Clinical Profile and Outcome of Neonates Admitted to Neonatal Intensive Care Unit (NICU) at a Tertiary Care Centre in Eastern Nepal

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Abstract

Introduction: Neonatal period is the most susceptible period of life due to different causes, which in most cases are preventable. Every year millions of neonates are born and a large proportion of them are admitted to the neonatal intensive care unit (NICU) for various indications. One of the Millennium Development Goals is to reduce under five mortality by two thirds by 2015. Therefore, this study was conducted to identify the clinical profile, pattern of diseases and common causes of mortality and morbidity in neonates admitted to NICU. **Materials and Methods**: A retrospective study was conducted at level III Neonatal NICU of a tertiary -care teaching hospital from January, 2012 to December, 2012. **Results**: Total of 361 neonates were admitted in NICU. Eighty six neonates (23.8%) were admitted due to prematurity and 73 (20.2%) with birth asphyxia. Among birth asphyxia, 40(54.8%)were in HIE III, 27.4% and 17.8% in HIE II and HIE I, respectively. One hundred eighteen (32.6%) cases were diagnosed as sepsis. The overall mortality was 20.2% during hospital stay. **Conclusions**: Sepsis, prematurity and birth asphyxia were major causes for admission in NICU. All these etiologies are preventable up to some extent and, if detected earlier, can be effectively treated in order to reduce morbidity and mortality.

Key words: Neonatal mortality, prematurity, sepsis, birth asphyxia.

Introduction

Neonatal period (0-28 days of life) is the most susceptible period of life due to different diseases, which in most cases are preventable[1]. Almost 50% of deaths in our country occur in the neonatal period[2]. Though considerable improvement in the survival of newborn in developed countries has been made but the mortality rate is still very high in the developing countries[3]. One of the Millennium Development Goals is to reduce the number of deaths in children under 5 years to two third by the year 2015, and to achieve this goal a substantial reduction in neonatal deaths will be required especially in the developing countries[4]. In the developed countries, the main cause of morbidity and mortality in the neonatal period is congenital abnormalities which are mostly non-preventable, but in the developing countries the common causes such as infections, jaundice, birth asphyxia and pneumonia predominate[5]. The neonatal disease pattern is a sensitive indicator of availability, utilization and effectiveness of mother and child health services in the community. Of the 130 million neonates born every year Globally, about 4 million die in the first 4 weeks of life[6]. Most of the neonatal deaths (99%) occur in the lower to middle income countries and half of them occur at home. 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[7]. The neonatal mortality of Nepal as per NDHS 2011 data is 33 per 1,000 live births[8]. Most of the causes of neonatal mortality and morbidity are preventable[9]. The pattern of neonatal diseases vary from place to place[10]. The major causes of neonatal deaths globally were estimated to be infections (35%), preterm births (28%) and asphyxia (23%)[11]. 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

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being 7%, 3% and 5%, respectively[1]. All these diseases can be prevented by good obstetric and perinatal care. The aim of this study was to identify the common causes for admission to the NICU and its outcome.

Materials and Methods

A retrospective study conducted at the Neonatal Intensive Care Unit (NICU), Department of Pediatrics and Adolescent Medicine, B.P. Koirala Institute of Health Sciences, Dharan, Nepal from January 2012 to December 2012. A total of 361 neonates admitted to NICU were included in the study. Our NICU is of level III having facilities of mechanical ventilation, arterial blood gas monitoring, central oxygen line, warmers, phototherapy, multichannel patient monitor etc which are needed for care of sick neonates. The data of all the neonatal admissions were documented and analyzed as per follows; Age, Gender, Place of delivery, Cause of admission, Birth Weight and Final outcome. Diagnosis was mainly clinical with specific laboratory or radiological findings. Sepsis and meningitis were diagnosed on clinical grounds along with C-reactive protein (CRP), complete blood count (CBC), positive blood culture and cerebrospinal fluid (CSF) examination. Congenital heart disease was diagnosed on ECG changes, Chest X-Ray and then confirmed by Echocardiography. Birth Asphyxia was diagnosed clinically and hypoxic ischemic encephalopathy (HIE) by Sarnat and Sarnat Staging. Diagnosis of prematurity was clinical or based on WHO definition for prematurity (live born neonates delivered before 37 weeks from 1st day of last menstrual period) and using new Ballard scoring. Low birth weight was defined as when birth weight was less than 2500 g. Neonatal jaundice was diagnosed by assessing serum bilirubin level along with G6PD estimation in males. Pneumonia was diagnosed mainly on clinical examination and radiological findings.

Results

Three hundred sixty one neonates were admitted in NICU during the study period, 237 (65.6%) were males and 124 (34.4%) were females. The most common cause of admission were prematurity with low birth weight/very low birth weight/ extremely low birth weight (LBW/VLBW/ELBW), birth asphyxia, sepsis, meconium aspiration syndrome (MAS), hyperbilirubinemia, cardiac anamolies, congenital anomalies, necrotizing enterocolitis, transient tachypnea of the newborn, polycythemia and apnea. The pattern of diseases admitted to NICU has been shown in Table 1. Eighty six neonates (23.8%) were admitted with a diagnosis of prematurity/ LBW/VLBW/ELBW. Seventy three neonates (20.2%) were admitted with birth asphyxia. Among birth asphyxia, 40 neonates (54.8%) were in HIE stage III, 20 (27.4%) in HIE stage II and 13 (17.8%) in HIE stage I. Fifty nine (16.3%) cases were admitted with a diagnosis of sepsis. One hundred eleven neonates (30.7%) required mechanical ventilation. Among the mechanically ventilated, 47 (42.3%) improved, 40 (36.1%) expired and 24 (21.6%) left against medical advice. Among the 250 (69.3%) neonates not requiring mechanical ventilation, 187 (74.8%) improved, 33 (13.2%) expired and 30(12.0%) left against medical advice. Our study showed total mortality of 73 (20.2%) (Table 2). The common procedures performed were lumber puncture in 50 (41.6), double volume exchange transfusion in 47 (39%), partial exchange 18 (15%) and chest tube insertion in 5 (4.1%) cases (Table 3). The congenital anomalies and culture positivity have been shown in Table 4 and Table 5, respectively.

Table 1: Distribution of study subjects

Diseases		Number (%)	Total
Prematurity		86	86 (23.8%)
Birth asphyxia	HIE III	40 (54.8%)	73 (20.2%)
	HIE II	20 (27.4%)	
	HIE I	13 (17.8%)	
Early Onset Neonatal Sepsis	Sepsis	29 (49.1%)	59 (16.3%)
	Pneumonia	25 (42.3%)	
	Meningitis	5 (8.6%)	
Late Onset Neonatal Sepsis	Meningitis	28 (47.5%)	59 (16.3%)
	Pneumonia	14 (23.7%)	
	Sepsis	17 (28.8%)	
Meconium Aspiration Syndrome	Mild	8 (26.6%)	30 (8.3%)
	Moderate	14 (46.6%)	
	Severe	8 (26.8%)	
Neonatal Hyperbilirubenemia		17	17 (4.7%)
Cardiac anamolies		10	10 (2.7%)
Congenital anamolies		10	10 (2.7%)

Table 1 continue ...

Necrotising Enterocolitis		7	7 (2.4%
Transient Tacchypnoea Of Newborn		5	5 (1.3%)
Polycythemia		3	3 (0.8%)
Apnea		2	2 (0.5%)
Total			**361**

Table 2: Outcome of neonates

Ventilator need	Improved	Expired	Lama	Total
No (250)	187 (74.8%)	33 (13.2%)	30 (12%)	250 (69.3%)
Yes (111)	47 (42.3%)	40 (36.1%)	24 (21.6%)	111 (30.7%)
Total	**234 (64.2%)**	**73 (20.2%)**	**54 (15.6%)**	**361**

Table 3: Procedures performed in study subjects

Procedure	Number	Percentage in total admission
Lumbar Puncture	50 (41.66%)	13.85%
Double Volume Exchange Transfusion	47 (39.16%)	13.01%
Partial Exchange Transfusion	18 (15.00%)	4.98%
Chest tube Insertion	5 (4.18)	1.38%
Total	**120**	

Table 4: Distribution of congenital abnormalities

Congenital anomalies	Number of cases
Jejunal atresia	2 (20%)
Anorectal Malformation	2 (20%)
Spinal bifida	1 (10%)
Pierre Robin Syndrome	1 (10%)
Spontaneous pneumothorax	1 (10%)
Laryngomalacia	1 (10%)
Cleft lip and palate	1 (10%)
Tracheo-oesophageal fistula	1 (10%)
Total	**10**

Table 5: Distribution of organisms from blood

Organism	Number
Methicillin resistant staphylococcus aureus	13 (43.3%)
Pseudomonas species	4 (13.3%)
Klebsiella pneumoniae	4 (13.3%)
Enterococcus species.	4 (13.3%)
Acinitobacter species	4 (13.3%)
Coagulase negative staphylococcus	3 (10.0%)
Citrobacter koseri	2 (6.8%)
Total	**30 (8.3%)**

Discussion

Being a tertiary-care centre, we get many neonates in advanced stage of the disease or complicated by their illness. Males predominate as study subjects, which is similar to other studies[1,12]. This may be because of the fact that males get more attention on part of caregivers and brought to the hospital for seeking health services. Sepsis accounted for about one- third cases requiring admission in our NICU. A much higher incidence (41.3%) has been reported by Jan et.al.[12] and lower incidence (6.4-10.5%) by other authors in their studies[13,14]. The variation in occurrence of sepsis depends upon the health practices being followed in the community and awareness of health professionals and parents providing the neonatal care. Since early and late neonatal sepsis accounted for equal percentage of patients in our study, so predisposing factors during antennal, intrapartum and postnatal period are equally important and should be taken into consideration in its prevention.

Prematurity was found to be the next common cause (23.8%) for admission. This is similar to the incidence reported from South Africa[15]. Conversely, a much higher incidence (34.6- 48.2%) has been reported from other neighboring countries[13,16]. Preterm neonates really require very close attention and advanced care because of their inherent handicaps and complications. Their higher incidence in developing world is a major concern, so preventive aspects should be taken in to consideration beside establishment of NICU in different regions of the country.

Birth asphyxia (20.2%) accounted for the third most common cause of admissions to our NICU and mostly (82.2%) in HIE stage II and III. The incidence is almost similar to that of Butt et.al.[17] and much lower than reported from South Africa[15]. Thus occurrence of high incidence of birth asphyxia and mostly in severe stages indicate the level of neonatal care existing in our heath sector especially in the community. So adequate attention is to be paid in training of heath workers who can effectively reduce the incidence as well as its severity and decrease the load of NICU admissions at tertiary care level. Meconium aspiration syndrome was found in 8.3% of cases, which also require urgent attention at the time of birth in the form of tracheal suctioning if the baby is depressed. However, this can be performed efficiently in inborn neonates where trained resident staff attends the delivery. Prakash and Das[18] reported the incidence in 3.67% of their cases.

Neonatal hyperbilirubinemia is the cause of admissions in 4.7% of neonates. Much higher incidence (36.2-54%) has been reported in other studies[12,17,19]. The NICU admissions in neonatal hyperbilirubinemia is mainly done for exchange transfusion and phototherapy. However, it can be curtailed by early detection, bilirubin monitoring and effective phototherapy.

Congenital anomalies found were Jejunal atresia, anal atresia, and tracheosephageal fistula, which needed immediate surgical interventions. Rest was minor malformations and were accompanying feature with some other illness requiring therapy.

Methicillin resistant staphylococcus aureus was detected in 43.3% of cases followed by pseudomonas species, Klebsiella pneumoniae, Enterococcus, Acinetobacter. Other authors reported Staphylococcus aureus, Coagulase Negative Staphylococcus (CoNS) and Klebsiella pneumoniae as the three predominant pathogens in their studies. However, they did not mention regarding methicillin resistance in Staphylococcal isolates[20,21].

Overall mortality observed was 20.2%. Those who required mechanical ventilation had higher mortality (36.1%) than the cases not on ventilation therapy (13.25). Thus it appears that need for ventilation is itself a risk factor for mortality. Other workers have reported higher mortality rate (25.8-34%)[18,22]. However, Jan et al[12] found much lower mortality (8.3%) in their audit report. The mortality dependes upon the stage of the disease and facilities available in a particular NICU. Moreover, attempt should be made to keep it at low as possible.

Conclusions

Thus, it appears that triad of sepsis, prematurity and birth asphyxia is major cause of NICU admissions at our centre. Need for ventilation adversely affected the outcome. This can be reduced by improving antenatal care of pregnant women, timely interventions and of high risk pregnancies to tertiary care centre.

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