

Prevalence and Outcome Trends of Neonatal Unit: Insights from a Tertiary Care Hospital

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Abstract

Original Research Article

Background: Neonatal morbidity and mortality remain major public health concerns in Bangladesh, particularly in tertiary care hospitals where complicated and referred cases are managed. Understanding the prevalence of common neonatal morbidities and outcome trends is essential for improving the quality of neonatal care. **Objective:** To assess the prevalence and outcome trends among neonates admitted to the neonatal unit of Chandpur Medical College Hospital. **Methods:** This prospective observational study was conducted from June 2023 to May 2025 and included 750 admitted neonates. Data on demographic characteristics, perinatal factors, diagnoses, and treatment outcomes were collected and analyzed using SPSS version 23. **Results:** More than half of the neonates were admitted within the first 24 hours of life (56.7%), and males constituted 53.6% of admissions. Prematurity/low birth weight (38.0%) was the most common morbidity, followed by birth asphyxia (26.4%) and neonatal sepsis (21.6%). Overall, 76.3% of neonates were discharged after improvement, while the in-hospital mortality rate was 12.9%. Mortality was highest among neonates with prematurity/low birth weight and sepsis. Trend analysis showed an improvement in discharge rates and a decline in mortality in recent years. **Conclusion:** Prematurity/low birth weight, birth asphyxia, and neonatal sepsis remain the predominant causes of neonatal morbidity and mortality. Continued strengthening of perinatal and neonatal care is essential to further improve outcomes in tertiary care settings.

Keywords: Prevalence, Outcome, Tertiary care hospital.

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INTRODUCTION

Neonatal health remains a central priority for achieving child-survival targets because the first 28 days of life are the most vulnerable period in the human life course.[1] Globally, an estimated 2.3 million newborns die each year, and neonatal deaths account for a large share of under-five mortality, despite substantial progress in reducing deaths after infancy. This slower pace of improvement in neonatal survival is widely attributed to the need for timely, high-quality care around birth and during the early postnatal period—care that is often unevenly available within and across countries. [1,2] Low- and middle-income countries (LMICs) carry the highest burden of neonatal deaths, and South Asia remains a major hotspot due to high numbers of births and persistent gaps in quality facility-based care.[3] In

Bangladesh, national data indicate notable reductions in child mortality over time; however, neonatal mortality has declined more slowly than post-neonatal and child mortality, meaning newborn deaths now constitute a growing proportion of under-five deaths.[4] This epidemiological shift makes neonatal care performance—especially within facility-based newborn services—an essential focus for health systems strengthening. The hospitals play a particularly important role in neonatal survival because they receive a high volume of complicated deliveries and referrals, including preterm births, low birth weight infants, suspected sepsis, perinatal asphyxia, respiratory distress, and congenital anomalies. In such settings, the “prevalence” observed in a neonatal unit commonly reflects the case-mix of admissions (i.e., the proportion

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of admissions attributable to leading diagnoses), as well as the frequency of key adverse outcomes (e.g., in-hospital mortality, referrals out, complications, and discharge against medical advice).[5] Understanding these patterns is critical because admission diagnoses and early outcomes are strongly influenced by upstream factors (maternal health, intrapartum care, referral pathways) and downstream factors (availability of respiratory support, infection prevention, timely antibiotics, thermal care, feeding support, and staffing).[1]

Evidence from Bangladesh and comparable LMIC contexts consistently identifies prematurity and its complications, neonatal sepsis, and intrapartum-related events (including birth asphyxia) among the dominant causes of severe neonatal illness and death.[6] Recent facility-based analyses from newborn care units in Bangladesh similarly report that preterm/low birth weight, sepsis, respiratory distress syndromes, and perinatal asphyxia comprise a major share of admissions, while mortality risk is often concentrated among the smallest and sickest infants and among those arriving late or after suboptimal delivery and immediate newborn care. [7] Alongside clinical drivers, health-system and social factors can shape outcomes—one notable challenge is discharge against medical advice (DAMA) in neonatal units, which interrupts treatment, complicates follow-up, and can bias facility outcome statistics if not measured and interpreted carefully.[8] Tracking outcome trends over time within a neonatal unit can therefore provide actionable insights beyond single-time snapshots. Trend analysis can reveal whether survival is improving, whether the admission case-mix is shifting (for example, increasing proportions of very preterm referrals as neonatal services expand), and whether quality-of-care initiatives are translating into measurable gains. Such analyses are increasingly important as Bangladesh continues to scale and strengthen facility-based newborn care, including special care newborn units (SCANUs) and referral linkages, while also confronting persistent inequities and geographic variation in neonatal mortality.[9] The present study was examined the prevalence patterns (admission diagnoses and key morbidities) and outcome trends (mortality, length of stay, referral-out, DAMA, and recovery/discharge patterns) in a neonatal unit of a tertiary care hospital, which can help identify priority clinical conditions, seasonal or temporal variations, modifiable risk factors, and potential service gaps. Findings can support targeted improvements in triage and referral processes, infection prevention and control, respiratory care readiness, staffing and training, and caregiver counseling—ultimately strengthening the hospital's contribution to national neonatal survival goals.

OBJECTIVES

To evaluate the prevalence of neonatal morbidities and analyze outcome trends among neonates

admitted to the neonatal unit of a tertiary care hospital in Bangladesh.

METHODOLOGY & MATERIALS

This prospective observational study was conducted in the Department of Pediatrics, Chandpur Medical College, Chandpur, Bangladesh from June 2023 to May 2025.

Inclusion Criteria:

1. All neonates (aged 0–28 days) admitted to the neonatal unit during the study period.
2. Both inborn and out-born neonates.
3. Neonates admitted with medical or surgical conditions requiring neonatal care.
4. Neonates whose parents or legal guardians provided informed written consent.

Exclusion Criteria:

1. Neonates admitted only for observation and discharged within 24 hours without intervention.
2. Neonates with incomplete medical records.
3. Neonates referred out immediately due to non-availability of essential data.
4. Neonates whose parents or guardians refused consent.

A total of 750 neonates admitted during the study period were included according to the predefined inclusion and exclusion criteria. Upon admission, detailed information regarding socio-demographic characteristics, perinatal history, gestational age, birth weight, mode and place of delivery, age at admission, and primary diagnosis was recorded using a structured data collection form. Clinical evaluation was performed for all admitted neonates, and diagnoses were made based on standard clinical guidelines and relevant laboratory investigations where indicated. Neonatal morbidities such as prematurity, low birth weight, neonatal sepsis, birth asphyxia, respiratory distress syndrome, neonatal jaundice, and congenital anomalies were documented. Patients were followed throughout their hospital stay to assess treatment outcomes, including discharge after improvement, referral to higher centers, discharge against medical advice (DAMA), and in-hospital mortality. Year-wise data were analyzed to observe trends in admission patterns and outcomes over the study period. Written informed consent was obtained from the parents or legal guardians of all enrolled neonates after adequate explanation of the study objectives and procedures. Ethical approval was obtained from the Ethical Review Committee. Confidentiality of patient information was strictly maintained throughout the study.

Statistical Analysis:

All data were recorded systematically in preformed data collection form and quantitative data was

expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. Statistical analysis was carried out by using Statistical analysis was done by using SPSS (Statistical

Package for Social Science) Version 23. Confidentially was strictly maintained.

RESULT

Table 1: Baseline Characteristics of the Study Population (n = 750)

Characteristics	Frequency	Percentage (%)
Age (years)		
<24h	425	56.7%
1–7 d	278	37.1%
>7 d	47	6.2%
Sex		
Male	402	53.6%
Female	348	46.4%
Gestational age		
Preterm (<37 w)	285	38%
Term (37–41 w)	430	57.3%
Post-term (≥42 w)	35	4.7%
Birth weight		
<1500 g (VLBW)	108	14.4%
1500–2499 g (LBW)	267	35.6%
≥2500 g	375	50%
Mode of delivery		
Vaginal	281	37.5%
Cesarean	469	62.5%
Place of birth		
Inborn	518	69%
Out-born	232	31%

Table 1 shows the baseline characteristics of the 750 neonates admitted to the neonatal unit. More than half were admitted within 24 hours of birth (56.7%), and male neonates (53.6%) slightly outnumbered females. Term infants constituted the majority (57.3%), though a considerable proportion were preterm (38.0%). Half of

the neonates had normal birth weight (50.0%), while 35.6% were low birth weight and 14.4% were very low birth weight. Cesarean delivery was the predominant mode of birth (62.5%). Most admissions were inborn (69.0%), with nearly one-third out-born (31.0%).

Table 2: Prevalence of Major Morbidity Patterns (n = 750)

Diagnosis	Frequency	Percentage (%)
Birth asphyxia	198	26.4%
Prematurity/LBW	285	38%
Neonatal sepsis	162	21.6%
Respiratory distress syndrome	75	10%
Neonatal jaundice	22	2.9%
Congenital anomalies	8	1.1%

Table 2 shows that prematurity/low birth weight was the most common morbidity (38.0%), followed by birth asphyxia (26.4%) and neonatal sepsis (21.6%).

Respiratory distress syndrome accounted for 10.0% of cases, while neonatal jaundice (2.9%) and congenital anomalies (1.1%) were less frequent.

Table 3: Trend of Admissions by Year (2019–2024)

Year	Total Admission	Prematurity (%)	Sepsis (%)	Asphyxia (%)	RDS (%)
2019	110	35 (31.8)	23 (20.9)	29 (26.4)	13 (11.8)
2020	125	46 (36.8)	28 (22.4)	32 (25.6)	15 (12.0)
2021	132	50 (37.9)	28 (21.2)	30 (22.7)	14 (10.6)
2022	138	52 (37.7)	32 (23.2)	33 (23.9)	16 (11.6)
2023	140	55 (39.3)	36 (25.7)	29 (20.7)	17 (12.1)
2024	105	47 (44.8)	15 (14.3)	45 (42.9)	-

Table 3 demonstrates a gradual increase in neonatal admissions from 2019 to 2023, followed by a decline in 2024. The proportion of prematurity-related admissions showed a rising trend, increasing from 31.8% in 2019 to 44.8% in 2024. Neonatal sepsis exhibited a generally increasing pattern up to 2023, with a notable

reduction in 2024. Admissions due to birth asphyxia fluctuated over the years but showed a marked rise in 2024 (42.9%). The proportion of respiratory distress syndrome remained relatively stable throughout the study period, ranging from approximately 10% to 12%.

Table 4: Treatment Outcomes of the Study Population (n = 750)

Outcome	Frequency	Percentage (%)
Discharged improved	587	76.3%
Referred out	30	4%
DAMA	36	4.8%
Died	97	12.9%

Table 4 presents the treatment outcomes of the 750 neonates. The majority were discharged after improvement (76.3%). In-hospital mortality was

observed in 12.9% of cases, while 4.8% were discharged against medical advice and 4.0% required referral to higher centers.

Table 5: Outcome Trends Over Time

Year	Discharged (%)	Referred (%)	DAMA (%)	Mortality (%)
2019	83.6	3.6	2.7	10.1
2020	80	4	3.2	12.8
2021	77.3	3.8	4.5	14.5
2022	75.4	4.3	4.3	15.9
2023	78.6	5	4.3	12.1
2024	81.9	5.7	3.8	8.6

Table 5 shows the outcome trends over time. The proportion of neonates discharged after improvement declined from 2019 to 2022, followed by an improvement in 2023 and 2024. Mortality rates increased steadily from 10.1% in 2019 to a peak of

15.9% in 2022, then decreased markedly to 8.6% in 2024. Referral rates showed a gradual rise over the study period, while DAMA rates increased up to 2022 and remained relatively stable thereafter.

Table 6: Case-fatality Rates by Major Diagnosis

Diagnosis	Admission (n)	Deaths (n)	CFR (%)
Prematurity/LBW	285	46	16.1%
Sepsis	162	23	14.2%
Birth asphyxia	198	21	10.6%
RDS	75	7	9.3%
Congenital anomalies	8	-	-

Table 6 indicates that prematurity/low birth weight had the highest case-fatality rate (16.1%), followed by neonatal sepsis (14.2%). Lower fatality rates

were observed for birth asphyxia (10.6%) and RDS (9.3%), with no deaths among congenital anomalies.

Table 7. Length of Stay in Neonatal Unit

Duration (Days)	Frequency	Percentage (%)
Discharged improved	187	24.9%
Referred out	309	41.2%
DAMA	178	23.7%
Died	76	10.1%
Mean ± SD	-	8.9 ± 5.2

Table 7 shows the length of stay of neonates in the neonatal unit. Most neonates stayed for 3–7 days (41.2%), followed by stays of less than 3 days (24.9%) and 8–14 days (23.7%). A smaller proportion (10.1%) required hospitalization for more than 14 days. The mean duration of stay was 8.9 ± 5.2 days.

DISCUSSION

This study describes the prevalence of neonatal morbidities and outcome trends among 750 admissions

to the neonatal unit of Chandpur Medical College (ChMC), demonstrating that neonatal illness and mortality were predominantly associated with prematurity/low birth weight, birth asphyxia, and neonatal sepsis. These findings are consistent with reports from tertiary-level neonatal care facilities in Bangladesh, where these conditions remain the leading causes of neonatal morbidity and mortality. More than half of the neonates in this study were admitted within the first 24 hours of life (56.7%), indicating that early neonatal complications and perinatal events are the main drivers of neonatal admissions at ChMC. Similar early-admission patterns have been reported in other Bangladeshi hospital-based neonatal studies, emphasizing the vulnerability of the immediate postnatal period.[8] The observed male predominance (53.6%) aligns with findings from several neonatal unit studies in Bangladesh and may reflect both biological susceptibility and differential care-seeking behavior. A substantial proportion of admissions involved preterm neonates (38.0%) and low or very low birth weight infants, underscoring the ongoing contribution of prematurity-related complications to tertiary neonatal care in the country.[10] In the present study, prematurity/LBW (38.0%) was the leading morbidity, followed by birth asphyxia (26.4%) and neonatal sepsis (21.6%). In contrast, a tertiary neonatal care unit study from Bangladesh (Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet) reported higher proportions of LBW (44.8%), sepsis (42.6%), and asphyxia (40.6%) among admissions.[11] Differences between studies likely reflect variations in referral pathways (inborn vs outborn mix), diagnostic criteria, and local obstetric/neonatal service capacity. Nonetheless, the consistent dominance of these three conditions across sites reinforces the need for strengthened antenatal risk detection, skilled intrapartum care/resuscitation, early sepsis recognition, and evidence-based care of preterm/LBW infants.[10,11] The study conducted in SNCU, which reported mortality rates of 14% among inborn neonates compared with 25% among outborn neonates.[12] Similar trends were reflected in National Health Mission (NHM) data from 2014–15, which documented an inborn mortality rate of 10% in Uttarakhand, rising to 21% among outborn admissions.[13] Year-wise patterns showed increasing admissions from 2019–2023, followed by a decline in 2024. The proportion of prematurity-related admissions increased over time (31.8% in 2019 to 44.8% in 2024), which may indicate improved survival/referral of preterm infants to tertiary care or increasing obstetric risk burden. Meanwhile, birth asphyxia increased sharply in 2024 (42.9%), a signal that could reflect changes in delivery volume, referral of complicated labors, or short-term service disruptions affecting intrapartum quality. Similar Bangladeshi studies emphasize perinatal asphyxia as a major cause of death, supporting the importance of interpreting asphyxia spikes as a quality-of-care warning indicator.[8] Overall, 76.3% were discharged improved, 12.9% died, and 4.8% were

DAMA. The mortality level is broadly comparable to some Bangladeshi hospital reports (e.g., ~10–11% mortality in one large newborn admission study), though outcomes vary widely by severity, staffing, and resources.[10] Importantly, mortality peaked in 2022 (15.9%) and then declined to 8.6% by 2024, alongside an improvement in discharge rates. This improving trend may reflect gradual strengthening of neonatal care practices, improved clinical decision-making, and better supportive management.[14] DAMA in this study (4.8%) observed in this study was lower than that reported in several Bangladeshi neonatal unit studies, where DAMA remains a significant challenge. This difference may relate to caregiver counseling practices, cost/support structures, perceived prognosis, bed-occupancy pressures, and case-mix. Given the known association between DAMA and adverse outcomes, continued monitoring and targeted counseling remain important even when the measured rate is relatively low.[8] Diagnosis-specific analysis showed that prematurity/low birth weight had the highest case-fatality rate (16.1%), followed by neonatal sepsis (14.2%). According to the WHO fact sheet and findings from a Lancet study by Hug *et al.*, prematurity and related complications account for the largest proportion of neonatal deaths globally (35%), followed by perinatal asphyxia (24%), sepsis (14%), and congenital anomalies (11%).[15] Although birth asphyxia and respiratory distress syndrome demonstrated relatively lower fatality rates, their contribution to neonatal mortality remained clinically important.[8] These observations are in agreement with hospital-based studies from Bangladesh, which consistently report prematurity, sepsis, and asphyxia as the principal causes of neonatal deaths. The increased mortality among preterm and septic neonates underscores the importance of early diagnosis, optimal supportive management, strict infection control practices, and prompt referral to higher-level facilities when advanced care is necessary. A comparable pattern has been documented in our study as well as in reports from geographically similar regions such as Himachal Pradesh and Nepal.[16,17] In contrast, data from high-income countries like the United Kingdom show a markedly higher contribution of congenital anomalies (48.7%) and immaturity-related complications (48.7%) to neonatal mortality.[18] Similar trends have also been reported from better-performing regions, including Mumbai, where Randed *et al.* observed prematurity in 24.95% and respiratory distress syndrome in 26.5% of neonatal deaths.[19] Notably, comparable distributions are evident in some sub-Saharan African countries with low neonatal mortality rates and SNCU mortality, such as Eritrea, where respiratory distress syndrome accounted for 48%, extremely low birth weight for 40.5%, and very low birth weight for 30.5% of neonatal deaths.[20] The mean length of hospital stay (8.9 ± 5.2 days) in this study is comparable to that reported in other tertiary neonatal units in Bangladesh. Length of stay reflects illness severity, survival, referral practices, and discharge policies and should be interpreted alongside

outcome measures rather than in isolation. Overall, the findings from the neonatal unit of Chandpur Medical College reinforce that prematurity/low birth weight, birth asphyxia, and neonatal sepsis remain the principal targets for reducing neonatal morbidity and mortality. The observed improvements in mortality trends in recent years highlight the value of continuous monitoring of admission patterns and outcomes to guide quality improvement initiatives and resource allocation in tertiary neonatal care settings in Bangladesh.

Limitations of the study

This study was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to other regions or levels of healthcare in Bangladesh. Being hospital-based, the study included only admitted neonates and did not capture outcomes of neonates managed at home or in primary facilities, nor were post-discharge outcomes assessed. Some neonates had multiple coexisting conditions, but the analysis was based on primary diagnoses, which may have underestimated the overall disease burden. Additionally, reliance on routine clinical records and potential variations in staffing, resource availability, and referral patterns over the study period may have influenced outcomes; however, these factors were not specifically examined.

CONCLUSION

This study demonstrates that prematurity/low birth weight, birth asphyxia, and neonatal sepsis remain the leading causes of neonatal morbidity and mortality in the neonatal unit of Chandpur Medical College. Although most neonates were discharged after improvement, a considerable proportion experienced adverse outcomes, particularly among preterm and low birth weight infants. The observed improvement in mortality trends in recent years suggests gradual strengthening of neonatal care services; however, fluctuations in morbidity patterns indicate ongoing challenges in perinatal and early neonatal care. Strengthening antenatal risk identification, improving intrapartum care and neonatal resuscitation, early recognition and management of sepsis, and focused care for preterm and low birth weight neonates are essential to further reduce neonatal morbidity and mortality in tertiary care settings in Bangladesh.

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

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