

Trends in Neonatal Mortality at a Tertiary Level Teaching Hospital

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Introduction

Advances in neonatal care have significantly increased survival and decreased morbidity among infants admitted to neonatal intensive care units (NICUs)¹.

There are, however, significant variations in outcomes among NICUs². Tribhuvan University Teaching hospital, the oldest medical college of Nepal is a tertiary care multidisciplinary hospital having 460 beds. It was established in the year 1972 and from its establishment it is providing obstetric services. It is a referral centre for obstetrics services where high-risk pregnant women are referred from throughout the country. However, neonatal service was started only in the year 1994 and neonatal care was essentially level II up to year 2008. With the increasing obstetrics referrals and large number of preterm deliveries, the existing neonatal services was upgraded to level III NICU. During this process in the year 2008, various equipments including monitors, syringe pumps, radiant warmer, incubators, CPAP, ventilators were added to the neonatal unit. The number of nursing staffs was increased to provide level III care from the year 2009.

At present, in neonatal unit there are three ventilators, several CPAP circuits, and three cardiothoracic monitors. Two paediatric residents are posted in rotation in neonatal ward throughout the year. There are all together 12 neonatal nursing staffs. Well babies and babies with minor problems like neonatal jaundice, suspected sepsis get treatment in postnatal ward.

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Abstract

Introduction: Neonatal services at Tribhuvan University Teaching hospital (TUTH) was essentially up to level II till year 2008 and upgraded to level III care in later years. A 4 years retrospective study was carried out at TUTH, Kathmandu, Nepal to determine any change in the trend of neonatal mortality after the improvement in its services. **Materials and Methods:** Labor room record book, neonatal record book, perinatal audit data and neonatal record charts were used to collect the data. **Results:** During the study period, there were total of 15063 live births. The neonatal mortality ranges from 9.46 to 14.88 per 1000 live births per year. There was no significant fall in trend of neonatal mortality (χ^2 for linear trend=1.40, $p=0.23$). There was also no significant fall in trend in perinatal mortality rates over this period (χ^2 for linear trend=1.92, $p=0.16$). The number of neonates referred to other hospitals has been significantly reduced by 61%. (χ^2 for linear trend=33.18, $p<0.001$). Majority of the neonatal deaths (72%) occurred within first 7 days of life and more than a third (39%) died within the first 24 hours of life. Respiratory distress syndrome, perinatal asphyxia and neonatal sepsis were three major causes of death. Deaths due to respiratory distress and perinatal asphyxia has not changed significantly over the years ($p=0.4$ and 0.25 respectively). Incidence of low birth weight ranges from 10.8 – 16.1% of total live births. 63% of neonatal mortality occurred in low birth weight babies. This trend has not changed in over the years ($\chi^2=1.03$, $p=0.31$). **Conclusion:** With the improvement in the services, though neonatal mortality remained unchanged, referral rates and mortality due to respiratory distress syndrome of prematurity has decreased.

Key words: neonatal mortality, prematurity, asphyxia

How to cite this article ?

Basnet S, Shrestha L. Trends in Neonatal Mortality at a Tertiary Level Teaching Hospital. J Nepal Paediatr Soc 2013;33(3):213-217.

As neonatal services were upgraded for last few years, it was time to analyze whether these measures have helped to improve neonatal care and survival. The neonatal mortality rates reflect the efficiency and effectiveness of health care services so this important indicator is used in this study. Indicators like neonatal mortality and perinatal mortality are also useful in planning for improved healthcare delivery³. It is important to review the pattern of neonatal morbidities and mortality at regular intervals so that neonatal care could be improved⁴. Therefore, this study was carried out with the objectives to analyze the trend of neonatal mortality and to see pattern of neonatal morbidities at neonatal unit of TUTH.

Materials and Methods

This is a retrospective descriptive study from April 2007 to April 2011 done at neonatal ward of TUTH. Labor room record book, neonatal record book, perinatal audit datas and neonatal record charts were used to collect the data. Data and figures of hospital deliveries, total live births, still births, gestational age, birth weight, first week deaths, neonatal deaths and causes of death were recorded. The number of babies referred to other centers was also recorded. All these yearly data were compared using χ^2 test with Stat direct software.

Result

From 2007 April to 2011 April, total of 15063 live babies were delivered at TUTH. Thirteen percent of these newborns required admission in neonatal unit. The yearly distribution of number of admitted newborns and referred newborn is shown in Table 1. There was no significant increase in number of neonatal admission in neonatal unit (χ^2 for linear trend=1.40, $p=0.23$) over these years.

The yearly distribution of birth as well as total number of neonatal death is shown in table 2.

The neonatal mortality ranges from 9.45 to 14.88 per 1000 live births per year (Figure 1).

There was no significant fall in trend in neonatal mortality rates over this 4 year period (χ^2 for linear trend=1.46, $p=0.23$).

The perinatal mortality rate over this period ranges from 15.59 to 20.24 per 1000 total births (table 3 and figure 2). There was also no significant fall in trend in perinatal mortality rates. (χ^2 for linear trend= 1.92, $p=0.16$).

The number of neonates referred to other hospitals has been significantly reduced by 61%. (χ^2 for linear trend=33.18, $p < 0.001$). Majority of the neonatal deaths (72%) occurred within first 7 days of life and more than a third (39%) died within the first 24 hours of life (figure 3).

Yearly distribution of 1st day neonatal death as proportion of early neonatal death is illustrated in figure 3.

Respiratory distress syndrome, perinatal asphyxia and sepsis were three major causes of neonatal deaths (fig 4). In recent years, early deaths due to respiratory distress syndrome and prematurity have gradually decreased from 33% to 25% whereas neonatal mortality due to perinatal asphyxia has increased from 41% to 51%. The trend for these mortalities have not changed significantly over 4 year period (χ^2 for respiratory distress syndrome= 1.07, $p=0.2$, χ^2 for perinatal asphyxia=1.47 and $p=0.22$). Ninety percent of mortality after 1st week occurred due to neonatal sepsis.

Incidence of low birth weight babies ranges from 10.8 – 16.1% of total live birth (table 4).

63% of early neonatal mortality occurred in low birth weight babies and the mortality trend of low birth weight babies has not changed over these years ($\chi^2=1.03$, $p=0.31$).

Table 1: Live births, neonatal admission and referral at TUTH (2007-2011)

Year	Live births	Neonatal admission (% of live birth)	Referral
2007 - 2008	3949	477 (15.98%)	36
2008 - 2009	3773	499 (13.22%)	40
2009 - 2010	3452	467 (13.4%)	14
2010 - 2011	3889	516 (13.11%)	5

Table 2: Live births, Neonatal deaths, Neonatal mortality rates at TUTH (2007-2011)

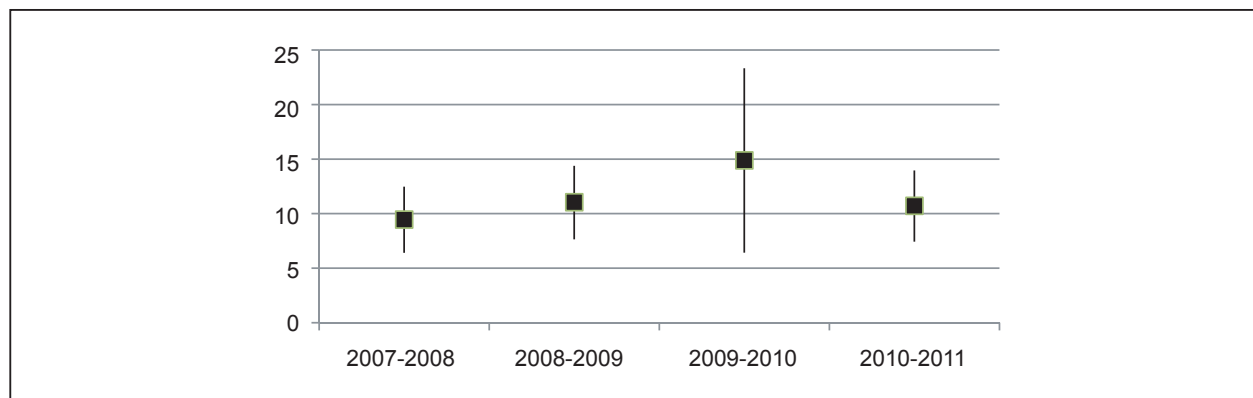
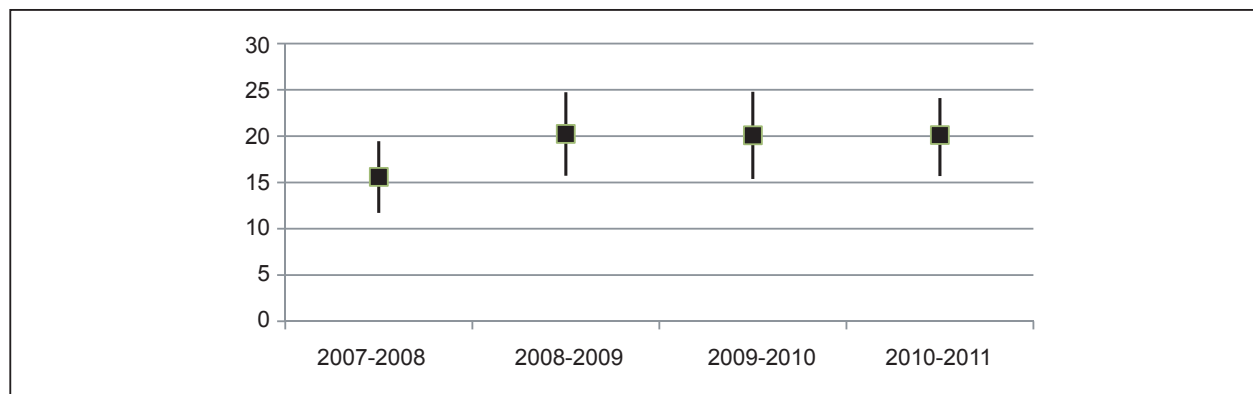
Year	Live births	Early neonatal deaths	Total NND	Total Neonatal mortality per 1000 live births	Early Neonatal mortality per 1000 live births	Total Neonatal mortality 95% CI
2007 - 2008	3949	24	36	9.45	6.07	6.41-12.48
2008 - 2009	3773	33	40	11.04	8.74	7.65-14.39
2009 - 2010	3452	35	52	14.88	10.13	6.43-23.32
2010 - 2011	3889	31	42	10.71	7.77	7.45-13.96
Total	15063	123	170	-	-	-

Table 3: Perinatal mortality at TUTH (2007-2011)

Year	Total birth	Still births	Early NND	Still births + Early NND	PMR	95% CI
2007 -2008	3986	37	25	62	15.59	11.71-19.46
2008 -2009	3814	41	36	77	20.24	15.72-24.75
2009-2010	3487	35	35	70	20.09	15.38-24.79
2010 -2011	3937	48	31	79	20.11	15.68-24.11

Table 4: Total LBW and preterm LBW babies

Year	Total LBW babies	Preterm LBW	Total live births	Rate of LBW per 1000	Preterm LBW (%)
2007 -2008	483	282	3986	161.75	9.14
2008 -2009	470	257	3814	123.23	6.73
2009-2010	459	246	3487	131.68	7.05
2010 - 2011	428	242	3937	108.71	6.14

**Fig 1:** Total neonatal mortality at TUTH with 95% CI (2007-2011)**Fig 2:** Perinatal mortality at TUTH (2007-2011)

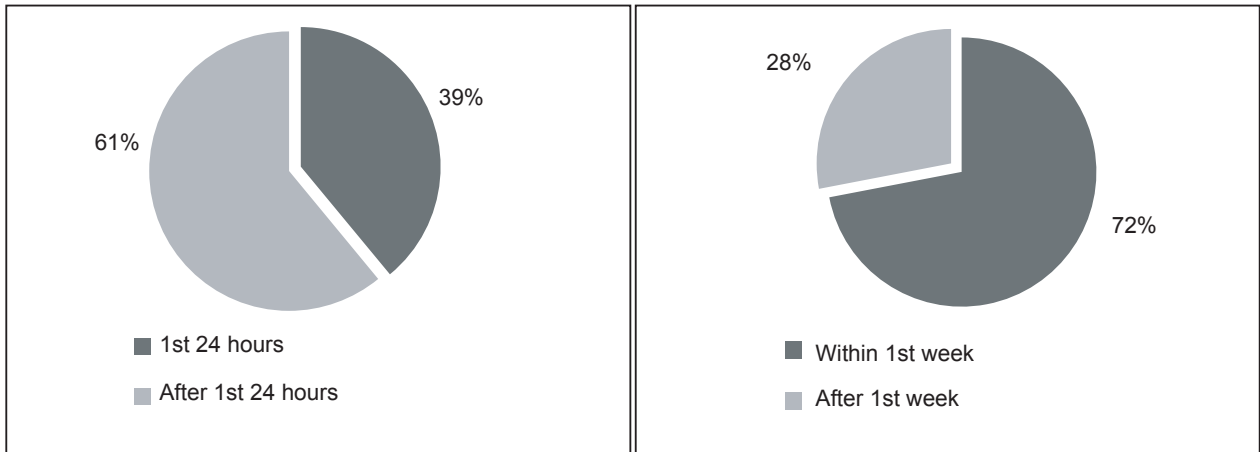


Fig 3: First week and first day neonatal deaths

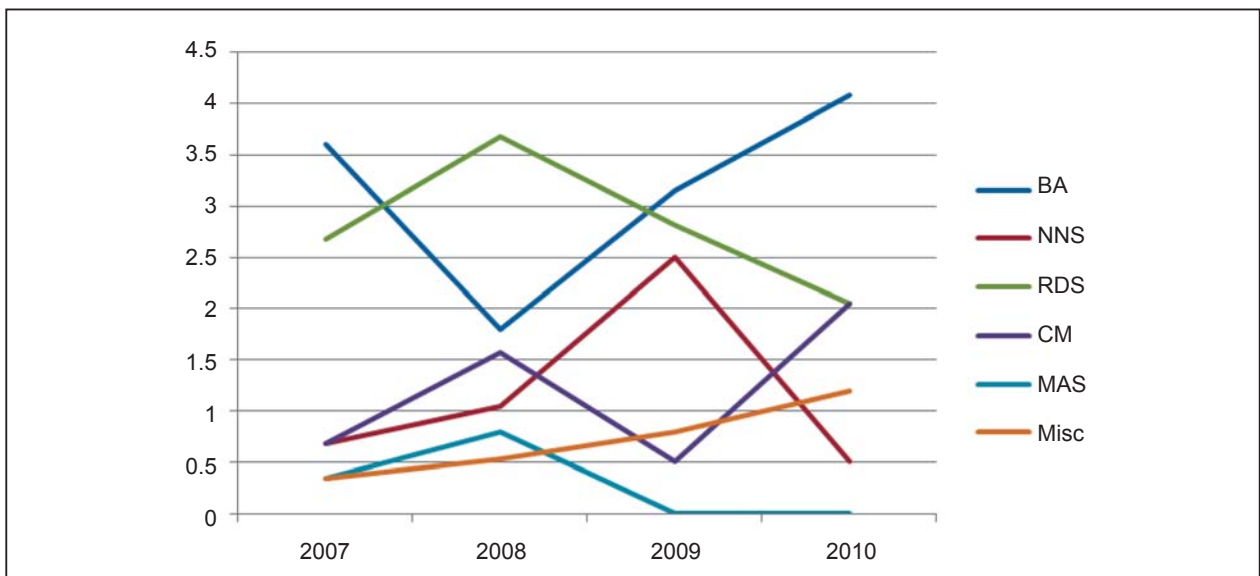


Fig 4: Different causes of early neonatal mortality per 1000 births

BA=Birth asphyxia, NNS=Neonatal sepsis, RDS=Respiratory distress syndrome
 CM=Congenital malformation, MAS=Meconium aspiration syndrome

Discussion

The present study describes the trend in neonatal mortality at TU Teaching Hospital over a period of four years. Neonatal mortality of Nepal in 2006 is 33 per 1000 live births⁵. During the study period, neonatal mortality rate of TUTH range from 6.07-10.13/1000 live births which is comparable with the other hospitals of Kathmandu valley during same time^{6,7,8}. The global estimation of PMR is 10 per 1000 births in developed countries, 50 per 1000 births in developing countries and 60 per 1000 births in least developed countries⁹. At Tribhuvan University Teaching Hospital (TUTH) during the study period PMR ranged from 15-20 per 1000 births which has remained unchanged as over previous years¹⁰. PMR in different hospitals of the Kathmandu valley during these years ranges from 31.3 to 14.4 per 100 births^{6,7,8,11}.

Prematurity, asphyxia and septicemia were three main causes of early neonatal deaths. During the study period, 41- 51% of early neonatal mortality occurred due to perinatal asphyxia and 25-33% of early neonatal mortality occurred due to respiratory distress syndrome of prematurity. This finding is comparable to the similar study¹² done in College of Medical Science, Bharatpur which showed 48.0% of neonatal death is due to birth asphyxia, 29.0% due to neonatal sepsis and 22.0% due to prematurity. A population based cohort study¹³ done in Southern Nepal showed 30.0% of NND is due to birth asphyxia. Similar study¹⁴ done at Patan Hospital revealed 30.0% on early neonatal death was due to respiratory distress syndrome, 25.0% due to neonatal sepsis, 16.0% due to congenital anomalies and 13.0% due to birth asphyxia. This indicates that mortality due to perinatal asphyxia is more frequent in TUTH than in Patan hospital. According to the World

Health Organization (WHO), between four and nine million newborns develop birth asphyxia each year. Of those, an estimated 1.2 million die and at least the same number develop severe consequences, such as epilepsy, cerebral palsy, and developmental delay¹⁵. The proportion of perinatal asphyxia is quite high for tertiary level hospital and its increasing trend warrants improvement in intrapartum monitoring and obstetric services at TUTH. The mortality trend of low birth weight babies has not changed over these years ($\chi^2=1.03$, $p=0.31$), though the deaths due to respiratory distress have decreased. There is significant reduction in number of referrals too. Increased use of antenatal corticoids and advancements in the field of assisted ventilation played a role to decrease neonatal mortality due to respiratory distress. Neonatal sepsis was main contributor for late neonatal death which necessitates strict adherence to infection control measure.

Advancing intensive care technologies is closely associated with improve survival in low birth weights.¹⁶ With the easy access to surfactant and advancements in the field of assisted ventilation, increased survival of low birth weight babies is expected at TUTH in future.

Conclusion

Even with improvement in the services, the neonatal mortality rate remained unchanged. The referral rate has been significantly reduced and mortality due to respiratory distress syndrome of prematurity has decreased. Perinatal asphyxia and neonatal sepsis are still the major causes of neonatal mortalities. Neonatal services have to be further improved to decrease of neonatal mortalities significantly.

Acknowledgment: We would like to thank all staff of NICU who helped me collecting data.

Conflict of Interest: None

Funding: None

Permission from IRB: Not required

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