

# Mortality and Morbidity Pattern of Preterm Babies at Tribhuvan University Teaching Hospital

Shrestha L<sup>1</sup>, Shrestha P<sup>2</sup>

<sup>1</sup>Dr. Laxman Shrestha, MBBS, MD, Associate Professor,

<sup>2</sup>Dr. Prabina Shrestha, MBBS, MD, Teaching Assistant.

Both from the Department of Paediatrics, Institute of Medicine, Tribhuvan University Teaching Hospital, Maharajgunj, Kathmandu, Nepal

## Introduction

Preterm birth is a major determinant of neonatal mortality and morbidity and has long-term adverse consequences for health<sup>1,2</sup>. In 2010, an estimated 14.9 million babies were born preterm, 11.1% of all live births worldwide, ranging from about 5% in several European countries to 18% in some African countries. More than 60% of preterm babies were born in south Asia and sub-Saharan Africa, where 52% of the global live births occur. The burden of preterm birth is substantial and is increasing in these regions<sup>3</sup>. The three main causes of neonatal mortality-complications of preterm birth, severe infections and intrapartum-related (asphyxia)-account for 90% of all newborn deaths in a study of estimated causes of mortality around the year 2010 for 20,000 neonatal deaths. Of these deaths preterm related mortality contribute to 52% of the total deaths<sup>4</sup>.

Among the neonates, very low birth weight (VLBW) preterm babies are at increased risk of perinatal, neonatal and postnatal mortality and morbidity, mainly due to infections and complications of prematurity. Mortality of VLBW neonates is 30 times more than that of newborns of normal weight<sup>5</sup>. Despite constituting a small portion of LBW newborns, VLBW infants have a large impact on both neonatal mortality and morbidity. They demand high technology health care delivery and consume a great amount of resources.

In TUTH there is increasing number of deliveries over the years, with increasing number of preterm deliveries. There has been increase in the deaths due to prematurity and has increased by almost 70% in

## Address for correspondence

Dr. Laxman Shrestha  
Department of Paediatrics, Institute of Medicine,  
Tribhuvan University Teaching Hospital, Maharajgunj,  
Kathmandu, Nepal  
E-mail: [laxmanshree@yahoo.com](mailto:laxmanshree@yahoo.com)

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## Abstract

**Introduction:** Preterm birth is a major determinant of neonatal mortality and morbidity and has long-term adverse consequences for health. The objectives of this study were to find the demographic characteristics and clinical course of preterm babies admitted at Neonatal Unit of TU Teaching Hospital. **Materials and Methods:** A retrospective study was done by collecting data from labour room, NICU and by reviewing medical records of all preterm babies admitted to NICU in 2011. **Results:** There were total of 266 preterm deliveries in TUTH in the year 2011. About 45% of them required NICU admission. Ninety five babies were included in the study. Most common cause of premature delivery was maternal pregnancy induced hypertension (26%). Other causes were preterm premature rupture of membrane (24%) and in 25% of cases the cause was unknown. There were 10 (10.5%) severe preterm babies with mean weight  $1.4 \pm 0.3$  kg, 27 (28.5 %) moderate preterm babies with mean weight  $1.8 \pm 0.4$  kg and 58 (61%) late preterm babies with mean weight  $2.2 \pm 0.5$  kg. Respiratory distress syndrome (RDS) was seen in 32% babies, hyperbilirubinemia in 40% babies, sepsis occurred in 37% and NEC in 4%. Hypothermia was seen in 10.5% and hypoglycemia in 5% babies. Apnea of prematurity was seen in 7% babies. Mechanical ventilation was required in 7% babies. The overall mortality was 12%. The main causes of death were respiratory distress syndrome and sepsis. The mean duration of stay was  $10.2 \pm 8.8$  days. The survival rate of severe preterm babies was 80%, moderate preterm babies was 78% while that of late preterm was 95%. **Conclusion:** The main causes of morbidities in preterm babies were respiratory distress, hyperbilirubinemia and sepsis. Respiratory distress syndrome and sepsis were the predominant causes of mortality in these babies.

**Key words:** Preterm babies, Sepsis, Very low birth weight, Morbidity, Mortality.

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last 5 years<sup>6</sup>. Recent advances in perinatal care, use of antenatal corticosteroids and availability of modern ventilator techniques have led to improved survival of preterm infants, but still prematurity and low birth weight are significant causes of mortality and morbidity.

The objectives of this study were to describe the demographic characteristics, probable cause of premature delivery, various morbidity pattern developed during the clinical course and to identify the causes of mortality of preterm babies admitted to NICU, TUTH.

## Material and Methods

This study was done at Neonatal unit of Tribhuvan University Teaching Hospital (TUTH). It is a level III neonatal intensive care unit. The study population comprised of neonates admitted to NICU with gestational age less than 37 completed weeks over a period of one year from January to December 2011 (17 Poush 2067 to 16 Poush 2068 BS). In this retrospective study, data was collected from hospital records of labour room, NICU and medical records of the admitted preterm babies were reviewed. Data regarding number of preterm deliveries, duration of hospital stay, various morbidity and mortality patterns and treatment provided in the NICU were reviewed. Maternal risk factors contributing to preterm delivery were also analyzed. On the basis of gestational age preterm babies were divided into 4 groups for the purpose of description and analyses as described by Goldenberg RL et al<sup>7</sup> as in table 1a and 1b.

## Results

During the study period, there were total of 3891 deliveries. Premature babies constituted 6.8% (266 babies) of total live births. Among preterm babies, 120 (45%) required admission in NICU. Twenty five babies were excluded from the study as complete records of 21 babies could not be retrieved or was grossly incomplete. Two babies had congenital malformations, two extremely low birth weight babies weighing 900 and 950 grams left against medical advice. Thus, medical records of 95 preterm babies were analyzed in this study. There were 63 males and 32 females. Male to female ratio was 2:1. The modes of deliveries were spontaneous vaginal delivery in 45% followed by emergency caesarian section in 43% and elective caesarian section in 12%.

The most common cause of premature delivery was pregnancy induced hypertension (26%). Other obstetrical causes were premature rupture of membrane, multiple gestations, placenta previa, oligohydramnios, maternal heart disease and gestational diabetes, constituting 51%. The cause was not known in 25% of the cases (Table 2).

There were 10 (10.5%) severe preterm babies with mean weight  $1.4 \pm 0.3$  kg, 27 (28.5 %) moderate preterm

babies with mean weight  $1.8 \pm 0.4$  kg and 58 (61%) late preterm babies with mean weight  $2.2 \pm 0.5$  kg. There were 7 twin sets.

The morbidities of the preterm babies in different gestational age groups are shown in table 3. Respiratory distress syndrome (RDS) was present in 32% of study population. Among the severe preterm babies RDS was present in 60% (6 out of 10 babies). Among the moderate preterm babies RDS was present in 70% (19 out of 27 babies) while it was present in 14% in late preterm babies (8 out of 58 babies). Hyperbilirubinemia requiring phototherapy was present in 40% of study population, 60% among severe preterm (6 out of 10) and 63% among moderate preterm (17 out of 27) and 26% among late preterm (15 out of 58). Apnea of prematurity occurred in 7%.

Sepsis was seen in 37% of study population. It was seen in 50% in severe preterm (5 out of 10 babies), 48% in moderate preterm (13 out of 27 babies) and 29% in late preterm (17 out of 58 babies). Staphylococcus aureus was isolated in blood culture in 6 babies. Necrotizing enterocolitis was seen in 4%.

Birth asphyxia was associated in 5% babies. Hypoglycemia was seen in 5% babies and hypothermia in 10.5%.

Antenatal steroids (Inj. Dexamethasone) were given to 21(22%) mothers. Of those mothers who received antenatal steroid 9 babies developed RDS. Out of babies who developed RDS, 30% (9/30) of the mothers had received antenatal steroid.

The treatment provided in NICU is summarized in table 4. Oxygen was required in 60 babies. Nasal continuous positive airway pressure (CPAP) was used in 28 babies. Among them 75% improved and 25% expired. Seven babies required mechanical ventilation (MV), out of which 2 improved. Pneumothorax was detected in 2 babies, 1 was on nasal CPAP, another 1 under MV. Antibiotics were given to 75 babies. Blood and blood products were given to 14 babies. Phototherapy was given to 40 babies while exchange transfusion was done in 1 baby. Kangaroo mother care (KMC) was done in 18 babies, whose weight ranged from 1.05 to 2.2kg, mean of  $1.55 \pm 0.3$  kg.

The overall mortality was 12%. The survival rate of severe preterm babies was 80%, moderate preterm babies was 78% while that of late preterm was 95%, as shown in table 5. Out of the total 11 deaths, 7 (55%) babies died of sepsis, 4 (36%) babies because of severe respiratory distress syndrome and one death (9%) was due to severe birth asphyxia.

**Table 1a:** Classification of preterm babies according to gestational age.

Extremely preterm	born before 28 weeks of gestation
Severe preterm	born at 28 to 31 weeks of gestation
Moderate preterm	born at 32 to 33 weeks of gestation
Late preterm	born at 34 weeks to less than 37 completed weeks of gestation

**Table 1b:** Classification of babies according to weight.

Extremely low birth weight (ELBW)	Weight less than 1 kg
Very low birth weight (VLBW)	Weight less than 1.5 kg
Low birth weight(LBW)	Weight less than 2.5 kg

**Table 2:** Causes of premature deliveries.

S. No	Cause of prematurity	Number (%)
1.	Medical causes :	48 (51)
	Pregnancy induced hypertension	25 (26)
	Multiple pregnancy	9 (9)
	Oligohydramnios	9 (9)
	Placenta previa	3 (3)
	Maternal heart disease	3 (3)
	Gestational diabetes	1 (1)
2.	Premature rupture of membrane	23 (24)
3.	Cause not known	24 (25)

**Table 3:** Incidences of various morbidities and comparison among different gestational age groups.

S.No	Morbidity features	No of babies (%)	Severe preterm (%)	Moderate preterm (%)	Late preterm (%)
1	Respiratory distress syndrome	30/95 (32%)	6/10 (60%)	19/27 (70%)	8/58 (14%)
2	Neonatal jaundice	38/95 (40%)	6/10 (60%)	17/27 (63%)	15/58 (26%)
3	Sepsis	35/95 (37%)	5/10 (50%)	13/27 (48%)	17/58 (29%)
4	Hypothermia	10/95 (10.5%)	2/10 (20%)	10/27 (37%)	6/58 (10%)
5	Hypoglycemia	5/95 (5%)	1/10 (10%)	2/27 (7%)	2/58 (3%)
6	Apnea of prematurity	7/95 (7%)	3/10 (30%)	2/27 (7%)	2/58 (3%)
7	Birth asphyxia	5/95 (5%)	1/10 (10%)	0/27	4/58 (7%)
8	Necrotizing Enterocolitis	4/95 (4%)	1/10 (10%)	2/27 (7%)	1/58 (1.5%)
9	PDA	2/95 (2%)	2/10 (20%)	0/27	0/58
10	IVH	1/95 (1%)	0/10	1/27 (3.5%)	0/58

**Table 4:** Summary of Treatment provided

S.No	Treatment	No of babies (%)
1	Oxygen	60 (63%)
2	Nasal CPAP	28 (30%)
3	Mechanical Ventilation	7 (7%)
4	Inotropes	18 (19%)
5	Antibiotics	75 (79%)
6	Blood and blood products	14 (15%)
7	Phototherapy	40 (42%)
8	Exchange transfusion	1 (1%)

Mean duration of stay was 10.2 ± 8.8 days.

**Table 5:** Mean weight, mortality and rate of survival of preterm babies (N=95)

S.No	Groups according to Gestation	Mean weight $\pm$ SD	Mortality	Rate of survival
1.	28 to 31 weeks (severe preterm)	1.4 $\pm$ 0.3 kg	2/10 (20%)	80%
2.	32 to 33 weeks (moderate preterm)	1.8 $\pm$ 0.4 kg	6/27 (22%)	78%
3.	34 to < 37weeks (late preterm)	2.2 $\pm$ 0.5 kg.	3/58 (5%)	95%

## Discussion

Preterm births have continued to increase despite years of research into its epidemiology, causes and management of preterm labour. Regardless of the cause, the burden of prematurity is enormous for the infant, family, health care system and the society<sup>2,8,9</sup>.

In this study, 51% of cases had obstetrical reasons for premature delivery, which were PIH, multiple pregnancy, oligohydramnios, placenta previa, maternal heart disease and gestational diabetes. This was different in comparison to data described from a study done in USA by Ananth CV et al from 1989-2000 that showed cause of premature deliveries is idiopathic in 45-50%, PROM in 30% and preterm deliveries in 15-20% were medically indicated<sup>10</sup>. This difference can be explained by the fact that, TUTH being a tertiary level referral centre, complicated cases are referred from the different parts of the country.

In this study, 61% of preterm babies were late preterm which is consistent with proportion described by Goldenberg RL et al<sup>7</sup>.

RDS was seen in 32% which was similar in a study done among preterm babies in Aga Khan University Hospital, Pakistan<sup>11</sup>. There was a decreasing trend in the frequency of RDS with increasing gestational age. The incidence was 60% in severe and 70% in moderate preterm, while it was 14% in late preterm. Out of the mothers who had received antenatal steroid, one third babies still developed RDS. Twenty eight (30%) babies required nasal CPAP, out of which 7 (25%) also required mechanical ventilation. Baki MA et al<sup>12</sup> also used assisted ventilation in the form of CPAP and MV in 37.5%. The neonatal death due to RDS was 36%, which had decreased in comparison to data from the same centre 7 years back<sup>13</sup>. Thirty percent of premature babies were put on Bubble-CPAP, among which 71% improved. This improvement can be attributed to the use of Bubble-CPAP, which was started in this centre from October 2008<sup>14</sup>.

Sepsis was a major concern occurring in 37%. It was seen in 50% and 48% in severe and moderate preterm babies respectively, higher than in late preterm babies. The organism isolated in blood culture in this study was staphylococcus aureus in 6 babies. The time of onset of sepsis, the risk factors were not looked into

and are limitations of this study. In a study of 92 VLBW babies by Hoque et al, sepsis at the time of admission was 8.7% and nosocomial infection was 53.2%. The organisms isolated in blood culture were gram negative, most commonly Acinetobacter<sup>15</sup>. Various studies show CONS, staphylococcus aureus, E coli to be common organisms<sup>16,17</sup>. There was rise in mortality due to sepsis as compared to data 10 years back in our center (from 33% to 50%)<sup>13</sup>.

The incidence of hyperbilirubinemia in severe and moderate preterm babies was 60% in this study, in contrast to a study done in a similar population at BP Koirala Institute of Health Sciences; Dharan, which was as high as 73.6%<sup>18</sup>. The incidence of hyperbilirubinemia in late preterm was 26% in this study, higher as compared to 14% in a study in Taiwan<sup>19</sup>.

Kangaroo mother care was done in 18 babies (19%) and acceptance of this practice by mothers was good. In a study done in Mumbai, 79% of mothers felt comfortable during the KMC and 73% felt they would be able to give KMC at home<sup>20</sup>. Metabolic problems like hypoglycemia and hypothermia were seen in 5 and 10% respectively. Similar incidences of hypoglycemia (8%) and hypothermia (10.5%) were seen in a study comparing late preterm babies to term babies in Boston<sup>21</sup>.

Data regarding feeding intolerances and time required to establish full feeds could not be collected in this study which is a limitation. Data regarding retinopathy of prematurity could not be obtained.

Mortality was 12% in this study, which was similar to a study done by Khan MR et al.<sup>11</sup> in a similar study population and found mortality to be 14%. Mortality was 20% in low birth weight babies in our centre 7 years back<sup>13</sup>. According to Baki MA et al, Mortality was 36% and was related to gestational age, birth weight, respiratory distress syndrome and requirement of mechanical ventilation<sup>12</sup>.

## Conclusion

There are increasing numbers of preterm deliveries in TU Teaching Hospital over the years. RDS and sepsis are important causes of mortality and morbidity in preterm



babies. It is essential to improve infection preventive strategies to prevent sepsis in NICU. Availability of monitoring, respiratory support equipments, and other therapies like surfactant administration could improve outcome of premature babies.

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