Pattern of Neonatal Admission and Outcome in Neonatal Intensive Care Unit of a Tertiary Care Hospital

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Abstract

Introduction: Analyzing the neonatal admission pattern helps the policymakers to make better strategies for healthcare provider to deliver better service.

Objective: To demonstrate the admission pattern and outcome of patients in the Neonatal Intensive Care Unit (NICU) in a tertiary care hospital of Bangladesh.

Materials and Methods: This retrospective descriptive study was conducted on all neonates admitted to the NICU of Combined Military Hospital, Dhaka from January to December 2015. Data were collected from file records of the patients regarding age, gender, mode of delivery, working diagnosis, length of stay in NICU and immediate outcome.

Results: A total of 502 neonates were admitted during the study period. Majority of the patients (77.3%) were admitted on the 1st day of life. There were 279(55.6%) males with a male to female ratio 1.2:1. The major cause of admission was prematurity (23.1%) and other leading causes were birth asphyxia 14.9%, infant of a diabetic mother 13.5%, neonatal sepsis 12.5%. Most of the neonates (82.7%) were delivered by caesarean section. About 84.1% were discharged after improvement, 65(12.94%) died and 15(3%) were referred to other specialties for further management. Within the first 24 hours of admission, 9.4% deaths occurred and two common causes of neonatal death were preterm (49.18%) and birth asphyxia (23%).

Conclusion: Good outcome of a neonate depends on adequate management, monitoring and good nursing care in an intensive care unit. By paying good attention to perinatal services and improving the facilities in the unit, morbidity and mortality in neonates can be reduced.

Key-words: Neonatal disease, Neonatal Intensive Care Unit, Preterm low birth weight, Prematurity, Birth asphyxia.

Introduction

The neonatal disease pattern is different from place to place and changes over time[1]. Evidence from relevant literature has shown enormous global progress in the care of newborns during the past 2-3 decades especially in the resource-rich settings. This progress is reflected in the considerable improvement in the survival rate of newborns and a better prognosis among survivals in the technically advanced nations. The reverse is the case in most developing countries where neonatal morbidity still remains a major medical problem[2].

The Neonatal Intensive Care Unit (NICU) is a key service area for high-risk newborns in the tertiary health institutions in the country. It is an area where newborns are promptly managed on a 24 hours basis. Since the inception of the department of neonatology in Combined Military Hospital (CMH), Dhaka in 1995 and subsequent establishment of NICU in 1996, there has been no comprehensive review of yearly performance activities in this very important key service area of the hospital. Regular neonatal auditing is very vital as disease pattern vary from place to place and with time, even in the same place[1]. Knowledge about characteristics and outcomes of critically ill patients admitted to Intensive Care Units in low-income countries may help making identification of priorities and estimating resources required for improvement of the care of critically ill patients in resource-limited regions of the world. There are many international studies on NICU patient's demographics and few in our country. As the disease pattern and outcome differ from one institute to another, this one-year retrospective study was undertaken in order to document the most common type of diseases with which the neonates are admitted in the NICU of CMH, Dhaka and their immediate outcome. This would help us to create awareness about neonatal problems and improve our neonatal services by better resource allocation.

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Materials and Methods

This was a retrospective review of all neonates admitted to the NICU of CMH Dhaka from January to December 2015. Data were retrieved from records of the patients regarding age, gender, mode of delivery, working diagnosis, length of stay in the NICU and immediate outcome. Diagnosis of the patients was made mainly on the basis of clinical grounds and also with the help of necessary available investigations. The neonatal period was defined as that time from birth to twenty-eight days of age. The Ballard score was used in the assessment of gestational age. Babies weighing 2500 grams or less were considered as having low birth weight (LBW), those weighing 1500 grams or less, and 1000 grams or less were categorized as very low or extremely LBW respectively. Large for gestational age (LGA) were babies weighing 4 kg and above. Pre-term deliveries were those babies delivered before 37weeks of gestation, while post-terms were those delivered after 42 weeks.

The diagnosis of birth asphyxia (BA) was made when there was a history of failure or delayed onset of spontaneous respiration after birth or when a baby needed positive pressure ventilation for more than one minute. The diagnosis of neonatal sepsis was made on the basis of history, clinical examination and also with the help of laboratory investigations, i.e., blood culture, CBC, C-reactive protein, toxic granulation, micro ESR, CSF, urine routine and microscopic examination and culture etc. Infants of Diabetic Mother (IDM) were diagnosed as per maternal history of Diabetes Mellitus during gestational period. All hospital inborn IDMs were observed in NICU just after birth. Those having any risk factor like maternal preeclampsia or neonatal complication during observation like less feeding or hypoglycemia were admitted to NICU. Neonatal Jaundice was diagnosed as per history; physical examination and laboratory evidence of hyperbilirubinaemia. Meconium Aspiration Syndrome (MAS) were diagnosed in an infant with meconium-stained amniotic fluid with early onset of respiratory distress who presents with poor lung compliance, hypoxemia and a characteristic lung radiograph. Congenital Heart Diseases (CHD) was diagnosed by clinical suspicion and radiographic as well as echocardiographic confirmation. Transient Tachypnea of the newborn (TTN) was diagnosed in a term or late preterm neonate having transient tachypnea with chest radiographic finding. The neonatal seizure was diagnosed clinically and with some laboratory evidence of aetiology. Different genetic syndromes were diagnosed mostly clinically by observing musculoskeletal features. The data were subjected to statistical analysis according to standard procedure. SPSS version 19.0 for Windows software was used for data recording and analysis. A permission to conduct this study was obtained from the hospital authority.

Results

During the study period, total admissions in the NICU were 502 of which 279(55.6%) were male with a male to female ratio of 1.2:1. Age on admission ranged from 1 day to 8 days with a mean of 1.5±1.1days and median of 1 day. Total 388 (77.3%) patients were admitted on the 1st day of life followed by 35(7%) patients on 2nd day and 41(8.2%) patients on 3rd day (Table-I).

Table-I: Age and sex distribution of neonatal admission in NICU (n=502)

Age	Male	Female	Total
D1	215(42.80%)	173(34.50%)	388(77.30%)
D2	17(3.40%)	18(3.60%)	35(7.00%)
D3	21(4.20%)	20(4.00%)	41(8.20%)
D4	14(2.80%)	06(1.20%)	20(4.00%)
D5	06(1.20%)	06(1.20%)	12(2.40%)
D6	04(0.80%)	00(0.00%)	04(0.80%)
D7	01(0.20%)	00(0.00%)	01(0.20%)
>1WK	01(0.20%)	00(0.00%)	01(0.20%)
Total	279(55.60%)	223(44.40%)	502(100%)

The major cause of admission was prematurity (23.1%) followed by birth asphyxia (14.9%) and IDM (13.5%) (Fig-1).
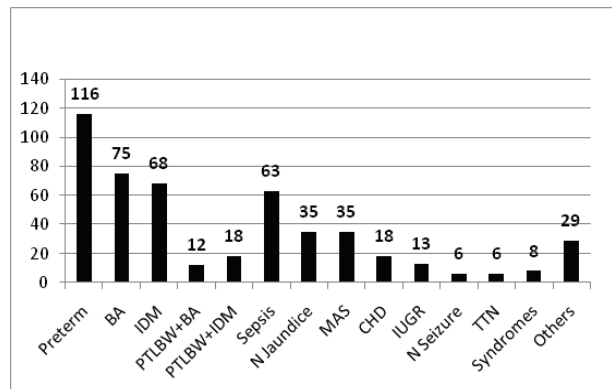

Fig-1: Diagnosis of admitted patients in NICU (n=502)

BA=Birth asphyxia, IDM=Infant of a Diabetic mother, PTLBW=Preterm low birth weight, MAS= Meconium Aspiration Syndrome, CHD=Congenital Heart Disease, IUGR=Intrauterine growth retardation, TTN= Transient tachypnea of newborn.

Most of the neonates (82.7%) were delivered by LUCS. In relation to sex, 225 (44.8%) male and 190(37.8%) female were delivered by LUCS whether 54 (10.8%) male and 33 (6.6%) female were delivered by NVD. But the result was not significant (P > 0.05) (Table-II).

Table-II: Delivery pattern of admitted neonates in NICU (n=502)

Delivery Pattern	Male	Female	Total
NVD	54(10.80%)	33(6.60%)	87(17.30%)
LUCS	225(44.80%)	190(37.80%)	415(82.70%)
Total	279(55.60%)	233(44.40%)	502(100%)

Out of 502 patients admitted, 422(84.1%) were discharged after improvement, 65(12.9%) died and 15(3%) were referred to other specialties for further management. No patient left against medical advice (Table-III).

Table-III: Outcome of neonatal admission in NICU (n=502)

Outcome of neonatal admission	N	%
Discharge	422	84.10
Death	65	12.90
Referral	15	03.00
Left against medical advice	00	00.00
Total	502	100.00

Month-wise admission and death pattern of neonates were observed. The highest rate of neonatal admission was in April (56, 11.1%) and the lowest was in July (27, 5.38%). The highest number of death (11, 2.2%) was in October (Fig-2).
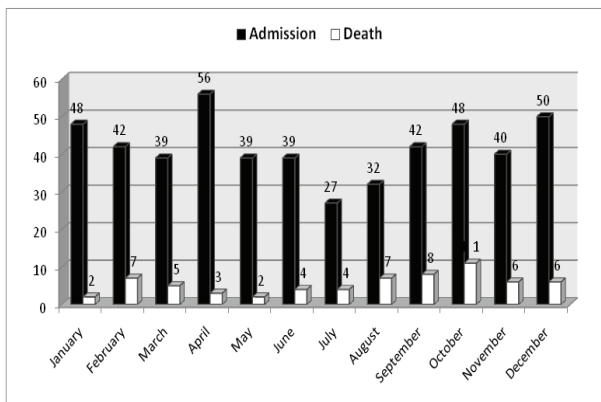

Fig-2: Month-wise admission and death pattern of neonates (n=502)

Among 502 patients, most of the patients (85.5%) had the length of stay in the NICU for <1 wk. Again 9.4% deaths occurred within the first 24 hours of admission.10.8% patients stayed in NICU for 1-2 wks duration and 1.8% patients died within this period (Table-IV).

Table-IV: Relation of death with duration of hospital stay in neonatal admission (n=502)

Duration	Death	Alive	Total
<1 WK	47(9.40%)	382(76.10%)	429(85.50%)
1-2 WK	09(1.80%)	45(9.00%)	54(10.80%)
2-3 WK	08(1.60%)	6(1.20%)	14(2.80%)
3-4 WK	01(0.20%)	3(0.60%)	04(0.80%)
>4 WK	00(0.00%)	1(0.20%)	01(0.20%)

In this study, the two common causes of neonatal death were preterm (49.18%) and BA (23%). Preterm includes PTLBW (21.5%), PT extreme LBW (15.38%) and PT very LBW (12.3%). Other causes were CHD (6.15%), neonatal sepsis (4.6%) and others (16.92%). Others included PTLBW with duodenal atresia, multiple congenital anomalies, hydrops fetalis, inborn error of metabolism, congenital adrenal hyperplasia, Pierre-Robin syndrome, Edward syndrome (Table-V).

Table-V: Cause of death (n=65)

Diagnosis	Number	%
Birth asphyxia	15	23.00
Preterm low birth weight	14	21.50
Preterm extreme LBW	10	15.30
Preterm very LBW	8	12.30
CHD	4	06.15
Neonatal sepsis	3	04.60
Others**	11	16.90

**Others- PTLBW with duodenal atresia, multiple congenital anomalies, hydropsfetalis, inborn error of metabolism, congenital adrenal hyperplasia, Pierre-Robin syndrome, Edward syndrome.

Discussion

During the study period, total admissions in the NICU were 502 of which 279 (55.6%) were male with a ratio of 1.2:1. The male predominance at admission is consistent with other studies[7,8]. Age on admission ranged from 1 day to 8 days with a mean of 1.5±1.1 days and median of 1 day. The majority of the newborns (77.3%) were admitted during the first 24 hours of life. It is comparable to a similar study done in Lahore, Pakistan[9]. It may be due to delivery in the same place. Most of the patients were inborn and were taken immediately after birth if there was any suspicion of complication.

This study showed that prematurity, birth asphyxia, IDM and neonatal sepsis were the major causes of admissions in our neonatal unit. Premature babies are not only the principal contributors to neonatal morbidity and mortality but they are the ones who experience more health problems and consume more health resources[10]. In this study, prematurity was the reason for admission in 23.1% of neonates, while it was 31.6% in an Egyptian study and 27.9% in a study of Pakistan[1,11]. Again this rate was lower (14.7% and 6.8%) in two other studies of Pakistan done in different institutes[9,12]. The PTLBW babies in this study had an association with IDM in 3.5% and with birth asphyxia in 2.3% cases. The figure from the current study is higher as the neonatal unit of CMH, Dhaka is the primary referral centre for in-born as well as tertiary center for newborns from other CMH of Bangladesh. The majority of preterm babies were admitted for observation of any postnatal morbidity.

The second cause of admission in this study was BA (14.9%) which is almost similar to a study of Singapore[13]. The rate was higher (>30%) in other international studies[1,7]. Again incidence of BA was reported as 36% and 20% in two other Bangladeshi studies[14,15]. Prevention is more important than treatment in case of BA. In a poor country like Bangladesh, the need for risk assessment of BA is thus obvious[4].

The lower rate of BA in this study is probably due to regular follow up of the pregnant mothers in CMH set up and early delivery by LUCS. IDM accounted for 13.5% and PTLBW with IDM for 3.5% admission in this study while it was only 2.5% in a Pakistani study[9]. Total 68 terms and 18 preterm IDMs were admitted in this one year period, whether the total number was 40 in a one year study done in Karachi, Pakistan[16]. Sepsis remains a major cause of neonatal mortality and morbidity especially in developing counties. Maternal infections, increased number of deliveries at home by traditional birth attendants (TBAs) under unhygienic conditions, prematurity, host immune response and unhygienic neonatal care are some of the important reasons for infection in neonates[1]. The rate of sepsis is high among neonatal admission of different hospitals in developing countries[1,2,8,17]. But it was low (12.5%) in this study due to good antenatal care.

The other causes of admissions in this study were neonatal jaundice (6.9%), MAS (6.9%), CHD (3.5%), IUGR (2.5%), neonatal seizure (1.2%), TTN (1.2%), Syndromes (1.5%) and others (5.7%). The neonatal admission pattern varied in different studies. In the NICU of Multan children hospital, Pakistan the other admissions were due to Neonatal Jaundice (6.60%), Pneumonia (4.7%), MAS (2.07%), Respiratory distress syndrome (1.2%), Pulmonary hypertension (1.29%) and CHD (1.01%)[1]. In another hospital of Pakistan, the pattern of admission was neonatal jaundice 11.3%, Meconium aspiration syndrome 30.5%, IUGR 4.5%, Neonatal seizures 1.67%, congenital heart disease 0.77% and surgical problems 0.83%[9]. Genetic syndrome was reported to be 13% in a study of USA[18].

In this study, most of the neonates (82.7%) were delivered by LUCS. This was almost similar to a Nigerian study whereas in another study of Africa the delivery was mostly by NVD (91%)[2,19]. Newborn delivery by LUCS was also higher in a study done in Dhaka medical college, Bangladesh[4]. Out of 502 patients admitted, 422(84.1%) were discharged after satisfactory improvement. This indicates increased awareness for timely admission of the neonates and good ICU care. Sixty five (12.9%) patients died and 15(3%) were referred to other specialties for further management. No patient left against medical advice. The outcome was a little bit different in some other studies. In a Pakistani study, discharge with advice was in 86.7% cases, death in 6.8% cases, referral in 3.8% cases and leaving against medical advice was in 2.7% cases[9]. In another study of Pakistan, 71.6% babies were discharged with satisfactory improvement; neonatal mortality was 8.14% and 20.2% of the patients left against medical advice[1].

The highest rate of neonatal admission (11.1%) was in April and the lowest rate was in July (5.38%). The highest number of death (2.2%) was in October. Out of 502 patients, 85.5% had a length of stay in the NICU for <1 wk. Again 9.4% deaths occurred within the first 24 hours of admission. The median hospital stay among survivors (88.3%) was 11.0 (range, 4 to 70) days in a study of Singapore[13]. Majority of the deaths occurred in the first week(83.5%) especially the first 24 hours (41%) of admission in a study done at Kenyattia National Hospital, Africa[19]. Mortality in the initial hours of admission is usually a reflection of the quality of emergency care. In this study, the overall mortality rate was 12.9%. The two common cause of neonatal death were preterm (49.18%) and birth asphyxia (23%). This result was consistent with a study done in pakistan[9].

The pattern of death was dissimilar to some other studies e.g. 15% mortality rate which occurred mostly due to BA (89%) in a study of Netherland, 26.6% mortality rate which occurred mostly due to PTLBW (32%) in a study of Nepal[20,21]. In a Bangladeshi study, the death rate of neonatal admission was 20.6%. The mortality was found among the admitted neonates due to low birth weight (28.1%), perinatal asphyxia (22.8%) and septicemia (18.9%)[17]. BA, sepsis and prematurity were reported as the three leading causes of newborn death in other studies of Bangladesh[22,23]. The pattern of death was quite different in a study of Singapore where the causes of death included congenital anomalies (43.75%), birth asphyxia (31.25%) and pulmonary failure secondary to meconium aspiration syndrome (12.5%)[13]. Limited facilities and manpower have been implicated in the higher mortality rates documented in the developing countries[7]. But the common trend in Combined Military Hospital, Dhaka seems to be that if the baby does not cry after birth or having any other complication like respiratory distress, cyanosis etc. then resuscitation of the newborn is started in the delivery room and is urgently transferred to the NICU. The NICU is also fully equipped having experienced staff. The mortality rate is therefore low in this study.

Conclusion
Prematurity, perinatal asphyxia, IDM and neonatal sepsis are the main reasons for admission in NICU of CMH Dhaka. Most of the neonates are discharged satisfactorily after a shorter duration of stay. A good outcome of a neonate depends on adequate management, monitoring and good nursing care of an intensive care unit. By paying good attention to perinatal services and improving the facilities in the unit, morbidity and mortality in neonates can be reduced as well.

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