

Causes of Morbidity and Mortality among the Neonates Admitted to the Neonatal Intensive Care Unit in a Rural Area of Bangladesh

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ABSTRACT

Introduction: Neonates are highly vulnerable to various health challenges. This period involves critical physiological adaptations necessary for survival outside the womb. Neonatal morbidity and mortality are significant public health concerns, especially in rural areas of developing countries like Bangladesh. This study aimed to assess the causes of morbidity and mortality among neonates admitted to the neonatal intensive care unit in a rural area of Bangladesh. **Methods & Materials:** This retrospective cross-sectional study was conducted in the Neonatal Intensive Care Unit (NICU), Kumudini Women's Medical College Hospital (KH), Tangail, Bangladesh from January to December 2023. We reviewed 2,777 records of neonates from a rural area of Bangladesh who received NICU care at the specified hospital. Purposive sampling was used for selection, and data analysis was performed with MS Office tools. **Results:** Of the 2,777 neonates, 75.19% recovered, 15.66% died, 14.55% were discharged on request, and 1.26% was referred. The major causes of death were prematurity (35.40%), perinatal asphyxia (28.74%) and neonates with respiratory distress (22.07%). For morbidity, notable conditions were PNA HIE II-III (25.56%), all preterm types (15.96%), neonates with respiratory distress (13.40%), meconium stain (13.36%), and neonatal jaundice (11.38%). **Conclusion:** The findings highlight the need to raise awareness about antenatal checkups, screen for high-risk pregnancies, promote institutional deliveries, and improve maternal health to prevent preterm labor and PNA. Enhancing NICU resources and treatment plans can significantly reduce deaths, infections, and discharge on-request rates.

Keywords: Causes of morbidity, Mortality, Neonates, Neonatal intensive care unit, NICU, Rural area

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INTRODUCTION

Neonatal death refers to the passing of a newborn within the first 4 weeks of life [1]. Despite some variations in causes, the three primary contributors to neonatal death are infections, prematurity, and birth asphyxia [2]. In 2018, 2.5 million neonates died globally. It is projected that 27.8 million neonates will die between 2018 and 2030 if countries continue to reduce their neonatal mortality rates at the current pace [3]. Analyzing care practices associated with variations in mortality rates can provide valuable insights into potential improvements [4]. Transferring women at high risk for very preterm births to perinatal centers significantly decreases neonatal mortality rates [5]. The type of tertiary care

facility where neonates are transferred may impact outcomes [6]. Infants born outside specialized centers face a higher risk of developing major neonatal complications and long-term neurodevelopmental disabilities, likely due to inadequate access to specialist support [7]. Improving neonatal mortality rates remains a challenge in developing countries like India due to limited data availability. Data on neonatal morbidity and mortality patterns in NICUs are scarce, and most available information comes primarily from tertiary care centers [8]. Previous authors have provided varied explanations for risk factors associated with neonatal mortality, including place of residence, antenatal care (ANC) follow-up, and neonatal illness [9,10]. In developing countries, prematurity, infections,

jaundice, birth asphyxia, and pneumonia are the leading causes of admissions to neonatal intensive care units (NICUs) [11]. In contrast, in developed countries, the primary causes of NICU admissions are mostly congenital anomalies, which are nonpreventable [11]. Globally, the causes of neonatal deaths vary depending on the available facilities and the quality of healthcare provided by local health centers [12]. The objective of this study was to assess the causes of morbidity and mortality among neonates admitted to the neonatal intensive care unit in a rural area of Bangladesh.

METHODS & MATERIALS

This was a retrospective cross-sectional study that was conducted in the Neonatal Intensive Care Unit (NICU), Kumudini Hospital (KH), Tangail, Bangladesh from January 2023 to December 2023. As the study subjects, a total of 2777 records of neonates who received medical services at NICU were enrolled in this study. A purposive sampling technique was used in sample selection. The study was approved by the ethical committee accordingly. According to the exclusion criteria for this study, neonates with incomplete medical records, those referred to other facilities, and those discharged against medical advice were excluded from the research. Neonatal mortality is defined as the number of neonates who died in the neonatal intensive care unit (NICU) during the study period. Data were analyzed using MS Office tools.

RESULT

In this study, among the total participants, 75.19% recovered, 15.66% died, 14.55% were discharged on request, and 1.26% were referred.

There were significant variations in the causes of illness. The most common ailments include perinatal asphyxia with hypoxic-ischemic encephalopathy stage I (PNA HIE I) at 15.66%, neonates with respiratory distress at 13.40%, meconium stain at 13.36%, neonatal jaundice (Physiological) at 11.38%, PNA HIE II at 8.32%, neonatal sepsis at 6.91%, very preterm (GA 28<32 weeks) at 5.01%, moderate preterm (GA 32 <34 weeks) at 4.97%, late preterm (GA 34<37 weeks) at 3.96%, pneumonia at 3.75%, infant of diabetic mother (IDM) at 3.56%, transient tachypnoea of newborn (TTN) at 2.95%, meconium aspiration syndrome (MAS) at 2.38%, extremely preterm (GA <28 weeks) at 2.02%, PNA HIE III at 1.58%, congenital heart disease (CHD) at 0.36%, neonatal seizure at 0.29%, and umbilical sepsis at 0.14%. The common causes of death along with their Case Fatality Rates (CFR) are Extremely Preterm at 80.36%, PNA HIE III at 77.27%, Very Preterm at 48.20%, Neonatal Seizure at 37.50%, Neonates with Respiratory Distress at 25.81%, CHD at 20%, Neonatal Sepsis at 14.58%, Late Preterm at 12.73%, PNA HIE I at 8.74%, Pneumonia at 7.69%, MAS at 4.55%, IDM at 4.04%, Neonatal Jaundice (Physiological) at 2.53%, and Meconium Stain at 1.08%. However, of the total deaths, Neonates with Respiratory Distress contributed 22.07%, Very Preterm 15.40%, PNA HIE II 12.18%, Extremely Preterm 10.34%, PNA HIE I 8.74%, PNA HIE III 7.82%, Neonatal Sepsis 6.44%, Moderate Preterm 6.44%, Late Preterm 3.22%, Pneumonia 1.84%, Neonatal Jaundice (Physiological) 1.84%, Meconium Stain 0.92%, IDM 0.92%, MAS 0.69%, Neonatal Seizure 0.69%, and CHD 0.46%. Premature Birth was the single largest category of cause of death, accounting for 35.40% of the total deaths.

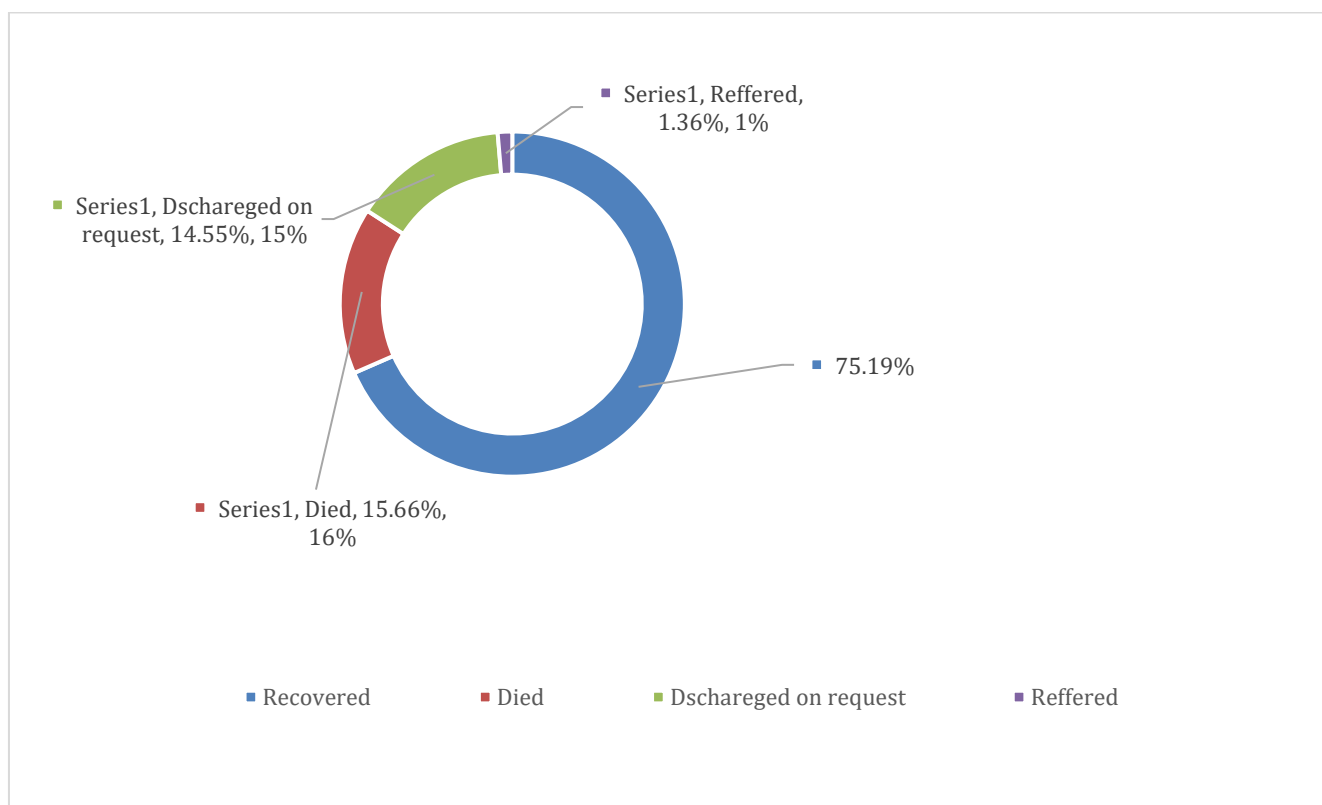


Figure – 1: Distribution of treatment outcomes at NICU

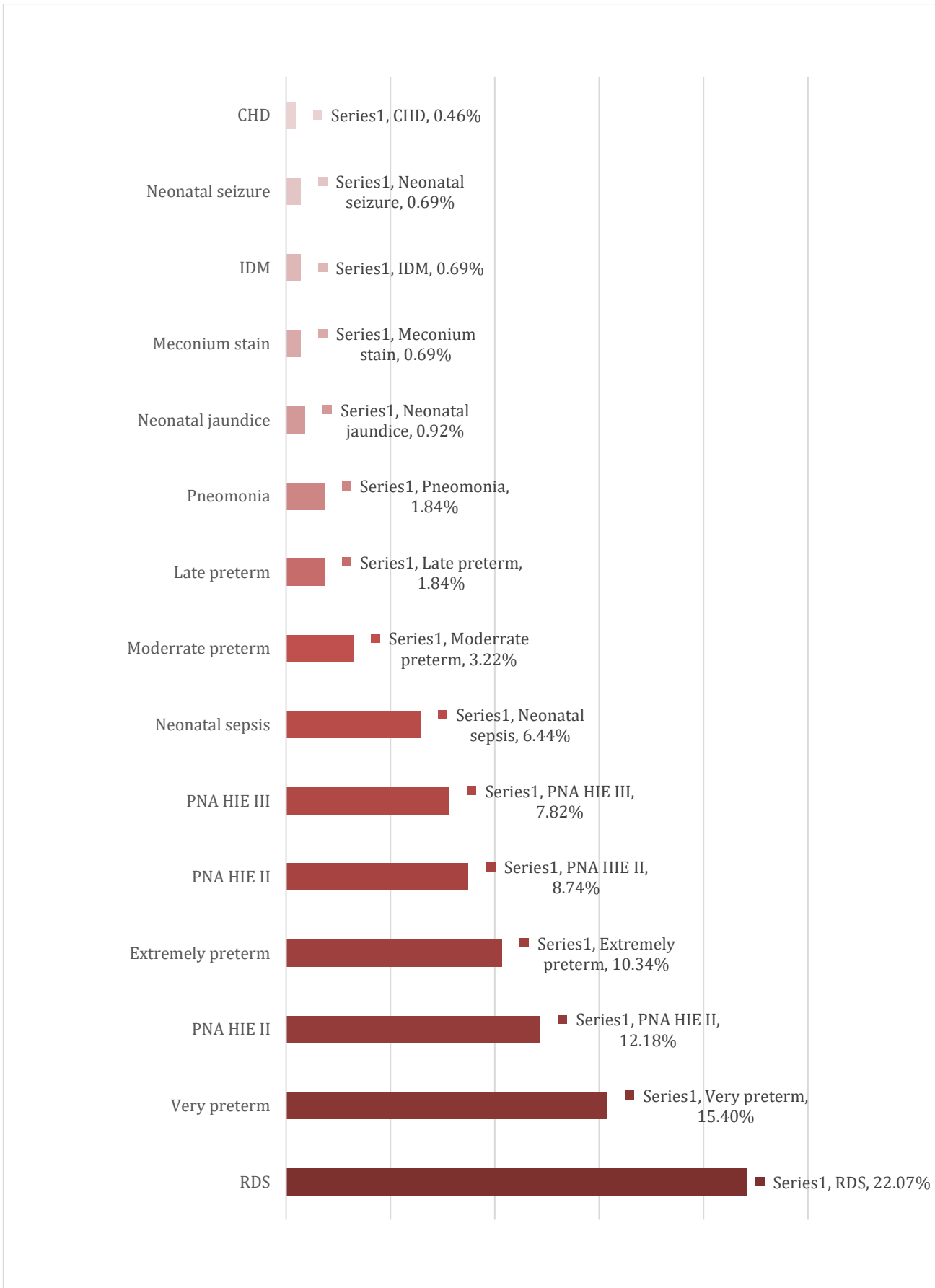


Figure - 2: Distribution of cause of illness

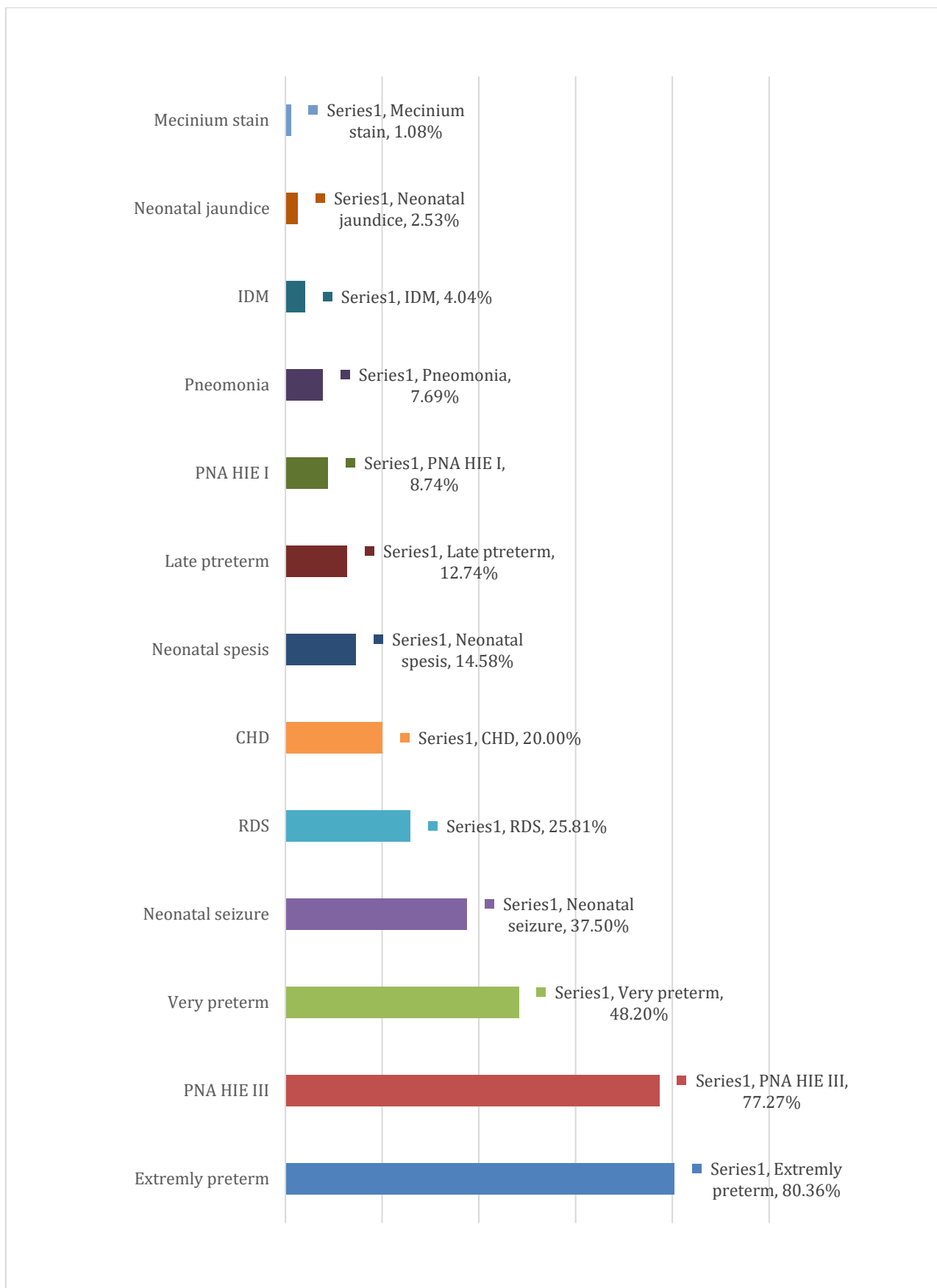


Figure – 3: Distribution of causes of fatality

*There is more than one cause of fatality in one neonate.

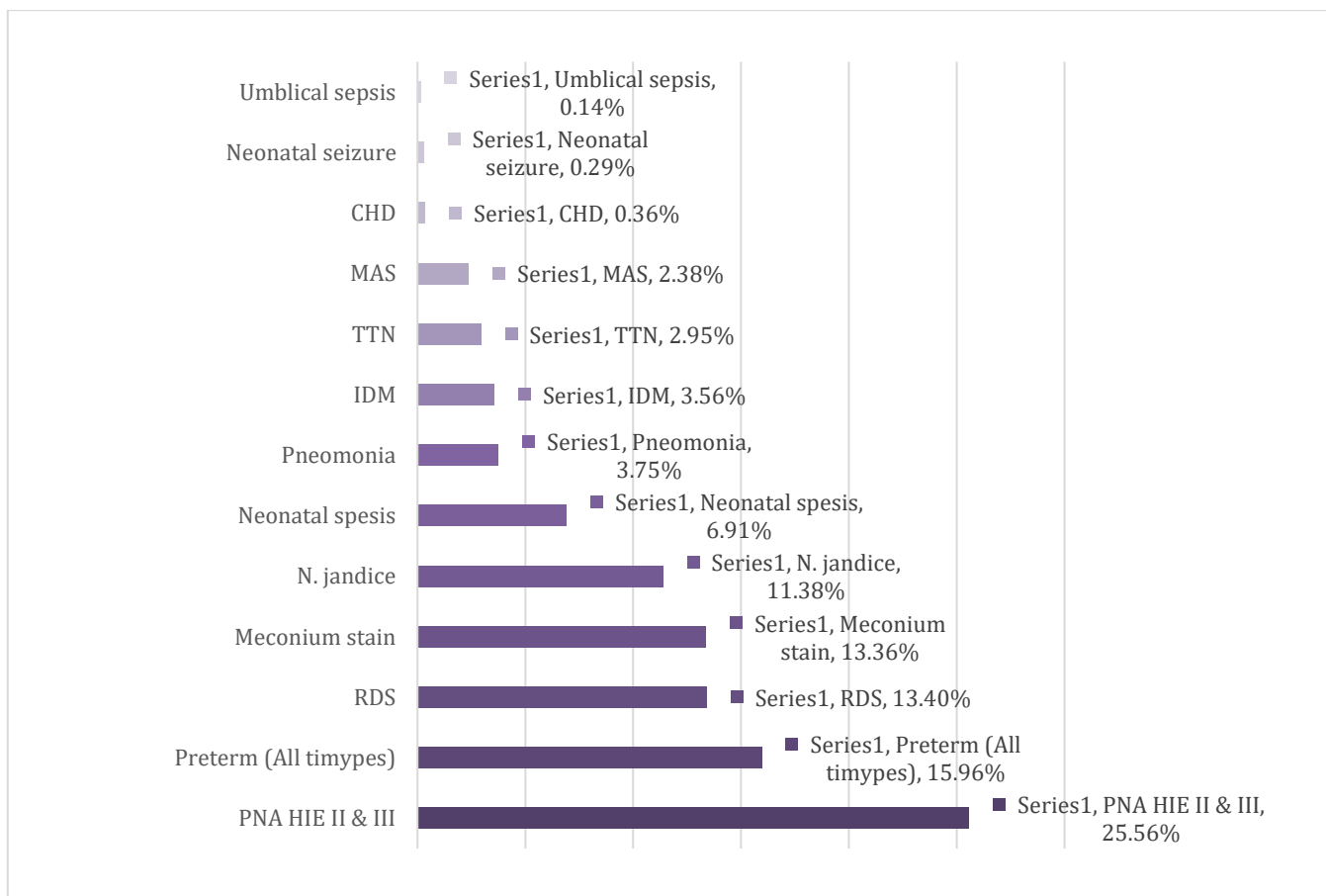


Figure - 4: Distribution of morbidity

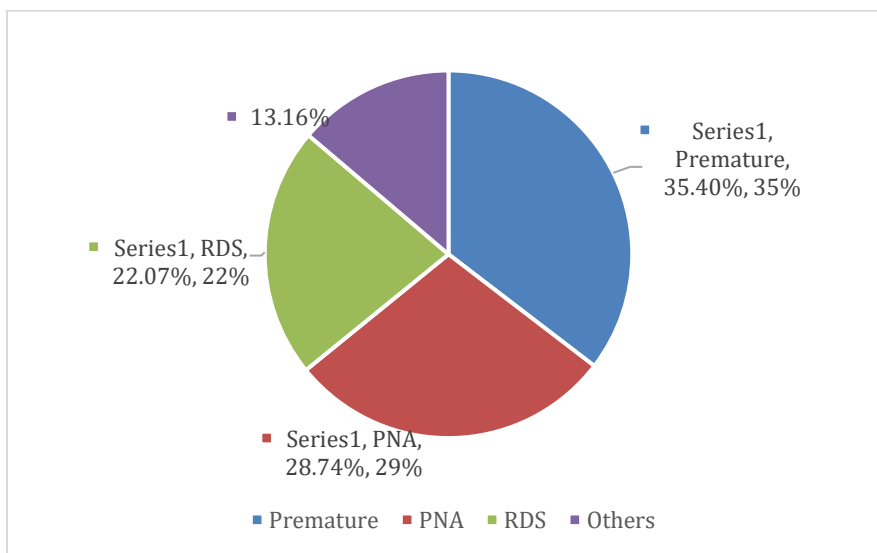


Figure - 5: Major causes of mortality

DISCUSSION

In our study, the causes of neonatal mortality were as follows: respiratory distress (22.07%), very preterm (15.40%), PNA HIE II (12.18%), extremely preterm (10.34%), PNA HIE I (8.74%), PNA HIE III (7.82%), neonatal sepsis (6.44%), moderately preterm (6.44%), late preterm (3.22%), pneumonia (1.84%), physiological neonatal jaundice (1.84%),

meconium stain (0.92%), IDM (0.92%), MAS (0.69%), neonatal seizure (0.69%), and CHD (0.46%). In a study, the primary causes of neonatal mortality were prematurity (44.45%), sepsis (27.78%), and birth asphyxia (13.89%) [13]. Of the expired neonates, 66.67% were out-born and 33.33% were inborn, with the majority (75%) dying between 24 to 48 hours of life. In the current study, the common causes of death

with their case fatality rates were: extremely preterm (80.36%), PNA HIE III (77.27%), very preterm (48.20%), neonatal seizure (37.50%), respiratory distress (25.81%), CHD (20%), neonatal sepsis (14.58%), late preterm (12.73%), PNA HIE I (8.74%), pneumonia (7.69%), MAS (4.55%), IDM (4.04%), physiological neonatal jaundice (2.53%), and meconium stain (1.08%). In another study, neonatal sepsis (30.65%) was the most common cause of death, followed by birth asphyxia with hypoxic-ischemic encephalopathy (29.04%), hyaline membrane disease (11.03%), neonatal jaundice (9.68%), meconium aspiration syndrome (7.69%), hemorrhagic disease of the newborn (1.68%), and congenital malformations (2.79%) [14]. A systematic review and meta-analysis revealed that the majority of neonatal deaths were attributed to perinatal asphyxia, prematurity complications, neonatal sepsis, and birth injuries [15]. In the current study, premature birth accounted for 35.40% of the deaths, making it the single largest category of cause of death. The second largest cause was perinatal asphyxia (PNA) at 28.74%, followed by neonates with respiratory distress syndrome (RDS) at 22.07%. These findings differed from another center where the percentage of premature babies was higher, but they were consistent with a study conducted by Banstola R. et al. [16, 17].

Limitation of the study:

This single-centered retrospective study was conducted over a very short period. Consequently, its findings may not fully represent the national scenario, potentially limiting the generalizability of the results across the entire country.

CONCLUSION

The findings underscore the critical need to raise awareness about antenatal checkups, screen for high-risk pregnancies, promote institutional deliveries, and improve maternal health to prevent preterm labor and PNA. Enhancing NICU resources and treatment plans can significantly reduce deaths, infections, and discharge on-request rates. Furthermore, investing in additional research focused on disease-specific prevention and management will likely yield better NICU healthcare outcomes. Collectively, these comprehensive measures will contribute to the well-being of mothers and newborns, fostering a healthier start to life.

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Conflict of interest: None declared

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

REFERENCES

1. Neonatal WH, Mortality P. Country, regional and global estimates. Geneva, Switzerland: World Health Organization. 2006.
2. Unicef. Ethiopia maternal and newborn health disparities. 2015. <https://www.medbox.org/ethiopia/maternal-and-newborn-health-disparities-ethiopia-key-facts/preview?q>.
3. Hug L, Alexander M, You D, Alkema L. National, regional, and global levels and trends in neonatal mortality between 1990 and 2017, with scenario-based projections to 2030: a systematic analysis. *The Lancet Global Health*. 2019 Jun 1;7(6):e710-20.
4. SB SS, Madhu GN, Singh R. A study of disease pattern and outcome of newborns admitted to NICU in a tertiary care hospital. *Journal of Evolution of Medical and Dental Sciences*. 2014 Feb 3;3(5):1113-9.
5. Marlow N, Bennett C, Draper ES, Hennessy EM, Morgan AS, Costeloe KL. Perinatal outcomes for extremely preterm babies in relation to place of birth in England: the EPICure 2 study. *Archives of Disease in Childhood-Fetal and Neonatal Edition*. 2014 May 1;99(3):F181-8.
6. Hirani BA, Mchome BL, Mazuguni NS, Mahande MJ. The decision delivery interval in emergency caesarean section and its associated maternal and fetal outcomes at a referral hospital in northern Tanzania: a cross-sectional study. *BMC pregnancy and childbirth*. 2017 Dec;17:1-6.
7. Van den Boogaard W, Zuniga I, Manzi M, Van den Bergh R, Lefevre A, Nanan-N'zeth K, Duchenne B, Etienne W, Juma N, Ndelema B, Zachariah R. How do low-birthweight neonates fare 2 years after discharge from a low-technology neonatal care unit in a rural district hospital in Burundi?. *Tropical Medicine & International Health*. 2017 Apr;22(4):423-30.
8. Chawla D, Suresh GK. Quality improvement in neonatal care—a new paradigm for developing countries. *The Indian Journal of Pediatrics*. 2014 Dec;81:1367-72.
9. Hoseini BL, Sadati ZM, Rakhshani MH. Assessment of neonatal mortality in the Neonatal Intensive Care Unit in Sabzevar City for the period of 2006–2013. *Electronic physician*. 2015 Nov;7(7):1494.
10. Demisse AG, Alemu F, Gizaw MA, Tigabu Z. Patterns of admission and factors associated with neonatal mortality among neonates admitted to the neonatal intensive care unit of University of Gondar Hospital, Northwest Ethiopia. *Pediatric health, medicine and therapeutics*. 2017 May 12:57-64.
11. Khinchi YR, Kumar A, Yadav S. Profile of neonatal sepsis. *J Coll Med Sci Nepal*. 2010 Aug;6(2):1-6.
12. Murtaza M, Ali MN, Khan IS, Zargar MH. Causes of mortality and morbidity among neonates admitted to the neonatal intensive care unit in Ladakh, India. *Journal of Mahatma Gandhi Institute of Medical Sciences*. 2021 Jan 1;26(1):42-5.
13. Namrata KC, Shrestha B, Bhattarai A, Paudel S, Subedi N. Pattern of morbidity and mortality among neonates admitted to neonatal intensive care unit in tertiary care centre, western Nepal. *Journal of Gandaki Medical College-Nepal*. 2021 Jul 3;14(1):24-8.
14. Krishnaiah M, Basha MS, Khaleef A, Rahman ZU. A Study on The Disease Pattern and Outcome in Neonatal Intensive Care Unit, Tertiary Care Hospital of Andhra Pradesh. *Journal of Maternal and Child Health*. 2023 May 16;8(3):312-23.
15. Tekelab T, Chojenta C, Smith R, Loxton D. The impact of antenatal care on neonatal mortality in sub-Saharan Africa: A systematic review and meta-analysis. *PloS one*. 2019 Sep 13;14(9):e0222566.
16. Gurubacharya SM, Gurubacharya RL. An overview of neonatal admissions at college of medical sciences (COMS). *Journal of Nepal Paediatric Society*. 2007;27(2):73-4.
17. Banstola R, Shrestha S, Ghimire JJ, Gurung R, Sigdel YR. Disease Pattern and Outcome of Neonates at Special Newborn Care Unit (SNCU) of Pokhara Academy of Health Science (PAHS), Nepal. *Nepal Journal of Obstetrics and Gynaecology*. 2017;12(2):61-4.