Causes of Mortality in Low Birth Weight Babies at a Tertiary Care Hospital

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ABSTRACT

Introduction: Decreasing the neonatal mortality has been a major concern to decrease under five mortality rate. Low birth weight (LBW) and prematurity related deaths account to significant percentage of all neonatal deaths worldwide. Causes of mortality in LBW babies are not well documented. Hence this study aims to determine the causes of neonatal mortality among the LBW babies at Patan Hospital, Nepal.

Method: It was a retrospective observational study done at the Department of Paediatrics, Patan Hospital, Lalitpur, Nepal. The study period was three years from April 2017 to March 2020. All LBW babies born within the study period were included. Perinatal audit and case records were reviewed and necessary data was extracted. Results were analyzed using appropriate tools.

Results: Total LBW babies were 3028 which was 13% of all live births. Deaths among LBW were 83 comprising mortality rate of 26.7 per thousand live births. Among all neonatal deaths 76% of the deaths were LBW babies. Sixty very LBW babies died which contributed to 55% of total neonatal deaths. Mean birth weight was 1185 grams, median 1045 with standard deviation 571 with range of 500 to 2484 grams. Respiratory distress syndrome (35%), sepsis (29%), congenital anomalies (23%) and birth asphyxia (12%) were the most common causes of mortality.

Conclusions: Respiratory distress syndrome and sepsis were the most common causes of neonatal mortality among LBW babies. Improved neonatal care with special focus to very and extremely LBW babies might help reduce neonatal mortality.

Key words: LBW; Mortality; Neonate

INTRODUCTION

Decreasing the neonatal mortality has been a major concern to decrease under five mortality rate. Nepal has decreased under five mortality rate from 162 to 30 per thousand over the period of thirty years whereas neonatal mortality has declined from 46 to 21 per thousand live births over the same period.[1] Neonatal deaths account for about half of all under five children deaths and more than two third of infant deaths. Overall neonatal mortality rate is 18 per 1000 live births worldwide.[2] In a tertiary hospital in Kathmandu neonatal mortality rate was 3.62 per 1000 live births.[3] Nepal's every newborn action plan has targeted to decrease the neonatal mortality rate to 11 per 1000 live births by 2035.[4] It is clear that much remains to be achieved in terms of reducing neonatal mortality to improve the overall childhood survival.

Low birth weight (LBW) has been defined as birth weight less than 2500 gram irrespective of gestational age.[5] Globally 15 to 20% of all live births are LBW.[6] In Nepal, incidence of LBW babies varies between 9 to 23 percentage in different hospitals.[7,8] Complications associated with prematurity and LBW are amongst the most common causes of neonatal morbidity and mortality in Nepal. Majority of LBW babies are premature while some of them are term or preterm small for gestational age. Both types of LBW babies are major clinical problems in neonatology department as they are associated with high mortality, serious co-morbidities like respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), necrotizing enterocolitis (NEC), pulmonary hemorrhage and later childhood disabilities.

LBW and prematurity related deaths account to 35% of all neonatal deaths worldwide.[9] Prematurity and LBW (33%), birth asphyxia (23%), sepsis (17%) and congenital anomalies (13%) are the commonest causes of neonatal mortality in Nepal.[10] Among premature and LBW babies causes of death are not well documented. However studies have shown that RDS, sepsis and birth asphyxia are major causes of death in LBW babies.[11-13] Hence this study aims to determine the causes of neonatal mortality among the LBW babies at Patan Hospital, Lalitpur, Nepal.

METHODS

It was a retrospective observational study done at the Department of Paediatrics, Patan Hospital, Lalitpur, Nepal. The study period was three years from April 2017 to March 2020. All babies born in the hospital with birth weight less than 2500 gram who expired in the hospital–were included. The neonates less than 500 gram or 22 weeks gestation were excluded as the babies are not viable. Babies who left against medical advice and out born babies were excluded. Nude weight was taken soon after birth in electronic weighing machine with sensitivity of 5 gm. Data regarding LBW babies were collected from the medical record section with the permission from concerned authority. The case records of all LBW mortalities were reviewed and the necessary information was extracted.

Maternal data like age, presence of diabetes and hypertension, per vaginal leaking more than 18 hours, gravida, parity, meconium stained liquor, fever within two weeks of delivery, mode of delivery, antenatal care (ANC) visits were recorded. Baby's data like gestational age, birth weight, major congenital anomalies, need of active resuscitation at the time of birth, small for gestation age (SGA) or appropriate for gestational age (AGA), length of stay were extracted. Gestational age was taken from last menstrual period. Small for gestational age (SGA) was defined as birth weight less than tenth percentile on Fenton chart. The diagnosis of the baby were extracted from the record file to see RDS, sepsis, shock, birth asphyxia, congestive cardiac failure (CCF), disseminated intravascular coagulation (DIC), NEC, IVH, pulmonary hemorrhage, acute kidney injury (AKI), pneumothorax and metabolic acidosis. Primary cause of death and comorbidities were recorded from the death certificate. In cases where more than one competing neonatal causes of death were present, recommendations for assigning cause of death for neonatal deaths in research studies were considered to assign the primary cause of death and other conditions were considered comorbidities.[14] The study was conducted after taking ethical clearance from the institutional

Table 1. Demographic profile of the patients

Demographic profile		Number (N)	Percent (%)
A	Maternal details		
1	Gestational diabetes	15	18.1
2	Gestational hypertension	15	18.1
3	PV leaking (> 18 hours)	19	22.9
4	Multiparity	50	60.2
5	Primiparity	33	39.8
6	LSCS	21	25.3
7	Vaginal delivery	62	74.7
B	Neonatal details		
1	Male	55	66.3
2	Female	28	33.7
3	Small for gestational age	21	25.3

review committee of the Patan Academy of Health Sciences. Data were analyzed using SPSS version 20 and results were expressed as number, percentage, mean and standard deviation using appropriate tables and graphs.

RESULTS

There were 23,184 live births and 109 neonatal deaths during the study period. Neonatal mortality rate was 4.7 per 1000 live births. Total number of babies less than 2500 grams were 3028 which was 13% of all live births. Deaths among LBW were 83 comprising mortality rate of 26.7 per thousand live births. Among all neonatal deaths, 76 percent of the deaths were LBW babies. Mean birth weight was 1185 grams, median 1045 with standard deviation 571 with range of 500 to 2484 grams. Two third of them were males, born to multiparous mother and born vaginally. Mean maternal age was 28 years with range of 20 to 39 years. Demographic profile has been shown in table 1.

Table 2. Weight specific mortality rate in per thousand live births

Birth weight in grams	Total number of babies	Mortality rate per thousand live births
< 1000	60	683
1000 - 1500	169	130
1500 - 2000	571	6
2000 - 2500	2228	4

Total number of Very low with wieight babies were 219 which contributed 0.95 percent of total live births. Sixty VLBW babies died which contributed to 55 percent of total deaths. Among LBW, mortality rate was 6.4 per 1000 live births. Extremely low birth weight babies contributed to 26% of all babies less than 2500 grams and 65% of less than 1500 grams. Weight specific mortality rate among LBW babies has been shown in table 2.

Almost 50% of neonatal deaths were less than 28 weeks and less than 1000 gm. Number of neonatal mortality according to gestational age and weight has been given in figure 1. Three babies had meconium stained liquor. Seventy percent of baby required positive pressure ventilation at the time of birth.

RDS, sepsis, major congenital anomalies and birth asphyxia were the commonest causes of mortality. Among 24 cases of sepsis two third were late onset sepsis. Among 19 cases of major congenital anomalies, four were congenital diaphragmatic hernia and esophageal atresia each, three were critical congenital heart disease and suspected Edward syndrome each, two suspected Patau syndrome and intracranial malformation each and one lethal skeletal dysplasia. Causes of mortality among LBW babies has been shown in figure 2.

Record showed that out of 29 patients who had RDS, 25 patients did not receive surfactant. Almost two third of babies expired within 24 hours of life. Timing of mortality has been shown in figure 3.

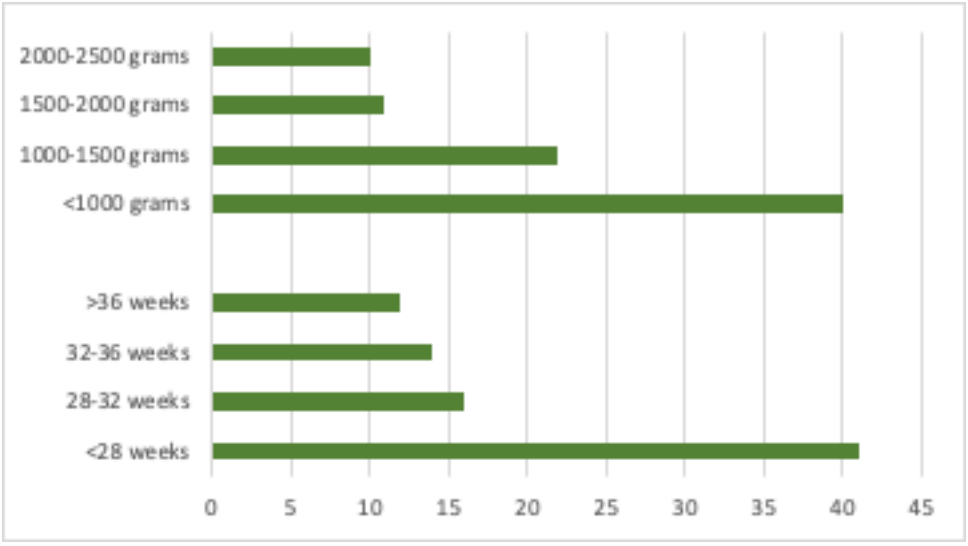

Figure 1. Mortality according to age and weight

Septic shock, metabolic acidosis and DIC were most common comorbidities among LBW mortalities. Comorbidities among LBW mortality has been shown in table 3.

DISCUSSION

LBW babies are ten times more likely to have mortality compared to normal weight babies in the first month of life.[15] Worldwide more than 80% of neonatal mortality are LBW babies.[16,17] Our study also shows more than three fourth neonatal mortalities were LBW babies. In our study survival among VLBW babies was 73% compared to a study done at eastern tertiary center of Nepal which showed survival rate of 60%.[11] Studies from Indian subcontinent have shown similar results with 63% to 75% survival among VLBW babies in different hospitals.[12,13]

In Pakistan and India, a study showed mortality of 923 and 860 per thousand live births among ELBW, 698 and 564 among VLBW and 124 and 66 among LBW babies compared to 683, 130 and 6.4 among respective weight groups in this study.[18] Those data were taken from the rural and semi urban geographical areas of Pakistan and India. Half of the babies were less than 26 weeks and two

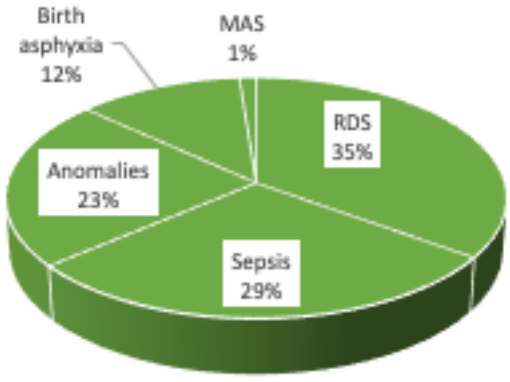

Figure 2. Causes of mortality among LBW babies

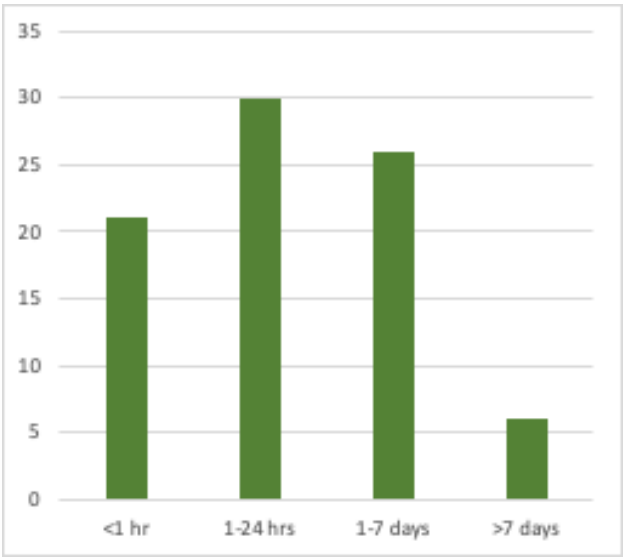

Figure 3. Time of death among LBW babies

Table 3. Co-morbidities among LBW mortality

Comorbidities	Number	Percentage
Septic Shock	21	25.30
Metabolic acidosis	20	24.10
DIC	12	14.46
Pulmonary hemorrhage	8	9.64
AKI	5	6.02
NEC	2	2.41
IVH	2	2.41
CCF	1	1.20
Pneumothorax	1	1.20

third of the babies were of less than 28 weeks and less than 1000 grams which is similar to other studies.[12,19]

This study shows higher mortality among males compared to females. This corresponds to the study by Brothwood et al. which shows mortality of 41% in boys compared to 21% mortality in girls among VLBW infants.[20] Hormonal, genetic and immunological differences are considered to be responsible for better survival in females compared to males.

This study shows RDS, sepsis, congenital anomalies and birth asphyxia are the common causes of neonatal mortality among LBW babies similar to the study done in eastern part of Nepal. Immature lung with surfactant deficiency, poor defense mechanism against infections and poor respiratory centre maturity are some of the reasons to develop various complications of prematurity like RDS, sepsis and birth asphyxia amongst the preterm babies. It is important to note that significant cases of RDS did not receive surfactant. Though it is common practice to give surfactant in RDS, unavailability, financial constraints or poor prognosis of extremely preterm babies were the reasons for not receiving the surfactant. Failure to administer surfactant in preterm babies might have contributed RDS to be the commonest cause of neonatal mortality in the study population. Hence the study does not reflect the quality of care of the newborn babies provided by the hospital.

This study showed almost two third patients expired in first day of life. Studies have shown that most deaths occur in early days of life among neonates. In a study in Nepal, almost 50% babies expired within five days.[11] In study by Barton et al, 46% babies expired within four hours.[21] Globally also 25 – 45% of neonatal deaths occur within 24 hours and almost three fourth deaths occur within first week of life.[22] Our study showed about two third deaths occurred within first 24 hours of life which is similar to global data which reveals three fourth deaths occur in first week and significant number of deaths occurring in first 24 hours.[23] Early deaths of those patients who did not receive surfactant might have led to higher early deaths in this study.

Septic shock, metabolic acidosis, DIC and pulmonary hemorrhage were the common co-morbidities among the mortalities. These co-morbidities have been found to be associated with higher mortality in the newborns.[11] Neonatal mortality rate is inversely proportional to birth weight and gestational age, though it varies between centre to centre and depends on quality of antenatal, antepartum and postnatal care. With improvement in neonatal care there has been improvement in outcomes of neonatal survival. Hence there has been increased interest about survival of LBW babies. Further improvement in neonatal care can still significantly improve the outcome among LBW babies.

Primary cause of death was taken from death certificate filled by the duty physician. Deciding the primary cause of death might have been confusing for the physician in few cases especially when the same neonate had multiple morbidities. So the accuracy of the primary cause of death cannot be ascertained. Still the study shows the spectrum or pattern of the problems or conditions that the expired newborns encountered. The results cannot be generalized to the community as it is a single tertiary care centre study with small sample size. Multi-center studies with large sample size will be required to establish the exact causes of mortality among LBW babies.

CONCLUSIONS

This study shows that prematurity leading to RDS, sepsis and major congenital anomalies are the leading causes of death among LBW babies in the study population. Improved care may help to have better survival in resource limited settings where neonatal mortality still remains high.

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