Original article

# Morbidity and mortality pattern of low birth weight babies

**S. Basnet, R. K.Adhikari, P. S. Shrestha**

Department of Child Health, Institute of Medicine, Maharajgunj, Kathmandu

***Correspodence to:*** Dr. Sudha Basnet, Department of Child Health, Institute of Medicine

e-mail: sudhab@healthnet.org.np

**Background:** The Neonatal Unit, established in 1984 provides Level II care. The increase in preterm births from 25% to 42% with 21% of perinatal deaths related to immaturity and it's consequences at birth prompted this study on low birth weight babies.

**Methods:** A retrospective study was done for all babies admitted from 2058 to 2061B.S.

**Results:** Of 1 327 babies, 29% were LBW with 62% being preterm. Increasing trends in babies < 1500gms and < 28 weeks at birth was noted. 70% were discharged, 10% referred (61% for advanced respiratory support) and 20% died. Respiratory distress and presumed sepsis were the most common reasons for admission as well as for deaths in LBW.

**Conclusion:** The existing Neonatal Unit facilities have become inadequate to deal with the increased number, morbidity and mortality pattern of inborn LBW babies. The unit needs to be upgraded to Level III with provision for mechanical ventilation, early use of nasal CPAP and institution of effective infection control measures to improve survival of this high risk group

*Key words:* Low birth weight, Neonatal unit, facilities

## Introduction

The Tribhuvan University Teaching Hospital (TUTH), established in 1984 serves as a referral and tertiary center for obstetric care in Nepal. All pregnant women are registered and receive antenatal care at the hospital. In some instances complicated pregnancies referred from other health institutions also are admitted and cared for by the Obstetric and Gynecology Department. The Neonatal Unit (NNU) provides Level II newborn care to only those babies delivered in the hospital with pediatric residents providing on-call support and six nurses with four support staff working round the clock in shifts. Neonatal unit facilities include capacity for ten beds with 8 cots, 3 incubators, 3 radiant warmers, four phototherapy units and central supply of oxygen.

The number of deliveries conducted at the hospital show increasing trends from 2805 total births in 2055 B.S. (1998 – 1999 A.D) to 3462 in 2061 B.S. Preterm births which accounted for 25% of all deliveries in 2055 B.S. rose to 42% in 2061 B.S. Perinatal mortality rates (PMR) also revealed similar trends, increasing from 23.17 in 2055 BS to 24.55 in 2061 BS where "conditions associated with immaturity" contributed to 21% of perinatal deaths in 2061 B.S. These data prompted us to conduct this study on low birth weight (LBW) babies and assess the need for upgrading facilities of the neonatal unit. The objectives of this study

were to estimate the prevalence and distribution of low birth weight among admitted babies, their morbidity pattern and analyze their outcome.

## Materials and Methods

A retrospective study was done. Data was collected from registers maintained in the Neonatal unit for babies who were admitted after birth in the hospital from the year 2058 to 2061 BS. LBW was defined as birth weight < 2.5 kg and preterm as birth at < 37 weeks of gestation, calculated from the date of last menstrual period. Very low birth weight (VLBW) was defined as weight < 1.5kg and extremely low birth weight (ELBW) as < 1 kg.

## Results

From 2058 to 2061, 1,327 babies were admitted with LBW comprising 388 (29%) of the total admissions to the neonatal unit. Among them, 241 (62%) were preterm and 147 (38%) were born small for gestational age.

Over the years although there is a decrease in the total number of admitted babies with weight < 2.5 kg, the number of babies with birth weight < 1.5 kg has increased (Fig.1), from 14% in 2058 to 20% in 2061

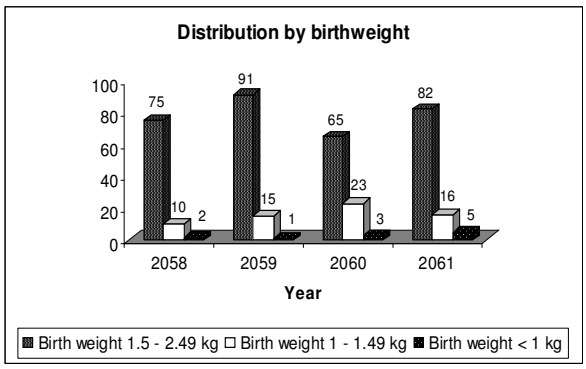


**Fig. 1:** Distribution of LBW babies by Birth weight

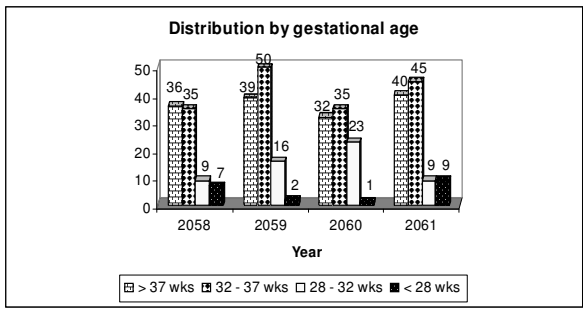


**Fig. 2:** Distribution of LBW babies by gestational age

Similar trends were observed with gestational age (Fig.2). Preterm babies increased from 59% in 2058 to 61% in 2061 with a noticeable rise in babies born at gestational age of < 28 weeks.

Respiratory distress, presumed sepsis and supportive care were the main reasons for admitting babies to the neonatal unit accounting for 79% of all admissions (Table 1). On analyzing reasons for referral, transfer for advanced respiratory support was the most frequent reason (61%) followed by babies with surgical conditions (18%).

**Table 1:** Morbidity Pattern of LBW babies admitted in the Neonatal Unit

| REASONS FOR ADMISSION | 2058 | 2059 | 2060 | 2061 | Total |
|---|---|---|---|---|---|
| **Respiratory Distress** | 25 | 40 | 21 | 30 | **116** |
| **Presumed Sepsis** | 22 | 23 | 24 | 33 | **102** |
| **Supportive Care** | 17 | 18 | 32 | 21 | **88** |
| **Birth Asphyxia** | 1 | 4 | 4 | 9 | **18** |
| **Hypoglycemia** | 15 | 16 | 3 | 5 | **39** |
| **Hyperbilirubinemia** | 6 | 6 | 2 | 0 | **14** |
| **Congenital Anomalies** | 1 | 0 | 5 | 5 | **11** |
| **Total** | **87** | **107** | **91** | **103** | **388** |

Of the 388 LBW babies, 273 (70%) were discharged and sent home, 40 (10%) had to be referred for more specialized care and 75 (20%) died. There is a direct relationship between LBW frequency and mortality, with lowest mortality (14%) in 2060 BS when proportion of LBW admitted was only 27% i.e. at its lowest (Table.2)

**Table 2:** Outcome of LBW in Neonatal unit

| Year | Total admissions | Total babies with weight < 2.5 kg (% of total admissions) | Sent home (% of total LBW) | Referred (% of total LBW) | Died (% of total LBW) |
|---|---|---|---|---|---|
| **2058** | 281 | 87(31) | 59(68) | 8 (9) | 20(23) |
| **2059** | 355 | 107(30) | 76(71) | 10(9) | 21(20) |
| **2060** | 335 | 91(27) | 67(74) | 11(12) | 13(14) |
| **2061** | 356 | 103(29) | 71(69) | 11(11) | 21(20) |
| | 1,327 | 388 (29) | 273* (70) | 40 (10) | 75 (20) |

* 19 babies left the hospital against medical advice

Over the study period there were 125 neonatal deaths, of which 75 were in LBW babies contributing to 60% of the overall mortality. Mortality of LBW babies (Fig. 3) was highest in 2061 B.S. and lowest in 2060 B.S. accounting for 68 % and 48% of neonatal deaths respectively.

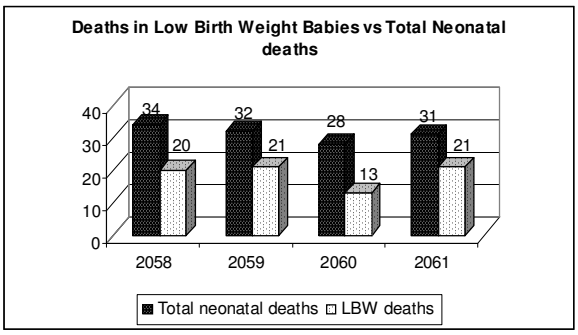


**Fig. 3:** Proportion of Deaths in Low Birth Weight Babies

On analyzing causes of mortality, 30 (40%) were due to respiratory distress of prematurity and 25 (33%) due to sepsis followed by other causes as shown (Table 3). 58 (77%) of the deaths occurred in the early neonatal period (i.e. in the first 7 days of life) and 17 (23%) in the late neonatal period. All (100%) deaths in the late neonatal period were due to sepsis. Respiratory distress of prematurity accounted for 52% of all deaths in the early neonatal period.

**Table 3:** Causes of Death of LBW babies admitted to the Neonatal Unit.

| Year | Respiratory distress of Prematurity | Extreme Prematurity | Birth Asphyxia | Sepsis | Meconium Aspiration Syndrome | Congenital Malformation | Total |
|---|---|---|---|---|---|---|---|
| **2058** | 6 | 6 | 1 | 5 | 2 | - | **20** |
| **2059** | 13 | - | - | 8 | - | - | **21** |
| **2060** | 5 | - | 2 | 5 | - | 1 | **13** |
| **2061** | 6 | 3 | 3 | 7 | - | 2 | **21** |
| **Total** | **30** | **9** | **6** | **25** | **2** | **3** | **75** |

## Discussion

Despite the increase in total births by 23% at TUTH over 7 years (2055 to 2061) and the number of newborn admissions by 27% over 4 years (2058 – 2061), the Neonatal Unit capacity has remained the same. Babies with birth weight < 2.5 kg account for one third of all admissions to the unit and the proportion of VLBW, ELBW babies and those born before 28 weeks of gestation show increasing trends. LBW contributes to one-half to two-thirds of neonatal deaths with most of the babies (77%) dying in the early neonatal period. The burden created by these increasing number of LBW and premature babies in the understaffed and many a times overcrowded neonatal unit with limited facilities provides an explanation for the high mortality rates of newborns at our hospital. According to American Academy of Pediatrics definition [1], the neonatal unit would classify as a Level II A nursery. It has the capability to provide service to all infants more than 32 weeks' gestational age and weighing more than 1500 g at birth but does not have the capabilities to provide assisted mechanical ventilation. Various studies have found that higher NICU level of care, higher nurse-to-patient ratios, and lower staff workload are all associated with lower neonatal mortality.[2,3,4] The study in California was also able to show that the level of care that is available at the hospital of birth is much more important for survival than is the level of care that ultimately is received. The odds ratios for mortality for infants who were < 2000 g and born at a hospital with no NICU or an intermediate NICU with no provision for mechanical ventilation were 2.38 (95% CI: 1.81–3.13; *P* < .001) and 1.92 (95% CI: 1.44–2.54; *P* < .001) respectively, compared with infants who were born at a hospital with a regional NICU. The authors recommend that women in early preterm labor should be moved to the regional hospital rather than be transferred there later with her infant. [2]At TUTH although we do admit women in early preterm labor, we do not have the adequate facilities to sustain the life of a preterm infant in need of advanced respiratory support.

Morbidity pattern of disease shows that respiratory distress in LBW babies was the major reason for admission (30%), referral (61%) and cause of death (52%) in the early neonatal period in this study. Of the 116 babies with respiratory distress on admission, 30 died and 24 had to be referred for advanced respiratory support. The introduction of neonatal intensive care, including mechanical ventilation, during the 1960s and its widespread application in the 1970s was associated with increased survival of very low birth weight infants.[5] The establishment of a neonatal intensive care unit (NICU) resulted in improved survival of inborn very low birth weight infants admitted to the neonatal unit of the University Hospital of the West Indies where 81 (69%) infants survived post-establishment of NICU compared to earlier when 73 (55%) survived (p = 0.02). This was due to an increase in survival of infants weighing 750 – 999gms, 17 (65%) compared to 9 (29%) (p < 0.05) and the number of infants ventilated, 39 (33%) compared to 12 (9%) (p <

0.001) in the pre- and post-NICU periods respectively.[6] In another study undertaken to analyze indications, outcome and factors influencing neonatal mechanical ventilation by Riyas in India, [7] the overall survival rate was 51% with 30% and 25% in babies weighing < 1500 gms and < 32 weeks respectively. The commonest indications for ventilation were birth asphyxia (37.3%) and hyaline membrane disease (31.4%). Inborn babies had better survival at 62.9% compared to 44.8% in outborn babies. Such positive impacts on newborn survival following establishment of higher levels of neonatal care with mechanical ventilators and the still poor outcome of LBW at TUTH where all babies are inborn with VLBW and preterm births showing increasing trends necessitates upgrading of facilities at the neonatal unit.

In this study sepsis was the second leading cause of death, accounting for 33% mortality. All 17 deaths in the late neonatal period were due to sepsis with a strong possibility that this was nosocomially acquired. Time of onset of sepsis with time at death and etiology of sepsis were not looked into, which is a limitation of the study. However what this study does reveal are the increasing number of admissions in the neonatal unit paving the way for overcrowding and the increased susceptibility of admitted LBW babies to infection. In an attempt to reduce congestion in the nursery and also tackle the problem of nosocomial infections a study was conducted at the Aga Khan University in Pakistan.[8] A stepdown unit was established in September 1994, with mothers providing all basic nursing care ,under supervision, for their LBW infants recovering from care in the NICU,

before being discharged from the hospital. Neonatal outcomes for the time periods before and after creation of the unit was analyzed and the findings were very encouraging. Length of stay in hospital fell significantly from mean 34 (SD 18) days in 1987-1990 to 16 (SD 14) days between 1999 and 2001 and overall rates of survival improved from 65% to 84% (P < 0.05). They were also able to show a significant decrease in the rates of overall nosocomial infections among infants admitted to the neonatal intensive care unit. In another study, early use of nasal CPAP, intermittent kangaroo mother care and training of nurses in supportive care of small babies were some of the interventions used to improve survival of LBW from 21% to 41% in a level II nursery in South Africa.[9] A similar strategy could be adopted in TUTH with creation of a step down unit where mothers would not only provide care to their LBW babies but also provide kangaroo mother care under supervision of trained nursing staff.

## Conclusion

The existing Neonatal Unit facilities of TUTH have become inadequate to deal with the increased number and morbidity pattern of admissions in LBW babies, who contribute significantly to neonatal mortality as well. In order to improve their survival, the neonatal unit needs to be upgraded to Level III with adequate facilities for provision of mechanical ventilation including establishment of protocols for the early use of nasal CPAP when indicated. Institution of effective infection control measures and future planning for establishment of a step down unit with provision for kangaroo mother care might be additional measures to improve management of these LBW babies and reduce congestion in the unit.

## References

1. Committee on Fetus and Newborn Levels of Neonatal Care *Pediatrics* November 2004; **114 (5):**1341-1347
2. Javier Cifuentes, Janet Bronstein, Ciaran S. Phibbs et al Mortality in Low Birth Weight Infants According to Level of Neonatal Care at Hospital of Birth *Pediatrics* 2002; **109:** 745 – 751
3. Sanderson, Maureen; Sappenfield, William; Jespersen, Kristen et al Association between level of delivery hospital and neonatal outcomes among South Carolina Medicaid recipients *American Journal of Obstetrics & Gynecology*. December 2000; **183(6):**1504-1511
4. Leo S. Morales, Douglas Staiger, Jeffrey D. Horbar et al Mortality Among Very Low-Birthweight Infants in Hospitals Serving Minority Populations *Am J Public Health* December 2005; 95(12) 2206 – 2212
5. Henderson-Smart DJ, Wilkinson A, Raynes-Greenow CH. Mechanical ventilation for newborn infants with respiratory failure due to pulmonary disease. *CochraneDatabase of Systematic Reviews* 2002, Issue 4.
6. H Trotman, M Barton The Impact of the Establishment of a Neonatal Intensive Care Unit on the Outcome of Very Low Birthweight Infants at the University Hospital of the West Indies *West Indian Med J* 2005; **54 (5)**: 297
7. Riyas P.K, Vijay Kumar, Kulkarni M.L Neonatal Mechanical Ventilation *Indian J Pediatr* 2003; **70(7):** 547-540

8. Zulfiqar A Bhutta, Iqtidar Khan, Suhail Salat et al Reducing length of stay in hospital for very low birth weight infants by involving mothers in a stepdown unit: an experience from Karachi (Pakistan) *BMJ* 2004;329;1151-1155

9. F.S. Bondi, M.Adhikari, Improved survival of non-ventilated very-low-birth-weight infants at Madadeni Hospital, KwaZulu-Natal *SA Journal of Child Health* April 2007 Vol.1 No.1