



SHORT TERM OUTCOMES OF EXTREME PRETERM NEONATES IN AN EXTRAMURAL TERTIARY NICU

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ABSTRACT **Background and Objectives-** Preterm delivery complications are the leading direct cause of neonatal fatalities, accounting for 2.3 million deaths worldwide each year. Prematurity is the single largest killer of children under 5 years of age. Among the ten nations that account for 60% of extreme preterm births worldwide, India comes in first place. Studies on the short-term outcomes of extreme preterm neonates are rather rare in Indian literature. The purpose of this study is to determine how extreme preterm affect morbidity and death. **Materials and Methods-** This prospective observational study was conducted in a tertiary care NICU in Southern India. The study period is of 2 years from June 2021 to May 2023. All eligible neonates, fulfilling the eligibility criteria of born between 23+0 to 27+6 weeks of gestational age were selected after informed consent for parents. A total of 55 neonates were considered as eligible sample size of the study. They were analyzed for short term morbidities comes under this study. SPSS was used for analysis. **Results-** Out of 55 extreme preterm neonates born. Mean birth weight and gestational age were 820 grams and 25+5 weeks. Full dose of antenatal steroids were given in 72% of subjects. Also magnesium sulfate was given in 26 subjects (49%). The most common complication seen in extreme preterm neonates was respiratory distress (100%) followed by sepsis in 24%. The study showed medical intervention in the form of inotropes, mechanical ventilation and surfactant were helpful in better outcome of neonates. Average duration of stay in the unit is 7 weeks. The survival outcome is of 50.9%, the mortality outcome in the study is of 32.7%. **Conclusion-** This study found that neonates born with extreme prematurity were at increased risk of mortality with improving survival rates over time. The survival rates in our unit is comparable with survival rates across other major tertiary care NICU in our nation. These findings suggest that more active and effective treatment strategies are needed, especially for neonates born at gestational age 23+0 to 27+6 weeks.

KEYWORDS : Short term outcome, Preterm, Morbidity, low birth weight, neurodevelopment.

INTRODUCTION-

Extremely preterm (EP) neonates with gestational age (GA) <28 weeks are at high risk of morbidity and mortality. Prematurity is associated with increased risk of infections, retinopathy of prematurity (ROP), necrotizing enterocolitis (NEC), intraventricular hemorrhage (IVH), respiratory distress syndrome (RDS), peri-ventricular leukomalacia (PVL) and so forth. The majority of them require advanced life support during the initial few days. [1] The WHO explains preterm birth as any birth that occurs before 37 full weeks of pregnancy. Based on gestational age, preterm birth can be further classified as follows: extremely preterm (under 28 weeks), very preterm (between 28⁰ weeks to 31⁶ weeks), and moderately preterm (between 32⁰ to 33⁶ weeks) and late preterm 34⁰ week to 36⁶ weeks). As a result, until 1970, the long-term survival rates were often under 10% [1]. Additionally, around a quarter of extreme preterm neonates born in the 1990s had a significant impairment during the preschool age, such as cerebral palsy, blindness, deafness, or cerebral palsy [2].

Due to significant advancements in perinatal care, such as antenatal steroids, surfactant replacement therapy, non-invasive breathing supports, aggressive parenteral and enteral nutrition therapy, caffeine therapy and increased active treatment, the outcomes of extreme preterm infants have significantly improved in recent decades. Preterm delivery complications are the leading direct cause of newborn fatalities, accounting for 2.6 million annual deaths worldwide. They are also the most prevalent cause of death for children under the age of five (3).

The short and long-term outcomes of extreme preterm neonates are included in the epidemiological statistics that are now available, which is crucial for family counseling, clinical practice, and societal policies. However, it is challenging to estimate the precise number of extreme preterm neonates in India, making population-based surveys of these children challenging to carry out the number of neonates with extreme prematurity. This is mainly due to a lack of vigorous and successful resuscitation, lack of uniform training among the various centres.

The extent to which factors that affect prenatal development and the etiology of extreme preterm delivery cause complications and the disruption of normal development occur is frequently unknown. There is a general shortage of studies on the short-term outcomes of extreme preterm neonates in Indian literature; therefore we're conducting this research to learn more about it.

MATERIALS AND METHODS-

This prospective observational study was conducted in the tertiary care NICU in Southern India for 2 year duration. All eligible neonates, fulfilling the eligibility criteria were selected after informed consent for parents. A total of 55 babies were considered as eligible sample size of the study.

Inclusion Criteria: Extreme preterm neonates of gestational age between 23⁰ to 27⁶ weeks delivered in the institute and outborn neonates transported from across nearby units.

Exclusion Criteria- Neonates with major congenital anomalies, still born babies.

METHODOLOGY-

The neonate underwent a thorough physical examination, which was recorded in a proforma. Investigations that are appropriate including hematological and radiological tests were carried out as needed throughout the patient's hospital stay. According to our hospital's standard NICU protocol, preterm care was provided such as receiving neonate in polyethylene wrap, in all non-depressed neonates carrying out delayed cord clamping.

In neonates with any signs of respiratory distress such as respiratory rate >60/min, significant retractions with SAS score >2, hypoxia with SpO₂ <90% baby was connected to Bubble CPAP support. In case of poor respiratory effort connecting the neonates to mechanical ventilation. Daily checks were made on the newborns for indications of preterm problems.

Statistical Analysis-

The statistical analysis was performed using SPSS for windows version 25.0. The findings were present in number and percentage analyzed by frequency, percent. Chi-square test was used to find the association among variables. The critical value of *P* indicating the probability of significant difference was taken as <0.05 for comparison.

RESULTS-

Table 1 – Baseline characteristics

variable	Mean	STANDARD DEVIATION
Gestational age	25+5weeks	1.37
Weight (in grams)	820grams	217.86

As per table 1 the mean birth weight and gestational age were 820grams and 25³⁵ weeks. Full dose of antenatal steroids were given in 72% of subjects. Also magnesium sulfate was given in 26 subjects (49%).

Table 2- Distribution of Subjects based on Gestational age

Gestational age	N (%)
23+1-24+0weeks	6 (11%)
24+1-26+0 weeks	43 (78%)
26+1-27+6 weeks	6(11%)

As per table 2 it was seen that all subjects were belonged to extremely preterm category but 11% were born in between 23⁺¹-24⁺⁰ weeks of GA while 78% born between 24⁺¹-26⁺⁰ weeks of GA and 11% in 26⁺¹-27⁺⁶ weeks.

Table 3- Distribution of Subjects based on Birth Weight

Birth weight (gms)	N (%)
<500	4 (7)
500-1000	45 (82%)
>1000	6(11%)

As per table 3 it was seen 82% subjects had weight between 500-1000 gms, while 11% belonged to birth weight >1000gms.

Table 4- Distribution of Subjects based on Complications

Complications	N (%)
Respiratory Distress Syndrome	55 (100%)
Seizures	4 (7%)
IVH	7 (12%)
NEC	7 (12%)
Sepsis	14(25%)
Retinopathy of Prematurity (ROP)	9 (16%)

As per table 4 the most common complication seen in Extreme preterm neonates was RDS followed by sepsis in 25% of subjects. Necrotising enterocolitis (NEC) and IVH was seen 12% of subjects and 7% had seizures but it was not significant. ROP was seen in 16% of subjects.

Table 5- Distribution of Subjects based on Requirement of Medical Interventions

Intervention	Given	Not given	p-value
Inotropes	34	21	0.02
Mechanical ventilation	19	36	0.01
Surfactant	42	13	0.01

As per table 5 medical intervention in the form of inotropes, mechanical ventilation and surfactant were found to be significant.

Table 6- Distribution of Subjects based on Mode of Delivery

Mode of delivery	N (%)
NVD	23 (42)
LSCS	32(58)

As per table 6 it was seen most of the subjects were delivered through LSCS (58%), while in 42% the mode of delivery was Normal vaginal delivery (NVD).

Table 7- Distribution of Subjects based on Outcomes

Outcomes	N (%)
Discharged	28(50.9%)
DAMA	9 (16.4%)
Death	18 (32.7%)

As per table 7 around 50.9% of subjects were discharged and 32.7% has shown mortality in the present study.

DISCUSSION-

Preterm neonates are susceptible to a variety of difficulties, such as respiratory distress syndrome, chronic lung illness, intestinal damage, weakened immune systems, cardiovascular abnormalities, hearing difficulties, vision issues, and injury to the brain. The highest mortality and morbidity rates are observed in newborns born below the lower limit of viability [6]. In terms of gender, there were 2% more men than women.

We found that birth weight, hypotensive shock and mechanical ventilation independently predicted mortality in extreme preterm neonates while birth weight, lack of antenatal steroids, birth asphyxia,

ventilation predicted major morbidities in them.

In comparison to studies conducted worldwide, 8% of preemies had perinatal asphyxia, which was a low number [7]. The primary cause of the low rate of asphyxia is the effective use of various intrapartum fetal monitoring tools and equipment, as well as the presence of trained professionals and the level of neonatal care provided. Delays in fluid clearance, the transition to air breathing, and surfactant deficiencies all contribute to respiratory problems. In order to avoid the respiratory problems associated with prematurity, antenatal steroids are administered. Since 76.3% of the participants in the current study received antenatal steroids, the RDS was minimal [8].

In the present study the most common complication seen in extreme preterm neonates was sepsis in 25% of subjects. Necrotising enterocolitis (NEC) and IVH was seen 12% of subjects and 7% had seizures but it was not significant. ROP was seen in 16% of subjects. According to few studies done the most common related problems were RDS (88.0%), ROP (45.1%), NEC (10.1%), IVH (37.4%), and PVL (6.2%) and nosocomial sepsis with a positive blood culture (15.7%) [9,10,11]. The likelihood of these issues may perhaps be much larger than we initially thought. Numerous infants who died as a result of medical care withdrawal and whose consequences did not manifest in our study. Additionally, particularly in areas with low levels of economic development, the identification of some problems may go unnoticed due to a lack of pertinent diagnostic equipment or post-discharge follow-up data. For instance, if a head ultrasound or MRI hadn't been performed on the patient in a timely manner, the diagnosis of IVH and PVL may have gone unnoticed. [12]

A systematic review and meta-analysis showed that antenatal corticosteroid therapy could reduce perinatal death and the incidence of RDS, IVH and NEC in preterm neonates. (13). However, a review of data reveals that 15% of all newborns receiving NICU treatment who are premature are harmed. Our unit has a low incidence rate because we follow protocolised approach to feeding, avoid using formula, and take the greatest aseptic precautions possible. We also have a human milk bank which helped in curtailing the risk of NEC. In the current study, 1.3% of babies had culture-proven sepsis whereas 8% of neonates had suspected sepsis.

The sepsis rate is higher as most cases received from outborn units with positive cultures. Recent reviews of sepsis and its clinical effects have been in-depth. Neonatal sepsis was shown to be 3.36 times more common in preterm infants than in term infants, according to a meta analysis. This conclusion is consistent with research from the United States and China. The immunological and organ systems of preterm infants are thought to be immature, which could be the cause. [14]

The potential for nosocomial infections is also taken into account because of extended hospital stays, invasive procedures, and indwelling catheters. Therefore, one of the most important steps in preventing sepsis in NICU is staff education, following bundled approach and training on infection control. The mortality rate of 32.7% among the 55 extreme preterm infants was noted.

The risk of maternal complications after early preterm delivery is substantial, particularly in women who undergo cesarean delivery. As per a study done on women undergoing classical cesarean delivery, 23.0% experienced maternal complications whereas the rate was 3.5% for women delivering vaginally. Given the effect on immediate maternal morbidity as well as increased risk associated with subsequent pregnancies, it is important that providers caring for women who deliver in the extreme preterm period be cognizant of these complications and be prepared to manage them [16].

There were still some limitations to our study. We had a small sample size. Second, we focused only on short-term outcomes and did not consider long term outcomes, especially in neural developmental disabilities

CONCLUSION-

For extreme preterm neonates, survival is progressively getting better. Care for extreme preterm neonates and conversations with families may be made easier with an understanding of short- and long-term outcomes. In the end, lowering preterm delivery is required to significantly lower the mortality and morbidity burden for extreme preterm neonates. RDS, NEC, and sepsis were all rather low. The rate of mortality was consistent with averages across various centres in our

country. To increase the quality of a premature neonate's result, we still plan to implement adequate prenatal and postnatal care.

Conflict of Interest- None declared

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