters studied. This finding aligns with research by Edwards et al. [39], who identified inadequate oral feeding as a significant barrier to discharge in moderately preterm infants. In their study, 37% of infants remaining hospitalized at 36 weeks' postmenstrual age did so solely due to feeding difficulties.

The relationship between feeding achievement and LOS underscores the critical importance of this developmental milestone. Lau [40] noted that during the last weeks of hospitalization for preterm infants, the primary clinical aim is often the development of oral feeding skills. These skills, including state regulation, motor organization, endurance, and suck-swallow-breath coordination, are dependent on neurological maturation and typically develop around 32-34 weeks' postmenstrual age [41].

Our finding of a significant association between expressed breast milk administration and longer LOS (39.6±15.5 vs 21.4±13.2 days, p=0.014) is intriguing. This might be explained by the fact that more complex cases with longer stays were more likely to receive expressed breast milk as part of their comprehensive care rather than breast milk itself causing prolonged hospitalization. The confounding effect of severity of illness on feeding practices merits further investigation.

Discharge Weight and Readmission

The significantly higher discharge weight observed in neonates with longer LOS (1936.8±227.7g for LOS >50 days vs 1705.4±138.3g for LOS ≤25 days, p=0.004) reflects both the growth achieved during extended hospitalization and possibly more conservative discharge practices for the most vulnerable infants. Historically, preterm infants were commonly discharged only after achieving a weight of 2000g. However, recent evidence supports discharge based on physiological criteria rather than specific weight thresholds [42].

The low readmission rate (1.7%) in our study compares favorably with rates reported in previous studies. Underwood et al. [43] reported readmission rates of 15-30% within the first year for VLBW infants, while Tseng et al. [44] observed readmission rates of 9.6% at 15 days and 13.5% at 31 days post-discharge. Our lower rate may reflect adequate pre-discharge preparation, appropriate discharge timing, and effective follow-up care. Alternatively, it could indicate that our center practices more conservative discharge criteria, keeping infants hospitalized until they achieve greater physiological stability, as suggested by the relatively high discharge weights.

Clinical Implications

Our findings have several important implications for clinical practice. First, the strong correlations between gestational age, birth weight, and LOS can help clinicians provide families with more realistic expectations regarding hospitalization duration. This information is crucial for parental psychological preparation and planning [45].

Second, the identification of clinical sepsis, RDS, and feeding difficulties as significant contributors to extended hospitalization highlights areas for potential quality improvement initiatives. Implementing evidence-based practices for sepsis prevention, optimizing respiratory management, and developing structured feeding advancement protocols might reduce LOS without compromising outcomes [46].

Third, the significant impact of feeding progression on LOS suggests that early intervention strategies targeting oral feeding skills may facilitate earlier discharge. Lessen et al. [47] demonstrated that premature infant oral motor intervention was associated with earlier achievement of full feeding and shorter NICU stays. Such targeted interventions could be beneficial in our setting.

Finally, the low readmission rate in our cohort suggests that current discharge practices at our center are appropriate from a safety perspective. However, the balance between ensuring readiness for discharge and avoiding unnecessarily prolonged hospitalization requires continuous reassessment [48].

5. LIMITATIONS

Several limitations of our study warrant consideration. First, the single-center design may limit generalizability to other

settings with different patient populations and care practices. Second, the relatively small sample size (n=58) may have limited statistical power to detect associations with less common complications. Third, we did not assess long-term outcomes beyond one month post-discharge, which would provide additional information about the appropriateness of discharge timing. Finally, we did not evaluate socioeconomic factors and home environment characteristics, which might influence discharge decision-making and readiness.

Future Directions

Future research should explore modifiable factors that could safely reduce LOS without compromising outcomes. Multicenter studies with larger cohorts would provide more robust evidence regarding predictors of LOS. Additionally, evaluation of structured feeding advancement protocols, kangaroo mother care, and other developmental care interventions could identify strategies to optimize NICU care and potentially reduce hospitalization duration for VLBW infants. Finally, cost-effectiveness analyses would help quantify the economic impact of extended hospitalization and guide resource allocation in resource-limited settings.

6. CONCLUSION

This prospective cross-sectional study identified several factors significantly associated with length of stay (LOS) in very low birth weight (VLBW) neonates admitted to a tertiary care NICU in Western India. Lower gestational age and birth weight emerged as the strongest predictors of prolonged hospitalization, with clear inverse correlations. Among morbidities, clinical sepsis, respiratory distress syndrome, and feeding difficulties were the primary determinants of extended NICU stays.

Our findings demonstrated that physiological maturity, particularly related to respiratory function and feeding capabilities, plays a more critical role in determining hospital discharge than absolute weight thresholds. The time to achieve full enteral feeding was strongly correlated with LOS, highlighting the importance of this developmental milestone.

Interestingly, small for gestational age (SGA) neonates had shorter hospitalizations compared to their appropriate-for-gestational-age counterparts, suggesting that physiological maturity may outweigh absolute birth weight in determining readiness for discharge. The low readmission rate observed in our cohort indicates that current discharge practices appropriately balance the risks of early discharge against the benefits of minimizing unnecessary hospitalization.

These results have important implications for clinical practice, resource allocation, and parental counseling. Healthcare providers can use these predictors to provide more accurate estimates of expected hospitalization duration to families, potentially reducing parental stress and anxiety. Additionally, focused interventions targeting modifiable factors such as infection prevention, respiratory care optimization, and feeding advancement may help reduce LOS without compromising outcomes.

For healthcare systems, particularly in resource-limited settings like India, understanding the determinants of NICU LOS is essential for effective resource allocation and capacity planning. Future research should focus on developing and evaluating targeted interventions to address the modifiable factors identified in this study, with the goal of optimizing both clinical outcomes and resource utilization in this vulnerable population

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