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Morbidity and Mortality Profile of Neonates Admitted in Special Newborn Care Unit of a Tertiary Medical Centre in India: A 5 years Retrospective Analysis

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Abstract

Background: India still has a long way to go in decreasing the infant mortality ratesand catch up with the target of India Newborn Action Plan of reducing the neonatal mortality rate(NMR) to a single digit by 2030. **Objective**: Newborns admitted to the special newborn care unit (SNCU) ofthe tertiary care facility were analyzed for their morbidity and mortality profiles as well as the factors affecting them. **Methods**: Data from the SNCU recordsof January 1, 2018, to December 31, 2022 was used in this record-based retrospective study. Data of the babies who got care at SNCU were taken and analyzed barring those who were referred or left against medical advice. The Chi-Square test was used to determine the relationship between mortality and various factor withstatistical significance taken as a P-value of <0.05. **Results**: Data from 35,995 newborns were analyzed. Of those, 3393 neonates succumbed while 32,602 were successfully discharged. Jaundice in newborns, sepsis and perinatal asphyxia were the main reasons for hospitalization. Sepsis, followed by preterm and birth asphyxia, was the main cause of death. The maturity status, birth weight, type of admission, age of admission, and length of stay were all found to be strongly related to the neonatal mortality. **Conclusion**: The study places a strong emphasis on monitoring and managing risk variables such maturity status, birth weight, and age of admission, with an emphasis on early management of preterm deliveries and low birth weightin order to lower infant mortality.

Keywords: morbidity, mortality, neonates, profile, retrospective, special newborn care unit.

Introduction

The decision-making process for designing interventions for prevention and treatment as well as the implementation and evaluation of healthcare programs depend on the availability of accurate data on the morbidity and mortality profile of

newborns. Despite being so brief, the neonatal and perinatal periods are the most crucial times in the life of an individual.[1] It reflects the socio-biological characteristics of the highest at-risk members of the society—mothers and infants— as well as their overall health.[2] About 4 million of the 130 million newborns born every year die during the neonatal period.[3] India is home to almost 1/4th of all newborn deaths worldwide.[4] The 2016 Sample Registration System (SRS) data report states that India now has a newborn death rate of 24 that ranges from 14 in urban regions to 27 in rural areas.[5] Neonatal mortality varies significantly amongst Indian states, from 47 in Madhya Pradesh to 8 in Goa.[6]

West Bengal has a neonatal mortality rate of 15.5 per 1000 live births, which is higher than the rates in Arunachal Pradesh, Goa, and Kerala but lower than the national average (24.9 per 1000 live births). This indicates that the healthcare needs further improvement, especially to increase the survival of babies with low birth weight(LBWs) and very low birth weight(VLBWs).[6]According to a study in the Lancet, the leading direct causes of neonatal deaths were preterm birth (27%), infection (26%), asphyxia (23%), congenital anomalies (7%), other conditions (7%), tetanus (7%), and diarrhea (3%).[7]The majority of these deaths could have beenprevented by better prenatal and postpartum care. This study was conducted to identify the major contributing factors to morbidity and mortality of neonates admitted to the SNCU, as well as the burden of preventable or modifiable causes. Thefindings will aid in developing measures to lower neonatal mortality.

Materials and Methods

Study area: Special newborn care unit (SNCU) of a tertiary teaching hospital in West Bengal, India.

Study design: a record-based retrospective study.

Study period: 1stJanuary, 2018 to 31st December, 2022.

Ethical clearance: Ethical clearance (Memo no. BSMC/IEC/3174, dated July 31, 2023) was obtained from the Institutional Ethics Committee before the initiation of thestudy.

Study subjects:
Inclusion criteria: All neonates <=28 days admitted to the SNCU during the study period. Exclusion criteria: Babies >28 days of life, discharged against medical advice or referred to a higher center.
A predesigned proforma was created, and relevant data such as age at admission, gender, body weight, place of delivery, reason for admission, age at the time of

death, outcomes, cause of death, and duration of stay in the hospital were gathered after extracting the same from the computer and logbook maintained in the SNCU.

Samplesize: 35995 (thirty-five thousand nine hundred and ninety-five) calculated by complete enumeration method.

Statistical analysis: EpiInfo version 3.5.1 software was used to do the statistical analysis. Continuous variables were expressed in terms of mean and standard deviation, and categorical variables were expressed as rate and ratio. The association between categorical variables was done by the chi-square test. A P-value <0.05 was set as statistically significant. The categorization of the babies based on gestational age and birth weights was done as per the World Health Organization (WHO), and diagnosing the disease conditions was done according to National Neonatology Forum (NNF) guidelines.

Results

Demographical characteristics
A total of 35,995 babies were included in the present study. The ratio of inborn to outborn babies was 2.09 whereas the male-to-female ratio was 1.34:1. Most of the babies were admitted within 24 hours of their birth. The basic demographic characteristics, morbidity and outcome of the neonates are shown in Table 1 and 2.
Table 1: Basic demography, morbidity, and outcome of neonates.

Variables	Subgroups	Number of babies in each subgroup	Percentages
Type of admission	Inborn	24,357	**67.68**
	Out born	11,638	33.32
Gender	Male	20611	**57.26**
	Female	15384	42.74
	<1 days	21597	**60.00**
Age at admission	1-6 days	10796	30.00
	≥7 days	3602	10.00
	≥ 37 weeks	20,563	**57.13**

| Maturity	34 - <37 weeks	10,997	30.55
	< 34 weeks	4,435	12.32
	≥2500	15236	42.32
Birth weight (grams)	1500-2499	17373	**48.27**
	1000-1499	2777	7.71
	<1000	609	1.69
Outcome	Discharge	32764	**91.02**
	Died	3231	8.98
	<1 day	1195	3.32
Duration of stay	1-3 days	13008	36.14
	4-7 days	13141	**36.51**
	>7 days	8651	24.03

Table 2:Basic demographic characteristics of neonates who died.

Variables	Subgroups	Number of babies in each subgroup	Percentages
Gender	Male	1951	**57.50**
	Female	1442	42.50
Type of admission	Inborn	1172	**67.68**
	Out born	1398	33.32
	<1 days	766	22.58
Age at death	1-6 days	1754	**51.69**
	≥ 7 days	873	25.73

Maturity	Term	1398	41.20
	Preterm	1995	**58.80**
	≥2500	718	21.16
Birth weight (grams)	1500-2499	1298	**38.26**
	1000-1499	855	25.20
	<1000	522	15.38
	<1 day	991	29.21
Duration of stay	1-3 days	1435	**42.29**
	4-7 days	474	13.97
	>7 days	493	14.53

Morbidity profiles

Figure 1 displays the morbidity profiles of the neonates in the present study. The four most common causes were neonatal jaundice, birth asphyxia, sepsis, and others, which includes prematurity without complications, minor congenital anomalies, and apparently healthy babies admitted for observation.
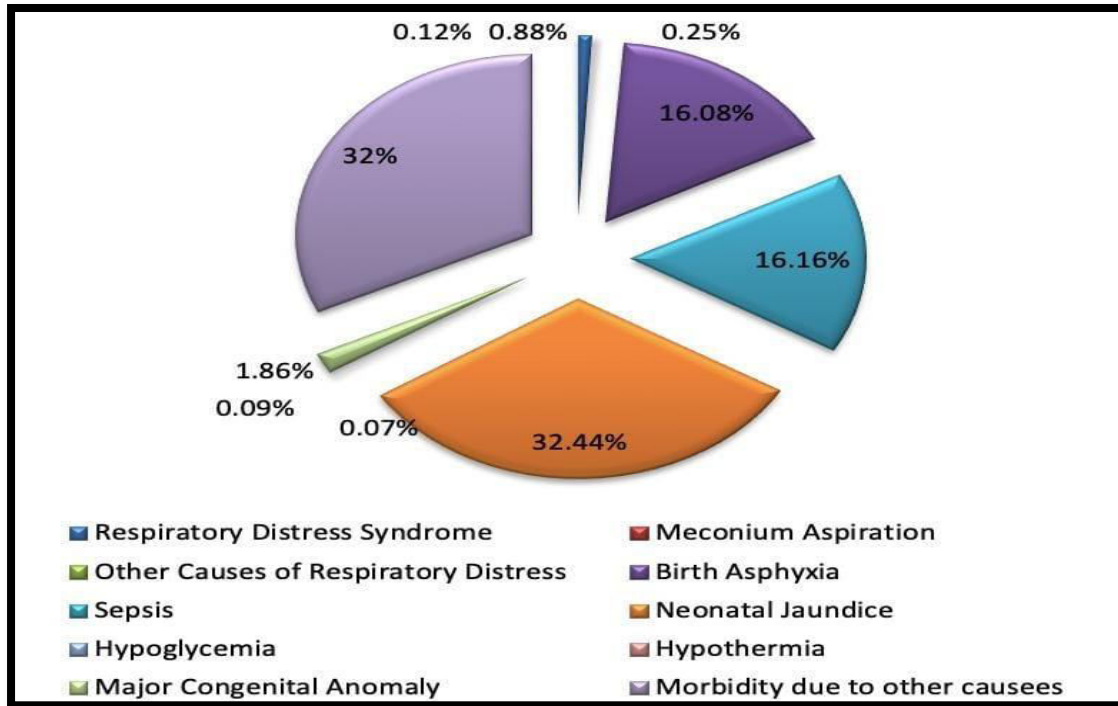
Demographical characteristics of the neonates who died.

The present study showed that inborn and male babies contributed 67.68% and 57.50% of total deaths, respectively; one fourth of all babies died within 7 days of life, and preterm and low birth weight babies exhibited the highest mortality.

Mortality profile

In the present study, it was found that the three major causes of neonatal mortality were sepsis, birth asphyxia, and prematurity, as depicted in Figure 2.
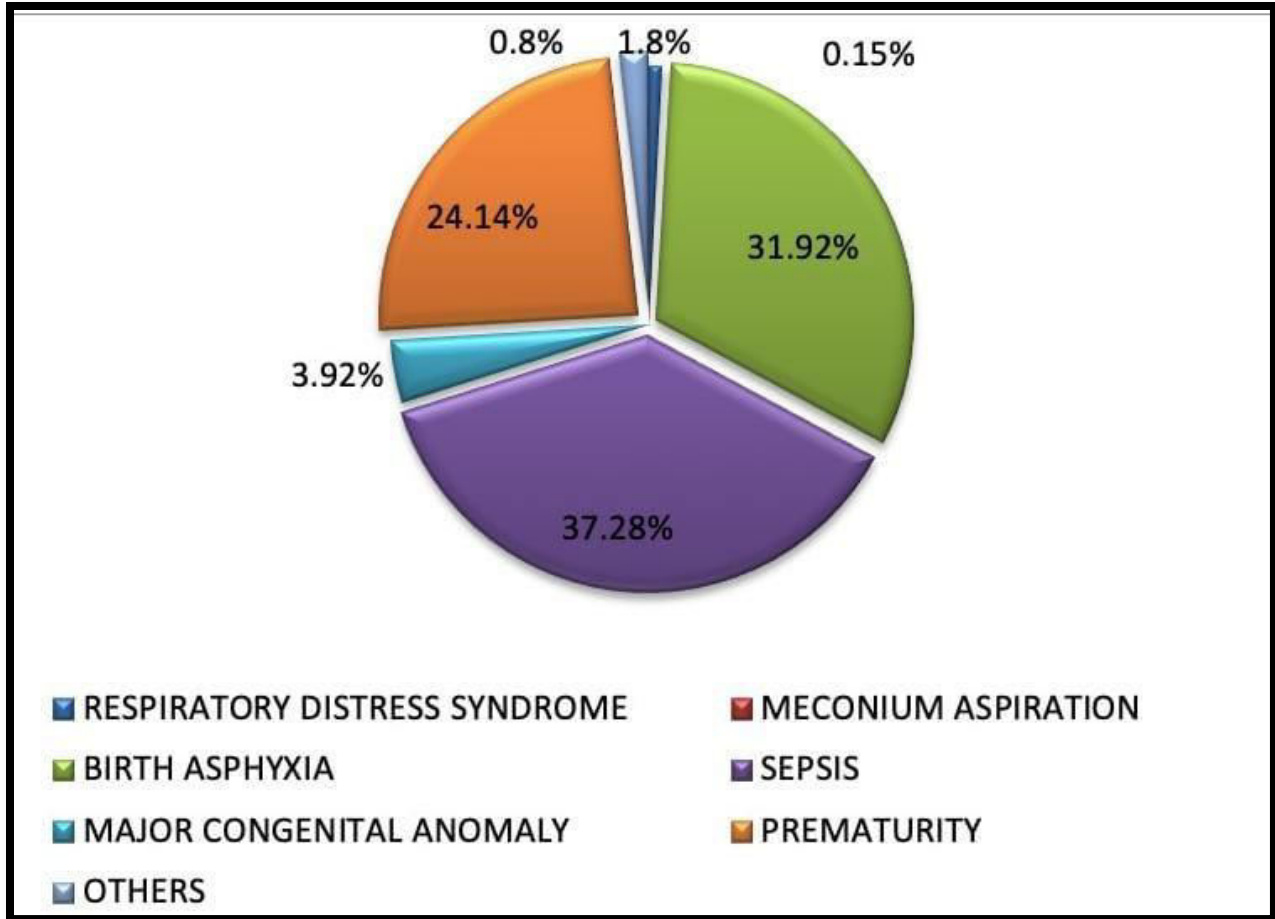
A chi-square test was performed to see the association between mortality and the different categorical variables, as shown in Table 3.

Table 3: Association of mortality with the different variables.

Variables	Subgroup	Survived (%)	Died (%)	Total (%)	P value
Gender	Male	18660 (90.53)	1951**(9.47)**	20611**(57.26)**	0.780
	Female	13942(90.63)	1442(9.37)	15384(42.74)	
Type of admission	Inborn	22163(91.49)	2061(8.51)	24224**(67.30)**	<0.0001
	Out born	10087(89.59)	1172**(10.41)**	11259(32.70)	

Maturity	Term	19165(93.20)	1398(6.8)	20563**(57.12)**	<0.0001
	Preterm	13437 (87.07)	1995**(12.93)**	15,432(42.88)	
Birth weight (grams)	≥2500	14518(95.29)	718(4.71)	15236(42.33)	<0.0001
	1500 – 2499	16075(92.53)	1298(7.47)	17373**(48.27)**	
	1000 – 1499	1922(69.21)	855(30.79)	2777(7.72)	
	<1000	87(16.67)	522**(83.33)**	609(1.69)	
Age at admission (day)	<1	20831(96.45)	766(3.55)	21597**(60)**	<0.0001
	1-6	9042(83.75)	1754(16.25)	10796(30)	
	≥ 7	2729(75.76)	873**(24.24)**	3602(10)	
Duration of stay (day)	<1	204(17.07)	991**(82.93)**	1195(3.32)	<0.0001
	1-3	11573(88.97)	1435(11.03)	13008(36.14)	
	4 – 7	12667(96.39)	474(3.61)	13141**(36.51)**	
	>7	8158(94.30)	493(5.70)	8651(24.03)	

Discussion

The SNCU of the present study in West Bengal currently holds 95 open-air servo-controlled beds, ten of which are for the NICU, three ventilators, five nCPAPs, and other top-of-the-line equipment for caring for highly delicate children with severe diseases. There is a separate lab for routine investigations. The SNCU also has portable x-rays and USG with colour droppers for diagnostic purposes. The care of babies was being monitored by nursing staff and skilled medical officers. With the assistance of other faculty members who were making their rounds with residents in the morning and evening, one knowledgeable faculty member has been designated as the SNCU in-charge and has been attempting to provide Facility Based Newborn Care.

The purpose of the current study, which was carried out in a tertiary care facility, was to investigate the various morbidity and mortality profiles of neonates admitted to SNCU between January 1 and December 31 of the subsequent year. In the future, policymakers may find this study useful in their planning and focus to lower newborn mortality to a single digit per 1000 live births.[8] For this study, 35995 infants in total were included. Male newborns made up 57.34% of this total, with female births making up the remaining 42.66%. Baby male to baby female ratio was 1.34:1. Researchers from other regions of India and Nepal also noted this male predominance.[9-14] This gender disparity may be caused by the greater vulnerability of the female gender in social and cultural contexts in India, where male children receive more attention from family members in all aspects of life, including health treatment, beginning at birth.

According to the United Nations Children's Fund (UNICEF), neonates were born in India with low birth weight in 28% of the world's children's report.[15] But according to the most recent research, 42.87% of newborns were born prematurely and 57.68% had low birth weights. This is because the SNCU of the tertiary care hospital in the present study serves people from rural areas and from low socioeconomic groups, reflecting the poor maternal health, antenatal check-up, under nutrition, anemia, and socioeconomic condition of rural society. These findings are in alignment with research conducted by other researchers from various parts of India.[11,16,17]

This current study revealed that nearly two-thirds (64.68%) of neonatal admissions were attributed to neonatal jaundice (32.44%), neonatal sepsis (16.16%), and birth asphyxia (16.08%). In accordance with reports by Ravikumar et al.[11] (24.72%), Adikane et al.[18] (29.25%), and Saharia et al.[19] (26.6%), neonatal hyperbilirubinemia was the most common reason for SNCU admission. This morbidity profile was also consistent with the study done by other researchers from different parts of the globe, but at different frequencies.[20-27]

In the current study, it came to light that sepsis (37.28%), birth asphyxia (31.92%), and preterm (24.14%) were the three primary reasons of neonatal mortality, presented in descending order. Like the current study, Pandiya et al. observed that sepsis was accountable for 40% of newborn fatalities.[28] Contrary to the findings of the current investigation, Malkar VR et al.[29] reported from an SNCU of a district hospital in Maharashtra that newborn sepsis was only a factor in 7.73% of neonatal deaths. It may be related to the fact that medical colleges and district hospitals have separate catchment areas. Babies with serious ailments were admitted to Medical College after being recommended by district, sub-divisional and super specialty hospitals. Other research studies[17,30,31] also noted these three primary causes of

mortality, but at varying rates. In the current study, categorical data was analyzed by the chi-square test, and it was discovered that outborn babies, LBW, preterm, age at admission, and duration of hospital stay less than 24 hours were all statistically significant and associated with a higher mortality rate (P value 0.0001 in each variable), as well as being consistent with the results from the Indian state of Madhya Pradesh published by Singh S. et al.[32]

Limitation of the study:

One of the major limitations of the study was that only six factors were considered; as a result, data on other crucial variables like the type of delivery, the number of antenatal visits, the number of previous pregnancies, residency in an urban or rural area, the newborn's mode of transportation, the mother's age, and socioeconomic status were not considered. Further multicenter prospective studies are recommendedas the single-center retrospective study methodology restricts the generalizability of our findings.

Conclusion:

The most frequent causes of admission to the SNCU were neonatal jaundice, neonatal asphyxia, and neonatal sepsis, whereas the most frequent causes of mortality were prematurity, sepsis, and birth asphyxia. The NMR in the SNCU substantially correlated with prematurity, LBW, place of delivery, length of stay, and age at admission. Controlling newborn fatalities in institutional settings should be primarily focusedon the early management of preterm deliveries and LBW babies. The findings of this study can be used to prioritize high-risk neonates for care and lower the number of unnecessary neonatal deaths in settings with resources constraints.

Conflicts of Interest: None

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