Morbidity Pattern and Hospital Outcome of Neonates Admitted in Tertiary Care Hospital, Nepal

Deepeshwara Nepal, Sumit Agrawal, Sushan Shrestha and Ajit Rayamajhi

Department of Paediatrics, Kanti Children's Hospital, Maharajgunj, Kathmandu, Nepal

Correspondence:
Deepeshwara Nepal
Kanti Children's Hospital,
Maharjgunj,
Kathmandu, Nepal
Email: drdeepeshwara@gmail.com

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ABSTRACT

Introduction: The first 28 days of life, neonatal period is crucial as neonates are susceptible to sepsis, birth asphyxia, hypoxic injuries and its consequences which may lead to lifelong morbidity. Knowing the causes of morbidity and mortality is an essential step to improve neonatal health. The aim of this study is to describe the pattern and causes of neonatal admission, immediate hospital outcome in the form of improved, died or left against medical advice and factors associated with its outcome.

Methods: This was a retrospective hospital based study carried out in Neonatal Intensive Care Unit (NICU) of Kanti Children's Hospital, Kathmandu, Nepal over a period of six months (February 2019 to July 2019 AD). Neonatal details including age, sex, gestational age, birth weight, and maternal age and parity, mode of delivery, place of delivery, neonatal morbidities and neonatal outcomes were recorded in a predesigned performa. Results were expressed as mean, percentage and p value. P- value was calculated by using chi-square test.

Results: A total of 163 neonates were admitted during the study period, among which 106 (65%) were males. The mean birth weight was 2483.96 ± 812.63 gm. Among admitted newborns 130 (79.8%) had good outcome, babies born to young mothers (< 20 years of age) had poor outcome which is statistically significant with p value of 0.002. Neonates whose birth weight were < 1000 gram had significantly poor outcome (0.001).

Conclusion: Common causes of NICU admission were neonatal sepsis, neonatal hyperbilirubinemia, prematurity and perinatal asphyxia. Babies born to young primipara mothers, extremely low birth weight, extremely premature babies and babies undergoing mechanical ventilation had poor outcome.

Key words: morbidity; mortality; neonates; prematurity; sepsis

INTRODUCTION

Neonatal period (the first 28 days of life) is crucial in human life as they are vulnerable to high morbidity and mortality. Advancement in perinatal and neonatal care have reduced Neonatal Mortality Rate (NMR) in developed countries, but these rates are still high in developing countries.[1] Every Newborn Action Plan recently endorsed by World Health Assembly calls for NMR < 10/1000 live birth.[2] But NMR of Nepal is 21/1000 live birth accounting 65.5% and 54% of infant and under 5 mortality rate respectively.[3] Worldwide the major direct causes of neonatal mortality are preterm birth (27%), infection (26%), perinatal asphyxia (23%) and congenital anomalies (7%).[2]A previous study done in Nepal showed sepsis as the leading cause of hospital admission and mortality (34.5%) followed by prematurity (23%) and perinatal asphyxia (23.3%).[4] As disease pattern vary from place to place and with time, even in the same place, regular neonatal auditing is vital but it is lacking in our country.[5] There are limited hospital based data regarding morbidity and mortality pattern of newborn in Nepal. Evidence based data on neonatal morbidities, mortalities and interventions especially facility based care are vital for formulating neonatal preventive health strategies to reduce neonatal mortality. So we undertook this study to see the common causes of admission and the root cause of mortality which will help us prioritise the areas in neonatal health. The aim of this study is to describe the pattern and causes of neonatal admission, immediate hospital outcome in the form of complete improvement, death and LAMA (Left against medical advice) and factors associated with its outcome.

METHODS

This was a retrospective hospital based study conducted at NICU of Kanti Children's Hospital, Kathmandu, Nepal, over the period of six months (February 2019 - July 2019). Data were retracted from medical record section of the hospital after obtaining ethical approval from IRC of our institute, which is the only Government tertiary care children's hospital and receives sick children including neonates from all over Nepal. A total of 163 extramural neonates (as there is no maternity service, it receives only extramural cases) admitted in NICU during the study period were included. Data on age (at time of hospital admission), sex, gestational age, birth weight, maternal age, parity and neonatal morbidity in terms of final diagnosis were recorded in a predesigned performa. Diagnosis was mainly clinical which was supported by laboratory findings, radio-imaging and echocardiography whenever indicated. Neonatal sepsis was diagnosed as per WHO clinical criteria defined in Integrated Management of Childhood and Neonatal Illness (IMNCI) along with septic screening including complete blood count, C reactive protein, micro ESR and blood culture. Neonatal sepsis was further divided into early onset neonatal sepsis (EONNS) when sepsis occurred within 72 hours of life and late onset neonatal sepsis (LONNS) when it occurred after 72 hours to 28 days of life. Meningitis was diagnosed with cerebrospinal fluid (CSF) analysis. Pneumonia was diagnosed on the basis of clinical features along with chest X ray (CXR) findings. Perinatal asphyxia was diagnosed based on the criteria set by WHO and National Neonatology Forum of India. Neonatal jaundice (NNJ) was diagnosed when the rise of bilirubin required need of phototherapy according to American Academy of Paediatrics guidelines for phototherapy for neonatal jaundice 35 weeks or above and NICE (National Institute for Health and Care Excellence) guidelines for < 35 weeks gestation period. Preterm was defined when the baby was born before the completion of 37 weeks of gestation on the basis of last menstrual period, which was further categorised as extremely preterm (< 28 weeks), very preterm (28 to < 32 weeks), moderately preterm (32 to < 34 weeks) and late preterm (34 to < 37 weeks). Birth weight was further categorised as extremely low birth weight (Less than 1000 gm), very low birth weight (1000 to 1499 gm), low birth weight (1500 to 2499 gm) and normal weight (> 2500 gm). Congenital heart disease (CHD) was diagnosed with echocardiography. Meconium aspiration syndrome (MAS) was diagnosed when there was history of meconium stained liquor with typical CXR along with respiratory distress and exclusion of other possible causes. Respiratory distress syndrome (RDS) was diagnosed when there was respiratory distress along with typical CXR finding in preterm

Table 1. Neonatal outcome versus socio-demographic and other clinical parameters and its significance

S.N.	Characteristics	Outcome		Total	p-value	OR (95%CI)
		Good outcome n (%)	Poor outcome n (%)			
1	**Age on admission**					
	< 24 hours	19 (65.5%)	10 (34.5%)	29 (100%)	0.059	
	24 to 72 hours	38 (82.6%)	8 (17.4%)	46 (100%)		
	72 hours to 7 days	34 (91.9%)	3 (8.1%)	37 (100%)		
	7 to 28 days	40 (78.4%)	11 (21.6%)	51 (100%)		
2	**Mother's age ***					
	< 20 years	8 (50%)	8 (50%)	16 (100%)	0.002	
	20 to 35 years	110 (82.1%)	24 (17.9%)	134 (100%)		
	> 35 Years	10 (100%)	0	10 (100%)		
3	**Parity**					
	Primi	67 (78.8%)	18 (21.2%)	85 (100%)	0.902	0.952
	Multi	63 (80.8%)	15 (19.2%)	78 (100%)		
4	**Sex**					
	Male	82 (77.35%)	24 (22.65%)	106 (100%)	0.365	0.677
	Female	48 (84.2%)	9 (15.8%)	57 (100%)		
5	**Place of delivery**					
	Institutional	121 (80.6%)	29 (19.4%)	150 (100%)	0.292	1.937
	Non- institutional	9 (69.2%)	4 (30.8%)	13 (100%)		
6	**Mode of delivery**					
	Spontaneous vaginal delivery	75 (75.7%)	24 (24.3%)	99 (100%)	0.253	
	Lower segment caesarean section	50 (84.7%)	9 (15.3%)	59 (100%)		
	Instrumental	5 (100%)	0	5 (100%)		

neonates. Outcomes were divided into two groups as good outcomes and bad outcomes. Good outcomes meant babies discharged with complete recovery, whereas poor outcome included both mortality as well as those babies who were discharged against medical advice (LAMA). Babies who went into LAMA were either in a very bad medical condition or had some financial burden due to the possibility of prolonged NICU stay or some form of family problems. The primary causes of mortality were classified according to WHO, ICD 10 version: 2010 criteria. Statistical analysis was done using SPSS (statistical package of social sciences) version 20.0.as mean, percentage and p value value was calculated using chi-square test. A p - value of < 0.05 was considered significant.

RESULTS

A total of 163 neonates were admitted during the study period. Mean birth weight of the neonates was 2483.96 ± 812.631 gm and the duration of hospital stay was 14.74 ± 13.035 days. There was a significant relationship between mother's age and outcome with a p-value of 0.002. Newborns born to young primi mothers (< 20 years) had highest mortality. All the newborns born to elderly mothers (> 35 years) had excellent outcome. Neonates who were admitted within 24 hours of life were more likely to die than other age group (P-value 0.059).

Table 2. Neonatal outcome vs. diagnosis

SN	Diagnosis	Outcome		Total n (%)
		Good outcome n (%)	Poor outcome n (%)	
1	Early onset neonatal sepsis	51 (83.6%)	10 (16.4%)	61 (100%)
2	Neonata jaundice	53 (93%)	4 (7%)	57 (100%)
3	Preterm	39 (75%)	13 (25%)	52 (100%)
4	Late onset neonatal sepsis	37 (77%)	11 (23%)	48 (100%)
5	Pneumonia	32 (76.2%)	10 (23.8%)	42 (100%)
6	Perinatal asphyxia	32 (82%)	7 (18%)	39 (100%)
7	Mechanical ventilation	12 (37.5%)	20 (62.5%)	32 (100%)
8	Congenital heart disease	26 (86.7%)	4 (13.3%)	30 (100%)
9	Respiratory distress syndrome	13 (65%)	7 (35%)	20 (100%)
10	Neonatal seizure	7 (63.6%)	4 (26.4%)	11 (100%)
11	Neonatal meningitis	5 (83.3%)	1 (16.7%)	6 (100%)
12	Meconium aspiration syndrome	5 (83.3%)	1 (16.7%)	6 (100%)
13	Hypoglycemia	4 (80%)	1 (20%)	5 (100%)
14	Hypocalcaemia	3 (100%)	0	3 (100%)

This could have been due to the early presentation of more severe diseases in this population. Male babies outnumbered females with respect to admissions (106 vs. 57) and poor outcome (24 vs. 9), but it was not statistically significant (p-value 0.365 and odds ratio 0.677). Likewise there was no significant differences in final outcome as regard to place of delivery, mode of delivery and parity of mothers. (Table 1)

Table 3. Outcome of neonates according to gestation and birth weight

Variables	Admission N (%)	Death N (%)	P value
Gestational age			
< 28 weeks	2 (1.2)	1 (3.4)	0.19
28 < 32 weeks	22 (13.5)	7 (24.1)	
32 < 34 weeks	9 (5.5)	3 (10.3)	
34 < 37 weeks	19 (11.7)	3 (10.3)	
37 < 40 weeks	68 (41.7)	10 (34.5)	
≥ 40 weeks	43 (26.4)	5 (11.6)	
Birth weight (gm)			
< 1000	3 (1.8)	3 (10.3)	0.001
1000 - 1499	21 (12.9)	4 (13.8)	
1500 - 2499	46 (28.2)	10 (34.5)	
≥ 2500	93 (57.1)	12 (41.4)	

Among the 163 admitted cases, EONNS was the commonest diagnosis seen in 61 newborns followed by NNJ. Among the diagnosis good outcome was seen in 100% cases of hypocalcaemia followed by NNJ (93%). Neonates who were ventilated mechanically had the highest poor outcome (20 out of 32 i.e. 62.5%). There was increasing trends of mortality rate as gestation age decreased. Mortality rate was significantly high in ELBW category (p-value = 0.001). Among the 163 newborns, 129 (79%) were discharged with complete recovery as shown in figure 1.

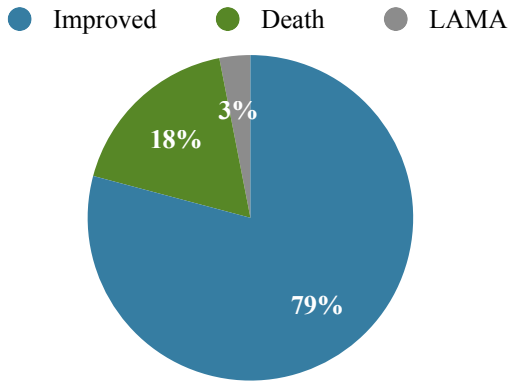

Figure 1. final outcomes of neonates

DISCUSSION

This study is dedicated to acknowledge the neonatal health problems in Nepal, a country poor in resources. In our geographic condition and limited resources, all newborns referred to our hospital are at critical stage. In order to achieve SDG by 2030 in neonatal health we have to improve our neonatal health status. Though management of premature and VLBW babies require high skilled manpower, sophisticated equipment and vigilant hospital management, simple interventions like KMC, early initiation and exclusive breastfeeding can help a lot when implemented properly. Knowing the existing pattern of neonatal morbidity and mortality in hospital setup like ours which represent the sickest population of neonates from all over the country plays the key role in determining appropriate measures to be applied by national health authority and stakeholders to improve the current situation and to meet the SDG goal of neonatal health of the country.

Even though we received babies in most critical stage in their diseases, good outcome was observed in 130 (79.8%) cases with only 33 (20.2%) cases having poor outcome which comes even low (16%) when we exclude LAMA cases. Studies from various parts of country showed high variability of neonatal mortality ranging from 3.32% - 24.74%.[6,11] Likewise similar type of variation in neonatal mortality were observed in different countries which ranged from 7.16% - 36.6%.[12-16] These variabilities in mortality within the country and also outside might be due to various reasons including severity of illness during admission, time lapse between illness and hospital arrival, percentage of extramural cases, availability of medical equipment and skill of the medical experts.

Male babies being predominant in both hospital admissions (77.35%) as well as in poor outcomes, (22.65%) raise the issues of biological vulnerability of male neonates, similar finding were observed in other studies.[6-12] Neonates born to young mothers who were less than 20 years have highest mortality rate which is statistically significant (p-value 0.002). This might be due to poor nutritional status, low maternal education, lack of family support, absence of antenatal checkup and poor socioeconomic condition. Surprisingly maternal age of more than 35 years was associated with very good outcome (100% survival), it might be due to small sample size, or biological maturity and excessive concern for their babies and hence presented to the hospital early in the course of illness.

There were total of 32 cases (19.6%) that required mechanical ventilators due to various reasons with highest mortality rate (62.5%) in this particular group. Thus requirement of mechanical ventilators is one of the bad prognostic factors for survival. Other workers reported lower mortality rate in their studies.[9,17] Another study from western region of our country, Pokhara showed even higher (87.5%) mortality rate.[6] This study showed that preterm babies who were born before 37 weeks of gestation were more likely to die as compared to those who were born after 37 weeks of age (p-value = 0.19). Poor outcome was significantly higher in ELBW babies as compared to normal weight babies (P-value 0.001).

Perinatal asphyxia comprised 39 (23.9%) cases, among them seven (18%) cases had poor outcome. Likewise 21 (12.8%) cases of neonatal sepsis had poor outcome. So neonates requiring mechanical ventilators, preterm babies, ELBW babies, perinatal asphyxia, neonatal sepsis, home deliveries, and babies born to young mothers are predictors of poor outcome noted in our study. Neonatal sepsis was the leading cause of death (41%) followed by birth asphyxia (37.2%) and prematurity (11.5%) in another study from eastern part of the country.[18] Similar types of contributing factors for neonatal death were found in other studies.[13-15]

Regarding neonatal morbidity, sepsis stands as the leading cause (53.9%). Even though we received only extramural referral cases EONNS occupy almost one third (31%) of study population whereas LONNS constituted 22.6%. Slightly less percentage (32.6%) of NNS was found in other studies from different parts of the country.[6,8,9] So it clearly indicates that we have to seriously think about the preventive measures like good ANC coverage, maintenance of good hygiene and strict aseptic

precaution during delivery. So, we have to improve our antenatal, intrapartum and postnatal service delivery.

Neonatal jaundice requiring phototherapy was observed in 57 (34.9%) neonates. Similar incidences were reported in other studies both in NICU and NIMCU setup (36.2 - 54%).[19-21] Though neonatal hyperbilirubinaemia was second common morbidity, it was the least common cause of neonatal mortality that too was due to co-morbid condition with NNS. Prematurity was the third most common cause of morbidity 52 (31.9%), similar incidence are reported from other studies.[22-24]

Perinatal asphyxia was another common cause of NICU admission accounting for 39 (24%) cases which were almost similar to that of other studies.[10,20] Such high prevalence clearly shows that we have to really focus on improving the skills of skilled birth attendant, and health personnel who perform neonatal resuscitation. We have to strengthen our heath care facility especially level 2 and 3 neonatal care units; it is high time to think of newer intervention like therapeutic hypothermia to prevent lifelong neurological sequelae of our neonates.

CONCLUSIONS

Neonatal sepsis, neonatal hyperbilirubinemia, perinatal asphyxia, LBW babies and prematurity were the leading causes of NICU admissions. All of these causes except neonatal hyperbilirubinemia were most common cause of neonatal death. All of these conditions seemed to be preventable. This study was done to know the recent neonatal morbidity and mortality pattern in NICU setup which helps to lay the foundation in prioritising these common conditions in national neonatal health strategy and develop facility based intervention package. There is highly unacceptable trend of newborn deaths in Nepal which can be prevented by ranking the common conditions and implementing appropriate measures accordingly.

This is a single cantered hospital based retrospective study. It would be more logical to conduct multi centred (including primary, secondary and tertiary care hospitals) prospective study including both intramural and extramural cases which would perhaps give a better picture of neonatal care in the country.

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