Clinical profile and outcome of babies admitted to Neonatal Intensive Care Unit (NICU)

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Abstract:

Introduction: Every year millions of babies are born and a large proportion of them are admitted to the neonatal ward for various indications. One of the Millennium Development Goals (MDG-4) is to reduce childhood mortality by two-thirds by 2015.This study was conducted to identify the general characteristics, disease spectrum and the commonest causes of morbidity and mortality in this group of babies.

Methods: Prospective observational study of all infants admitted to neonatal intensive care unit, Manipal Teaching Hospital, Pokhara during November 2010 to April 2011.

Results: 182 neonates were admitted during the period of study; 32.4% babies were inborn. 41.2 % babies were admitted directly from the emergency or outpatient department and 22.5 % were referred from district hospitals. Male: female ratio was 1.1:1. There were 67.5 % term babies and 31.3% preterm babies. 44.5% were admitted in the first 24 hours of life; commonest indications for admission were neonatal jaundice (24.7%); sepsis (21.4%) and perinatal asphyxia (19.2%). 76.9% babies were discharged after improvement, 6.5% left against medical advice and 1.62% were referred for surgical interventions and mortality was seen in 13.7%. Commonest cause for mortality was hyaline membrane disease (28%) and hypoxic ischaemic encephalopathy stage 3 (28%). **Conclusion:** Neonatal period is a very vulnerable period with a high risk of morbidity and mortality; most of which are preventable with good obstetric and subsequent neonatal care. Early anticipation and prompt management is very essential to reduce neonatal mortality.

Keywords: *admissions, neonates, NICU, outcomes*

Introduction

Of the 130 million babies born every year, about 4 million die in the first 4 weeks of life—the neonatal period.[1] Most of the neonatal deaths (99 %) occur in the lower to middle income countries and half of them occur at home.[1] The risk of a newborn dying is 24 per 1,000 live births in the first week of life, 3 per 1,000 per week during the rest of the first month, and 0.12 per 1,000 per week after the first year of life.[2] The neonatal mortality rate of Nepal as per NDHS 2011 data is 33 per 1000 live births.[3] Neonatal period is a very vulnerable period of life due to many problems which can occur, more so in babies born preterm or low-birth weight. Most of the causes of neonatal morbidity and mortality are preventable.[4] The neonatal disease pattern changes between different places and from time to time even at the same place.[5] The major causes of neonatal deaths globally were estimated to be infections (35%), pre-term births (28%) and asphyxia (23%).[6] A study previously done in Nepal shows asphyxia as the leading cause of hospital admission (22%) followed by prematurity (20%) and sepsis (17%) with mortality due to these three causes being 7 %, 3% and 5% respectively.[7] Almost all of these can be prevented by good obstetric and perinatal management. The aim of this study was to identify the commonest causes for admission to the neonatal intensive care unit (NICU) and to anticipate and manage the complications accordingly.

Methods

This was a prospective observational study carried out in the neonatal intensive care unit (NICU) of the Department of Pediatrics, Manipal Teaching Hospital, Pokhara from November 2010 to April 2011. Manipal Teaching Hospital is a teaching institute in Western Nepal which has a 20 bedded NICU with two ventilators, phototherapy units and facilities for exchange transfusion. All babies admitted to the NICU were included in the study. Data of all the admitted babies were analyzed and categorized on the basis of intramural or extramural deliveries, sex, gestational age, weight for gestation, referral centre, age at presentation, indications for admission, duration of hospitalization, complications encountered, bacteriological profile, procedures done during hospitalization, etc. Other variables analyzed were outcome related to gestation, sex and weight; mortality rate and its causes. Data were entered and analyzed using Epi Info version 3.5.2. Those babies who were admitted to NICU for low birth weight but who were above 30 days old were excluded from the study.

Results

During the period of study, there were a total of 182 neonates admitted to the NICU; 59 babies (32.4%) were inborn; rest (67.5%) were outborn. Maximum number of babies (n=75; 41.2%) were admitted through the emergency room or outpatient department directly; while 41 babies (22.5%) were referred from district hospitals (**Ref. Fig 1)**

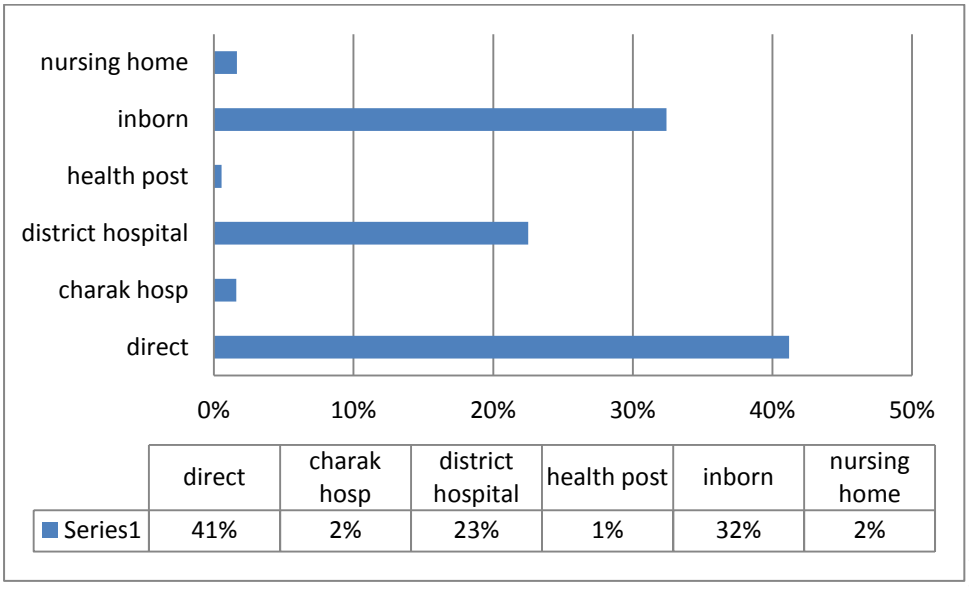

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Fig. 1: Mode of admission-

There were 96 males and 86 females (M: F=1.1:1). Majority of the babies (n=123; 67.5%) were term, 57 (31.3%) were preterm. Prematurity with complications was seen in 51 babies (89.4%) while 6

babies (10.5%) were admitted only for prematurity. 81 babies (44.5%) were admitted on the first day of life; whereas 54 babies (29.6%) were admitted between second to fifth days of life (**Ref. Fig.2**).

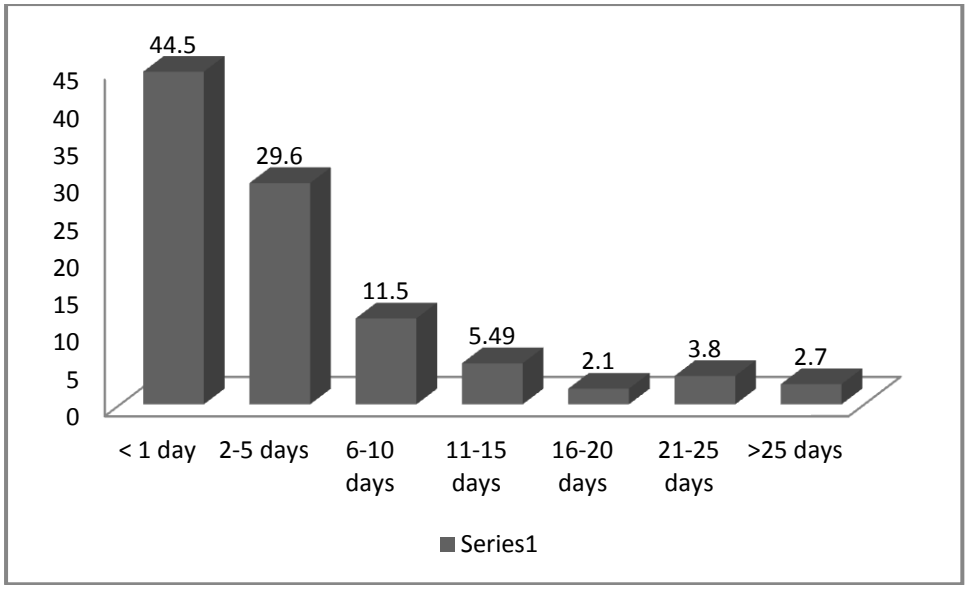

Fig. 2: Age at admission

The commonest indication for admission was neonatal jaundice (n=45; 24.7%) followed closely by sepsis (n=39; 21.4%) and then perinatal asphyxia (n=35; 19.2%) (**Ref. Table 1**). Low birth weight with complications was found in 83 babies (45.6%); however only low birth weight was found in 9 babies (4.9%). Out of the total admissions, 107 babies (58.7%) had an uncomplicated course during hospitalization while 75 babies (41.2%) had complications during their stay in the hospital.

Table 1: Indications for admissions:

Admission indications	**n=**	**%**
Sepsis	39	21.4
Perinatal asphyxia	35	19.2
Neonatal jaundice	45	24.7
Low birth weight (LBW) only	9	4.9
Very LBW	4	2.1
Extremely LBW	1	0.54
Meconium aspiration syndrome	8	4.32
Hyaline membrane disease	3	1.6
Ichthyosis	1	0.54
Surgical causes	7	3.7
Polycythemia	1	0.54
Necrotizing enterocolitis	1	0.54
Respiratory distress	9	4.9
Prematurity only	6	3.2
Aspiration pneumonia	3	1.6
Pneumonia	2	1.08
Congenital heart disease	1	0.54
Haemorrhagic disease of newborn	1	0.54

Congenital hydrocephalus	1	0.54
Seizures	1	0.54
Congenital heartdisease	1	0.54
Observation	2	1.08
VDRL positive mother for screening	1	0.54

The commonest complications encountered after admission were jaundice (n=26; 34.6%) followed by seizures (n=21; 28%).71 babies (39%) required phototherapy, 4 babies (2.1%) were put on mechanical ventilation and 3 babies (1.6%) on bubble CPAP (**Ref. Table 2).**

Table 2: Interventions done:

Procedures done	**n =**
Bubble CPAP	3
Double volume exchange transfusion	5
Mechanical ventilation	4
Blood transfusion	5
Phototherapy	71
Cranioreduction	1
Skin grafting	1
Laparatomy	3
Lumbar puncture	3
None	91

Positive cultures were identified from 13 patients; but 4 cases were excluded because of growth of skin contaminants. 4 (2.1%) positive growths were from blood and 5 (100%) from pus. 48.3% babies (n=88) were discharged within 2-5 days of admission (**Ref. Fig 3**).

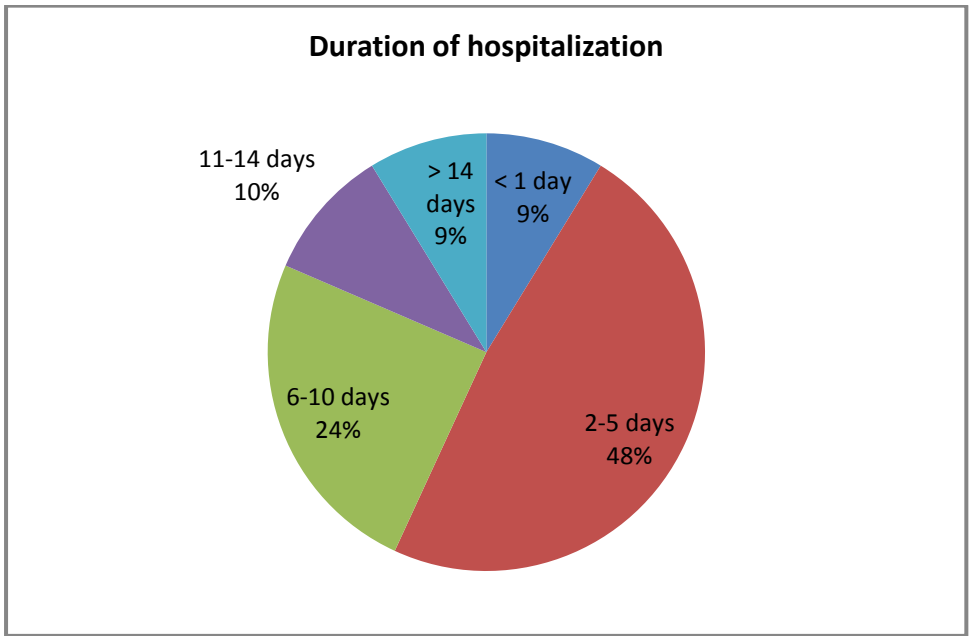

Fig. 3: Duration of hospitalization

140 babies (76.9%) were discharged after improvement, 12 (6.5%) left against medical advice, 3 babies (1.62%) were referred to higher centres for surgical interventions and there were 25 (13.7%) mortalities. Commonest causes for mortality were hyaline membrane disease (28%) and hypoxic ischaemic encephalopathy stage 3 (28%).Sepsis as the cause of death was found in 20% cases.

Mortality was seen most frequently in the babies born preterm (n=17; 29.8%) (**Ref. Table 3**), commonest cause of mortality in this group being due to hyaline membrane disease (n=8; 47%). Mortality rate was seen more in the male sex as compared to the female sex (68% vs 32%). Similarly mortality was observed more in the babies having birth weight appropriate for gestational age (61.5%) as compared to small for gestational age (38.5%).

Table 3: Outcome of major neonatal diseases

Disease	n	Improved	LAMA	Mortality
Jaundice	45	44 (97.7%)	1 (2.2%)	-
Sepsis	39	34 (87.1%)	-	5 (12.8%)
Perinatal asphyxia	35	25 (71.4%)	1 (2.8%)	9 (25.7%)
Prematurity	57	34 (59.6%)	6 (10.5%)	17 (29.8%)
Low birth weight	83	51 (61.4%)	8 (9.6%)	22 (26.5%)

Discussion

During the period of study over six months; there were a total of 533 deliveries; 153 of those being caesarean deliveries, 5 vacuum and 4 forceps deliveries. Out of those inborn deliveries, 59 (11%) babies were admitted to the NICU for various indications. During the period of study there were a total of 182 admissions in the NICU. The commonest source of admission was directly from the outpatient department or the emergency room (41.2%). These babies were either home deliveries or were delivered at some health institutions and discharged home. Apart from that, 41 babies (22.4%) were referred from district hospitals. Among the district hospitals, 27 cases (65.8%) cases were referred from Western Regional Hospital, Kaski. This is in bearing with the fact that Manipal Teaching Hospital is the only tertiary care centre which caters to the Western region of Nepal. This study shows that 44.5 % of the neonatal admissions occur in the first 24 hours of life. Other studies have a similar figure with first day admissions ranging from 33.61% in a study done in Karachi[8] to 44.47% in Larkana[9]. This shows that a majority of newborn problems occurs in the first 24 hours of life. Male to female ratio was 1.1:1 with a slight male predominance. This can be explained by the fact that the number of deliveries of male babies outnumbers the female babies which has been noted by seeing the number of deliveries conducted in this hospital in the last six months where the male to female deliveries was 1.09:1; similar finding was noted in other studies where there was a male predominance .[10,11]

This study highlights jaundice, sepsis and perinatal asphyxia as being the commonest indication for admission in the neonatal intensive care unit. Neonatal jaundice comprised of the commonest reason for admission (24.7%), followed by sepsis (21.4%) and perinatal asphyxia (19.2%). A study done in Pakistan has highlighted sepsis (28.9%) as the commonest while second being prematurity (26.5%) and jaundice being the 3rd (19.9%) and finally birth asphyxia (16.5%) as the 4th commonest cause for admission.[10] Another study done in Pakistan has commented on birth asphyxia as being the commonest reason for admission followed by jaundice, prematurity and sepsis.[12] A study conducted in Nepal has highlighted birth asphyxia as a cause of NICU admission in 14%.[13] In our study prematurity was seen in 57 babies (31.3%), out of which 51 babies (89%) had complications; while 6 babies (10.5%) were admitted for prematurity alone and did not develop any complications. Other studies show the incidence of prematurity as varying from 7-23.5%.[14-15] Among the preterm babies, commonest complication noted was jaundice (n=11; 36.6%) and apnea of prematurity (n=11; 36.6%).Low birth weight only was seen in 9 babies (4.9%). Low birth weight with complications was seen in 83 babies (45.6%), with 13 babies (15.6%) being VLBW and 1 baby (1.2%) being ELBW. Similar findings are noted in other studies where the incidence of low birth weight ranges from 41.2% [10] to 53%[15].Studies from India[8] and Bangladesh[16], however shows lower rates of low birth weights. In those babies admitted for various other indications, jaundice (n=26; 34.6%) was noted to be the commonest complication; phototherapy was given for 71 babies and double volume exchange

transfusion was done in 5 babies. Second most common complication was seizures (n=21; 28%); most of them being due to perinatal asphyxia (n=14; 66.6%) followed by sepsis (n=3; 14.2%). In two cases each (9.5%), the causes were hypoglycaemia and structural defect of the brain. Sepsis as a complication after admission was not seen in any case which reflects the standard of neonatal care that is being provided in this institute. Four babies required mechanical ventilation and two required to be put on bubble CPAP. Duration of hospitalization was 2-5 days in 48% cases. Mean duration of hospitalization was 6.98 (± 5.4 SD) days. 9% babies stayed for < 1 day; either due to mortality or being taken on LAMA.

Positive cultures were isolated from 8 samples of blood, but 4 were discarded as there was growth of skin contaminants; so 4 samples were regarded as having positive growth (2.1%) from all the samples that had been sent. This finding is concordant with another study conducted in Kanti Children Hospital in 2008-9 where there was culture positivity of 6.1%.[17] A study conducted in Bharatpur has identified positive blood cultures in 0.46% of cases.[18] A previous study done in this same institute shows positivity in 44.9% cases.[19] The reason why we had such a low isolation could be because majority of the babies (67.5%) were outborn and had received some antibiotics from outside before they were admitted here. Out of the inborn group, only 3 babies were admitted for sepsis; rest were admitted for jaundice, asphyxia and prematurity. 5 samples of pus cultures yielded positive reports. E.coli was isolated from two, Enterococci from one and Klebsiella pneumonia from 1 sample of blood culture. Pus culture yielded Staph. aureus in 2 cases, Citrobacter in 2 cases and Coagulase negative staph. in 1 case.

140 babies (76.9%) were discharged after improvement, 12 (6.5%) left against medical advice and 3 babies (1.62%) were referred to higher centres. Among the referrals, two were for intestinal obstruction and one for a leaking omphalocele for surgical interventions. There were 25 (13.7%) mortalities which is similar to studies in Pakistan[10] and South Africa.[15] Mortality was seen in 29.8% of preterm babies as compared to 7.3% of term newborns. This is again similar (35%) to a study done in Saudi Arabia.[20] Similarly, mortality was seen more in babies appropriate for gestational age (61.5%) as compared to 38.5% for small for gestational age and 0% for large babies. Mortality rate was 68% in males as compared to females, a finding which is comparable to a study done in South Africa.[15] The commonest cause for mortality in preterms was hyaline membrane disease (n=8; 47%). Commonest cause for mortality in term and preterm babies combined were perinatal asphyxia with hypoxic ischaemic encephalopathy (28%) and hyaline membrane disease (28%). In relation to underlying disease, mortality was seen in 25.7% cases of asphyxia and 12.8% cases of sepsis. The major causes of neonatal deaths globally were estimated to be infections (35%), pre-term births (28%) and asphyxia (23%).[6] A study done in Nepal shows that mortality due to these three causes comprises of 5%, 3% and 7% respectively.[7]

Conclusion

According to our study, jaundice, perinatal asphyxia and sepsis are some important and leading causes of morbidity in newborn babies.Commonest causes of mortality were asphyxia and hyaline membrane disease.Most of the morbidities and subsequently the mortalities can be miminized by improving the antenatal care of pregnant women, timely interventions and timely referral to tertiary care centres for delivery of high risk pregnancies. Another factor which must be addressed is the potential risks of prematurity and low-birth weight and the management of their complications. Creating awareness among health personnel especially of district hospitals about the importance of handwashing and use sof sterile technique for delivery has to be emphasized to minimize the risk of sepsis.

References

1. Zupan J, Aahman E. Perinatal mortality for the year 2000:

estimates developed by WHO. Geneva: World Health Organization, 2005.

2. Fort AL, Kothari MT, Abderrahim N. Association between maternal, birth and newborn characteristics and neonatal mortality in five Asian countries. Demographic and health research. August 2008; 55.
3. Population division, Ministry of Health and Population; New ERA; ORC Macro International Inc., Nepal Demographic and Health Survey 2011.
4. Bhutta ZA. Priorities in newborn care and development of clinical neonatology in Pakistan: Where to now? J Coll Physicians Surg Pak 1997; 7: 231-4.
5. Aurangzeb B, Hameed A. Neonatal sepsis in hospital born babies: bacterial isolates and antibiotic susceptibility patterns. J Coll Physicians Surg 2003; 13:629-32.
6. Lawn JE, Wilczynska-ktende K, Cousens SN. Estimat-ing the causes of four million deaths in the year 2000. Int J Epidemiol. 2006 Jun: 35 (3); 718-9.
7. Gurubacharya SM, Gurubacharya RL. An overview of neonatal admissions at College of Medical Sciences. J. Nepal Paediatr. Soc. 2007; 27(2):73-4.
8. Parkash J, Das N.Pattern of admission to neonatal unit. J Coll Physician Surg Pak 2005; 15:341-44.
9. Abbasi KA. Neonatal disease profile in Larkana before and after establishment of neonatal ward. J Pak Med Assoc 1995; 45:235-6.
10. Rahim F, Jan A, et al. Pattern and outcome of admissions to neonatal unit of Khyber Teaching Hospital, Peshawar. Pak J Med Sci 2007; 23 (2):249-253.
11. Trotman H. The neonatal intensive care unit at the University Hospital of the West Indies- The first few years' experience. West Indian Med J 2006; 55 (2):75.
12. Butt NA, Malik A, Kazi MY. Pattern of neonatal admissions in a tertiary care hospital. Available at website http://pjmhsonline.com/pattern_of_neonatal admissions_i.htm.
13. Dongol S, Singh J, et al.Clinical profile of birth asphyxia in Dhulikhel hospital: A retrospective study. J. Nepal Paediatr. Soc. Sept-Dec 2010; 30 (3): 141-6.
14. Sonkusare S, Rai L,Naik P. Preterm birth: Mode of delivery and neonatal outcome. Med J Malaysia. Dec 2009; 64 (4): 303-6.
15. Hoque M, Haaq S, Islam R. Causes of neonatal admissions and deaths at a rural hospital in KwaZulu-Natal, South Africa. South Afri J Epidemiol Infect.2011; 26 (1):26-9.
16. Islam MN. Situation of neonatal health in Bangladesh orion 2000; Available at website http://www.orion-group.net/orion/20 Medical Journal Vol.6.
17. Shrestha NJ,Subedi KU, Rai GK. Bacteriological profile of neonatal sepsis: A hospital based study. J. Nepal Paediatr. Soc. Jan-April 2011;31 (1): 1-5.
18. Khinchi YR, Kumar A, Yadav S. Profile of neonatal sepsis. J of College of Medical Sciences- Nepal.2010;6(2):1-6.
19. Shaw CK, Shaw P, Thapalial A. Neonatal sepsis bacterial isolates and antibiotic susceptibility patterns at a NICU in a tertiary care hospital in Western Nepal: A retrospective analysis. KUMJ. 2007; 5(2): 153-160.
20. Arafa MA, Alshehri MA. Predictors of neonatal mortality in the intensive care unit in Abha, Saudi Arabia. Saudi Med J. 2003; 24 (12):1374-6.