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Clinical profile and admission pattern of neonates in a special newborn care unit of a rural district hospital; a two-year experience from Dhading hospital

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Abstract

Introduction: Neonatal mortality rate (NMR) is 21 per 1000 live births as per the Nepal demographic health survey (NDHS) 2022, with no significant decline in the last decade. Neonatal mortality can be reduced if quality of care can be provided from a special newborn care unit (SNCU) at the periphery. Hence, this study aims to describe the clinical profile, disease patterns, and outcomes of neonates admitted to a level II SNCU in a rural district hospital, providing evidence to strengthen neonatal care services in similar settings.

Method: A retrospective study was conducted at Dhading Hospital for 2 years, from Mangsir 2079 (16th November 2022) to Kartik 2081 (15th November 2024). Data on gender, gestational age, presenting symptoms, final diagnosis, and outcome were collected from hospital records and analyzed in Microsoft Excel 2013.

Result: A total of 704 neonates were studied. Neonatal jaundice 241 (34.23%) was the commonest cause of admission, followed by sepsis 195 (27.70%) and perinatal asphyxia 92 (13.07%). Likewise, 581 (82.53%) were term, 38 (5.40%) were post-term, and 85 (12.07%) were premature. Out of 1450 births during a 2-year period, 23 (1.59%) babies had congenital anomalies. Similarly, 643 (91.33%) babies were discharged from SNCU, whereas 38 (5.40%) were referred to level 3 care, and 8 (1.14%) expired.

Conclusion: Enhancing the level 2 neonatal care unit at a peripheral hospital improves outcomes. Establishment of functional SNCU should be prioritized as a key strategy to reduce neonatal mortality in Nepal.

Keywords: Neonate; NICU; Outcome; Sepsis; SNCU

INTRODUCTION

The neonatal period (0–28 days) is a critical phase of physiological transition during which newborns are highly susceptible to illnesses that contribute significantly to morbidity and mortality.¹ According to the Nepal Demographic and Health Survey (NDHS) 2022, the neonatal mortality rate (NMR) is 21 per 1,000 live births, while the under-five mortality rate (U5MR) stands at 33 per 1,000 live births, with neonatal deaths accounting for nearly two-thirds of all under-five deaths.² The Sustainable Development Goals (SDG) aim to reduce NMR to at least 12 per 1,000 live births by 2030.³ Neonatal sepsis, birth asphyxia, and prematurity are the leading causes of neonatal deaths in Nepal, with approximately 40% occurring within the first day of life.⁴ Ensuring optimal care in this immediate postnatal period is therefore crucial.

Beyond the clinical condition of newborns, outcomes such as recovery and mortality are influenced by the availability of skilled health personnel, specialized equipment, and essential medicines, as well as timely admission and intervention.⁵ Wealth status of family, place, and ecological zone of residence, and ethnicity are directly linked to mortality.⁶ To address this burden, the Government of Nepal introduced the Free Newborn Care (FNC) package in fiscal year 2072/73 (2016 AD), outlining a tiered neonatal care system: Level I newborn care at health posts and primary health care centers, Level II care special newborn care unit (SNCU) at district hospitals, and Level III neonatal intensive care unit (NICU) services in zonal and tertiary hospitals.⁷ SNCU is located near labor rooms and provides comprehensive care for sick neonates except for mechanical ventilation and major surgery. Establishing functional SNCUs is vital for reducing neonatal mortality.³ The revised Every Newborn Action Plan (ENAP) sets the target that by 2025, 80% of districts should have a small and sick newborn care (SSNC) unit capable of providing WHO Level II inpatient services, including continuous positive airway pressure (CPAP) support. WHO-defined Level II care includes thermal care, kangaroo mother care (KMC), assisted feeding and intravenous fluids, safe oxygen therapy, management of neonatal sepsis, phototherapy for jaundice, and identification and management or referral of congenital anomalies.⁸ In Nepal's FNC framework, SSNC corresponds to the SNCU level of care. Despite this, recent national data from 2079/80 shows that only 61 SNCUs exist across district hospitals, with many not functioning optimally.⁹ Evaluating SNCUs' performance with regard to clinical care quality standards, organizational structure is essential to drive continuous improvement and strengthen accountability.¹⁰

Given these gaps, this study aims to describe the clinical profile, disease patterns, and outcomes of neonates admitted to a Level II SNCU in a rural district hospital, providing evidence to strengthen neonatal care services in similar settings.

METHOD

A retrospective study was conducted at Dhading hospital for 2 years, from Mangsir 2079 (16th November 2022) to Kartik 2081 (15th November 2024). It is a 50-bed government provincial hospital located in a rural setting outside the Kathmandu Valley, in Bagmati Province, with a level II SNCU facility. A total of 5 beds were allocated for SNCU. Facilities and services at SNCU were in accordance with the criteria laid down in the free newborn care guideline 2075.7. Accordingly, facilities like warmers, phototherapy, bubble CPAP, and monitors were available.

Retrospective data were obtained from hospital records. Information about the newborn's gender, gestational age, birth weight, initial symptoms at admission, final diagnosis and outcome, including whether the baby was discharged after completion of treatment, discharged upon request (DOPR), left against medical advice (LAMA), referred to a tertiary center with a level 3 care, or expired were retrieved. Data on congenital anomaly was also collected. Diagnosis was mainly based on clinical parameters. However, specific laboratory or radiological findings were considered whenever feasible and available. All babies with clinical or laboratory suspicion of sepsis were labeled as sepsis. Evaluation with complete blood count (CBC), C-reactive protein (CRP), and blood culture was performed for all babies with suspected sepsis. Urine culture, chest radiography, and lumbar puncture for cerebrospinal fluid (CSF) examination were done only when indicated. Diagnosis of congenital heart disease (CHD) was made retrospectively after echocardiography reports were available.

Perinatal asphyxia is defined as the failure to initiate or sustain spontaneous breathing at birth.¹¹ Low birth weight was defined as birth weight less than 2500 grams.¹² Prematurity, as per the WHO definition, was any live-born baby before 37 completed weeks.¹³ Data was entered and analyzed in Microsoft Excel 2013. A percentage was used to show the proportion of a group or a set.

RESULT

A total of 704 babies were admitted during the period. The majority of the babies were admitted in the month of Shrawan in both years: 48 in 2080 and 61 in 2081. The admission trend for the two years is shown in Figure 1.

The average length of hospital stay is 2.93 days. In this cohort, 99 (14.06%) of the total admitted babies were outborn. The majority, 382 (54.26%) of babies were male. Similarly, 532 (75.57%) of the babies were delivered by spontaneous vaginal delivery (SVD), and 172 (24.43%) were delivered via lower segment cesarean section (LSCS). Of the admitted babies, 643 (91.33%) were discharged from SNCU, 38 (5.40%) were referred to level 3 care, 15 (2.13%) were placed on DOPR or LAMA, and 8 (1.14%) expired. Among 8 neonatal deaths, 2 resulted from prematurity with complications, 5 from perinatal asphyxia with hypoxic

ischemic encephalopathy (HIE) sequelae and 1 from gross congenital abnormalities.

Likewise, 581(82.53%) were term, 38(5.40%) were post-term, and 85(12.07%) were premature. Among premature babies, 9 babies were less than 32 weeks of gestation(WOG), 25 babies were between 32-34 WOG, and 51 were between 34+1 and 36⁺⁶ WOG. The lowest gestational age admitted was

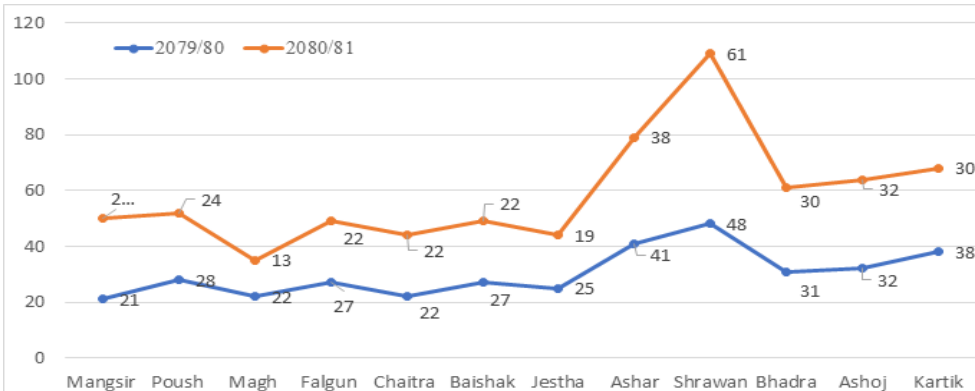


Figure 1. Admission trend in SNCU

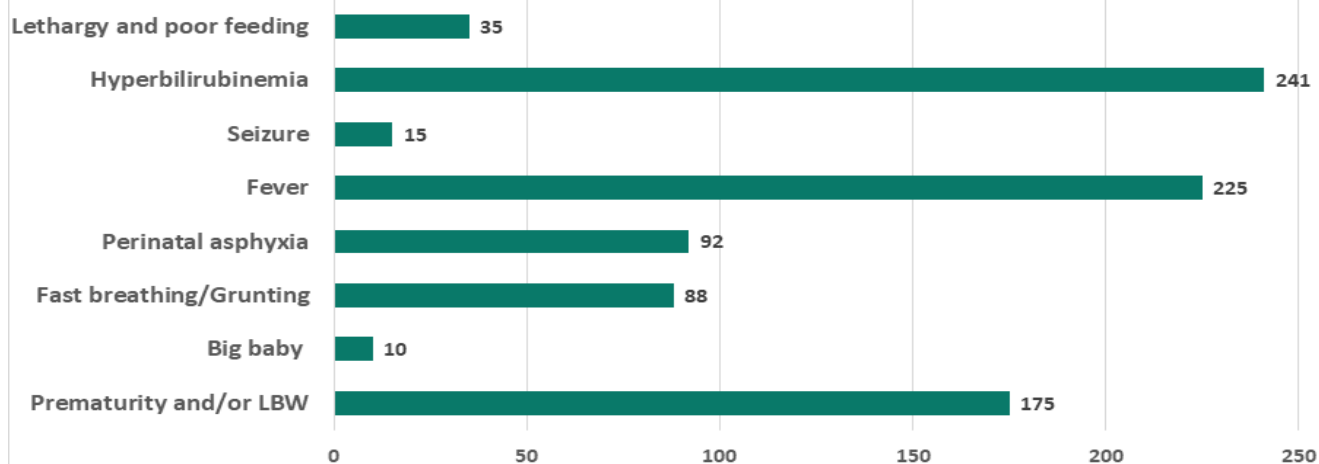


Figure 2. Presenting symptoms to SNCU

Table 1. Diagnosis of babies admitted at SNCU (N=704)

Diagnosis	f (%)
NNJ	241(34.23%)
Sepsis	195(27.70%)
Perinatal asphyxia	92(13.07%)
TTN	68(9.67%)
MAS	28(3.98%)
NEC	17(2.41%)
Hypoglycemia	16(2.27%)
Mild RDS	12(1.70%)
Hypocalcemia	12(1.70%)
Congenital anomaly (Observation)	8(1.14%)
Apnea of prematurity	7(1%)
CHD	7(1%)
CAH	1(0.14%)

27+5 WOG with a birth weight of 800 g. Hyperbilirubinemia (241) was the predominant presenting symptom, followed by fever (225). Some of the babies were admitted for multiple problems. Details are shown in Figure 2.

Neonatal jaundice (NNJ), 241(34.23%), was the commonest diagnosis of the babies admitted, followed by sepsis(195, 27.70%) and perinatal asphyxia, 92(13.07%). Details are shown in Table 1.

During 2-year period, 23 babies were delivered with congenital anomaly out of which 8 babies were admitted at SNCU for observation. Details of the pattern of congenital anomalies is shown in table 2.

Table 2. Patterns of congenital anomaly

Anomalies	Number
Cardiovascular	7
Orofacial	6
Musculoskeletal	5
Genito-urinary	2
Syndromic	2
Gastro-intestinal	1

DISCUSSION

During the study period, 704 neonates were admitted to SNCU. Among the total admitted babies, males were predominant, with a male-to-female ratio of 1.2:1. This finding is similar to that of other studies conducted in various neonatal units.^{14,15} Admission is highest in the month of Shrawan (July/August) in both years (48 in 2080/2023 and 61 in 2081/2024) and lowest in month of Magh (January/February) (13 in 2081/2025) in the second year. This is comparable to the study by Chapagain RH et al., in which the highest admission rate was in Bhadra and the lowest in Poush.¹⁵ A similar trend is also seen in the study by Lee SJ, et al.¹⁶ This trend may be attributable to a higher number of births during that period, which led to increased care requirements and, subsequently, higher SNCU admission rates.

The majority, 643(91.33%) of admitted babies, were discharged after improvement, with 38(5.40%) neonates referred to a tertiary center, accounting for 5.40%. Out of the admitted babies, 643(91.33%) were discharged from SNCU, whereas 38(5.40%) were referred to level 3 care. The majority of babies referred for respiratory distress who were not settled with conventional bubble CPAP, 18(47.37%), perinatal asphyxia with HIE grade 2 and above, 8(21.05%), NNJ in near exchange transfusion range, 6(15.79%), and neonates with suspicion of critical cyanotic congenital heart disease, 3(97.89%). Likewise, 3(7.89%) babies were referred for evaluation of neonatal surgical conditions. In a study by Khot PB et al., prematurity (24%), NNJ(16%), and respiratory distress syndrome (12%) were the most common causes of referral.¹⁷ Only 8 babies (1.14%) of the total admitted babies expired over a 2-year period. The mortality rate is lower than that reported in similar studies in other parts of Nepal.^{14,18,19,20} As the study was carried out in a level 2 facility, babies needing advanced support were referred to NICU, which likely contributed to the lower neonatal mortality compared to findings from other studies done by Paudeal, et al., Shrestha S, et al., Nepal D, et al. and Kanodia P, et al.^{14,18,19,20}

Among neonatal deaths, 5 were referred to Dhading Hospital, indicating a serious condition at arrival. Because most health posts and birthing centres lack healthcare providers trained in neonatal care, including neonatal resuscitation, many newborns who need advanced neonatal care face serious risks. Babies are often referred without maintaining normal body temperature, with no respiratory support, and often with no intravenous access or orogastric tube for feeding, posing risk of hypothermia, hypoglycemia, and hypoxia-related morbidity. National data quantifying deaths that occur specifically during transport in Nepal is lacking. However, a study done by Singh J, et al. from India showed mortality of 30.1% out of 1013 neonates referred from the periphery, where 32.5% were hypothermic.²¹ Similarly, a study done by Deepak Rathod et al. showed that one-fifth of 303 referred newborns died, with 76% hypothermic and 10% hypoglycemic at the time of admission.²² Nepal Government should prioritize safe, timely, and well-equipped transport to reduce avoidable neonatal deaths.

Dhading hospital serves as the referral site for birthing centres, health posts, and primary health centres (PHCs), and accordingly, 99(14.06%) outborn babies were admitted during the two-year period. This underscores the importance of functional level 2 care to reduce neonatal mortality in every district, as mortality due to delays in the delivery of appropriate health care can be averted, along with the safe transport of the neonate to level 3 care when required. Global evidence has also shown that 44% of neonatal deaths can be averted by providing quality small and sick newborn(SSNB) care.²³

In our cohort, 85(12.07%) were premature babies, out of

which 34 babies had gestational age less than 32 weeks of gestation. This finding aligns with various studies conducted across different neonatal units in Nepal.^{14,18-20} Out of 85 preterm babies, only 2 expired due to complications associated with prematurity in our study. Strengthening the SNCU facility can improve neonatal outcomes, especially in a rural setup with limited NICU facilities. We were able to save babies weighing up to 800 g.

Out of 1450 births, 23(1.59%) babies had congenital anomalies. The prevalence in our study is like that reported by Dongol SS, et al., (1.1%) but lower than that reported by Shakya H et al., (3.75%).^{24,25} Cardiovascular anomalies were the most frequently observed defects consistent with patterns described in these studies. Atrial septal defect and cleft palate, each identified in 4 cases, were the most common congenital anomalies in our cohort.

Most babies in our study presented with hyperbilirubinemia (241). Fever (225) and perinatal asphyxia (92) are among the top three presenting symptoms, which were then followed by fast breathing or grunting (88). Presenting symptoms are not mutually exclusive. A study by Paudel PK et al. found that fast breathing was the most common presenting symptom, followed by fever. NNJ (241, 34.23%) was the most common reason for admission in our study, followed by sepsis (195, 27.70%) and perinatal asphyxia (92, 13.07%). NNJ alone contributed to nearly one-third of all admissions. Most studies from Nepal also identify sepsis, NNJ, and perinatal asphyxia as the leading causes of neonatal admission.^{14,15,19,20,26} However, unlike our findings, many of these studies report sepsis as the primary indication of admission.^{18-20,26,27} The difference may be explained by the fact that during the study period, a separate study showing the correlation between timing of delayed cord clamping(1, 2, or 3 minutes) and the development of hyperbilirubinemia was underway, leading to increased SNCU admissions for NNJ. As a result, the incidence of NNJ in our study was higher than that of sepsis. In our study, among the neonates diagnosed with sepsis, 2 were managed as meningitis following lumbar puncture, 9 had culture-positive urinary tract infection (UTI), all with E. Coli isolates, and 8 were managed as pneumonia. Only 1 baby had culture-proven sepsis with coagulase-negative Staphylococcus isolated from blood. The remaining babies were managed as suspected sepsis.

To our knowledge, this likely represents the only published study from a level 2 SNCU facility in Nepal. The findings provide evidence to support the establishment of functional SNCU care, ensuring that newborns receive prompt, quality care at peripheral facilities, which can play a crucial role in reducing neonatal mortality. However, this is a single hospital-based study, and the findings have limited generalizability. Moreover, outcomes of babies who received LAMA/DOPR were not followed, which represents

another limitation of our study.

CONCLUSION

Level 2 SNCU plays a critical role in improving neonatal outcomes in rural, resource-limited settings. In our study, NNJ, sepsis, and perinatal asphyxia were the leading causes of admission, with most neonates improving under SNCU care. Strengthening level 2 newborn care units at peripheral hospitals significantly improves neonatal outcomes. Prompt care and functional referral can reduce neonatal mortality. Further multicenter studies are needed to validate these findings and guide national policy.

DECLARATIONS

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Conflict of interest

None

Funding

None

Ethical Clearance

Study conducted after approval from Dhading Hospital.

Consent for the Study

Not applicable.

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