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Original Research Article

Patterns of neonatal admissions and mortality among neonates admitted to special neonatal care units: a two-year cross-sectional study at selected special neonatal care units in Odisha, India

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ABSTRACT

Background: Odisha has built 44 special newborn care units to treat severely sick infants at various levels. This study aimed to determine morbidity and mortality profiles among neonates admitted to the SNCUs and extend efforts to improve outcomes by investigating crucial variables.
Methods: We conducted a cross-sectional descriptive study on all neonates admitted to SNCUs of 4 districts (Balangir, Kalahandi, Koraput, and Rayagada) between two calendar years (January 2020 and December 2021). We collected data on epidemiology, clinical presentation, and neonatal and maternal characteristics. We used Microsoft Excel to analyze categorical and continuous variables, with the Chi^2 test for proportion comparison.
Results: 17615 neonates were admitted in 2020-2021, 58% below one day and 59% male. ST babies were predominant. Outborn unit had 52% admissions, with 67% full-term and 31% pre-term. 74% of outborns used government vehicles for transportation. Most diagnoses were birth asphyxia, HIE, neonatal jaundice, low birth weight, and neonatal sepsis. The study found that 43% of neonates died from hypoxic ischaemic encephalopathy /perinatal asphyxia, 22% from Sepsis, 12% from extremely low birth weight babies, and 9% from prematurity. The Chi^2 test showed a statistically significant difference in survival rates between doctors and dai, with a 91% survival rate and a 71% survival rate.
Conclusions: Birth asphyxia was found to be the most essential cause of morbidity and mortality. Regular training at district levels is crucial for ensuring proper newborn care, including warmth, feeding, cleanliness, and prevention of asphyxia, to reduce preterm birth and low birth weight.

Keywords: SNCU, Neonates, Low birth weight, Birth asphyxia

INTRODUCTION

With 2.3 million babies expected to die in the first month of life in 2022, this is the time when children are most at risk of not surviving. Among the most critical times of life, the newborn period (the first 28 days of life) accounts for nearly half (47%) of all deaths among children under the age of five in 2022. As such, enhanced quality intrapartum and neonatal care is necessary.[1] Since 1990, there has been a significant global improvement in child survival. Neonatal fatalities decreased from 5 million in 1990 to 2.4 million in 2020 worldwide. Nonetheless, compared to post-neonatal under-5 mortality, the drop in neonatal death has been slower between 1990 and 2020. Approximately one million infants died in the first 24 hours of life in 2019, making up 75% of all neonatal deaths that occur during the first week of life. The majority of newborn deaths in 2019 were caused by preterm birth, infections, birth abnormalities, and difficulties connected to labor (such as

birth asphyxia or lack of breathing at birth). [2] The neonatal period is one of the most critical and sensitive human life cycles. The majority of newborn fatalities take place in developing countries. To meet the 2030 target of a single-digit newborn mortality rate (NMR) in India, under the National health mission, the facility based neonatal care (FBNC) and home-based neonatal care (HBNC) program for newborns was launched in 2011 to complete the continuum of care from facility to community.[3] Facility-based newborn care and home-based neonatal care are the two main components of NMR reduction. FBNC deals with prenatal care, caring for sick babies, and tending to small and ill infants. The Infant mortality rate of Odisha is higher than the Indian average. Odisha has one of the highest infant mortality rates in India. Odisha's IMR is 36, compared to 28 for India, as per SRS 2022. To treat severely ill infants at various medical college hospitals, district hospitals, and sub-divisional hospitals, the Odisha state has built 44 special newborn care units (SNCUs). The SNCU is a neonatal unit located close to the labor room, which performs 3000 deliveries annually, that provides sick babies with specialist treatment except for significant surgery and assisted ventilation.[3]

Aim and objectives

This study aimed to determine the neonatal morbidity and mortality profile among infants admitted to the study SNCUs and extend efforts to improve outcomes by investigating crucial variables and providing pertinent data on demographics, clinical characteristics, and related outcomes.

METHODS

A cross-sectional descriptive study conducted at Special New-born Care Units (SNCUs) of 4 districts (Balangir, Kalahandi, Koraput, and Rayagada). The data was collected for two calendar years (January 2020 and December 2021).

Total 17615 neonates were admitted during the 2 calendar years 2020-2021. We took all 17615 admitted neonates in our study. Hence, exclusion criteria for the study participants are not needed in our study. All neonates admitted to the 4 SNCUs. A total of 17615 neonates were admitted during 2020-2021. We took all 17615 admitted neonates in our study. We collected data on epidemiology, clinical presentation, neonatal characteristics, and maternal characteristics, such as age, gender, weight at admission, place of delivery, reason for admission (diagnosis), length of hospital or clinic stay, and baby outcome.

Data source

The desired data were collected from the Monthly Progress Report and the 'SNCU Online Portal,' which records real-time data on admission, discharge and follow-up of admitted sick neonates of the SNCU.

Statistical analysis

Data was entered and compiled using Microsoft Excel. Frequencies and percentages are used to characterize categorical variables. The interquartile range and median describe continuous variables. Time distribution was plotted in an epi-curve. The Chi-square test was utilized to compare the proportions. Statistical significance was accepted at a 5% probability level, with a p value of less than 0.05. We used the IMRAD format to report this study.

RESULTS

Table 1 shows the profile of admitted neonates in 4 SNCUs in Odisha. A total of 17615 neonates were admitted during 2020-2021. 58% (N=10161) of babies were below one day; Males were 59% (N=10397). In the Caste category, ST (Schedule Tribe) babies were predominant (N=6101, 35%). Inborn units have 8496 (48%) admissions, and Outborn units have 9119 (52%) admissions, 11754 (67%) neonates were full term (37-42 weeks), and 5448 (31%) neonates were pre-term babies (<37 weeks). Most neonates (64%, N=11339) stayed in the SNCU for 0-4 days (Duration of Stay). The median duration of stay of all neonates was 3 days.

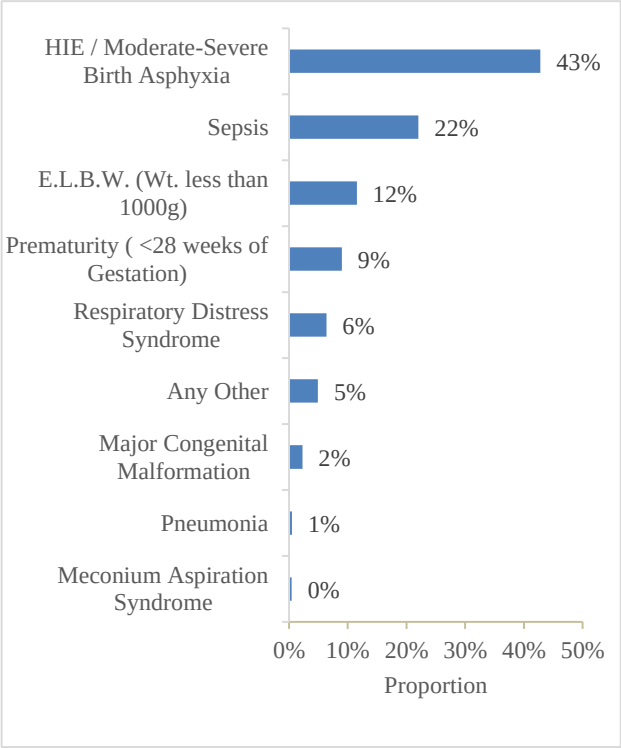

Figure 1: Causes of death (n=2145).

The interquartile range of duration of stay was 2-6 days. Out of 9119 outborn, 74%, i.e., 6706 sick neonates,

availed government vehicles for transportation to the SNCUs.

Table 1: Neonatal characteristics (n=17615).

Characteristics	N	%
Age (days)		
<1	10161	58
1 to 3	4459	25
4 to 7	1426	8
>7	1569	9
Gender		
Male	10397	59
Female	7201	41
Agender	17	0
Caste category		
ST	6101	35
SC	4063	23
OBC	5903	34
General	1536	9
Not available/Didn't Answer	12	0
Delivery location		
In born	8496	48
Total out born	9119	52
Outborn (health facility referred)	7984	88
Outborn (community referred)	1135	12
Maturity		
Full-term (37-42 weeks)	11754	67
Pre-term (<37 weeks)	5448	31
Post-term (≥42 weeks)	413	2
Birth weight (grams)		
Normal (≥2500)	6832	39
Low birth weight (1500-2499)	8173	46
Very low birth weight (1000-1499)	2144	12
Extremely low birth weight (<1000)	466	3
Mode of transport from other facilities		
Govt. vehicle	6706	74
Self-arranged	2413	26
Duration of stay (days)		
0-4	11339	64
5-9	4912	28
10-14	886	5
>15	478	3
Final diagnosis		
Birth asphyxia	3768	21
Others	3113	18
HIE of newborn	2517	14
Neonatal jaundice	2182	12
Low birth weight (1000 gm - 2499 gm)	2171	12
Neonatal sepsis	2093	12
Prematurity (28-<37 weeks)	1753	10
Place of delivery		
Government institute	14529	82
Private Institute	922	5
Other districts	1183	7
Home delivery	771	4
On the way to the hospital	210	1

Most of the neonates' final diagnosis was birth asphyxia (3768 neonates, 21%), followed by HIE of newborns (N=2517, 14%) and neonatal jaundice (N=2182, 12%), low birth weight (N=2171, 12%), neonatal sepsis (N=2093, 12%).

Table 2: Mortality profile (n=2145).

Characteristics	N	%
Age (days)		
<1	1483	69
>7	116	5
1 to 3	483	23
4 to 7	63	3
Gender		
Male	1259	58.7
Female	881	41
Agender	5	0.3
Type of admission		
In born	885	41
Out born (Health facility referred)	1079	50
Outborn (community referred)	181	8
Birth weight (grams)		
≥2500	501	23
<1000	311	14
1000-1499	498	23
1500-2499	835	39
Maturity		
Full-term (37-42 weeks)	501	23
Post-term (≥42 weeks)	311	14
Pre-term (<37 weeks)	498	23
Duration of stay (days)		
>15	48	2
0-4	1873	87
10-14	46	2
5-9	178	8

The outcome of the admitted Neonates, 2020-2021

Out of the 17615 neonates admitted, 12571 (or 71% of the total) were well enough to be discharged after treatment, 2034 (or 12% of the total) were sent to higher-level hospitals for better care, 2145 (or 12% of the total) were pronounced dead, and 865 (or 5% of the total) were left against medical advice (LAMA). Figure 1 shows the causes of death (n=2145). Maximum neonates (N= 918, 43%) died of hypoxic ischaemic encephalopathy (HIE) and perinatal asphyxia, followed by sepsis, 22% (N=473); extremely low birth weight Babies (ELBWs) (N=248, 12%) and 193 neonates (9%) died due to prematurity (<28 weeks of Gestation).

Figure 2 predicts that babies born with extremely low birth weight (999 gm or less) were more susceptible to mortality (85%), extreme immaturity (<28 weeks) (83%), respiratory distress syndrome (8%), congenital malformation (24%), birth asphyxia (22%), neonatal sepsis (19%), prematurity (28-37 weeks), 18%, acquired pneumonia (14%) and hie of newborn (11%). Table 2

connotes the mortality profile of admitted neonates at the 4 SNCUs of Odisha. Out of 17615 admitted neonates, a total of 2145 fatalities occurred. 1483 (69%) babies were below one day. Male deaths were 59%.

Table 3: Maternal characteristics (n=17615).

Delivery attended	Total	Survived N (%)	Expired N (%)	Chi-squared test
ANM	147	118 (80)	29 (20)	0.026
Dai	21	15 (71)	6 (29)	
Doctor	7883	7193 (91)	690 (9)	
Nurse	8887	7569 (85)	1318 (15)	
Other	181	153 (85)	28 (15)	
Relative	496	422 (85)	74 (15)	

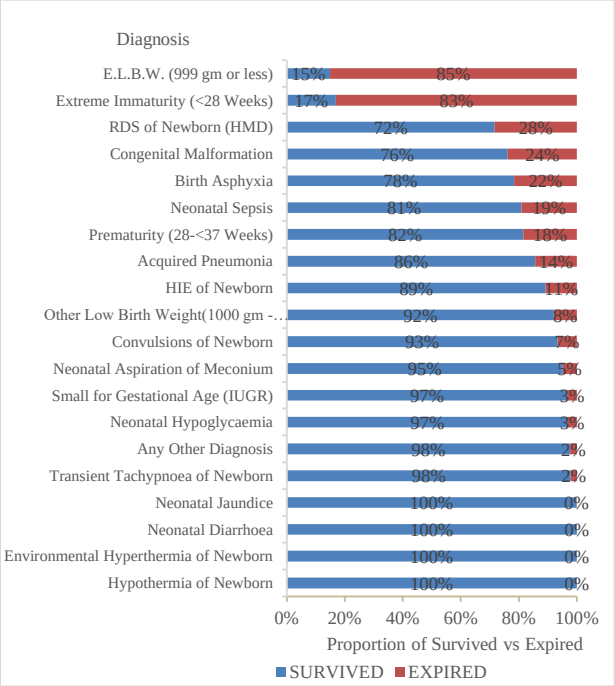

Figure 2: Neonatal mortality among all admitted neonates (n=17615).

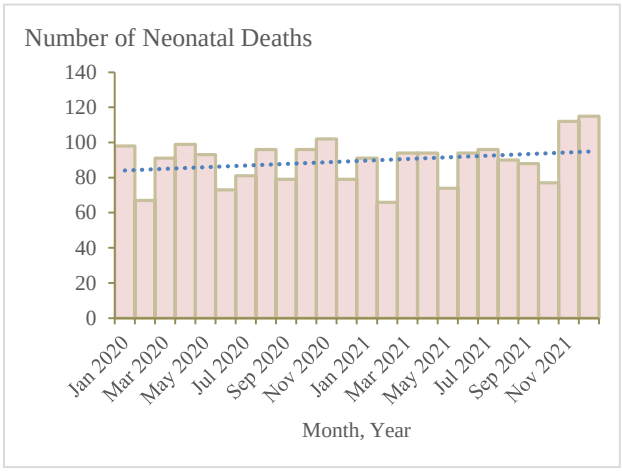

Figure 3: Mortality pattern, month wise, January 2020 to December 2021 (n=2145).

The outborn unit has 24383 (59%) deaths. Among them, health facilities referred deaths were 50%m (N=1079). Out of all deaths, Low Birth Weight babies were 77%. Preterm deaths were 51% (N=1089). 87% (N=18730 of deaths occurred with 0-4 days of duration of stay. Figure 3 depicts the month-wise mortality pattern of neonates admitted to the 4 SNCUs from January 2020 to December 2021. In January 2020, there were 98 neonatal deaths and in December 2021, 120 neonatal deaths occurred. Table 3 shows that, in delivery attended by the Doctor, the survival rate is 91% (n=7193), and the rate is 9% (N=690). Compared to Dai, the expiration rate was 29%, and the survival rate was 71%. The Chi-squared test gives us statistically significant results.

DISCUSSION

Precise information regarding newborns' morbidity and mortality profile is crucial for healthcare administrators and providers to make informed decisions, plan interventions for prevention and treatment, and oversee the implementation and assessment of healthcare initiatives. In all, 17,615 neonates were covered by our study. Of these, about 12% died, and approximately 71% of the patients were discharged. The results of our investigation were consistent with research conducted in central India by Soni et al and Nepal by Paudell et al of babies, around half were inborn.[2,3] Soni et al conducted a similar study in the Raigarh district of Chhattisgarh, finding that over 50% (57.7%) of the population had inborn admissions.[4] Caregivers tend to pay him extra attention to male neonates. The fact that over 50% of the study cohort was male further demonstrated this in our investigation. Many regions of the world exhibit male predominance; a cross-sectional study carried out in Northern Ethiopia confirms this, with the majority of participants being male.[5] Most newborns admitted in our study were younger than 12 hours, whereas, in comparable studies conducted in Yemen's Western Asia region and Ghana's Western region, most neonates were younger than 24 hours and younger than 72 hours, respectively.[6,7] Furthermore, our analysis revealed that the age of the admitted newborns was an independent predictor of mortality. Over 40% of the baby's weight falls between 1.5 and 2.499 kg, consistent with findings

from a related study in the NICU in Kathmandu, Nepal.[8] According to our study, 30% (N=5448) of infants were premature. Studies carried out nationwide by Chintha et al Mahajan et al and Sachan et al revealed that around one-third of all hospitalized babies were premature.[9-11] Prematurity is the leading cause of newborn deaths, responsible for 40% of neonatal deaths in India, according to the most recent million death survey (MDS) data.[12] Nonetheless, premature birth accounts for 51% of all deaths in our study. Premature babies are more prone to die from neonatal sepsis, apnea, hypothermia, trouble feeding, and potentially fatal infections, including pneumonia. Birth Asphyxia, HIE, Neonatal Jaundice, Low birth weight, Sepsis, and Prematurity in Newborns were the most common causes of morbidity, similar to the studies in Nigeria, India, and Tanzania.[12-14] The most prevalent conditions among neonatal deaths were birth asphyxia, hypoxic ischaemic encephalopathy, sepsis, and low birth weight; these results are consistent with research conducted in Kumasi, Ghana, Cameroun, and Nigeria.[15-17]

Limitations

Limitations were; this study pertains to the study period of January 2020 to December 2021. Hence, the study results could not be compared to the pre-and post-COVID periods. This study does not examine maternal diseases' role in newborns' outcomes.

CONCLUSION

According to this study, birth asphyxia, hypoxic ischaemic encephalopathy, Neonatal Jaundice, LBW, Sepsis, and Prematurity are the leading causes of morbidity. Prenatal care and implementing proper measures can reduce the incidence of both preterm birth and low birth weight. Appropriate and regular training sessions must be held at all district levels to ensure proper essential newborn care by imparting adequate knowledge of maintaining warmth, feeding, cleanliness, and preventing asphyxia.

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

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