

Original Research Article

Demographic and clinical status of the neonates admitted to an intensive care unit in Bangladesh

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ABSTRACT

Background: The neonatal intensive care unit is a fundamental sector for the survival of high-risk newborns. Such a unit involves high-complexity assistance with teams trained in newborn care, reconciling technological advances with proper approaches to humanized care practices. Usually, the outcomes of neonatal intensive care unit patients depend upon the demographic and clinical status of the patients. In Bangladesh, we have very limited research-based information regarding this issue. This study aimed to assess the demographic and clinical status of neonates admitted to an intensive care unit in Bangladesh.

Methods: This was an observational cohort study that was conducted in the Neonatal Intensive Care Unit (I.C.U.) of Dhaka Shishu Hospital, Dhaka, Bangladesh during the period from October 2009 to September 2010. In total 230 neonates admitted to the Neonatal Intensive Care Unit, after fulfilling the inclusion criteria were enrolled in this study as study subjects. Properly written consent was taken in favour of all the participants before data collection. All data were processed, analysed and disseminated by using MS Excel and SPSS version 15.0 program as per necessity.

Results: Among the total of 230 participants, the male-female ratio was 1.7:1 and gestational age was found as >37 weeks in 60% of neonates. The age of the majority of the neonates (53%) was <7 days. The diaphragmatic hernia was present in the highest number (n=17) of cases as a single congenital anomaly. As the disease pattern, perinatal asphyxia with complications, preterm low birth weight with sepsis and congenital anomalies were found in 24.8%, 20.4% and 23% of cases respectively. Among the total of our patients, in 55% of cases, acid-base derangements were present.

Conclusions: The higher frequency of ICU admission of male neonates is alarming for the neonatal care system. The first week of neonatal ICU may be considered the most critical period, especially for preterm babies. Neonates with perinatal asphyxia, preterm low birth weight with sepsis and congenital anomalies are some common features among neonatal ICU care patients.

Keywords: Clinical, Demographic, Intensive care unit, Features, Neonates

INTRODUCTION

In the area of child health, major changes are taking place all over the world to achieve the goals set out in the international declarations.¹ Several reports showed that globally almost 40% of deaths of children under the age of 5 take place during the neonatal period.² Every year over 4 million babies die in the 1st 4 weeks of life; 3 million of these deaths occur in the early neonatal period.³ Neonatal outcome especially that of low-birth-weight infants reflects the standard of perinatal care in a country.⁴ Across the globe, there are significant variations in infant mortality rate (IMR) by nation. In developing countries, the majority of infant deaths result from infectious diseases, even in the neonatal period 24% of the deaths are caused by severe infections, 29% from PNA, 7% from tetanus, and 24% from complications of prematurity.⁵ Bangladesh has made noteworthy progress in child survival over the last few decades with under 5 mortalities declining to 53/1000 live births in 2011 from 133 deaths per 1000 live births in 1991, while infant deaths reduced from 87 to 43 per 1000 live births and neonatal deaths declined from 52 to 32 deaths per 1000 live births.⁶

The mortality rate of Dhaka Shishu Hospital, Bangladesh is 237/1000 admissions.⁷ Intensive care of these infants carries the potential for significant reduction of both mortality and morbidity.⁸ There are many reports on mortality rates of NICU from different developed and developing countries since the 1970s starting with Daga who found 23.6%, Kapil and Bagga found 25.7%, while mortality of critically ill neonates in I.C.U. of Dhaka Shishu Hospital was 491/1000 admission from July 1995 to June 1996; 530/1000 admission during 1997 to 1999 and 452/1000 from July 2003 to December 2003.⁹⁻¹³

Over the past 3 decades, neonatal mortality has fallen steadily. This improvement has been attributed in large part to the development of the NICU.¹⁴ Another study was conducted in the NICU at Orotta National Referral Hospital in Eritrea, where the neonatal mortality was 8.2% and the overall neonatal mortality in Eritrea was 18 per 1000 live birth in 2019.¹⁵ The main objective of this study was to assess the demographic and clinical status of neonates admitted to an intensive care unit in Bangladesh.

METHODS

This was an observational cohort study that was conducted in the Neonatal Intensive Care Unit (I.C.U.) of Dhaka Shishu Hospital, Dhaka, Bangladesh during the period from October 2009 to September 2010. In total 230 neonates admitted to the Neonatal Intensive Care Unit, after fulfilling the inclusion criteria were enrolled in this study as study subjects. The study was approved by the ethical committee of the mentioned hospital. Properly written consent was taken from all the participants before data collection. As per the inclusion criteria of this study,

ICU-admitted preterm, term and post-term neonates of both sexes either case of medical and surgical cases having congenital anomalies were included. On the other hand, according to the exclusion criteria of this study, those neonates who discontinued the treatment and neonates whose parents were unwilling to participate were excluded. All the demographic and clinical data of the participants were recorded. Maternal history included-maternal illness (pyrexia), and duration of membrane rupture. Whether foul-smelling P.V. discharge, N.V.D. or C/S, condition of the baby at birth, whether any resuscitation was needed or not. Gestational age was determined from maternal records. The admission weight of the baby was recorded by the electronic weighing machine, history of crying or breathing immediately after birth, apnoea/ cyanosis, convulsion, respiratory distress, reluctance to feed, and bleeding manifestations were also recorded. The presence of Perinatal asphyxia was clinically diagnosed by - a history of delayed crying or breathing and the presence of cyanosis immediately after birth. Perinatal asphyxia with complications- was considered as with convulsions &/or with septicemia. A predesigned questionnaire was used in data collection. Analysis was done by employing SPSS Version 15 & Epi Info 7 software packages.

RESULTS

In this study, in total 230 neonates admitted to the Neonatal Intensive Care Unit, after fulfilling the inclusion criteria were enrolled as study subjects. Among the total of 230 participants, 63% were male whereas the rest 37% were female. So male participants were dominating in number and the male-female ratio was 1.7:1. Gestational age was found <37 weeks in 40% of cases and >37 weeks was found in 60% of cases.

Table 1: Distribution of neonates by gestational age, age and weight (N=230)

Variables	n	%
Gestational age (week)	<37	92 40%
	>37	138 60%
Age	<7 days	122 53%
	>7 days	108 47%
Weight	<2500 gm	87 37.8%
	>2500 gm	143 62.2%

The age of the majority of the neonates (53%) was <7 days and the weight of the majority of the neonates was >2500 gm. As per the distribution of neonates by congenital anomalies, we observed that diaphragmatic hernia was present in the highest number (n=17) of cases as a single congenital anomaly followed by congenital heart diseases (n=16) and tracheoesophageal fistula (n=14). As the disease pattern, perinatal asphyxia with complications was found in 24.8%, preterm low birth weight with sepsis was found in 20.4% and congenital anomalies were found in 23% of cases which were

noticeable at the time of admission. Among the total of our patients, in 55% of cases, acid-base derangements were present.

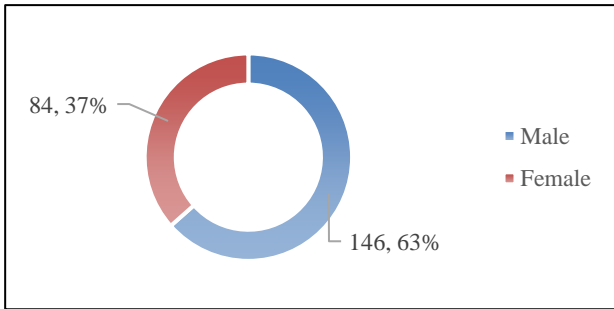
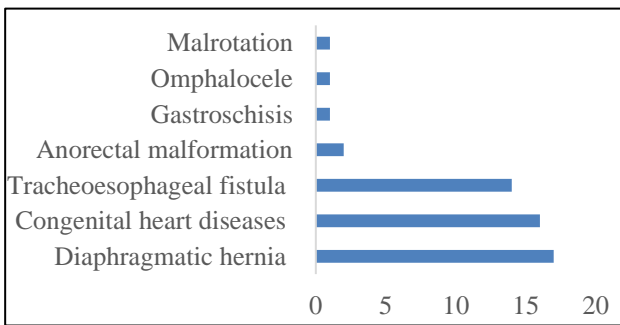
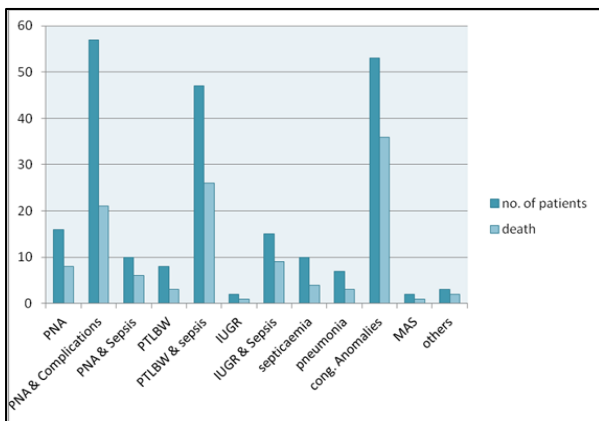


Figure 1: Distribution of participants by gender (N=230).



D. Hernia=Diaphragmatic hernia, CHD=Congenital heart disease, ARM=Anorectal malformation, TEF=Tracheoesophageal fistula

Figure 2: Distribution of neonates by congenital anomalies (N=230).



PNA = Perinatal asphyxia, PTLBW = Preterm low birth weight, IUGR = Intrauterine growth retardation, MAS = Meconium aspiration syndrome

Figure 3: Distribution of neonates by disease pattern and death (N=230).

As for the types of acidosis, mixed acidosis accounted for the highest number (55%) among total cases. In this study, 99 (43%) neonates had BE (Base excess/deficit)

within the range of +5 to -5 while 47 (20.4%) neonates had > -12.

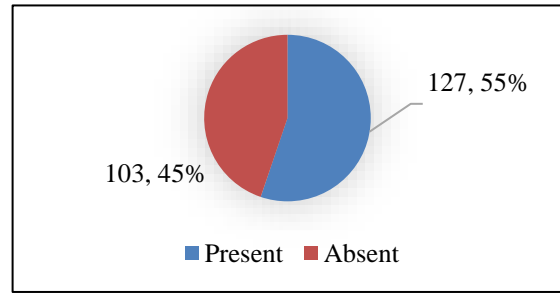


Figure 4: Presence and absence of acid-base derangements in studied neonates (N=230).

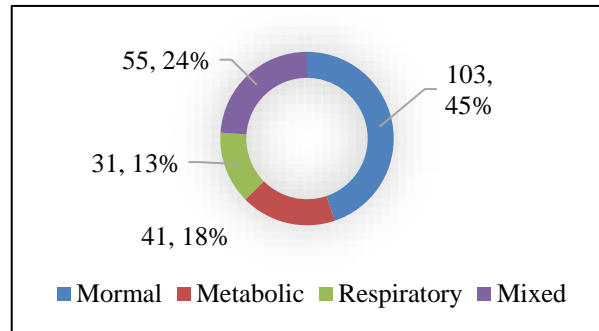


Figure 5: Distribution of neonates by different types of acidosis on admission (N=230).

Table 2: Distribution of neonates by the level of BE (N=230).

BE groups	n	%
+5 to -5	99	43.0%
-6 to -12	84	36.5%
-12 to -16	24	10.4%
> -20	23	10.0%

DISCUSSION

This study aimed to assess the demographic and clinical status of neonates admitted to an intensive care unit in Bangladesh. In this study, the gestational age of the neonates was found <37 weeks in 40% of cases, and >37 weeks was found in 60% of cases. The age of the majority of the neonates (53%) was <7 days and the weight of the majority of the neonates was >2500 gm. The mortality of critically ill neonates in NICU over the years has remained most same in Bangladesh. Nosocomial infection contributes a lot in this arena. Although the overall standard of neonatal service has improved in Bangladesh since the early nineteen eighties onwards, the survival of LBW infants was not yet changed and the limitations are mainly in terms of technology and nursing support to ensure the continuity of care.¹⁶ The goal of critical care for newborns and children is to provide optimal surveillance and support to

the developing organ systems of patients with life-threatening conditions.¹⁷ As per the sex distribution of our study population, male neonates were 63.5% and female neonates were 36.5%. The male predominance so far in admission agrees with other studies like Kapil and Bagga (73%).¹⁸ The main reasons for NICU admission were perinatal asphyxia with complications (24.8%), problems related to preterm low birth weight (20.4%) and major congenital anomalies (23%) in this study. It was observed that 55.2% of the critically ill newborns treated in the NICU had acid-base derangements and had higher mortality than those without acid-base imbalances. A highly significant correlation was found between mortality outcome acidosis. The odds ratio for mortality outcome in comparison to blood gas abnormalities was statistically significant in all modalities of acidosis. Hossain et al found 70% of neonates suffer from acid-base imbalances.¹⁹

In this study, 30 neonates died among the forty-one neonates having metabolic acidosis. Hossain et al also found a highly significant correlation regarding this. Low et al showed a progression of the severity of newborn complications with increasing metabolic acidosis (base deficit > -12).^{19,20} Significant mortality was found in both respiratory and mixed acidosis (combined metabolic and respiratory acidosis) in this study. Acidemia associated with asphyxia inhibits surfactant production and increases pulmonary vascular resistance.^{21,22} An EEG-documented abnormal cerebral function has been shown in preterm infants < 32 weeks gestation concerning episodes of acidosis.²³

Limitation

This was a hospital-based single-centered study with small-sized samples. Moreover, the study was conducted over a very short period. So, the findings of this study may not reflect the exact scenario of the whole country.

CONCLUSION

The higher frequency of ICU admission of male neonates is alarming for the neonatal care system. The first week of neonatal ICU may be considered the most critical period, especially for preterm babies. Neonates with perinatal asphyxia, preterm low birth weight with sepsis and congenital anomalies are some common features among neonatal ICU care patients.

Recommendations

Acid-base derangements are also very common problems in such cases. To get more specific results, we would like to recommend similar studies in several places with larger-sized samples.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. United Nations Development Programme. Millennium Development Report. New York: UNDP.2011. Available at <http://www.undp.org.bd.2011/info>. Accessed on 12 January 2023.
2. Landers C. Maternal and newborn health: a global challenge. In: The state of the world's children, US Fund for UNICEF youth Report. New York: UNICEF. 2009:1-5.
3. Tinker A, Parker R. Advancing newborn health: The saving newborn lives initiative. *Glob Public Health.* 2010;5(1):28-47.
4. Begum SA. Incidence and risk factors of neonatal sepsis in Special Care Nursery Unit of Edinburgh (U K). *Bangladesh J Child Health.* 1992;16(3/4):84-9.
5. Bonita F, Richard EB. Overview of Pediatrics. In: Behrman RE, Kliegman RM, Stanton (eds). *Nelson Textbook of Pediatrics.* 19th ed. Philadelphia: WB Saunders Company. 2011:1-5.
6. National Institute of Population Research and Training. *Bangladesh Demographic and Health Survey.* Dhaka. Government of Bangladesh. 2011.
7. Chowdhury MAKA, Banu K, Rahaman M. Birth asphyxia- a prospective study in Dhaka Shishu Hospital. *J Child Health.* 1996;12:18-22.
8. Tabib SB. Management of Low Birth Weight Babies. *Bangladesh J Child Health.* 1987;11(3):43-5.
9. Daga SR. Mortality in infants discharged from Neonatal Intensive Care Units. *Indian Paediatrics.* 1984;21:453-5.
10. Kapil D, Bagga A. The profile and outcome of patients admitted to Paediatric Intensive Care Unit. *Indian J Paediatr.* 1993;60:5-10.
11. Hossain MM. Predictors of outcome among critically ill newborn Treated in ICU. MD (Paed) Thesis. Bangladesh institute of Child Health, Dhaka. 1997;5:54-121.
12. Akhter S, Chowdhury MAKA, Amin R, Ibrahim H, Quader A Outcome of neonatal ICU – Care in Dhaka Shishu Hospital (DSH). Presented at 1 st National Conference and Scientific Session, Bangladesh Neonatal Forum. 1999.
13. Hossain MM, Shirin M, Mamun MAA, Chowdhury NA, Hassan MQ, Afroza S. Electrolyte abnormalities in neonates Admitted in Intensive Care Unit. *Bangladesh J Child Health.* 2004;28:13-7.
14. Niven GR, Harding JE. Another outcome of neonatal intensive care; First-year mortality and hospital morbidity. *J Paediatric Child Health.* 1995;31:137-42.
15. Shah S, Zemichael O, Meng H. Factors associated with mortality and length of stay in hospitalized

- neonates in Eritrea, Africa: a cross-sectional study. *BMJ.* 2012;5:83-9.
16. Begum HA, Islam Y, Ali SA, Nurun N. Outcome of extremely low birth weight infants. *Bangladesh J Child Health.* 1993;17(4):134-9.
 17. Prayor RW, Matson JR. Evaluation of the critically ill child. *Indian J Pediatr.* 1988;55:735-7.
 18. Kapil D, Bagga A. The profile and outcome of patients admitted to the Paediatric Intensive Care Unit. *Indian J Paediatr.* 1993;60:5-10.
 19. Hossain M, Amin R. Acid-base status as a predictor of mortality among newborns admitted to intensive care unit (ICU). *J Child Health.* 2001;17:2-8.
 20. Couriel JM. Interpretation of blood gas analysis. *Indian J Paediatr.* 1993;55:656-60.
 21. Thibault DW, Hall FK, Sheehan MB, Hall RT. Postasphyxial lung disease in Newborn infants with severe perinatal acidosis. *Am J Obstet Gynecol.* 1984; 150:393-9.
 22. Rudolph AM, Yuan S. Response of the pulmonary vasculature to hypoxia and Hydrogen ion changes. *J Clin Invest.* 1966;45:399-411.
 23. Eaton DG, Wertheim D, Oozeer R, Dubowitz LM, Dubowitz V. Reversible changes in cerebral activity associated with acidosis in preterm neonates. *Acta Pediatr.* 1994;83:486-492.

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