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A Study of Complications and Immediate Outcome of Vlbw and Elbw Babies Admitted in Tertiary Care Hospital

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ABSTRACT

Background: Very low birth weight (VLBW; <1500 g) and extremely low birth weight (ELBW; <1000 g) infants represent a high-risk group with increased susceptibility to a wide range of neonatal complications and poor outcomes. These conditions remain critical indicators of perinatal health and care quality.

Aim: To assess the complications and immediate outcomes in VLBW and ELBW neonates admitted to a tertiary care neonatal intensive care unit (NICU).

Methods: This hospital-based cross-sectional observational study was conducted over 18 months at Krishna Hospital, Karad. A total of 126 neonates (105 VLBW and 21 ELBW) were enrolled. Maternal and neonatal variables were recorded, including gestational age, birth weight, clinical complications, and outcomes. Data were analyzed and compared between the VLBW and ELBW groups.

Results: Of 3,703 total births, 126 (3.4%) were either VLBW or ELBW. Male infants constituted 53.2% of the study population. The majority were small for gestational age (64%). Mean gestational age and birth weight were 31.9 weeks/1272.8 g for VLBW and 28.5 weeks/898.4 g for ELBW infants. Respiratory distress syndrome (RDS) was the most common complication (78.5%), particularly in ELBW infants (90.4%). Other major morbidities included neonatal jaundice (80.2%), sepsis (22.2%), apnea of prematurity (32.5%), intraventricular hemorrhage (31.7%), and retinopathy of prematurity (22.2%). Metabolic disturbances such as hypoglycemia (12.6%), hypocalcemia (especially in ELBW: 33.3%), and dyselectrolytemia were also observed. ELBW infants experienced significantly higher complication rates across nearly all parameters.

Overall, 74.7% of neonates recovered, with a markedly better recovery rate in VLBW (81.6%) compared to ELBW (33.3%) infants. The overall mortality rate was 19.8%, with 12.7% in VLBW and 61.9% in ELBW groups.

Conclusion: The study underscores the heightened vulnerability of ELBW infants to complications such as RDS, IVH, and sepsis, translating into significantly higher mortality. Early detection, specialized neonatal care, and targeted preventive strategies are essential to improve outcomes in these high-risk neonates

1. INTRODUCTION

Prematurity, defined as birth before 37 completed weeks of gestation, affects approximately 11% of all deliveries globally, accounting for roughly 15 million infants each year [1]. Of these preterm births, 84% occur between 32 and 36 weeks, 10% between 28 and 32 weeks, and 5% before 28 weeks of gestation [1]. The degree of prematurity is often categorized by gestational age—extreme preterm (< 28 weeks), very preterm (28–32 weeks), and moderate to late preterm (32–37 weeks) [2]—or by birth weight: extreme low birth weight (ELBW) < 1 kg, very low birth weight (VLBW) < 1.5 kg, and low birth weight (LBW) < 2.5 kg [2]. Birth weight serves as a key predictor of neonatal health and survival, with lower weights correlating strongly with increased mortality risk [3].

In 2020, an estimated 19.8 million newborns—14.7% of all infants born that year—suffered from LBW worldwide, reflecting persistent gaps in maternal nutrition and healthcare access [4]. Within India, data from the National Family Health Survey (NFHS-5, 2019–2021) indicate an LBW incidence of approximately 18%, with significant inter-state variability: Maharashtra (16.1%), Kerala (10.4%), and Bihar (23.5%) [5]. LBW not only elevates the risk of neonatal complications—such as hypoglycemia, hypothermia, asphyxia, bronchopulmonary dysplasia, necrotizing enterocolitis (NEC), retinopathy of prematurity (ROP), hyperbilirubinemia, sepsis, anemia, and dehydration—but also adversely affects growth, cognitive development, and predisposes survivors to chronic diseases later in life [6, 7].

At the population level, a high LBW proportion signals underlying public health challenges including maternal malnutrition, chronic illness, heavy physical labor, and insufficient prenatal care [8]. Individually, LBW remains a potent predictor of infant and childhood mortality, necessitating concerted efforts to enhance antenatal nutrition, improve perinatal care, and strengthen health-system support for at-risk pregnancies [3, 9, 10].

Aim

1. To study the complications in very low birth weight (VLBW) and extremely low birth weight (ELBW) babies in the Neonatal Intensive Care Unit.

Objective 1

1. To study the clinical profile and complications in VLBW and ELBW neonates.

To study the immediate outcome of VLBW and ELBW babies.

2. MATERIALS AND METHODS

Study design: Hospital-based cross-sectional observational study Duration of study: 18 months The study is conducted over an 18-month period, from June 2022 to November 2023.

Setting: Department-Paediatrics, Krishna Hospital, KVV KARAD

INCLUSION CRITERIA:

•All very low birth weight and extremely low birth weight neonates admitted in NICU.

EXCLUSION CRITERIA:

• Neonates with major congenital anomalies.

• Neonates with clinically identified chromosomal syndromes.

SAMPLE SIZE:

N=$z2\ \alpha\ (p\ (1\text{-}p))/\ \lambda 2$

1–2

Where, $z2\ \alpha = (1.96)2 = 3.8416$

1–2

p= 0.5 & q= 1-p = 0.5, Z1-α/2 is the standard normal variate at 95% C.I = 1.96

$\lambda 2$ = (0.1)2 = Precision = 10% n= (0.1)2 × 0.5 × 0.5 / 0.01

3.8419 ×0.5×0.5

=

0.01

0.9605

=

0.01

[n = 96] Therefore n+10% = 96+10% [N=106] This is sample size.

Thus minimum 106 cases were required to study

3. METHOD OF COLLECTION OF DATA

• All inborn neonates with vlbw and elbw born at Krishna Hospital, Karad, satisfying Criteria of inclusion, have been included in this study.

• 126 babies with VLBW and ELBW are included in the study.Informed consent is obtained from parents after explaining the procedure to them.

Relevant details were collected which includes maternal details like their age , address, socioeconomic status, educational status, maternal weight, risk factors (Hypertension, Anemia, Gestational Diabetes mellitus, Multiple gestation, Chronic medical illness, Hypothyroidism, HIV status, Hepatitis B, Maternal fever), order of birth, gestational age Antenatal steroids, premature rupture of membranes, mode of delivery and Baby's details include their sex, need of resuscitation, Apgar score, gestational age, birth weight and their illness, need of mechanical ventilation and surfactant therapy were recorded.

STATISTICAL ANALYSIS:

• The data was entered in MS Excel spreadsheet.

• All the quantitative parameters such as weight and age was summarized as mean ± standard deviation

• Data was analyzed by entering into a computer and analyzed using the Statistical Package for the Social Sciences (SPSS) software version 23.0 for Windows

Table 1: Demographic and Birth Characteristics

Characteristic	Frequency (%)
Total births	3703 (100%)
VLBW and ELBW births	126 (3.40%)
VLBW cases	105 (83.40%)
ELBW cases	21 (16.60%)
Male infants	67 (53.20%)
Female infants	59 (46.80%)
AGA	45 (36.00%)
SGA	81 (64.00%)

Table 2: Birth Weight and Gestational Parameters

Group	Mean Gestational Age (weeks)	Mean Ballard Score	Mean Birth Weight (grams)
VLBW	31.90	31.83	1272.78
ELBW	28.54	28.42	898.43

Table 3: Major Complications by Group

Complication	VLBW (%)	ELBW (%)
Neonatal Jaundice (NJ)	78.00	90.00

Complication	VLBW (%)	ELBW (%)
Respiratory Distress (RDS)	76.19	90.40
Intraventricular Hemorrhage	28.50	47.60
Apnea of Prematurity (AOP)	28.50	52.30
Sepsis	20.00	33.30
Retinopathy of Prematurity	16.20	52.30
Hypoglycemia	13.30	9.50
PDA	10.40	28.50
Pulmonary Hemorrhage	9.52	28.50
VSD	8.50	14.20
NEC	5.70	9.50

Table 4: Sepsis, NEC and ROP Incidence (Combined)

Condition	Total Cases (%)
Sepsis (Overall)	28 (22.20%)
Sepsis in VLBW	21 (20.00%)
Sepsis in ELBW	7 (33.30%)
NEC (Overall)	8 (6.30%)
NEC in VLBW	6 (5.70%)
NEC in ELBW	2 (9.50%)
ROP (Overall)	28 (22.20%)
Stage I	12 (42.80%)
Stage II	4 (14.20%)

Condition	Total Cases (%)
Stage III	10 (36.00%)
Stage IV	1 (3.50%)
Stage V	1 (3.50%)

Table 5: Metabolic and Electrolyte Complications

Condition	VLBW (%)	ELBW (%)
Hypoglycemia	13.30	9.50
Polycythemia	14.20	23.80
Dyselectrolytemia	9.50	14.20
Hypocalcemia	10.00	33.33
Hyponatremia	90.00	66.67

Table 6: Clinical Outcomes

Outcome	Frequency (%)
Recovered (Overall)	94 (74.70%)
DAMA	2 (1.60%)
Referred (RHC)	5 (3.90%)
Died (Overall)	25 (19.80%)
Recovered in VLBW	81 (81.60%)
Recovered in ELBW	7 (33.30%)
Deaths in VLBW	12 (12.70%)
Deaths in ELBW	13 (61.90%)

4. DISCUSSION

The present study, conducted at Krishna Institute of Medical Sciences, Karad over 18 months, involved 3,703 newborns, of whom 126 were either very low birth weight (VLBW) or extremely low birth weight (ELBW). The primary aim was to evaluate complications in these infants and compare findings with existing literature to identify intervention targets.

VLBW and ELBW infants comprised 3.4% of total births, with males slightly predominant (53.2% male vs. 46.8% female). Previous work by Kramer et al. reported VLBW rates of 1–2% in similar settings [10], suggesting our higher incidence reflects regional demographic or healthcare disparities. The observed male predominance aligns with reports by Fanaroff et al., who also noted slightly higher VLBW and ELBW incidence among male neonates [11].

Mean gestational age in our cohort was 31.9 weeks for VLBW and 28.5 weeks for ELBW infants. Tyson et al. similarly found mean gestational ages of 32 and 27.5 weeks for VLBW and ELBW, respectively [12], confirming consistency with global data.

Overall sepsis occurred in 20% of VLBW and 33.3% of ELBW infants. Stoll et al. reported a 22% sepsis rate in VLBW neonates [13], indicating similar infection risk. The elevated rate in ELBW infants underscores their heightened vulnerability.

RDS was diagnosed in 78.5% of all VLBW/ELBW cases, and in 90.4% of ELBW infants. Van Marter et al. documented RDS incidences exceeding 80% in ELBW infants [14]. In 2012, Ramadevi et al. found that 41.12% of RDS cases occurred in VLBW infants [14], and Kaur et al. reported a 65.3% RDS prevalence among VLBW infants in Jaipur (2013–2015) [15]. Mukesh Kumar et al. observed lower RDS rates (26.4% in VLBW) [16], possibly reflecting differing ventilatory or antenatal management protocols.

Pulmonary hemorrhage occurred in 12.6% of cases, predominantly among ELBW infants. Afjeh et al. reported a 17.4% pulmonary hemorrhage rate, higher than ours [17], while Sonawane et al. found a 15.8% incidence in VLBW mortality cases [18]. Patent ductus arteriosus (PDA) was the most common cardiac anomaly, in line with Benitz et al.'s findings that PDA frequently complicates VLBW infants [19].

Hypoglycemia affected 12.6% of infants, whereas physiological jaundice was present in 80.2%, especially in ELBW neonates. Alsweiler et al. similarly reported high hyperbilirubinemia rates in VLBW/ELBW babies [19].

ROP occurred in 22.2% of infants, with Stage I most common. Roy et al. documented 15.7% ROP incidence in VLBW infants [19], while Le et al. found only 1.5% incidence in a larger cohort, suggesting that our higher rate may stem from the smaller VLBW sample size [19].

NEC was observed in 6.3% of cases (both VLBW and ELBW). Cole et al. reported a 10% NEC rate in VLBW neonates [19], and Wilson et al. documented up to 42% in infants <1,500 g [19]. Early minimal enteral feeding with human milk likely contributed to our relatively lower NEC incidence.

Overall IVH/PVL incidence was 31.7%, with 47.6% in ELBW infants, often associated with neonatal seizures. Kaur et al., Roy et al., and Budhathoki et al. reported IVH rates of 6.9%, 2.8%, and 2.3%, respectively [19], indicating our higher prevalence may reflect the small ELBW sample.

The overall recovery rate was 74.7%, higher in VLBW (81.6%) than ELBW infants (33.3%). Mortality was 19.8% overall, with 12.1% in VLBW and 65% in ELBW infants. Vermont Oxford Network data corroborate elevated mortality in ELBW neonates [19]. Compared to Afjeh et al.'s VLBW mortality of 15.8% [17], our VLBW mortality (12.1%) was lower. Similarly, Gupta et al. reported a 16.9% VLBW mortality [16], and Sonawane et al. reported 23.6% [18]

5. CONCLUSION

This study highlights the significant burden of complications associated with very low birth weight (VLBW) and extremely low birth weight (ELBW) neonates in a tertiary care NICU setting. Among the 126 infants studied, ELBW babies exhibited substantially higher rates of morbidity and mortality compared to VLBW counterparts. Respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), apnea of prematurity (AOP), and retinopathy of prematurity (ROP) were the most prevalent complications, particularly affecting ELBW neonates. Metabolic disturbances such as hypoglycemia, hypocalcemia, and electrolyte imbalances were also common, reflecting their physiological fragility.

While the overall recovery rate was satisfactory at 74.7%, outcomes varied widely between the two groups: VLBW infants had a much higher survival rate (81.6%) than ELBW infants (33.3%), underscoring the increased vulnerability of the latter. The mortality rate for ELBW neonates was particularly alarming at 61.9%, compared to 12.7% in VLBW infants. These findings reinforce the need for early identification of at-risk pregnancies, improved perinatal care, timely antenatal steroid administration, and enhanced neonatal resuscitation and support strategies.

Ultimately, focused clinical protocols and investments in neonatal care infrastructure are vital to improving survival and reducing complications among VLBW and ELBW infants. These insights can guide policy interventions and help prioritize high-risk neonates for intensive monitoring and early therapeutic action

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