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Original Research Paper

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MORTALITY PROFILE OF PRETERM INFANTS <32 WEEKS IN A TERTIARY CARE NICU AT A CHARITABLE HOSPITAL IN EASTERN INDIA

Dr. Aparna Mitra — DCH, DNB (Ped), Associate Professor, Department of Pediatrics, Ramakrishna Mission Seva Pratishthan & Vivekananda Institute of Medical Sciences, Kolkata India.

Dr. Tapabrata Chattopadhyay* — MD(Peds), FRCP(UK), FRCPCH(Lond), Professor, Department of Pediatrics Ramakrishna Mission Seva Pratishthan & Vivekananda Institute of Medical Sciences, Kolkata India. *Corresponding Author

ABSTRACT

Introduction: India has ⅕ of the world's premature babies, and prematurity accounts for 40% of Neonatal Mortality in India. Determination of the cause of death is essential in formulating strategies to improve preterm care and reduce mortality.

Method: We conducted a retrospective study at the NICU of Ramakrishna Mission Seva Pratishthan, a charitable hospital with a teaching institute, the Vivekananda Institute of Medical Sciences. We included all intramural babies between 24 and 32 weeks, born between 1st of January 2018 and 31st of December 2020, in the study to determine mortality rates and the etiology of the deaths that occurred.

Results: Overall mortality in babies <32 weeks was 12.39%,33.33% in babies <28 weeks and 4.76% in babies between 28 and 32 weeks. The predominant cause of death was perinatal asphyxia (46.67%), followed by prematurity-related causes (40%), while sepsis accounted for 13.33% of deaths.

Conclusion: The study found that while we can decrease the incidence of sepsis as an etiology for preterm deaths, perinatal asphyxia remains an important cause of death and calls for better antenatal and labor room management to further improve mortality rates.

KEYWORDS : etiology; extreme preterm; mortality; very preterm

INTRODUCTION

Despite the dramatic reduction in child mortality in the last 30y years, the current trends predict that globally close to 24 million newborns will die between 2020 and 2030, mostly in Sub-Saharan Africa and South Asia[1] .The cause of death in 80% of these cases is preterm birth, intrapartum events such as birth asphyxia, or infections such as sepsis or pneumonia[2-3].

According to the World Health Organization, 15 million babies are born prematurely worldwide every year, and 1 million die every year due to prematurity-related complications[2]. Common causes of preterm birth include multiple pregnancies, infections, and chronic conditions like diabetes and hypertension; however, often no cause is identified[4].

India has ⅕of the world's preterm babies. Here more than 3,000,000 babies are born prematurely every year, and more than 3,00,000 children under five die due to direct preterm complications[4].

India, like most countries, has shown an increase in preterm birth rates in the last 20 years. Possible causes are better census, increased maternal age and underlying maternal health conditions like diabetes and hypertension, greater use of infertility treatments leading to multiple births, and changing obstetric practices.

As per the recent Million Death Study (MDS) report, prematurity accounts for 40% of the Neonatal Mortality Rate in India[5]. Through the years 2000 to 2016, there has been a steady increase in neonatal deaths from prematurity while there has been a corresponding decrease in neonatal mortality from sepsis or birth-related complications.

AIMS & OBJECTIVES

We conducted this retrospective study to determine the survival rates and the causes of death in preterm babies less than 32 weeks of gestation in a nonprofit charitable tertiary care NICU in Kolkata, India.

METHODOLOGY

We conducted this study at Ramakrishna Mission Seva Pratishthan, a private charitable hospital in Kolkata, India, with a delivery rate of about 3000 live births a year. The hospital is a tertiary care hospital with a well-equipped NICU, managed by post-graduate trainees and faculty from the affiliated Vivekananda Institute of Medical Sciences and a competent nursing staff trained at the institute's nursing school. The hospital is governed by the monks of Ramakrishna Math, and Ramakrishna Mission, and the average daily cost of NICU care ranges from Rs 100 to Rs 3000 (less than $50).

All babies of gestational age 24 weeks to 32 weeks admitted in the NICU from January 1, 2018, to December 31st, 2020, were included in the study. We excluded babies born before 24 completed weeks of gestation and all babies born outside the hospital (and managed in a separate NICU).

Gestational age was estimated from all available information, i.e., last menstrual period, ultrasound examination, and clinical assessment using the modified Ballard's scoring system.

We analyzed the causes of death, and since the cause is often multifactorial, we took the most important factor accounting for death as the cause.

We classified the causes of death as per National Neonatal Perinatal Database (NNPD) definitions[6].

1.Prematurity related deaths: deaths resulting from prematurity related complications such as extremely low gestation, respiratory distress syndrome (RDS), Patent Ductus Arteriosus (PDA), bronchopulmonary dysplasia (BPD), necrotizing enterocolitis (NEC) or severe grades (grade III or IV) of intraventricular hemorrhage (IVH).

2.Perinatal asphyxia: death of a neonate in the setting of and with features of perinatal hypoxia and/or birth asphyxia followed by manifestations of or hypoxic-ischemic injury of the

brain (hypoxic-ischemic encephalopathy) or other organs.

3. Neonatal Sepsis: death attributable to pneumonia, sepsis, or meningitis (culture-positive as well as culture-negative).

4. Congenital malformations: death due to lethal congenital malformation.

5. Others: deaths due to causes not classified by above or not established.

We used statistical tools in Google sheets for statistical analysis.

RESULTS

Table-1. Mortality profile of extreme and very preterm babies 2018-2020

	Births	Deaths	Percentage of Deaths
<28 weeks	33	11	33.33%
28-32 weeks	84	4	4.76%
>32 weeks	1279	19	1.36%

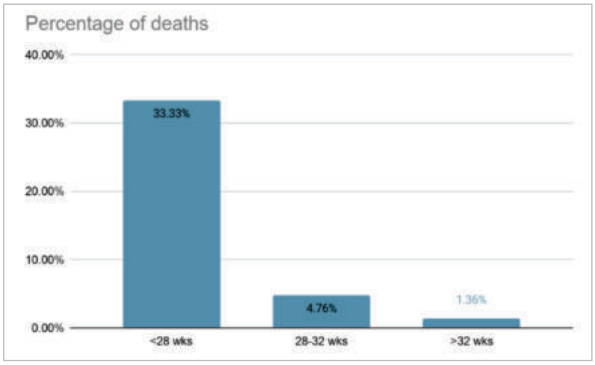

Figure 1. Mortality profile of extreme and very preterm babies 2018-2020

Between 1st of January 2018 to 31st of December 2020, a total of 1396 were admitted to our NICU, of whom 33 babies (2.36%) were of gestation less than 28 weeks and 84 babies were of between 28-32 weeks (6.01%,), the total babies less than 32 weeks being 117 (8.38% of all NICU admissions).

- The total number of NICU deaths was 34 (2.43% of all admissions)
- The total number of deaths in babies less than 28 weeks was 11 (32.35% of total NICU deaths and 33.33% of all babies less than 28 weeks admitted to the NICU).
- The total number of deaths in babies between 28 and 32 weeks was 4 (11.76% of all NICU deaths and 4.76% of all babies between 28 and 32 weeks admitted to the NICU)

Overall the total number of babies less than 32 weeks who died was 15 (44.12% of all NICU deaths and 12.39% of all babies less than 32 weeks admitted in the NICU).

The number of deaths in babies of gestation more than 32 weeks was 19 (55.88% of all deaths in the NICU and 1.36% of all NICU admitted babies more than 32 weeks).

Table 2. Causes of deaths in extreme and very preterm babies 2018-2020

	Perinatal Asphyxia	Prematurity -Related Deaths	Neonatal Sepsis	Congenital Malformations
<28 wks	4	5	2	0
28-32 wks	3	1	0	0
<32 wks	7	6	2	0

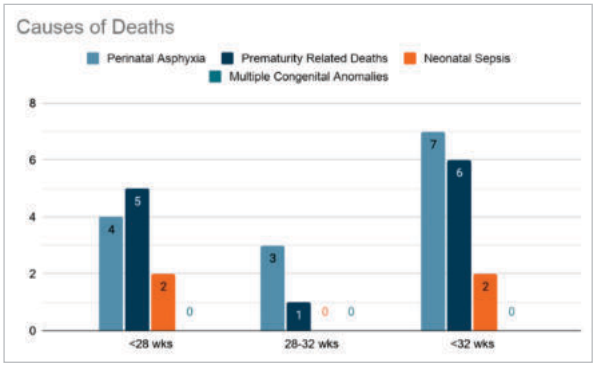

Figure 2. Causes of deaths in extreme and very preterm babies 2018-2020

The causes of death in the above babies who succumbed were;

In babies less than 28 weeks gestation: prematurity-related deaths 5 (45.45%), perinatal-asphyxia 4 (36.36%), and sepsis 2 (18.18%).

Of the four babies who had perinatal asphyxia, 2 were a pair of 26-week twins; one was a 25-week preemie, the second of twins. The fourth was a 27 week 910-gram baby who died on day 4 of life.

The prematurity-related complications that caused death in 5 babies in this group were Respiratory Distress Syndrome in 3 babies and Intraventricular Hemorrhage in 2 babies (grade III and IV). Two babies died of sepsis, one 1250-gram 27-week baby in 2018, and another 775-gram 26-week babyin 2019. In both cases, blood cultures grew E.coli.

In babies between 28 and 32 weeks: prematurity related deaths 1 (25%) and perinatal asphyxia 3 (75%)

In 2018, a 775-gram 28-week female baby died due to RDS. In the same year, two babies died of perinatal asphyxia, the first a 30 week 800-gram male newborn and the second a 28 week 830-gram female preemie.

There was no death among the 22 babies born in 2019 in the gestational group 28-32 weeks. In 2020, a 1300-gram 31 weeker died on day 2 of life from complications of severe perinatal asphyxia.

Hence, in summary, out of the 15 babies of gestation less than 32 weeks who died,7(46.67%) had perinatal asphyxia, 6 (40%) died due to prematurity related complications, and two babies (13.33%) died due to neonatal sepsis, E.coli being the causative organism.

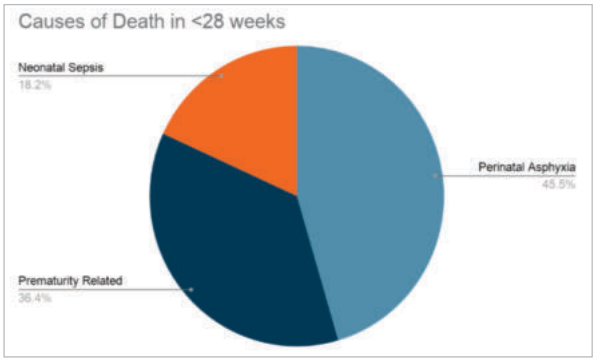

Figure 3. Causes of death in extremely preterm babies 2018-2020

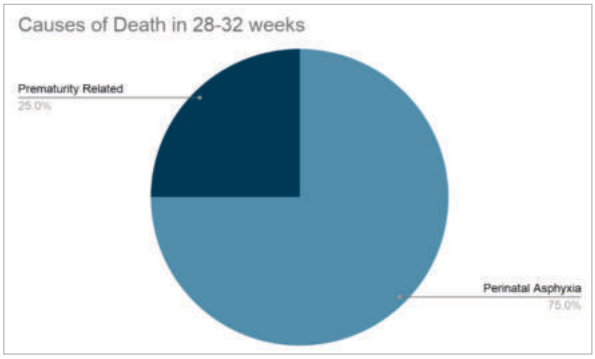

Figure 4. Causes of death in very preterm babies 2018-2020

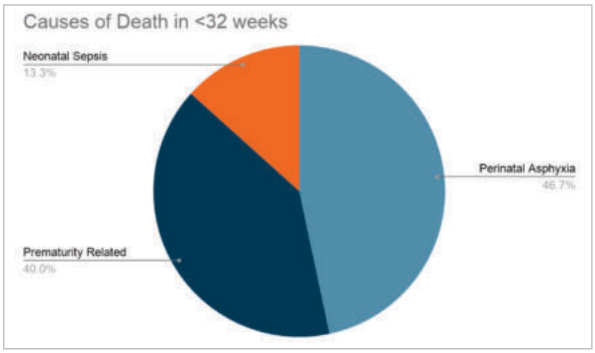

Figure 5. Causes of death in extreme and very preterm babies 2018-2020

DISCUSSION

According to the World Health Organization, there is "a dramatic difference" in the survival of premature babies depending on where they are born. For example, more than 90% of extremely preterm babies born in low-income countries die within the first few days of life, yet less than 10% of extremely preterm babies do so in high-income settings [2].

Our findings of survival of 66.66% of babies less than 28 weeks gestation and more than 95% in babies between 28 and 32 weeks were encouraging.

Mortality rates in extremely preterm babies in two French cohorts were 32.55%, and 21.2% and that of babies between 28 and 32 weeks was 4.7% and 2.7% [7]. In a recently published Chinese study, mortality rates in less than 28 weeks gestation and between 28 and 32 weeks gestation was 41.6% and 4.3%, respectively [8] .Thus, the mortality rates in our NICU were at par with international data.

Neonatal deaths receive limited attention partly due to a lack of robust estimates of a cause of death[9]. A population-based retrospective cohort study among very preterm babies in Australia showed IVH to be the commonest cause of death followed by acute respiratory illnesses and sepsis[10].A recently published study from Ethiopia shows RDS to be the most prevalent cause of preterm death followed by sepsis[11]. In a large prospective Indian study using three hospital-based data sets from National Neonatal Perinatal Database (NNPD), Delhi Neonatal Infection Study (DeNIS), and Goat Lung Surfactant Extract (GLSE)-plus cohorts, K Jain et al. in 2019 [12] analyzed that among preterm neonates of less than 33 weeks, sepsis is an important direct cause of death attributing to 20-40% of mortality, prematurity related complications were the causes of death in 40-50% cases and perinatal events accounted for only 9-12% deaths in this gestational group.

Contrary to all these studies, we found, perinatal asphyxia to be the commonest cause of death (46.67%). Deaths due to prematurity-related causes (40%) in our NICU were similar to other published data. However, those due to sepsis wereless (13.33%) in babies less than 32 weeks of gestation. This could be attributed to certain strict NICU protocols like early enteral feeding with expressed breast milk, rational use of antibiotics, early removal of cannula whenever possible, and early introduction of kangaroo mother care, along with other usual guidelines for maintenance of asepsis like strict handwashing, maintenance of adequate distance between each newborn and regular fumigation of the NICU.

CONCLUSION:

Determination of the cause of death is essential to formulate measures to improve NICU care and establish preventive strategies, specially in countries in Southern Asia, striving to attain the Sustainable Development Goals [13] while struggling to tackle the Covid 19 pandemic to the best of their abilities.

Our study shows that strict measures in infection control can reduce the number of deaths from sepsis even in extreme and very preterm babies, even in low-cost settings.

The higher incidence of deaths due to perinatal asphyxia calls for further studies regarding antenatal care, earlier intervention, and better labor room management.

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Conflict of Interest: None
Ethical approval: The study was approved by the concerned authorities.

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