



Original Research Article

Clinical profile of newborns admitted in Special Newborn Care Unit of a tertiary teaching hospital of Arunachal Pradesh: A Retrospective Cross Sectional Study

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Abstract

Introduction: *The neonatal period presents the greatest daily risk of death compared to any other stage of childhood.*

Objective: *To study the clinical profile of neonates admitted in Special Newborn Care Unit (SNCU) in a tertiary teaching hospital of a tribal area.*

Materials and Methods: *A retrospective case record analysis of all admissions between January 2017 to December 2022 was done based on medical record data. The neonates with complete record were included in the study.*

Results: *Total of 1476 newborns were admitted from the year 2017 to 2022 in SNCU of TRIHMS, out of which, 860 (58.3%) patients were male and 612 (41.5%) were females. 84.4% admissions were inborn and 15.6% were outborn patients. Major causes of admission were neonatal jaundice (22.4%) followed by prematurity (15.4%), neonatal sepsis (15.1%) and birth asphyxia (11.4%). The outcome rates for survival, referral, deaths and LAMA were 79.3%, 9.7%, 5.8% and 5.1% respectively. The leading causes of mortality were birth asphyxia (22.3%), prematurity (21.2%) and sepsis (11.8%).*

Conclusion: *In our SNCU, common causes of deaths are birth asphyxia, prematurity, sepsis respiratory distress syndrome and congenital heart disease. Enhancing antenatal care, improving access to healthcare facilities, ensuring timely referral of high risk cases, building capacity and providing intensive interventional management can significantly reduce neonatal mortality and its associated complications. Surveillance and training interventions for managing these causes should be established and reinforced.*

Keywords: *Neonates, morbidity, mortality, preterm, sepsis.*

Introduction

The neonatal period is a critical and vulnerable time, often marked by issues that are, in many cases, preventable. Children who die in the neonatal period suffer from conditions and diseases associated with lack of quality care at or immediately after birth and in the first few days of life.

According to National Family Health Survey-5 (NFHS-5) data, neonatal mortality rate (NMR) is 24.9 per 1000 live birth in India and 7.7 per live birth in Arunachal Pradesh^[1]. The leading causes which contribute to neonatal mortality in developing countries are birth asphyxia, prematurity, low birth weight and sepsis^[2].

Establishment of Special Newborn Care Units (SNCUs) plays a critical role in reducing the neonatal morbidity and mortality. SNCU is a neonatal unit in the vicinity of labour room which is to provide special care (all care except assisted ventilation and major surgery) for sick newborns. Our SNCU in TRIHMS was established in 2017 which started with 2 beds and gradually progressed to have bed strength of 12 with 6 beds in step down area (rooming in facility), equipped with radiant warmers, facility for phototherapy, surfactant administration but no ventilation care available.

Overall clinical profile of neonates differs in different SNCU. There is a lack of information of neonatal morbidity and mortality profile from Arunachal Pradesh. Outcomes of this study can be used for improving the existing healthcare services to reduce neonatal mortality. The objective of our study was to determine the clinical profile of neonates admitted in SNCU of a tertiary teaching hospital in a tribal area.

Methodology

The study was a retrospective cross sectional study based in SNCU of TRIHMS, Arunachal Pradesh. Ethical clearance from ethics committee of the institute was obtained (IEC/2023/008). Data was collected for the years 2017-2022 from files retrieved through Medical Record Department.

All newborns admitted SNCU from 2017-2022 were included and any newborn with incomplete data during this period were excluded. Inborn neonates included neonates delivered in TRIHMS while out born neonates included neonates delivered in other institutes.

Data was analysed according to age, gender, gestation (term/preterm/extreme preterm), birth weight {normal, low birth weight (LBW), very low birth weight (VLBW), extreme low birth weight (ELBW)}, causes of admission, outcomes {survived/ death/ referral/ leave against medical advice (LAMA)} and duration of hospital stay. The standard case definitions of National Neonatology Forum were used. Confidentiality of data at all levels was strictly maintained.

Statistical Analysis

All data were recorded in MS Excel and was analyzed using arithmetic mean and also expressed in percentages.

Results

There were a total of 1476 patients admitted from the year 2017 to 2022 in SNCU of TRIHMS with average duration of stay of 5.62 days. Out of which, 860 (58.3%) patients were male and 612 (41.5%) were females. Male to female ratio was 1.4:1. There were 4(0.2%) patients admitted with ambiguous genitalia.

Table 1: Admission profile based on gender, birth weight and gestation of neonates

CATEGORIES	Inborn(n=1246) n (%)	Outborn(n=230)n (%)	Total (n=1476) n (%)
GENDER			
Male	724 (49%)	136 (9.2%)	860(58.3%)
Female	520 (35.2%)	92 (6.2%)	612(41.5%)
Ambiguous	2 (0.01%)	2 (0.01%)	4(0.2%)
BIRTH WEIGHT (KG)			
>2.5	804	119	923 (62.5%)
1.5-2.499	362	78	440 (29.8%)
1-1.499	68	27	95 (6.5%)
<1	12	6	18 (1.2%)
GESTATION (WEEKS)			
>37	881	144	1025 (69.4%)
34-37	354	80	434 (29.4%)
<34	11	6	17 (1.2%)

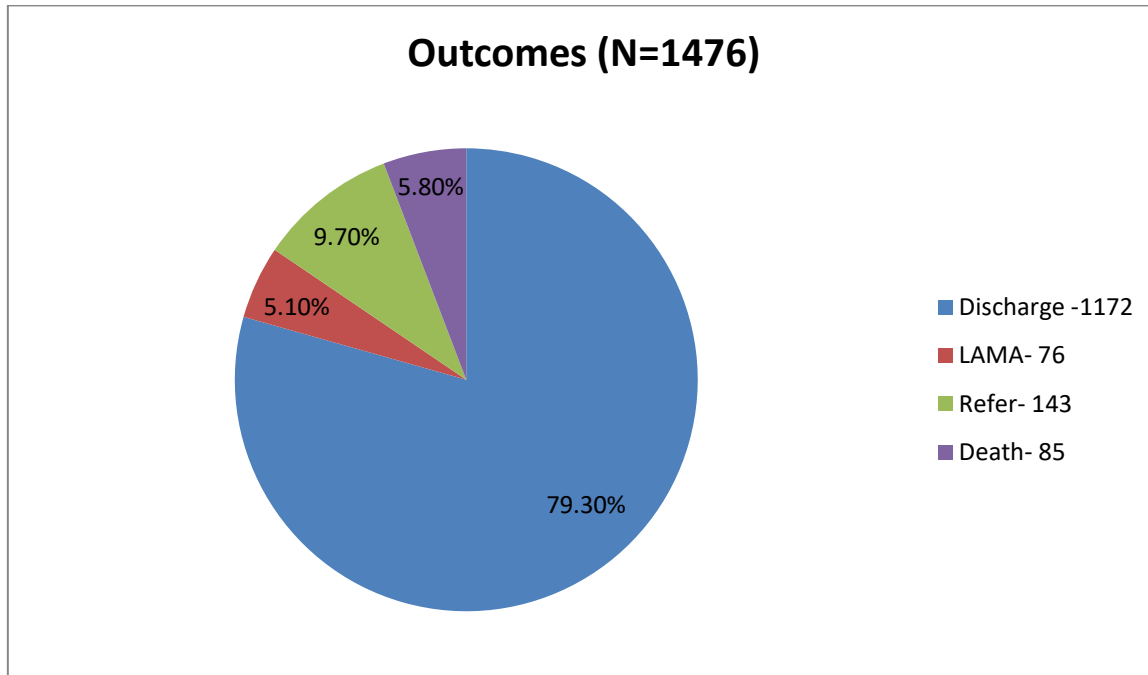
According to gestational maturity, newborns were divided into three groups of which 1025(69.4%) were term (>37 weeks), 434 (29.4%) were preterm (34-37 weeks) and 17 (1.2%) were extremely preterm.923 (62.5%) neonates had birth weight

>2.5kg, 440(29.8%) of neonates belonged to LBW category (1.5-2.499kg), 95 (6.5%) of neonates belonged to very LBW group (1-1.499kg) and 18 (1.2%) were of extremely LBW category (table 1).

Table 2: Morbidity Profile

DIAGNOSIS	Inborn(n=1246) n (%)	Outborn(n=230) n (%)	TOTAL (n= 1476) n (%)
Respiratory distress syndrome	44	9	53 (3.6%)
Transient tachypnea of newborn	55	8	63 (4.3%)
Meconium aspiration syndrome	63	4	67 (4.5%)
Pneumonia	46	13	59 (4)
Birth asphyxia	159	9	168 (11.4)
Neonatal sepsis	176	47	223 (15.1)
Congenital heart disease	37	7	44 (3)
Neonatal jaundice	277	53	330 (22.4)
Neonatal hypoglycemia	57	5	62 (4.2)
Gross congenital anomaly	36	9	45 (3.04)
Neonatal seizures	18	4	22 (1.5)
Prematurity	193	35	228 (15.4)
Neural tube defect	9	5	14 (0.9)
Tracheoesophageal fistula	2	3	5 (0.3)
Intrauterine growth restriction	6	0	6 (0.4)
Hypothermia	12	4	16 (1.1)
Surgical	20	10	30 (2)
Low birth weight	25	3	28 (1.9)
Hemolytic disease of newborn	3	1	4 (0.3)
Acute renal failure	1	0	1 (0.1)
Environmental hyperthermia	7	1	8 (0.5)

Fig 1: Outcomes (N= 1476)



During the study period, 79.3% neonates were successfully discharged, 9.7% neonates were referred to higher centres, 5.8% neonates expired

and 5.1% neonates went LAMA (table 3). Our SNCU survival rate was 94.2% (table 4).

Table 3: Mortality profile based on gender, birth weight and gestation of neonates

CATEGORIES	Survival (n=1391, 94.2%) n (%)	Mortality (n=85, 5.8%) n (%)	Total (n=1476) n (%)
Gender			
Male	810 (58.2%)	50 (58.8%)	860(58.3%)
Female	578 (41.6%)	34 (40%)	612(41.5%)
Ambiguous	3 (0.02%)	1 (1.2%)	4(0.2%)
Birth weight (kg)			
>2.5	890 (63.9%)	33 (38.8%)	923 (62.5%)
1.5-2.499	415 (29.8%)	25 (29.4%)	440 (29.8%)
1-1.499	78 (5.6%)	17 (20%)	95 (6.5%)
<1	8 (0.7%)	10 (11.8%)	18 (1.2%)
Gestation (weeks)			
>37	986 (70.9%)	39 (45.9%)	1025 (69.4%)
34-37	397 (28.5%)	37 (43.5%)	434 (29.4%)
<34	8 (0.6%)	9 (10.6%)	17 (1.2%)
Admission type			
Inborn	1181(94.7%)	65 (5.3%)	1246(84.4%)
Outborn	210 (91.3%)	20 (8.7%)	230 (15.6%)

Out of the 85 expired neonates (table 3), mortality was higher in preterm than in term neonates (54.1% vs 45.9%).

Table 4: Disease specific mortality

DISEASE	Survival (n=1391, 94.2%) n (%)	Mortality (n=85, 5.8%) n (%)	Total (n=1476) n (%)
Respiratory distress syndrome	45	8 (9.4%)	53 (3.6%)
Transient tachypnea of newborn	62	1 (1.2%)	63 (4.3%)
Meconium aspiration syndrome	63	4 (4.7%)	67 (4.5%)
Pneumonia	55	4 (4.7%)	59 (4%)
Birth asphyxia	149	19 (22.3%)	168 (11.4)
Neonatal sepsis	213	10 (11.8%)	223 (15.1%)
Congenital heart disease	36	8 (9.4%)	44 (3%)
Neonatal jaundice	329	1 (1.2%)	330 (22.4)
Neonatal hypoglycemia	60	2 (2.4%)	62 (4.2%)
Gross congenital anomaly	39	6 (7%)	45 (3.04%)
Prematurity	210	18 (21.2%)	228 (15.4)
Neural tube defect	12	2 (2.4%)	14 (0.9%)
Surgical	28	2 (2.4%)	30 (2%)

Table 5: Mortality profile of surgical cases

Surgical Cases	Survival (n=28, 93.3%) n (%)	Mortality (n=2, 6.7%) n (%)
Subacute intestinal obstruction	5 (17.8%)	-
Atresia	6 (21.4%)	-
Hirschsprung disease	4 (14.3%)	-
Congenital Diaphragmatic hernia	-	2 (100%)
Hypertrophic pyloric stenosis	2 (7.1%)	-
Gastric Outlet obstruction	3 (10.7%)	-
Anorectal malformation	6 (21.4%)	-
Hydroureteronephrosis	1 (3.5%)	-
Omphalocele	1 (3.5%)	-

Table 6: Mortality based on age at admission and duration of SNCU stay

Parameter	Total (n=1476) n (%)	Survival (n=1391, 94.2%) n (%)	Mortality (n=85, 5.8%) n (%)
Age at admission (days)			
0-7	1244 (84.3%)	1168 (84%)	76 (89.4%)
>7	232 (15.7%)	223 (16%)	9 (10.6%)
Duration (days)			
≤ 1	193 (13.1%)	163 (11.7%)	30 (35.3%)
2-3	557 (37.7%)	518 (37.2%)	39 (41.1%)
4-7	436 (29.5%)	431 (30.9%)	5 (5.9%)
>7	290 (9.6%)	279 (20.2%)	11 (17.7%)

Table 7: Admission and discharge trend over the years

Year	Total Admissions	Discharge	LAMA	Referred	Death
2017	89	64	10	8	7
2018	121	94	4	15	8
2019	139	87	4	39	9
2020	171	127	15	20	9
2021	350	294	15	20	21
2022	606	506	28	41	31

Discussion

This study was conducted to outline the patterns of morbidity, outcomes and causes leading to mortality of neonates admitted in SNCU of a tertiary teaching hospital. Data from this study can be useful for health care providers and policy makers to improve the existing healthcare services to reduce neonatal mortality and this is probably the first study of its kind from Arunachal Pradesh. During the study period, admission rate increased over the years from 89 admissions in 2017 to 606 in 2021. In our study 84.4% babies were inborn and 15.6% were outborn which is similar to studies of Mendu *et al* (82.76% vs 17.24%), Randad *et al* (76.46% vs 23.54%) and Kumar *et al* (60.8% vs 39.2%)^[3-6]. This probably reflects the ease of access to hospital for inborn babies. 58.3% neonates were male and 41.5% were females which is similar to studies by Kumar R *et al*^[5]. Gender bias as a cause for higher number of male admissions needs to be further evaluated. We also had 0.2% patients admitted with ambiguous genitalia.

Among the total newborns admitted, 69.4% newborns were term and 30.6% were preterm which is comparable to the studies by Kumar R *et al* and Modi R *et al*^[5,6]. According to the United Nation Children's Fund, "The state of the World's Children" report, 28% of neonates were LBW in India^[7]. Similarly, in our study, 29.8% of neonates belonged to LBW category, 6.5% of neonates belonged to very LBW group and 1.2% were of extreme LBW. This could be due to poor maternal health, low socioeconomic status and poor health seeking behaviour. In other studies, LBW admissions were 35.8% in Mendu *et al*^[3], 46.53% in Anupama *et al*^[8] and 51.47% in Sharma *et al*^[9] which are higher than our study.

The most common causes of admission were neonatal jaundice (22.4%). This is similar to studies by Kumar *et al*, Prasad *et al*, Kotwal *et al* and Saini *et al*^[5, 10-12]. Other causes of morbidity included prematurity (15.4%), neonatal sepsis (15.1%) and birth asphyxia (11.4%). The

commonest causes of neonatal morbidity in this study are in concordance to various studies^[13-14].

The overall mortality was 5.8% of total enrolled cases which was similar to study conducted by Sridhar *et al* (7.16%)^[15]. Whereas, the mortality rate is high in studies of Kumar *et al* (8.15%)^[5], Sharma *et al* (25.45%)^[9], Anupama *et al* (12.37%)^[8], Prasanna *et al* (10.1%)^[16] and Mundlodet *et al* (13.7%)^[17]. Birth asphyxia was the major cause of mortality which was 22.3% followed by prematurity (21.2%), sepsis (11.8%), respiratory distress syndrome (9.4%) and congenital heart disease (9.4%). This was similar to the studies by national neonatology perinatal database (NNPD)^[18], Prasanna *et al*^[16], Mundlodet *et al*^[17] and Rahman *et al*^[19].

According to the Million Death Survey (MDS) report prematurity is the most important cause of neonatal deaths, accounting for 40% of neonatal mortality in India^[20]. Comparing the mortality according to gestation in our study, overall mortality in preterm were more than term neonates (54.1% vs 45.9%). A premature newborn is more likely to develop hypothermia, difficulty in feeding, apnea and more susceptible to infections. Further, 89.4% neonates expired in early neonatal period (within first 7 days of life) compared to 10.6% neonates in late neonatal period.

Out of the total admitted 79.3% neonates were successfully discharged and 9.7% neonates were referred to higher centres. Our SNCU survival rate is 94.2%. This maybe because critically ill newborns were referred due to non availability of neonatal intensive care and super speciality facility.

The main limitation of our study is that this study was conducted in a tertiary care centre so the data does not reflect the actual scenario of the community. Also the outcome of newborns that left against medical advice and referred outside is not known which could have modified the results. Multicentre prospective studies in the state will provide a better idea.

Conclusion

The present study shows that neonatal jaundice, prematurity, neonatal sepsis and birth asphyxia are leading causes of morbidities in newborn babies. Common causes of neonatal mortality were birth asphyxia, prematurity, sepsis and respiratory distress syndrome. In spite of many advances in neonatal care, the abovementioned factors still continue to be the leading causes of mortality in neonates. The majority of the morbidities and subsequent mortalities can be prevented by improving antenatal care, early referral, timely intervention and neonatal care facilities. We hope the outcome of our study aids in improving the healthcare services and overall neonatal outcome.

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Conflict of Interest: None declared

References

1. International Institute for Population Sciences (IIPS) and ICF 2020. National Family Health Survey (NFHS-5), State and District factsheets.
2. UNICEF 2009. Toolkit for setting up special care newborn units, stabilisation units and newborn care corners.
3. Mendu SB, Kota V, Neela AR, Bukkapatnam SB. Morbidity and mortality profile of neonates admitted in special newborn care unit in tertiary care centre in rural area of Telangana state, India. *Int J Scientific Study*. Nov 2021; 9 (8)
4. Randad K, Choudhary D, Garg A, Jethaliya R. Pattern of neonatal morbidity and mortality: A retrospective study in a special newborn care unit, Mumbai. *Indian J Child Health* 2020; 7: 299-303
5. Kumar R, Mundhra R, Jain A, Jain S. Morbidity and mortality profile of neonates admitted in special newborn care unit of a teaching hospital in Uttarakhand, India. *Int J Res Med Sci*. 2019 Jan; 7 (1): 241-246.
6. Modi R, Modi B, Patel JK, Punitha KM. Study of the morbidity and the mortality pattern in the neonatal intensive care unit at a tertiary care teaching hospital in Gandhinagar district, Gujarat. *India J Res Med Den Sci*. 2015; 3 (3): 208-12.
7. UNICEF Nov 2009. The state of the world's children.
8. Anupama D, Bidyut BN, Anjana TN. Morbidity and mortality profile of newborns admitted to the neonatal intensive care unit of a tertiary care teaching hospital of Assam. *J Med Sci Clin Res* 2020; 8 : 697-702.
9. Sharma AK, Gaur a. Profile of neonatal mortality in special newborn care unit of tertiary care hospital. *Int J Contempediatr* 2019; 6: 4205.
10. Prasad V, Singh N. Causes of morbidity and mortality in neonates admitted in Government medical college, Haldwani in Kumaon Region (Uttarakhand) India. *JPBS*. 2011; 8(8):1-4.
11. Kotwal YS, Yatoo GH, Ahmed Jan FA. Morbidity and mortality among neonates admitted to a neonatal intensive care unit of a tertiary care teaching hospital of Jammu and Kashmir, India. *NeonatPediatr Med*. 2011; 3: 136
12. Saini N, Chhabra S, Chhabra S, Garg L, Garg N. Pattern of neonatal morbidity and mortality: a prospective study in a district hospital in urban India. *J Clin Neonatol*. 2016 Jul 1; 5(3): 183-8.
13. Patil R, Koppad R, Shreesail B. Clinical profile and outcome of babies admitted to Neonatal Intensive Care Unit, Mc Gann Teaching Hospital, Shivamogga, Karnataka: a longitudinal study. *Sch J App Med Sci*. 2014; 2 (6G): 3357-60.
14. Manikyamba D, Madhavi N, Prasad AK, Padmavathi IV, Anitha D. Morbidity and mortality profile of LBW babies and their growth and neurodevelopmental outcome

- at 1 year- NICU, Government General Hospital, Kakinada. Sch J App Med Sci. 2015 July; 3 (4B): 1721-5.
15. Sridhar PV, Thammanna PS, Sandeep M. Morbidity pattern and hospital outcome of neonates admitted in a tertiary care teaching hospital, Mandya. Int J Scientific Study. Sep 2015; 3 (6)
 16. Prasanna CL, suneetha B, Prabhu GR, Prakash PS. Morbidity and mortality pattern among babies admitted in special newborn care unit, Nellore, Andhra Pradesh, India. Int J ContempPediatr 2019; 6: 1898-903.
 17. Mundlod S, Thakkarwad S. Mortality profile and outcome analysis in level two SNCU in tribal medical college district Adilabad Telangana. IP Int J med Paediatr Oncol 2019; 5: 125-8.
 18. Morbidity and mortality among outborn neonates at 10 tertiary care institutions in India during the year 2000. J Trop Pediatr 2004 Jun; 50(3):170-4. PMID:15233194
 19. Rahman M, Bezboruah G, Bhoktiari M. Morbidity and mortality profile of neonates admitted in special newborn care unit in a tertiary care hospital: A retrospective study. J Clin of Diagn Res. 2023 Apr; 17 (4): SC01- SC04.
 20. Bassani DG, Kumar R, Awasthi S, Morris SK, Wager JFS. Causes of neonatal and child mortality in India: A nationally representative mortality survey. NIH Public AccessBone 2011; 23: 1-7.