

Epidemiological Profile of Neonates Admitted to a Neonatal Intensive Care Unit in Tertiary Care Referral Center of Nepal: A Four Years Cross Sectional Study

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ABSTRACT

Background: The most vulnerable time for child's survival is the neonatal period with the highest risk of dying at an average global rate of 17 deaths per 1,000 live births in 2022. Sepsis, prematurity and perinatal asphyxia are the common causes of neonatal morbidity and mortality. This study was aimed to assess the morbidities of newborns admitted in tertiary care neonatal intensive care unit of Nepal and their outcome.

Methods: A prospective cross sectional study was carried out for 4 years (2076 Shrawan – 2080 Asar) in NICU of Bharatpur Hospital, Chitwan. All patients admitted in NICU within study period were included in the study. Data were entered onto a spreadsheet and then analyzed using SPSS version 16.

Results: The total number of neonates admitted in NICU in last four years (Shrawan 2076 to Asar 2080) was 2810 with male: female ratio being 1.5:1. Sepsis (64.9%) was the commonest diagnosis in NICU admitted babies, followed by neonatal jaundice (26.1%), prematurity (26.0%) and PND (22.2%) respectively. Total discharged neonates after successful management were 2433 (86.5%) while 96 (3.4%) neonates expired. Forty eight (1.8%) neonates were referred to other center and 233 (8.3%) left the hospital against medical advice (LAMA). Among neonates with birth weight less than 2500 gm, 66(6%) expired and 149(13.5%) went on LAMA.

Conclusions: Sepsis, neonatal jaundice and birth asphyxia were the common diagnosis in NICU admitted babies. Similarly, preterm/low birth weight babies had higher mortality and major portion of them leave against medical advice.

Keywords: neonate; NICU admission; sepsis.

INTRODUCTION

Neonatal period remains the most vulnerable time with the highest risk of dying at an average global rate of 17 deaths per 1,000 live births in 2022. Globally, 2.3 million children died in the first month of life in 2022.¹ As the Millennium Development Goals-4 target was not achieved, Sustainable Development Goals (SDGs) were proposed with a target to end neonatal mortality to ≤ 12 deaths per 1,000 live births by 2030.²⁻⁴

Neonatal sepsis, prematurity and birth asphyxia are the leading causes of neonatal hospital admission in Nepal.⁵ There is a stagnant neonatal mortality rate of 21 per 1000 live births in Nepal in last 5 years indicated by 2016 and 2022 Nepal Demographic Health Survey (NDHS).⁶ This highlights the need for improved hospital care that

target the newborn.⁷ This study aims to find out the neonatal morbidities admitted in tertiary care neonatal intensive care unit of Nepal and their outcome.

METHODS

This was a prospective cross sectional study conducted in Neonatal Intensive Care Unit (NICU) of Bharatpur Hospital (BH). This hospital has one of the largest NICU of the whole nation which takes care of neonates from around 22 districts. It has 20 functional beds, with the doctor-to-bed ratio of 1:6 and nurse-to-bed ratio of 1:3 in a shift. It is equipped with seven ventilators, two High Frequency Oscillatory Ventilators, four Continuous Positive Airway Pressure (CPAP) Machines, two incubators, an ultrasonography and echocardiography machine, High Flow Nasal Cannula (HFNC), nine single

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and two double phototherapy machines, therapeutic hypothermia machine, portable X-ray and two Arterial Blood Gas (ABG) machines.

A prospective cross sectional study was carried out for four years (2076 Shrawan to 2080 Asar) in NICU of Bharatpur Hospital, Chitwan. All neonates admitted in NICU within study period were included in the study. Neonates with parents or care takers not giving consent were excluded. A preformed short semi structured questionnaire was developed to collect data. Ethical approval was taken from Institutional Review Committee (IRC) of Bharatpur Hospital. (Ref: 075/76-0014)

Details such as gestational age, gender, birth weight, place of delivery, mode of delivery, cause of admission (diagnosis), final outcome of the babies, morbidity and mortality pattern in admitted newborns were collected.

Neonatal sepsis was classified as suspected and culture proven sepsis on the basis of clinical profile, septic screen and blood culture.⁸ Diagnosis of perinatal asphyxia was based on the criteria set by the World Health Organization.⁹ APGAR score at one minute of 0 to 3 and 4 to 7 signifies severe and moderate birth asphyxia respectively. Hypoxic ischemic encephalopathy was classified on the basis of Sarnat and Sarnat staging.¹⁰

Data were entered onto an excel spreadsheet and presented as means and percentages in tabular form. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 16.

RESULTS

The total number of neonates admitted in NICU in last four years (Shrawan 2076 to Asar 2080) were 2810 (Table no 1). There were 1722(61.28%) males and 1088 (38.72%) females. Male babies outnumbered their female counterpart with a ratio of 1.5:1. Both inborn and outborn neonates were admitted. 80.4% of total deliveries were inborn while the remaining was outborn.

Regarding the birth weight of these babies, 60 (2.13%) babies were extremely low birth weight (less than 1000 grams), 238 (8.46%) newborns very low birth weight (less than 1500 grams), 802(28.54%) newborns were low birth weight (less than 2500 grams). 1619 (57.61%) had normal birth weight (between 2500 grams to 4000 grams) and 91(3.26%) were big babies (more than 4000 grams).

Term deliveries were 1755(62.4%) in number. There were significant number of preterm delivery that comprised of 731(26.1%) of total deliveries. The major causes for neonatal morbidity were sepsis 1825 (64.94%), followed by neonatal jaundice 733(26.08%) and birth asphyxia 476(16.93%). As the major portion of admission fell under sepsis, 2582 (91.8%) received antibiotics. Similarly, 887 (31.5%) neonates received phototherapy for treatment of neonatal jaundice. Among 2810 newborn, 10.8% of all admission i.e. 305 required mechanical ventilation, 1117 (39.7%) were on CPAP and 75 (2.6%) required surfactant.

Table 1. Demographic distribution.

Variables	2076/77	2077/78	2078/79	2079/80	Total in 4 years
Total Admission	718	648	613	831	2810
Gender					
Male	436	401	392	493	1722 (61.2%)
Female	282	247	221	338	1088 (38.8%)
Type of delivery					
Inborn	588 (81.8%)	536 (82.7%)	479 (78.1%)	657 (79.0%)	2260 (80.4%)
Outborn	130 (18.2%)	112 (17.3%)	134 (21.9%)	174 (21.0%)	550 (19.6%)
Weight of the baby					
<1 kg	8	16	15	21	60 (2.1%)
1-1.5 kg	45	47	62	84	238 (8.5%)
1.5-2.5 kg	188	177	173	264	802(28.5%)
2.5-4 kg	456	385	345	433	1619 (57.6%)
>4 kg	21	23	18	29	91 (3.3%)
Mode of delivery					

Table 1. Demographic distribution.					
Variables	2076/77	2077/78	2078/79	2079/80	Total in 4 years
Home Delivery	5	10	7	3	25 (0.8%)
Assisted Delivery	16	26	12	26	80 (2.8%)
SVD	397	334	335	414	1460 (51.9%)
LSCS	300	278	279	388	1245 (44.5%)
Type of delivery as per gestation					
Term Delivery	498	403	340	514	1755(62.4%)
Pre-Term Delivery	153	172	191	215	731(26.1%)
Post term delivery	67	73	82	102	324 (11.5%)
Diagnosis/ Complications					
Sepsis	474 (66.1%)	396 (61.1%)	399 (65.0%)	556 (66.9%)	1825 (64.9%)
NNJ	238 (33.1%)	207 (31.9%)	140 (22.8%)	148 (17.8%)	733 (26.1%)
Prematurity	153 (21.3%)	172 (26.5%)	191 (31.1%)	215 (25.8%)	731(26.0%)
PND	157 (21.8%)	158 (24.3%)	148 (24.1%)	162 (19.4%)	625(22.2%)
RDS	68	131	92	158	449 (15.9%)
MAS	105	116	69	116	406 (14.4%)
IUGR	46	39	15	59	159 (5.6%)
Treatment used					
Antibiotics	706	658	550	668	2582 (91.8%)
CPAP	223	239	294	361	1117 (39.7%)
Phototherapy	275	188	155	269	887 (31.5%)
Lumbar Puncture	150	156	119	171	596 (21.2%)
Total Umbilical Line	89	121	142	198	550(19.5%)
Ventilator	66	76	67	96	305 (10%)
Blood Transfusion	31	29	18	41	119 (4.2%)
Surfactant Used	14	18	19	24	75 (2.6%)
Non Invasive Ventilation (NIV)	23	32	9	6	70 (2.5%)
Outcome					
Recovery	622 (86.6%)	549 (84.7%)	539 (87.9%)	723 (87.0%)	2433 (86.5%)
left against medical advice(LAMA)	56(7.8%)	61(9.4%)	46(7.5%)	70(8.5%)	233(8.3%)
Mortality	31(4.3%)	27(4.1%)	16(2.6%)	22(2.6%)	96 (3.4%)
Referral	9(1.3%)	11(1.8%)	12(2.0%)	16(1.9%)	48 (1.8%)
Total	718	648	613	831	2810 (100%)

On the basis of outcome, out of 2810 neonates, 2433 cases (86.58%) were recovered and discharged to home, 233 (8.29%) left against medical advice(LAMA), 96 (3.41%) expired and 48 (1.72%) referred to other centers. Among neonates with birth weight <2500 gm i.e low birth weight (LBW), 66(6%) expired and 149(13.5%) went on LAMA. Thirty (1.7%) neonates with birth weight >2500 gm expired during treatment and 84(4.9%) neonates left against medical advice (Table no 2).

Table 2. Distribution of Outcome as per birth weight. (2076-2080)

Birth weight	Outcome				Total
	Recovered	Referred	LAMA	Mortality	
<2.5 Kg	862(78.3%)	23(2.0%)	149(13.5%)	66(6.2%)	1100(39.2%)
>2.5 Kg	1571(91.8%)	25(1.4%)	84(4.9%)	30(1.7%)	1710(60.8%)
Total	2433(86.5%)	48(1.7%)	233(8.3%)	96(3.4%)	2810 (100%)

DISCUSSION

The present study was conducted in the Bharatpur Hospital of Bharatpur, Chitwan Nepal. It provides care and support to those neonates born within the hospitals, i.e. inborn, and also to those who are referred from peripheral health facilities and community, i.e. outborn.

In our present study, total 2810 newborns were admitted in NICU during study period and male: female ratio was 1.5:1. In a study done by Gebremariam et al in Hospital Dekemhare, Eritrea, there was also male predominance with a male to female ratio of 1.3:1.¹¹ Similar pattern of male dominance was found in a study conducted by Al Wassia et. al.¹² Kutubur et al. also found male predominance in a study conducted in Aasham, India.¹³ Gender bias towards male babies is a universal phenomenon and is seen in all regions and cultures. That is the reason male babies are brought in higher numbers to seek medical attention and thus have greater chance of detection of neonatal problems.¹⁴

From this study, it was found that maximum number of neonates i.e. 2260(80.4%) were born in our hospital. This may be because large number of delivery cases are referred from around Chitwan where there are less number of health facilities with well-equipped infrastructure and efficient manpower working there and Bharatpur Hospital is one of the tertiary care hospitals and one of the largest government hospital of the nation where people from various social and economic grounds come to seek medical advice and management.

In this study, 1619(57.6%) neonates were between 2.5 - 4 kg birth weight. 802(28.5%) neonates were below 2.5 kg i.e. low birth weight. There were also significant number of extremely low birth babies (ELBW) i.e. 60 (2.1%) in last four years. It may be because most of the mothers belong to low socioeconomic condition and with poor literacy rate and they don't have enough idea on iron folic acid intake, and having adequate antenatal care visits. Most of them become anaemic and also they have smoking habits, all leading to low birth weight babies. Similar results were found on a various studies.¹³⁻¹⁶ But these findings were less than that in study conducted by Gebremariam et al in Eritrea where 75.6% of the

neonates had birth weight 2.5-4 Kg.¹¹

This study revealed that 25 (0.8%) of neonates were delivered at home which is less than the study done by Malkar VR et al.¹⁷ where there were 5.8% of home deliveries. The preterm delivery was 25.6% which was similar to the study conducted by Sharma et al. where prevalence of preterm neonates was found to be 22.75%.¹⁸

Our study showed sepsis (early and late) was the commonest cause of NICU admission. Sepsis accounted for around two third cases requiring admission in our NICU i.e 1825 (64.9%). This correlates with the national data of commonest cause of neonatal morbidity and mortality.¹⁹ Sepsis was followed by neonatal jaundice (26.1%), prematurity (26.0%) and birth asphyxia (16.9%) in our study. It was similar to the study conducted by Chapagain RH et al.²⁰ In a study conducted by Shakya A et al, the most common cause of neonatal admission was sepsis (45.9%).²¹ Neonatal sepsis 91 (60.26%) was the most common cause of hospital admissions followed by meconium aspiration syndrome 21(13.9%) and prematurity 10(6.62%) in a study conducted by Shrestha et al.²² Similar result was found in a study performed by Jan et al. who reported a high incidence (41.3%) of neonatal sepsis.²³ In the same way, other studies showed that, infection, prematurity, respiratory distress and asphyxia were among the main factors for neonatal admission.²⁴ This is because neonatal sepsis may acquire during intrauterine period, during delivery time or after delivery at nursery itself.

The outcomes were classified into four groups, namely expired (mortality), normal discharge (recovery), left against medical advice (LAMA), and referred. In our study, 2433 (86.5%) were discharged after improvement, 233 (8.3%) left against medical advice, 48 (1.8%) babies were referred to higher centers for intensive care and there were 96 (3.4%) mortalities. Yousuf et al. reported 85% successful discharge NICU in Bathinda, Punjab, in 2017.²⁵ Similar results were seen in the study performed by Sinha et al. ²⁶(84.30%) and Ravikumar et al.²⁷ (83.39%).

The mortality rate in the present study was found to be 3.4%. Similar consensus was noted in study by Kanodia

P et al.⁶ It is slightly higher than in study performed by Chapagain RH et al.¹⁸ and is much lower than different studies.^{28,29} In our study, 233 (8.3%) of the patients took LAMA discharge. It was similar to the study done by Sharma et al.³⁰ where they concluded that the most common reason for LAMA was poor prognosis explained by the treating physician followed by no improvement. Most people leave against medical advice for many reasons like family, personal or financial problems, dissatisfaction with medical care given, preference for another hospital, false perception that the overlying condition was terminal as well as communication gap between health care providers and parents.

The limitation of our study was that this was a single hospital based study so it may not be entirely representative of the whole neonatal population of the country as well as reflect all the disease patterns seen in all hospitals. Also, the outcomes of babies who left against medical advice or those who were referred could not be reflected in this study.

CONCLUSIONS

In this study, sepsis was the leading cause of admission into the neonatal unit followed by neonatal jaundice and perinatal asphyxia. Similarly, preterm/low birth weight babies had higher mortality and major portion of them leave against medical advice. Neonatal disease pattern is a sensitive indicator of availability, utilization and effectiveness of maternal and child health services in the community. And it can be helpful in generating data about patterns of diseases in neonates which will lead to make policies in achieving SDG by 2030.⁴

CONFLICT OF INTEREST

None

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