Original Research Article

Prevalence, Clinical Profile and Outcome Predictors in Very Low Birth Weight and Extremely Low Birth Weight Neonates in Tertiary Care Hospital

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ABSTRACT

Background: Neonates with very low birth weight (VLBW) and extremely low birth weight (ELBW) has a much higher chance of experiencing serious health complications or even death. Their results depend on a myriad of newborn and maternal variables. Thus, it is important to assess and treat them specifically.

Objective: The goals of this study are to quantify and assess the clinical profile, and to identify factors that are predictive of adverse outcomes of VLBW and ELBW neonates.

Methods: This prospective observational research was conducted in the tertiary level neonatal intensive care unit (NICU) from 2022 to 2024. Of the 88 newborns enrolled, information gathered include factors such as birth weight, gestational age, gender, family medical history, prenatal treatment, delivery specifics, clinical trajectory and outcomes. Neonates were treated according to standard treatment guidelines.

Results: There was a frequency of 1.10% for VLBW and 0.18% for ELBW. Thrombocytopenia, respiratory distress syndrome, and sepsis were among the most common complications. Results improved when antenatal steroids were used and when ANC visits were sufficient. Comparing ELBW and VLBW infants, the mortality rate was greater in the former (52.94% vs. 23.94%). Low gestational age, pulmonary haemorrhage, DIC, thrombocytopenia, and the requirement for ventilatory support were major indicators of poor prognosis.

Conclusion: Neonates born with very low birth weight (VLBW) or extremely low birth weight (ELBW) are at increased risk and should receive intensive prenatal care, the early detection of maternal risk factors, and specialized newborn care. Neonatal intensive care units need to identify factors that can lead to a bad result so that they can allocate resources more wisely and intervene quickly.

Keywords: VLBW, ELBW, Neonatal Morbidity, Neonatal Mortality, NICU, Gestational Age, ANC, Sepsis, RDS, Neonatal Outcomes

INTRODUCTION

Low birth weight neonates are babies whose first measured weight is less than 2500 gm without respect to gestational age. Preferably, it should be measured within the first hour of life before significant postnatal weight loss has occurred.[1,2] It includes both preterm neonates and term neonates.[3] They are at increased risk of death because of underdeveloped or poorly developed organ systems and the inability to physiologically respond to their external environment. Therefore, a newborn's weight at birth is considered as an important marker of maternal and foetal health.[4]

The major health problems associated with low birth weight (LBW) neonatal mortality include feeding difficulties, hypoglycaemia, hypothermia, pulmonary immaturity, susceptibility to infection, fluid and electrolyte imbalance.[5]These health problems keep

them at a higher risk of dying within the first 28 days of life. Besides, those who survive the neonatal period are also more likely to suffer from stunted growth and lower intelligence quotient in early childhood.[6,7]Even the consequences of low birth weight continue into adulthood as increasing the risk of adult- onset chronic conditions, such as obesity and diabetes.[8]

Globally, the incidence and mortality of LBW neonates are still high and are considered a major cause of neonatal mortality especially in developing countries. It contributes to 60–80% of all neonatal deaths annually.[9] For many neonates, mainly low birth weight neonates, their day of birth is also their day of death, with approximately 1 and 2 million deaths occurring on the day of their birth and in the first week of their life annually in the world, respectively.[10]

There is paucity of the literature reporting mortality and morbidities of VLBW & ELBW neonates from low- and middle-income countries (LMICs). Although there has been impressive expansion of tertiary care neonatal services in India in the past two decades, many units cater to pre dominantly out born or to a mixed population of inborn and out born neonates. The reported survival of VLBW & ELBW infants from these units varied from 40 to 60%.[11–14]

As often there is a referral bias favouring relatively sturdier babies, the truer picture with respect to survival and morbidities of VLBW & ELBW infants is lacking in these settings.

Hence, we planned to conduct this study focusing on in hospital morbidities and mortality of VLBW & ELBW infants in a birth cohort at a tertiary care centre from India, which is relatively well resourced compared with most other units in the country. The current data would help in understanding the factors associated with these morbidities, as well as in counselling the parents in developing country settings.

MATERIAL AND METHODS

Study Design and Setting:

A tertiary level Neonatal Intensive Care Unit (NICU) was the site of this prospective observational research. "The purpose of the research was to assess the health outcomes, complications, and deaths of newborns who were born with very low birth weight (VLBW, 1000-1500 gm) or extremely low birth weight (ELBW, <1000 gm)". After Approved from the Ethics Committee, the enrolment began in November 2022 and ended in April 2024, a duration of 1.5 years.

Sample Size:

The research involved a total of 88 newborns. The formula $n = (Z^2 \times P \times (1 - P))/e^2$ was used to get the sample size. In this case, the intended accuracy is half of the desired confidence interval width, (e) is the anticipated real percentage, and (Z = 1.96) corresponds to a 95% confidence interval. No exact numbers for P or e were given, but the sample size was decided in a way that would allow for sufficient statistical analysis to meet the study's goals.

Inclusion and Exclusion Criteria:

The study included all neonates, both intramural (born in the hospital) and extramural (referred from other facilities), with birth weights ranging from 1000–1500 gm (VLBW) or <1000 gm (ELBW). Neonates were excluded if their parents did not provide consent for participation. This ensured ethical compliance while focusing on the target population of low-birth-weight neonates.

Data Collection:

Neonates meeting the inclusion criteria had their birth weight measured using an electronic weighing machine with a sensitivity of ±1 g. A detailed history was collected upon admission, including maternal factors such as age, height, weight, drug intake, previous abortions, and conditions like anemia, antepartum haemorrhage, hypertension, diabetes, and fever, which could influence neonatal outcomes. Neonates underwent frequent clinical examinations as required, with clinical findings and progress during their hospital stay meticulously recorded.

Clinical and Laboratory Monitoring:

Laboratory parameters, including complete blood counts, blood culture and sensitivity, C-reactive protein, random blood sugar, serum bilirubin, serum calcium, and serum electrolytes, were documented. Treatments administered, such as oxygen therapy, antibiotics, intravenous fluids, parenteral nutrition, and feeding patterns, were evaluated and recorded in a structured proforma. All neonates were monitored and managed in the NICU according to standard protocol guidelines, ensuring consistency in care.

Outcome Assessment:

The study evaluated morbidities and mortalities during the neonates' NICU stay. Clinical progress, complications, and treatment outcomes were systematically recorded to assess the health trajectory of VLBW and ELBW neonates. This comprehensive approach allowed for a thorough analysis of factors contributing to neonatal outcomes.

Data Analysis

Data were compiled using MS Office Excel and analysed with statistical software. Descriptive statistics, including frequency, percentage, and mean, were used to summarize the data. "Inferential statistics, such as Pearson's chi-square test, relative risk, and p-value, were applied to test associations between variables, with a p-value (<0.05) considered statistically significant". Results were presented in tables and figures as needed to facilitate interpretation.

RESULTS

Our study was conducted over a period of 18 months, from November 2022 to April 2024, in the tertiary care NICU. During study period, 71 VLBW & 17 ELBW (total 88) neonates were enrolled in the study. Out of total live births (4755) during study period, 57(1.2% of live births) were intramural and 31 were extramural.

Out of 88 neonates,71(80.68%) was VLBW and 17(19.32%) were ELBW. The mean birth weight/admission weight was 1.16kg (range:0.65kg to 1.49kg).
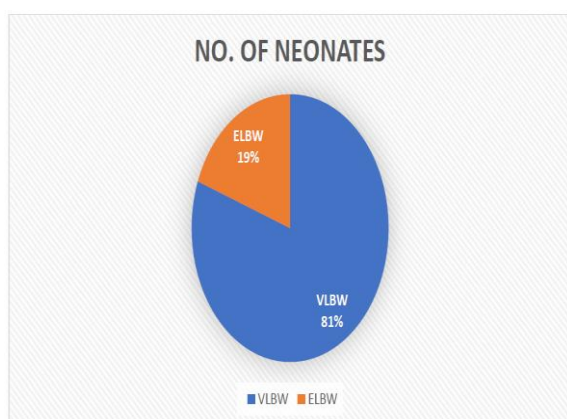
Figure-1: Distribution of Neonates According to Birth Weight

Out of 71 VLBW neonates, 42(59.15%) were male and 29(40.85%) were female. Out of 17 ELBW neonates, 7(41.17%) were male and 10(58.83%) were female.

Out of 71 VLBW neonates, 48 patients (67.60%) were in-born and 23 patients (32.40%) were out-born and were admitted within 24 hr of birth to Dhiraj Hospital. Out of 17 ELBW neonates, 9 patients (52.97%) were in-born and 8 patients (47.03%) were out-born.

Out of 88 admitted neonates,4(4.54%) neonates were <28 weeks of GA, 46(52.27%) were 28 to <32

weeks,16(18.18%) were 32 to <34 weeks, 20(22.72%) were 34 to <37 weeks and 2(2.27%) were≥37 weeks of GA.

Out of 71 VLBW neonates2 (2.81%) were <28 weeks of GA,33(46.47%) was 28 to<32 weeks of GA, 16 (22.53%) were 32 to <34 weeks of GA, 18(25.35%) were 34 to<37 weeks of GA, 2(2.81%) were ≥37 weeks of GA.

Out of 17ELBW neonates 2 (11.76%) were <28 weeks of GA, 13 (76.47%) were 28to <32 weeks of GA, 2 (11.76%) were 34 to<37 weeks of GA.
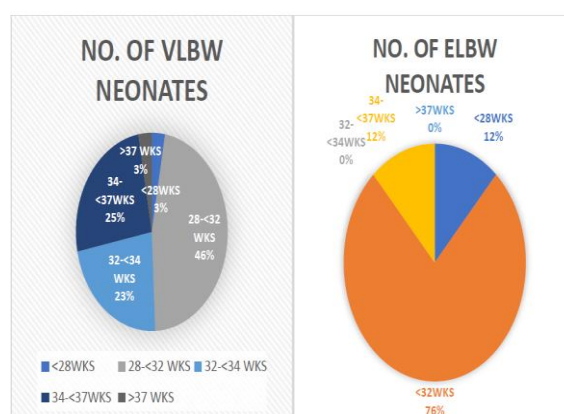
Figure-2: Distribution of VLBW & ELBW Neonates According to Gestational Age

Out of 88 neonates, 40 (45.45%) was SGA and 48(54.55%) were AGA. No neonate was large for gestational age. Out of 71 VLBW neonates, SGA were 28(39.43%) and AGA were 43(60.56%). Out of17 ELBW neonates, SGA were 12(70.58%) and AGA were 5(29.42%).
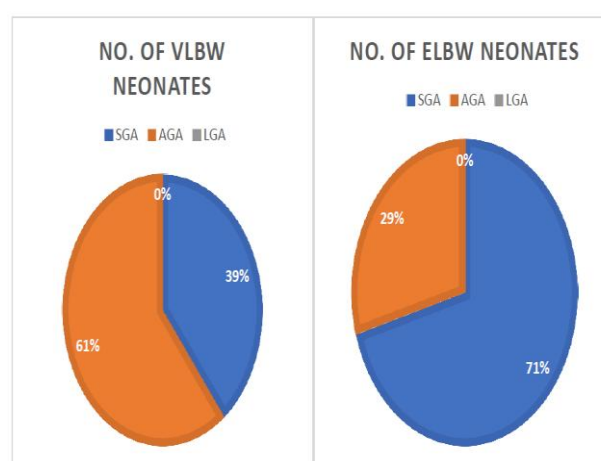

Figure-3: Distribution of VLBW & ELBW Neonates According to Weight for Gestational Age

Out of 71 VLBW,63(88.73%) had taken adequate ANC visits (>3), and 8(11.26%) had inadequate visits

(≤3). Out of 17 ELBW neonates,14(82.35%) had adequate ANC visits (>3), and 3(17.64%) had inadequate visits.

46 (52.27%) mothers had previous Bad Obstetric Histories and 42(47.73%) did not have any previous Bad Obstetric History. Among 46 mothers with a Bad Obstetric History, 28 (60.86%) had previous abortion,12(26.10%) had previous preterm delivery,3(6.52%) had previous neonatal death and 3(6.52%) had previous still birth.
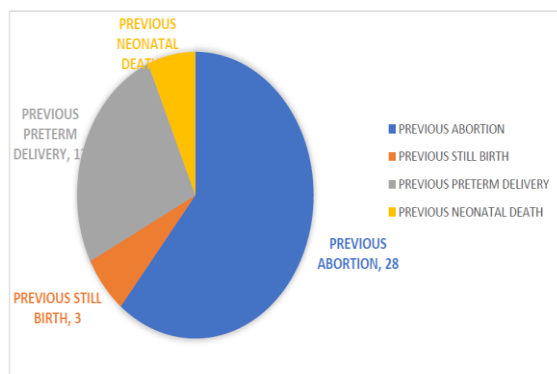

Figure-4: Frequency of Bad Obstetric History

Out of 71 VLBW neonates, 54(76.05%) mothers had anemia, 19(26.76%) mothers had oligohydramnios, 13(18.3%) mothers had PIH, 10(14.08%) mothers had multiple gestational, 8(11.27%) mothers had AEDF/REDF/ CP RATIO <1, 7(9.85%) mothers had PROM, 4(5.63%) mothers had pre-eclampsia, 2(2.81%) mothers had APH.
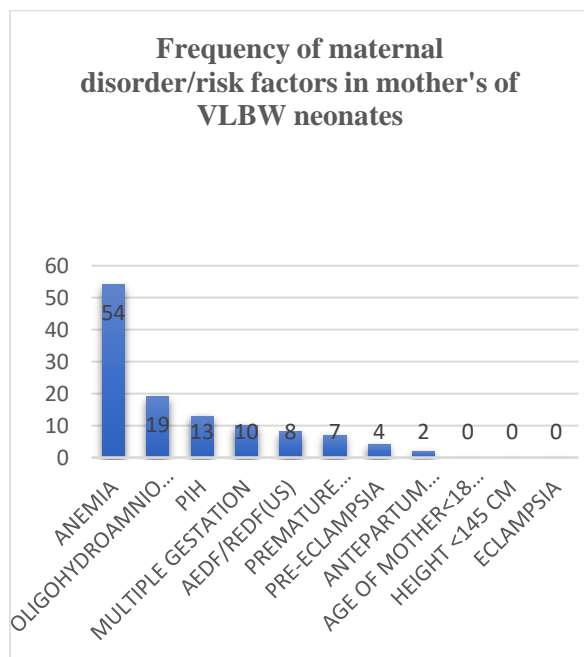
Figure-5: Frequency of Maternal Disorders/Risk Factors in VLBW Neonates

Out of 17ELBW neonates, 13(76.47%) mothers had anemia, 4(23.53%) mothers had oligohydramnios,3(17.65%) mothers had PIH,6(35.30%) mothers had multiple gestational, 4(23.52%) mothers hadAEDF/REDF/CPRATIO<1,2(11.76%) mothers had PROM, 2(11.76%) mothers had pre-eclampsia, 3(17.65%) mothers had APH, 1(5.88%) mother had eclampsia,1(5.88%) mother had height <145 cm.
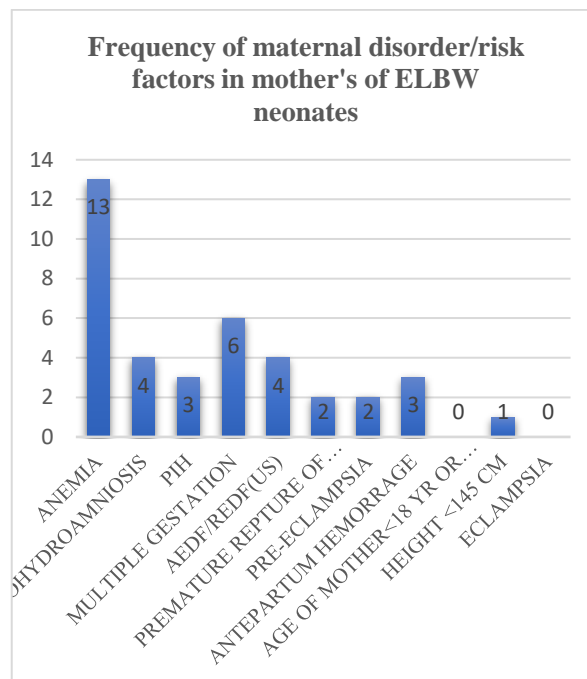
Figure-6: Frequency of Maternal Disorders/Risk Factors in ELBW Neonates

DISCUSSION

Care for newborns with Very Low Birth Weight (VLBW) or Extremely Low Birth Weight (ELBW) presents substantial clinical difficulties and complications, as this research shows. These newborns made up a large percentage of the NICU population, with a total frequency of 1.28% among all live births.

Our results highlight the fact that compared to VLBW newborns, ELBW neonates have much greater rates of death and morbidity. As far as problems go, the most common ones were anaemia, thrombocytopenia, respiratory distress syndrome, and sepsis. Complications include pulmonary haemorrhage and disseminated intravascular coagulation (DIC), as well as a lower gestational age, was significantly linked to poor outcomes. Invasive breathing assistance was often necessary.

Positive maternal factors, including adequate antenatal visits and administration of antenatal steroids, were linked to improved neonatal outcomes. These results emphasize the critical role of maternal care and early neonatal interventions in improving survival and reducing complications in this vulnerable population.

CONCLUSIONS

In conclusion, early identification of risk factors, meticulous perinatal care, and adherence to standardized NICU management protocols are essential to improve outcomes in VLBW and ELBW neonates. Continued focus on maternal health and neonatal intensive care advancements is imperative for reducing neonatal morbidity and mortality in this high-risk group.

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