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Morbidities and Outcome of a Neonatal Intensive Care in Western Nepal

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ABSTRACT

Background: Neonatal mortality rate of developing countries is declining over decades. In the recent years increasing number of preterm and high risk neonates have facilities for tertiary care treatment. The aim of the study was to assess the morbidities and outcome of neonatal intensive care admissions.

Methods: It was a retrospective observational study carried out in neonatal intensive care unit of the Manipal Teaching Hospital, Pokhara, Nepal from January 2014 to December 2015. Neonatal details including place of delivery, birth weight, gestation, diagnosis at admission, hospital course and final outcome were recorded in predesigned proforma. Risk of mortality was calculated using odds ratio and 95% confidence interval.

Results: There were total 1708 admission during study period and inborn as well as out born neonates were equally admitted. Neonatal hyperbilirubinemia (37.1%), neonatal sepsis 532 (31.2%), prematurity, 314 (18.4%) perinatal asphyxia 112 (6.6%), meconium aspiration syndrome 79 (4.6%) and intrauterine growth restriction 49 (2.8%) were main indications for hospitalization. A total of 1410 (82.6%) the patients were discharged after treatment, 167 (9.7) left against medical advice, 115 (6.7%) died in hospital and 16 (1%) cases were referred. Preterm neonates had twice the risk of mortality than term neonates (OR =2.1664). Birth weight < 2500 grams had three times more risk of neonatal mortality than normal birth weight (OR =3.0783).

Conclusions: Neonatal hyperbilirubinemia, prematurity and neonatal sepsis were common morbidities inneonatal intensive care unit.

Keywords: Morbidity; mortality; NICU.

INTRODUCTION

Mortality rates among overall neonatal intensive care unit (NICU) admissions is reported to be 4 - 46% and 0.2 - 64.4% in developed and developing countries.[1] There is significant reduction in under five mortality rates but newborn mortality have reduced much slowly.[2-4] Prematurity, birth asphyxia and infections are three important causes of neonatal deaths.[5-9] In the developed countries genetic or structural anomalies is major cause of poor outcome.[10] Most of the neonatal deaths occur in the first week of life.[11] Level of care, patient load and place of delivery determine neonatal outcome.[9,12-14] Though there is increased survival of very low birth weight infants,[15,16] outcome of extremely low birth weight neonates is still unfavorable even in well-equipped centers.[17,18] There is limited information about neonatal outcome from developing countries. Current study aims to find morbidities and causes of poor outcome in a tertiary neonatal unit of western Nepal.

METHODS

Manipal Teaching Hospital is a tertiary care center located in Pokhara, western region of Nepal. It is the first established NICU facility in the region. It is currently 20 bedded with two neonatal ventilators, two continuous positive airway pressure (CPAP) machines with facilities for surfactant administration and exchange transfusion. Inborn neonates as well as outborn cases referred from all the districts in the western region of the country are treated.

Details of all NICU admission were collected in a predesigned proforma from the period of 1st January 2014 to the 31st December 2015. Neonatal details including age, sex, birth weight, gestation, diagnosis at admission, hospital course and final outcome were recorded in predesigned proforma. Neonates more than 30 days of chronological age on the first day of admission

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were excluded from the study. Patients were divided in two groups of inborn and out born unit admission. Final outcome was recorded as discharged, left against medical advice (LAMA), referred for pediatric surgical indications to other centers and death during hospital course.

Preterm was defined as neonates born gestation less than 37 weeks and rest as term gestation. Birth weight categorized as normal birth weight (NBW) more than 2500 grams, low birth weight (LBW)2500- 1500 grams, very low birth weight (VLBW) 1000 -1500grams and extremely low birth weight(ELBW) less than 1000 grams. Causes of death were recorded in the following groups, prematurity with complications, early and late onset neonatal sepsis, perinatal asphyxia, meconium aspiration syndrome, and congenital malformations. Hyaline membrane disease, pulmonary hemorrhage, intraventicular hemorrhage, necrotizing enterocolitis and sepsis after admission of prematurity were designated as causes of death under the complications of prematurity. Death related to trauma, late onset hemorrhagic disease of newborn and kernicterus were placed in others.

Data was analyzed using SPSS version 18. Continuous data was presented as mean and standard deviation (SD), categorical data was presented as frequency and percentage. Risk of mortality was calculated using odds ratio (OR) and 95% confidence interval.

RESULTS

There were total 1708 admission during two years period and inborn as well as out born neonates were equally admitted. There were 57.55 % male, 42.45% female and 46.72% of total admissions were due to prematurity with low birth weight. Low birth weight accounted for 34.8% of NICU admission while VLBW and ELBW contributed to 9.7% and 2.2 % of admission respectively (Table1). Most of the neonates (75%) were admitted for less than a week and remaining one fourth of neonates were admitted for longer duration (Table 1). A total of 1410 (82.6%) the patients were discharged after treatment, 167 (9.7) left against medical advice, 115 (6.7%) died in hospital and 16 (1 %) cases were referred for pediatric surgeries.

More than one third (37.1%) of neonatal unit admission was in phototherapy room for treatment of unconjugated hyperbilirubinemia.Unconjugated hyperbilirubinemia was a comorbidity in additional 375(22%) neonates. Overall 28 (1.2 %) neonates required double volume exchange transfusion (Table 2). Indications for hospitalization were neonatal sepsis in 532 (31.2%), prematurity in 314 (18.4%) perinatal asphyxia with hypoxic ischemic encephalopathy in 112 (6.6%), meconium aspiration syndrome in 79 (4.6%) and intrauterine growth restriction in 49 (2.8%) of neonates. Remaining 14 (0.8 %) had congenital heart disease and 17 (1%) had major congenital malformation or genetic syndromes. Miscellaneous causes, late onset haemorrhagic disease of new-born, birth injuries, meconium gastritis accounted for 15(0.9%) of total admission (Table 2).

Table 1. Baseline characteristics of neonatal admission.

Caracteristics		n	%
Birth place	Inborn	862	50.47%
	Out born	846	49.53%
	Total	1708	100%
Sex	Male	983	57.55
	Female	725	42.45
Gestation	Term	910	53.27
	preterm	798	46.72
Birth weight	NBW*	920	53.86
	LBW†	594	34.77
	VLBW‡	166	9.71
	ELBW§	38	2.22
Duration of hospital stay in days	Less than 3	472	27.6
	3-7	818	47.9
	8-14	292	17.1
	More than 14	126	7.4

** Normal birth weight,† low birth weight, ‡ very low birth weight, § Extremely low birth weight.*

Prematurity with complications (60%), neonatal sepsis (17.4%), perinatal asphyxia (11.3%) and meconium aspiration syndrome (7.0%) were the major causes of neonatal mortality in our study. Low birth weight accounted for 34% of death while VLBW and ELBW contributed to 26.1% and 10.4 % of neonatal mortality respectively (Table3). Mortality rate was higher in males compared with the females (7.6% vs. 5.5) but there was no statistically significant difference. There was no significant difference in death rates of inborn and outborn neonates (OR =0.9648). There were 64% premature and 71.3 % low birth weight neonates among total NICU deaths. Mean duration of hospital stay days was 4.37 ± 5.42 in neonates with poor outcome (Table 3). Preterm neonates have higher death rates compared to term neonates (OR =2.1664). Likewise birth weight < 2500 grams carried three times more risk of neonatal mortality compared with normal birth weight (OR =3.0783).

Table 2. Morbidity pattern of NICU patients.

Morbidities	Inborn		Outborn		Total
	n	%	n	%	n (%)
Unconjugated hyperbilirubinemia requiring only phototherapy	430	66.8	214	33.2	634(37.1%)
Unconjugated hyperbilirubinemia as comorbidity	240	64.0	135	36.0	375 (22.0)
Unconjugated hyperbilirubinemia requiring exchange transfusion	12	43.0	16	57.0	28(1.6)
Preterm	210	66.9	104	33.1	314(18.4)
Early onset neonatal sepsis	83	38.0	135	62.0	218(12.8)
Late onset neonatal sepsis	46	18.0	210	82.0	256(15.0)
Perinatal asphyxia	49	43.7	63	56.3	112(6.6)
Intrauterine growth restriction	20	40.8	29	59.2	49(2.8)
Meconium aspiration syndrome	44	55.7	35	44.3	79(4.6)
Congenital malformations	8	47.0	9	53.0	17(1.0)
Congenital heart disease	7	50.0	7	50.0	14(0.8)
Miscellaneous causes	9	60.0	6	40.0	15(0.9)

Table 3. Characteristics of neonates with mortality.

Characteristics		n	%
Birth place	Inborn	59	51.3
	Out born	56	48.7
Sex	Male	75	65.2
	Female	40	34.8
Gestation	Term	41	35.7
	preterm	74	64.3
Birth weight	NBW*	33	28.7
	LBW†	40	34.0
	VLBW‡	30	26.1
	ELBW§	12	10.4
Mean duration of hospital stay days Mean ± SD		4.37	5.426

** Normal birth weight,† low birth weight, ‡ very low birth weight, § Extremely low birth weight.*

Table 4. Characteristics of neonates with mortality.

Characteristics		Total patients	Mortality n(%)	Odd ratio	95%CI
Birth place	Inborn	862	59(6.84)	0.9648	0.6607 to 1.4088
	Out born	846	56(6.6)		
	Total	1708	115(6.7)		
Sex	Male	983	75(7.6)	1.4145	0.9516 to 2.1025
	Female	725	40(5.5)		
Gestation	Term	910	41(4.5)	2.1664	1.4607 to 3.2129
	preterm	798	74(9.3)		
Birth weight	Weight > 2500 grams	920	33(3.6)	3.0783	2.0309 to 4.6658
	Weight<2500 grams	798	82(10.3)		

DISCUSSION

Neonatal mortality is still high in developing countries compared to developed world.[3] There is high prevalence of small for gestation in our country further complicating neonatal course.[19] Risk of death for babies born premature and small for gestational age can be used as indicator for monitoring the quality of care for these babies in health facility setting.[20]

We have presented neonatal morbidity pattern and outcome parameters from a tertiary care neonatal center in a developing country. Our cohort was mixed group of neonates inborn and out born referred from other centers in same district as well as surrounding districts in this region. Neonatal hyperbilirubenemia was most common indication for hospitalization accounting 37.7 % of total admission in phototherapy units. Additional 22 % of neonates in the remaining group had required treatment for neonatal hyperbilirubinemia making neonatal jaundice a problem in 59% of neonates. Neonatal hyperbilirubinemia is described as a common comorbidity in a study by Shrestha et al., a study from Kathmandu, Nepal.[21] Improvement in neonatal care and provision of phototherapy units in local health facilities in future will be beneficial.

In addition to neonatal sepsis (31.2%), other causes for NICU admissions were prematurity (18.4%), complication related to birth i.e. perinatal asphyxia with hypoxic ischemic encephalopathy and meconium aspiration syndrome in accounted for 11.2% of total neonatal admission. Previous studies had described higher admission for perinatal asphyxia, 20% by Shah et al. from the eastern Nepal[22] and 22% by Hedstrom et al. from rural Uganda.[9] Though there is high prevalence of SGA in our country (17.9%) from the earlier data,[19] uncomplicated small for gestation accounted for only 2.8 % of hospital admission in current study.

Preterm birth was two times more prevalent in inborn compared to out born in NICU admissions. We had mixed strata of neonates higher number of outborn term neonates admitted with neonatal sepsis. Early as well as late onset sepsis was more frequent in outborn neonates comprising 72.8% of total sepsis cases. Strikingly complications related with birth, both perinatal asphyxia as well as meconium aspiration syndrome was equally common in inborn neonates. This might be explained by referral of mother in late stage to our obstetrics unit from other centers.

Male mortality was higher than the females in our study. Similar result was described by Katz et al. from Sarlahi district of Nepal.[10] Death rates for an inborn and outborn neonate was similar in our study. Earlier study by Hedstrom et al. from Uganda's neonatal center found two times more risk of mortality in outborn neonates.[9] Most of the neonates with poor outcome belonged to premature and LBW group. Mean duration of hospital stay days was 4.37 ± 5.42 in neonates with poor outcome.

Prematurity and birth weight are major prognostic factors for NICU outcome. In our study, preterm neonates with the gestation of less than 37 weeks had two times more risk of mortality compared with the term neonates (OR =2.1664). Birth weight of less than 2500 grams was major risk factor and three times more risk of neonatal mortality compared with normal birth weight (OR =3.0783). It was observed that significant proportion of neonates in LBW had poor neonatal outcome. Future projects directed to improve neonatal care should address problems of LBW in addition to continuing care for NBW neonates.

Survival to discharge was 82.6% in the NICU in this study. Earlier study from Uganda survival rate was 78% .[9] The mortality rate in ELBW and VLBW was 32% and 18% respectively in the present data. Survival rate was more than previous studies from our country. Poudel et al reported survival of 60.8% in VLBW from a center in eastern Nepal.[15] In another earlier study by Shrestha et al., mortality rate in VLBW and LBW was 80% and 39.5% respectively.[21] The survival rate of 56.1 % in ELBW neonates is reported among in a recent study by Tagare et al. from a tertiary care level unit in India.[16]Over the years, outcome of preterm and low birth weight seems to be improving in NICU of developing countries.

The findings of current study should be interpreted keeping in view the following limitations. Fraction of total patients, most of them sick premature with low birth weight had discontinued medical treatment. Other potential limitation was admission for neonatal hyperbilirubenemia was also included in total number of patients in our study. These factors might have underestimated poor outcome.

CONCLUSIONS

Neonatal sepsis, neonatal hyperbilirubinemia prematurity, perinatal asphyxia and meconium aspiration syndrome were major causes of neonatal morbidity and mortality in our study. Maternal and neonatal health care strategies should be further strengthened for prevention of complications related to birth. Primary and secondary level neonatal care is essential for further reductions in NBW and LBW neonatal morbidities and mortality. Policies to support parents for continuing treatment of sick neonates might change outcome of patients

leaving against medical advice. Long term and sustained progress in the outcome is only possible with improved survival of VLBW and ELBW neonates in tertiary care.

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