

**Original research article**

**EXAMINATION OF NEONATAL MORBIDITY AND MORTALITY IN LOW-BIRTH-WEIGHT NEONATES IN AN INTENSIVE CARE UNIT**

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**Abstract**

**Background:** The most common cause of newborn morbidity is prematurity, especially in very low birth weight (VLBW) infants. The World Health Organisation (WHO) defines very low birth weight neonates as those that weigh less than 1500g at birth, regardless of gestational age. Birth weight is the most important predictor of health problems during pregnancy, delivery and the newborn period.

**Methods:** The Neonatal Intensive Care Unit of the Department of Paediatrics, Viswabharathi Medical College & General Hospital R T Nagar Near Penchikalapadu, Kurnool, Andhra Pradesh, India was the site of this prospective cohort study. From March 2022 to February 2023, all very low birth weight (VLBW) newborns admitted to the Neonatal Intensive Care Unit were included in this study.

**Results:** Hospitalized infants with very low birth weights (LBW) total 315 in this study. The most common maternal risk factor for VLBW is hypertension during pregnancy, followed by anaemia. Most mothers are economically marginal. The result is poor nutrition, anaemia, and babies born with low bodymass index.

**Conclusion:** Very low birth weight infants could be prevented with better nutritional guidance to prevent anaemia. It is important to improve antenatal steroid treatment. Most deaths occurred due to sepsis and RDS. Most infant deaths can be traced back to premature birth.

**Keywords:** Very low birth weight (VLBW), neonatal mortality, morbidity, ICU

**INTRODUCTION**

Premature birth, defined as a foetal age (GA) of less than 37 weeks, is the leading cause of morbidity in neonates, especially very low birth weight (VLBW) neonates. Morbidity is more common in premature babies with a very low birth weight (VLBW). When a baby is born weighing less than 1500 grammes, the World Health Organisation classifies them as having a "very low birth weight". This categorization holds true regardless of the stage of pregnancy. The birth weight of the infant is the single most critical determinant in determining the baby's neonatal and long-term health. It depends not only on how long the pregnancy lasts but also on how big the

foetus gets inside the mother's womb. Very low birth weight (VLBW) infants make up less than 2% of all births everywhere. Very low birth weight (VLBW) newborns account for between 4 and 7 percent of births in India and 30 percent of neonatal fatalities. The rate of extremely low birth weight can be used as a predictor of the infant mortality rate. More than half of all neonatal deaths are caused by babies with extremely low birth weight <sup>[1, 2, 3]</sup>.

The infant mortality rate is highly correlated with that of children under the age of five. India is responsible for 6.4% of the world's annual infant mortality rate, or 6.4 million infant deaths annually. The purpose of this study is to examine the risk factors for mortality and morbidity among babies who were born prematurely or with extremely low birth weights and are now getting medical care. Recent advances have led to an increase in the proportion of infants that are extremely underweight at birth. Infants born prematurely or with a very low birth weight are more likely to experience health complications such hypoglycemia, sepsis, hyperbilirubinemia and respiratory distress. Medical personnel will be better prepared to prevent and treat complications related to very low birth weight if more research is conducted to identify the causes of this condition. As a direct result of this, we can prevent problems from developing in these newborns at an earlier age. Our ability to accurately diagnose illness and pinpoint the cause of death in neonates with extremely low birth weight will be invaluable as we work to devise and execute methods to bring the infant mortality rate down <sup>[4, 5, 6]</sup>.

## **METHODS**

A prospective Cohort Study was conducted at the Neonatal Intensive Care unit of the Department of Paediatrics, Viswabharathi Medical College & General Hospital R T Nagar Near Penchikalapadu, Kurnool, Andhra Pradesh, India. All very low birth weight newborns admitted to the Neonatal Intensive Care Unit between March 2022 to February 2023 were the subject of data analysis in this study.

### **Selection Criteria Inclusion Criteria**

NICU admissions for all newborns with very low birth weight between January March 2022 to February 2023.

### **Exclusion Criteria**

1. Neonates with significant congenital abnormalities.
2. Newborns with chromosomal disorders that have been clinically detected.

All VLBW infants were enrolled in the trial following written informed consent from the parents. With the parents' approval, the researchers were able to use their clinical information for the investigation. Furthermore, approval from the ethical committee was obtained. All of the VLBW neonates hospitalized to our NICU were included in the study. Relevant data was gathered, including details about the mothers' age, address, socioeconomic standing, level of education, weight, and risk factors (such as hypertension, anaemia, gestational diabetes mellitus, multiple pregnancies, chronic illnesses, hypothyroidism, HIV status, hepatitis B and maternal fever). Other pertinent data included the babies' gestational ages, antenatal steroids use, preterm birth, delivery method, and birth weight. The baby's information included their sex, if they needed resuscitation, their Apgar score, gestational age, and birth weight, as well as information about their illness, need for mechanical breathing, and response to surfactant therapy <sup>[7, 8]</sup>.

Newborns with a low risk of problems may initially be placed on the mother's belly after delivery.

A bulb syringe or a soft catheter can be used to draw secretions from the mouth. The airway of a newborn who is breathing on their own and not in distress does not need to be cleared by any form of assisted technique. It has been demonstrated that giving newborns an extra 30 seconds before cutting the umbilical cord can lower their risk of developing anaemia.

As soon as a newborn is delivered, it is normal practise to evaluate them systematically using the Apgar score. It wasn't designed to be a tool for figuring out how the neurological exam would turn out. The incidence of cerebral palsy is lower in neonates with Apgar scores of 0-3 at 5 minutes than it is in infants with Apgar values of 7-10. However, infants with Apgar scores of 0-3 at 5 minutes have a greater prevalence of cerebral palsy. Both a low umbilical artery blood pH and a low Apgar score are signs of neonatal death<sup>[8, 9]</sup>.

### RESULTS

**Table 1: Distribution of age**

<b>Gender</b>	<b>VLBW Neonates</b>	
	<b>n</b>	<b>(%)</b>
Male	166	52.7%
Female	149	47.3%

The study included 315 infants with VLBW in total. 166 (52.7%) of the 315 newborns with VLBW were males and 149 (47.3%) were female.

**Table 2: Locality of birth**

<b>Locality</b>	<b>VLBW Neonates</b>	
	<b>n</b>	<b>(%)</b>
In Born	198	62.8%
Out Born	117	37.2%

Out of 315 VLBW neonates, 198 (62.8%) were inborn and 117 (37.2%) were out born.

**Table 3: VLBW Neonates Mean Birth Weight**

<b>Mean birth weight of VLBW neonates</b>			
	<b>Mean</b>	<b>SD</b>	<b>Std. Error</b>
Male	1.358	0.134	0.007
Female	1.312	0.138	0.008
Total	1.335	0.136	0.005

Males had a mean birth weight of 1.33 kg, while girls had a weight of 1.27 kg, with a standard deviation of 0.13. Out of 315 VLBW infants, 117 (37.2%) were delivered naturally vaginally and 198 (62%) were delivered via caesarean section.

**Table 4: Delivery mode**

Mode of Delivery Normal	VLBW Neonates	
	n	(%)
LSCS	166	53.1%
Female	149	46.9%

**Table 5: Gestational Age**

GA	VLBW Neonates	
	n	(%)
SGA	112	35.5%
AGA	105	33.3%
IUGR	98	31.2%

112 (35.5%) of the 315 VLBW newborns were SGA, 105 (33.3%) were-AGA and 98 (31.2%) were IUGR. There were more SGA babies among them as a percentage.

**Table 6: Gestational Age**

Gestational Age	VLBW Neonates	
	n	(%)
< 28 weeks	34	10.7%
28-32 weeks	134	42.6%
32-34 weeks	102	32.4%
34-36 weeks	45	14.3%

In table 6, the majority of VLBW newborns belonged to the gestational age ranges of 28 to 32 and 32 to 34 weeks (n = 134, 42.6% and 102, 32.4%, respectively).

**Table 7: Risk Factors of Maternal**

Maternal Risk Factors	Number	(%)
No Risk	97	30.7
Gestational Hypertension	117	36.5
Anemia	70	22.2
Hypothyroid	10	3.1
Gestational Diabetes	15	4.7
HIV	6	1.9
Multiple Gestation	0	0
Chronic Medical Illness	0	0
Hepatitis B	0	0

Table 7 shows that Gestational hypertension (117, 36.5%) is the most prevalent maternal risk factor for VLBW, followed by Anaemia (70, 22.2%), Gestational Diabetes Mellitus (15, 4.7%) and Hypothyroidism (10, 3.1%). There were no maternal risk factors for any of the 97 VLBW infants.

**Table 8: Demographic Features of the Study**

Demographic Features of the Study		
		Number (%)
Gender	Male	166 (52.69%)
	Female	149 (47.31%)
Gestational Age	<28 Weeks	34 (10.7%)
	28-32 weeks	134 (42.6%)
	32-34 Weeks	102 (32.4%)
	34-36 Weeks	45 (14.3%)
Place of Birth	Inborn	198 (62.8%)
	Out born	117 (37.2%)
SGA		112 (35.5%)
AGA		105 (33.3%)
IUGR		98 (31.2%)

The results of the investigation are shown in Table 8. Out of 315 VLBW neonates, 149 (47.3%) were girls and 166 (52.7%) were males, 198 (62.8%) were inborn, and 117 (37.2%) were out born. The majority of them were in the gestational ages 28-32 (n = 134, 42.6%) and 32-34 weeks (n = 102, 32.4%) and tiny for gestational age.

**Table 9: Delivery & Interventions**

Delivery & Interventions		
		Number (%)
Mode of Delivery	Normal	166 (53.1%)
	LSCS	149 (46.9%)
Resuscitation Required		28 (12.96%)
Surfactant		47 (21.7%)
NCPAP		66 (30.5%)
Mechanical Ventilation		75 (34.7%)

According to Table 9, 149 babies were born using LSCS, while 166 (53.1%) were delivered normally vaginally. For 28 babies (12.9%), birth resuscitation was necessary. 47 (21.7%) people had surfactant therapy, 66 (30.5%) received NCPAP and 75 (34.7%) received mechanical ventilation.

**Table 10: Morbidity Pattern in VLBW Neonates**

Disease	VLBW Neonates	
	n	(%)
Sepsis	135	23%
Respiratory Distress Syndrome	107	18.9%
Transient Tachypnea of Newborn	88	16%
Hypoglycemia	49	8.6%
Neonatal Hyperbilirubinemia	33	5.8%
Asphyxia	26	4.6%
Meningitis	26	4.6%

Intraventricular Hemorrhage	17	3.1%
Shock	17	3.1%
Pneumonia	12	2.12%
Hydrocephalus	10	1.76%
Patent Ductus Arteriosus	8	1.41%
Apnea of Prematurity	11	1.94%
Necrotising Enterocolitis	9	1.6%
Retinopathy of Prematurity	6	1.1%
Infant of Diabetic Mother	6	1.1%
Pneumothorax	3	0.5%
Meconium Aspiration Syndrome	3	0.5%

### **DISCUSSION**

315 extremely low birth weight neonates in all were admitted to the NICU throughout the research. With 70 cases, anaemia was the second most frequent maternal risk factor linked to extremely low birth weight, after gestational hypertension, which had 117 cases. The mothers are mainly from lower social and economic classes. As a result, there is insufficient intake, which raises the risk of infections and causes anaemia, both of which indirectly contribute to low birth weight in children. Neonatal jaundice, which required phototherapy, respiratory morbidity, and hypoglycemia were reported in the study by Jaiswal *et al.* to be the most often discovered morbidities in late-preterm neonates. In our research, sepsis occurred first, then RDS, TTN and NNH. The predominant morbidity in our investigation was sepsis, we found. In a study by Jaiswal *et al.*, it was found that IUGR, repeated pregnancies, and caesarean births were risk factors for morbidity. But in our analysis, the two significant risk factors were anaemia and gestational hypertension. In this study, we found no difference in morbidity between standard vaginal delivery and caesarean birth for VLBW infants. Sepsis is the most common disease in VLBW neonates (n = 133 or 35% of them), followed by RDS (n = 105, or 27%), TTN (n = 85, or 22%) and hypoglycemia (n = 47 or 12%), according to Apgar *et al.* and Weiner *et al.* Sepsis and IVH were the two most frequent causes of death, according to the study. In our study, respiratory distress syndrome (RDS) (n=107, 18.9%) came in second place to sepsis (n=135, 23%) as the primary cause of death <sup>[10, 11]</sup>.

Mechanical ventilation and birth weight are the two main factors contributing to infant death in cases of very low birth weight (VLBW), according to a study by Silverman *et al.* The three main factors that contributed to morbidity were RDS (n=56, 33.6%), birth asphyxia (n=54, 32.4%) and sepsis (n=46, 27.6%). (n=43, 25.8%) RDS was the main cause of death. 90% of VLBW babies had RDS, which had a 34.6% incidence and a 78% mortality rate. In our investigation of VLBW newborns, sepsis and RDS were the two most frequent causes of morbidity and mortality. One of the leading causes of death in newborns with VLBW is RDS, which accounts for 40% of mortality. In the Kaur and Thapar *et al.* investigation, jaundice, HMD, and sepsis were the three main causes of morbidity. They were most frequently between 33 and 36 weeks gestation (n=45, 14.3%) and most frequently undersized for gestational age (n=89, 57.8%). Our study's primary causes of morbidity in VLBW newborns were sepsis and RDS, which is similar to this study's primary causes. But the bulk of them (n = 134, 42.6%) and (n = 102, 32.4%), were between 28 and 32 weeks' gestation <sup>[12, 13]</sup>.

In the study by Ghulam Nabi *et al.*, jaundice was the predominant morbidity. But in our analysis, morbidity is accounted for by jaundice in 33 (5.8%) cases. In the Ballot *et al* investigation, NEC, HMD, and extreme preterm were the three main causes of death. Our analysis revealed that sepsis and RDS were the major killers. The two maternal conditions that were most frequently associated to LBW were anaemia (43.36%) and hypertensive disorders of pregnancy (17.6%). In our study, RDS and sepsis were the two major morbidities among VLBW newborns. The most common risk factors for VLBW in our investigation were maternal hypertension and anaemia. Hypoglycemia is responsible for 49 (8.6%) of the morbidity in our study. Preterm babies are more likely to experience hypoglycemia as a result of hormonal dysregulation, immature hepatic glycogenolysis and adipose tissue lipolysis, as well as insufficient hepatic gluconeogenesis and ketogenesis [14, 15]. In the Rasania *et al.* study, sepsis was present in 28.6% of cases, RDS in 7.37%, and birth asphyxia in 16.39% of patients. Hyperbilirubinemia was observed in 32.78% of cases. There was a noticeably higher demand for respiratory support in mild preterm infants (47.8%). 23% of individuals in our study developed sepsis, 18.9% had RDS, 16% had TTN, and 8.6% had hypoglycemia [16, 17].

The leading causes of infant mortality, according to a different study carried out at Banaras University, are neonatal infections, shock, perinatal hypoxia, and apnea. Sepsis (n=49, 52%), RDS (n=40), preterm (n=1%), and IVH (n=4%) account for the majority of deaths in our study. The respiratory distress syndrome affected 105 of the 315 VLBW infants; 43 of them received surfactant therapy, but 38 of them passed away. The majority of VLBW neonates were born between the gestational ages of 28 and 32 and 32 and 34 weeks. Of the 315 VLBW babies, 88 (or 25%) died, leaving 227 (or 75%) to survive [18, 1, 9, 20]. Mechanical ventilation was necessary for neonates with VLBW (n = 71; 18.5%). Gender, place of birth, place of residence and sex had no bearing on the result. The results were positively linked with mechanical ventilation and gestational age. With a decrease in gestational age, both morbidity and mortality increase. The leading causes of mortality in infants are RDS and sepsis, hence the level of care for babies during the prenatal, perinatal, and postnatal phases needs to be raised. We must enhance antenatal care and education at the local level, as well as the continued education of healthcare professionals like NRP [21, 22].

## **CONCLUSION**

To reduce the number of babies delivered with very low birth weights, nutritional guidance should be addressed to minimize anaemia. The use of antenatal steroids needs to be increased. The two main killers were RDS and sepsis. The majority of newborn deaths are due to prematurity. Premature births are the primary focus of this. Initiatives to prevent preterm birth that are effective can lower the perinatal morbidity rate in our state. This comprises preventative actions at several levels, with an emphasis on preventing pregnancy-induced hypertension (PIH), which is the main reason for premature births at our centre, early detection, and effective care. There should be more prenatal steroid therapy. The government must establish strict aseptic practises in birth rooms, early CPAP administration, and efficient transit facilities in order to raise standards for neonatal health.

**CONFLICT OF INTEREST:** None.

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