

Original Research Article

CLINICAL PROFILE AND OUTCOME OF NEONATES ADMITTED IN SPECIAL NEWBORN CARE UNIT OF A TERTIARY CARE HOSPITAL IN A HILLY DISTRICT OF ASSAM: A RETROSPECTIVE STUDY

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ABSTRACT

Background: The neonatal period comprising just the first 28 days of life, carries the highest mortality risk during childhood. Despite being less than 2% of the under-5 childhood, the newborn period accounts for over half of U-5 child mortality. Children who die within the first 28 days of birth suffer from conditions and diseases associated with lack of quality care at or immediately after birth and in the first few days of life. Therefore, optimum care improves children's survival and lays the foundation for optimal long-term physical and neurocognitive development. **Aim:** To study the clinical profile and outcome of neonates admitted in Special Newborn Care Unit (SNCU) in a tertiary care hospital in a hilly district of Assam.

Materials and Methods: This hospital-based retrospective study was carried out in SNCU, Department of Paediatrics, Diphu Medical College and Hospital (DMCH), Diphu, Assam, India. The study period was from 1st January 2023 to 31st December 2025. A total of 5909 neonates (both inborn and outborn) from birth to 28 days of life admitted in SNCU during the study period were included in the study. Clinical profile and outcome data of admitted neonates were collected from the monthly reporting format and patient records and compiled in MS Excel sheet and analysed using arithmetic mean and also expressed in percentages.

Results: During the study period, 5909 neonates were admitted in SNCU, of which, inborn were 4907 (83%) and outborn were 1002 (17%). Male and female in the study population were 3290 (55.7%) and 2619 (44.3%) respectively. Term and Preterm (PT) babies were 4432 (75%) and 1477 (25%). Normal birth weight and Low Birth Weight (LBW) babies were 4371(74%) vs 1538(26%). Neonatal jaundice, birth asphyxia, meconium aspiration syndrome (MAS), neonatal sepsis were common morbidities requiring admission. Mortality was 3.38% which was higher in outborn (9.98%) than inborn (2.04%). Birth asphyxia (48%) was the most common cause of mortality followed by Respiratory Distress Syndrome (RDS) with prematurity (32%) and neonatal sepsis (16.5%). Birth asphyxia was higher in outborn (50%) than inborn (46%). Neonatal sepsis was higher in outborn (19%) than inborn (14%). Highest number of death occurred within seven days of birth (74%) and among LBW babies (54%).

Conclusion: Birth asphyxia, RDS with prematurity and neonatal sepsis are common causes of neonatal mortality. Outcomes of this study can be used for improving the existing healthcare services to reduce neonatal mortality and thereby we can reduce U-5 child mortality significantly.

Keywords: Inborn, Outborn, Birth asphyxia, Neonatal jaundice, Low birth weight, Preterm.

INTRODUCTION

Newborn infants are unique in their physiology and health problems. The neonatal period is characterized by the transition to extrauterine life and rapid growth and development. Comprising just the first 28 days of life, this period carries the highest mortality risk during childhood. Despite being less than 2% of the under-5 childhood, the newborn period accounts for over half of U-5 child mortality.^[1] The current neonatal mortality rate (NMR) in India is 20 per thousand live births (SRS 2020).^[1] Globally, 130 million babies are born every year and of these, four millions die during the newborn period, i.e., first four weeks of life. Most neonatal deaths occur in first week of life (75%) and almost 25% during first 24 hours.^[2] The risk of mortality during neonatal period is 30-fold higher than during post neonatal period. Every year about 26 million babies (20% of global births) are born in India and almost 0.75 million die during neonatal period, which accounts for 30% global deaths.^[2] According to National Family Health Survey-5 (NFHS-5) data, neonatal mortality rate is 24.9 per 1000 live birth in India and 22.5 per 1000 live births in Assam.^[3]

Children who die within first 28 days of birth suffer from conditions and diseases associated with lack of quality of care at or immediately after birth and in the first few days of life.^[4] The knowledge of clinical profile and outcome of neonates helps in developing and strengthening the existing health policies for reducing neonatal mortality. The clinical profile and outcome of neonates differ in different SNCU. At present there is no data on clinical profile and outcome of neonates admitted in SNCU in hilly tribal areas of Assam. The department of Paediatrics, Diphu Medical College and Hospital is a tertiary care teaching hospital in a hilly area where patients from all over the neighbouring hilly areas are being referred and cared. Therefore, this study is undertaken to know the clinical profiles and the outcome of the neonates admitted in Special Newborn Care Unit (SNCU) of Diphu Medical College and Hospital, Diphu with the objective of detailed analysis of reason for admission and outcome of admitted neonates which is essential for planning and improvement of existing perinatal and neonatal services to reduce neonatal mortality.

MATERIALS AND METHODS

This retrospective hospital-based study was carried out in SNCU, Department of Paediatrics, Diphu Medical College and Hospital (DMCH), Diphu, Assam, India. Clinical profile and outcome data were collected from 1st January 2023 to 31st December 2025 and the analysis of data was done from May 2026 to June 2026. Ethical clearance was obtained from Institutional Ethics Committee (IEC) (No. DMCH/EC/2022/105/127 dated 22nd April 2026, DMCH, Diphu.

Inclusion Criteria: A total of 5909 neonates (both inborn and outborn) from birth to 28 days of life admitted in SNCU during the study period were included in the study.

Exclusion Criteria: Still-births neonates were not admitted in SNCU were excluded from the study.

The data was analysed according to age, gestation (term, preterm), gender, normal birth weight, Low Birth Weight (LBW), Very Low Birth Weight (VLBW), Extremely Low Birth Weight (ELBW), causes of admissions and deaths. Inborn neonates means admitted neonates are delivered in DMCH, Diphu and outborn neonates means admitted neonates are delivered outside DMCH and referred to DMCH, Diphu.

Statistical Analysis

Data was collected from the monthly reporting format and patient records and compiled in MS Excel. Data was analysed using arithmetic mean and also expressed in percentages. Percentage is used to compare one quantity against another.

RESULTS

During the study period, a total 5909 neonates were admitted in SNCU, inborn were 4907 (83%) and outborn were 1002 (17%). The ratio of neonates of inborn and outborn was 4.9:1. The overall male and female were 3290(55.7%) and 2619(44.3%) and ratio was 1.3:1. The male and female of inborn were 2721 (55.5%) and 2186 (45.5%) and ratio was 1.2:1. The male and female of outborn were 569 (56.8%) and 433 (43.2%) and ratio was 1.3:1. Results showed higher male admission in both the units. [Table 1]

Table 1: Admission Profile based on gender, gestation and birth weight

Categories	Inborn (N=4907) (%)	Outborn (N=1002) (%)	Total(N=5909) N (%)
Gender			
Male	2721(55.5)	569(56.8)	3290(55.7)
Female	2186(45.5)	433(43.2)	2619(44.3)
Gestation(weeks)			
>37	3789(77.2)	643(64.2)	4432(75)
34-37	578(11.8)	126(12.6)	704(11.9)
<34	540(11)	233(23.2)	773(13.1)
Birth weight(gm)			
>2500	3765(76.7)	606(60.5)	4371(74)
1500-2499	1051(21.4)	298(29.7)	1349(22.8)

1000-1499	72(1.5)	79(7.9)	151(2.6)
<1000	19(0.4)	19(1.9)	38(0.6)

As per gestation, overall, 4432(75%) were term babies [Table-1] and 1477 (25%) were PT babies [Table-2]. In inborn and outborn unit, preterm (PT)

babies were 1118 (22.8%) and 359(35.8%) respectively [Table-2]. So, more percentage of PT babies were admitted in outborn than in inborn unit.

Table 2: Admission profile based on preterm neonates

SNCU	Gestation (34-37 weeks) N(%)	Gestation (<34 weeks) N(%)	Total Preterm (PT) Neonates N(%)
Inborn	578(11.8)	540(11)	1118(22.8)
Outborn	126(12.6)	233(23)	359(35.8)
Total	704(11.9)	773(13.1)	1477(25)

In the inborn unit, 3765 (76.7%) were normal birth weight [Table-1] while 1142 (23.3%) were LBW [Table-3]. In the outborn unit, 606 (60.5%) were normal birth weight [Table-1] while 396 (39.5%)

were LBW [Table-3]. As per birth weight criteria overall 4371 (74%) were normal birth weight and 1538 (26%) were LBW [Table-3].

Table 3: Admission profile based on low birth weight neonates

SNCU	Birth weight(gm) (1500-2499) N(%)	Birth weight(gm) (1000-1499) N(%)	Birth weight(gm) (<1000) N(%)	Low birth weight (LBW) neonate N(%)
Inborn	1051(21.4)	72(1.5)	19(0.4)	1142(23.3)
Outborn	298(29.7)	79(7.9)	19(1.9)	396(39.5)
Total	1349(22.8)	151(2.6)	38(0.6)	1538(26)

In the inborn unit neonatal jaundice 2572 (52.4%) was the most common cause of admission followed by birth asphyxia 553 (11.3%) and meconium aspiration syndrome (MAS) 270(5.5%). In outborn unit, neonatal jaundice 303 (30.2%) was the most common cause of admission followed by birth asphyxia 198 (19.8%) and neonatal sepsis 69(6.9%).

Overall neonatal jaundice 2875 (48.6%), birth asphyxia 751 (12.7%), meconium aspiration syndrome (MAS) 283(4.8%) and neonatal sepsis 239(4%). The percentage of newborn babies suffering from birth asphyxia, neonatal sepsis, major congenital malformation and RDS was more in outborn babies. [Table 4]

Table 4: Morbidity profile of admitted neonates

Disease	Inborn (N=4907)(%)	Outborn (N=1002)(%)	Total (N=5909)(%)
Respiratory Distress syndrome (RDS)	51(1.0)	15(1.5)	66(1.3)
Meconium aspiration syndrome (MAS)	270(5.5)	13(1.3)	283(4.8)
Other causes of respiratory distress	190(3.9)	16(1.6)	206(3.5)
Birth Asphyxia	553(11.3)	198(19.8)	751(12.7)
Sepsis	170(3.5)	69(6.9)	239(4)
Major Congenital Malformation	46(0.9)	26(2.6)	72(1.2)
Jaundice	2572(52.4)	303(30.2)	2,875(48.6)
Hypothermia	2(0.04)	2(0.2)	4(0.06)
Hypoglycemia	13(0.3)	3(0.3)	16(0.3)
Others	1040(21.2)	357(35.6)	1,397(23.6)

In inborn unit 4649(94.7%) patients were discharged successfully while 94 (1.9%) patients left the SNCU against medical advice. In outborn unit 816 (81.4%)

patients were discharged successfully while 41 (4.1%) patients Left Against Medical Advice (LAMA). Overall, LAMA was 135(2.3%). [Table 5]

Table 5: Outcome of admitted neonates

Outcome	Inborn (N=4907)(%)	Outborn (N=1002)(%)	Total (N=5909)(%)
Discharged	4649(94.7)	816(81.4)	5,465(92.5)
Referral	64(1.3)	45(4.5)	109(1.8)
Left Against Medical Advice (LAMA)	94(1.9)	41(4.1)	135(2.3)
Died	100(2.04)	100(9.98)	200(3.38)

Mortality rate was overall 200 out of 5909 (3.38%) whereas in inborn unit it was 100 out of 4907 (2.04%) and outborn 100 out of 1002 (9.98%) [Table-5]. Among the total 200 deaths, overall 125

(62.5%) were male and 75 (37.5%) were female. In inborn unit 59 (59%) were males and 41 (41%) were females whereas in outborn unit 66 (66%) were males and 34 (34%) were females. [Table 6]

Table 6: Mortality profile based on gender, gestation and birth weight

Categories	Inborn (N=100)(%)	Outborn (N=100)(%)	Total (N=200)(%)
Gender			
Male	59(59)	66(66)	125(62.5)
Female	41(41)	34(34)	75(37.5)
Gestation(weeks)			
Term	54(54)	66(66)	120(60)
Preterm	46(46)	34(34)	80(40)
Birth weight(gm)			
>2500	38(38)	54(54)	92(46)
1500-2499	35(35)	22(22)	57(28.5)
1000-1499	12(12)	15(15)	27(13.5)
<1000	15(12)	9(9)	24(12)

In inborn deaths male:female ratio was 1.4:1 whereas in outborn deaths male: female ratio was 1.9:1 and overall deaths male:female ratio was 1.7:1. So, in both the units male mortality was higher than female. Overall term babies were 120(60%) and PT babies were 80(40%) [Table-6]. Among the death, 92 (46%) were normal birth weight babies and 54% were LBW babies.

Neonatal age at death shows that only 11 (11%) of inborn and 8 (8%) of outborn deaths occurs within

first 24 hours of life while majority of deaths occurred between 1-7 days of life, 72(72%) vs 57(57%) in inborn and outborn unit respectively [Table-7]. Overall death in first 7 days of birth was 74%. Study of duration between admission and death shows that most of deaths occurred between 1-3 days of admission, inborn 58 (58%) and outborn 55 (55%). [Table 7]

Table 7: Mortality profile based on age of neonates at the time of death and duration between admission and death

Categories	Inborn (N=100)(%)	Outborn (N=100)(%)	Total (N=200)(%)
Age of neonates at the time of death			
<1 day	11(11)	8(8)	19(9.5)
1-7days	72(72)	57(57)	129(64.5)
>7 days	17(17)	35(35)	52(26)
Duration between admission and death.			
<1 day	11(11)	18(18)	29(14.5)
1-3 days	58(58)	55(55)	113(56.5)
4-7 days	19(19)	14(14)	33(16.5)
>7days	12(12)	13(13)	25(12.5)

Birth asphyxia was the major cause of mortality which was 96 (48%) (inborn 46% and outborn 50%). It was followed by RDS with prematurity 64 (32%) (Inborn 37%, outborn 27%), Sepsis 33

(16.5%) (inborn 14%, outborn 19%), major congenital malformation 6 (3%) (inborn 2%, outborn 4%) and MAS 1(0.5%) (inborn 1%, outborn 0%) [Table-8], respectively.

Table 8: Disease specific mortality

Disease	Inborn (N=100)(%)	Outborn (N=100)(%)	Total (N=200) N(%)
RDS with prematurity	37(37)	27(27)	64(32)
MAS	1(1)	0(0)	1(0.5)
Birth Asphyxia	46(46)	50(50)	96(48)
Sepsis	14(14)	19(19)	33(16.5)
Major congenital anomaly	2(2)	4(4)	6(3)

Proportionate mortality according to the birth weight was that with decreasing birth weight mortality increases significantly. Overall proportionate mortality of normal weight baby was

2.1% which increases with decreasing weight as in 1500-2499 gm babies 4.2%, 1000-1499 gm babies 17.9% and <1000 gm babies 63.2%. [Table 9]

Table 9: Proportionate mortality

Birth weight(gm)	Inborn	Outborn	Total
>2500	38/3765(1)	54/606(8.9)	92/4371(2.1)
1500-2499	35/1051(3.3)	22/298(7.4)	57/1349(4.2)
1000-1499	12/72(1.7)	15/79(19)	27/15(17.9)
<1000	15/19(78.9)	9/19(47.4)	24/38(63.2)

DISCUSSION

Neonatal jaundice, birth asphyxia, meconium aspiration syndrome and neonatal sepsis are common morbidities requiring admission [Table-4]. Birth asphyxia, Respiratory Distress Syndrome (RDS) with prematurity and neonatal sepsis are common causes of neonatal mortality [Table-8].

During the study period, 5909 neonates were admitted in SNCU, inborn 4907 (83%) and outborn 1002 (17%). Similar findings were reported by other studies done by Kumar R et al., in Uttarakhand, India showed (inborn 60.8%, outborn 39.2%).^[5] Rahman K and Begum R at Tezpur, Assam, India showed (inborn 64.7%, outborn 35.2%), Randad K et al., in Mumbai, India showed (inborn 76.46%, outborn 23.54%), Mendu SB et al., in rural area of Telangana state, India showed (inborn 82.76%, outborn 17.24%), Anupama D et al., at Silchar, Assam showed (inborn 60.5%, outborn 39.5%) and Prasanna CL et al., at Andhra Pradesh showed (inborn 58.5%, outborn 41.5%).^[5-10]

There was male preponderance with 55.7% were male babies and 44.3% were female babies. Similar findings were reported from the studies done by Kumar R et al., in Uttarakhand, India (59.54% vs 40.46%), Rahman K and Begum R at Tezpur, Assam (58.7% vs 41.2%), Anupama D et al., at Silchar, Assam (58.53% vs 41.38%), Sharma AK and Gaur A at Gwalior, Madhya Pradesh (63.07% vs 36.92%), Som M et al., at in Odisha (60.2% vs 39.8%) and Modi R et al., in Gujarat, India (56.36% vs 43.63%).^[5,6,9,11,12,13] Higher number of male admissions needs to be further evaluated.

In the present study overall 75% babies were term and 25% were PT which was comparable to the study done by Modi R et al., in Gujarat, India showed (54.3% vs 45.7%).^[13] In the present study, overall admission of LBW babies were 26%. In other studies, the LBW admissions were Rahman K and Begum R at Tezpur, Assam showed 49.8%, Anupama D et al., at Silchar, Assam showed 47.7%, Sharma AK and Gaur A at Gwalior, Madhya Pradesh showed 61.5% and Rakholia R et al., in Uttarakhand, India showed (61.6%) which was higher than the present study.^[6,9,11,14]

Neonatal Jaundice was found to be the most common cause of admission in 52.4% neonates. Similar studies were done by Kotwal YS et al., in Jammu and Kashmir, India showed neonatal jaundice 26.7%.^[15] Rahman K and Begum R at Tezpur, Assam showed neonatal jaundice 19.9% and Anupama D et al., at Silchar Assam showed neonatal jaundice 19.04%, respectively which was lower than the present study.^[6,9] Significantly higher number of jaundice babies were admitted in inborn unit (52.4% vs 30.2%). This is because the jaundice babies were diagnosed early during regular postnatal round. In the present study the overall incidence of birth asphyxia was 12.7%. The study conducted by Rahman K and Begum R at Tezpur, Assam showed

28.7%, and Anupama D et al., at Silchar, Assam showed 11.65%.^[6,9] The incidence of births asphyxia was higher in outborn babies compared to inborn babies (outborn 19.8%, inborn 11.3%). This findings was similar with studies conducted by Rahman K and Begum R at Tezpur, Assam showed (outborn 31.2%, inborn 27.3%) and Anupama D et al., at Silchar, Assam showed (outborn 13.06%, inborn 10.73%).^[6,9] It may be due to delayed referrals of high risk mothers, lack of access to health facilities, inadequate antenatal check up and lack of effective neonatal care at or after birth. The overall incidence of neonatal sepsis was 4%. Other studies done by Rahman K and Begum R at Tezpur, Assam showed 10.8%, and Anupama D et al., at Silchar, Assam showed 21.61%,^[6,9] which was higher than the present study. The overall incidence of LAMA was 2.3% , the studies done by Rahman K and Begum R at Tezpur, Assam showed 8.1%, and Anupama D et al., at Silchar, Assam showed 4.17%.^[6,9] which was higher than the present study.

Overall mortality rate was 3.38%, the similar studies done by Rahman K and Begum R at Tezpur, Assam showed (11.4%) and Anupama D et al., in Silchar, Assam showed (12.37%).^[6,9] The mortality data shows higher mortality in outborn (9.98%) compared to inborn (2.04%). Studies done by Rahman K and Begum R at Tezpur, Assam showed higher outborn mortality (outborn 14.3%, inborn 9.9%), and Anupama D et al., at Silchar, Assam showed higher outborn mortality (outborn 18.01%, inborn 8.69%).^[6,9] The higher outborn mortality may be due to inadequate functioning of peripheral neonatal facilities like Newborn Stabilisation Unit, delayed referral, lack of pre-transport stabilization. Gender specific mortality shows that male:female death was 62.5% vs 37.5%. The study done by Rahman K and Begum R at Tezpur, Assam showed the similar trend of male:female deaths was 58.7% vs 41.2%.^[6] Term babies were more than PT (60% vs 40%), which was similar to study done by Kumar R et al., in Uttarakhand, India (59.6% vs 40.3%) and Rahman K and Begum R at Tezpur, Assam (56.7% vs 43.2%).^[5,6] A total of 74% deaths occurred within the first seven days of life. This was inconcordance with the study done by Rahman K and Begum R at Tezpur, Assam showed 88.5%, and Anupama D et al., at Silchar, Assam showed 87.6%.^[6,9] Majority of death in early neonatal period emphasises on the importance of care during early neonatal period.

On analysis of the major causes of neonatal death in SNCU it was observed that birth asphyxia contributed overall 48% (inborn 46% and outborn 50% deaths in SNCU. Birth asphyxia was the leading cause of death in other studies done by Rahman K and Begum R at Tezpur, Assam showed overall 53.9% (inborn 57.8% and outborn 48.9%), Anupama D et al., at Silchar, Assam showed overall 50.48% (inborn 57.74% and outborn 45.11%).^[6,9]

Overall death due to RDS with prematurity was 32% which was similar to the study done by Kumar R et al., in Uttarakhand, India showed 17.5% and

Rahman K and Begum R at Tezpur, Assam showed 23.2%.^[5,6] Overall death due to sepsis was 16.5%. Similar findings were reported by Rahman K and Begum R, at Tezpur, Assam showed 12.4%.^[6] Anupama D et al., at Silchar, Assam showed 34.15%,^[9] which was higher than the present study. Outborn unit shows high mortality due to sepsis than inborn unit (19% vs 14%). This was similar to the study done by Kumar R et al., in Uttarakhand, India showed (outborn 29.17%, inborn 24.62%), Rahman K and Begum R at Tezpur, Assam showed (outborn 18.5%, inborn 7.7%), Anupama D et al., at Silchar, Assam showed (outborn 33.17%, inborn 18.76%).^[5,6,9] High incidence of death due to sepsis in outborn may be due to unhygienic delivery practices in the periphery. Death due to sepsis can be reduced by timely intervention. Proportionate mortality reveals that lower the birth weight higher the probability of death (>2500 gm: 2.1%, 1500-2499 gm: 4.2%, 1000-1499 gm: 17.9%, <1000 gm: 63.2%). Similar trend was also shown by Rahman K and Begum R at Tezpur, Assam (>2500 gm: 9.4%, 1500-2499 gm: 10.2%, 1000 gm-1499 gm: 22.1%, <1000 gm: 56.9%).^[6] Outcomes of this study can be used for improving the existing healthcare services to reduce neonatal mortality.

CONCLUSION

The present study shows that neonatal jaundice, birth asphyxia, meconium aspiration syndrome and neonatal sepsis are common morbidities requiring admission. Birth asphyxia is the most common cause of mortality followed by RDS with prematurity and neonatal sepsis. Improvement of maternal health, proper antenatal, natal and postnatal care and timely intervention by referral to tertiary care hospital will help to improve neonatal outcome. Regular training of doctors, nurses, improvement of infrastructure and adequate manpower is important to improve neonatal outcome.

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