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Original Research Article

Contributors and associated risk factors of neonatal mortality in a tertiary care hospital in the sub-Himalayan region of West Bengal

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ABSTRACT

Background: Lack of revision of knowledge on the magnitude of problem, cause and factors associated with neonatal mortality hampering early interventions and thus preventing reduction of neonatal mortality rate in India. Neonatal mortality statistics are sensitive indicators of the utility, convenience and effectiveness of maternal child health service in the community. This study was done to see the mortality pattern of neonates and contributing factors at the special newborn care unit (SNCU) and neonatal intensive care unit (NICU) of a rural tertiary care hospital so that special attention to those cause and factors can lead to favourable outcomes.
Methods: This was a cross sectional retrospective study done in the SNCU and NICU of rural tertiary care centre of West Bengal for a period of three years with neonates admitted before 28 days of life. Data were collected in pre-designed proforma by analysing the case sheets from the records section of the hospital. Results were analysed by descriptive analytical method.
Results: Total 13738 babies were admitted in the study period (7143 inborn and 6595 outborn). Majority of the inborns (86.8%) and outborns (68.4%) were discharged during that period while 9.4% inborns and 19.5% outborns were expired and only those expired cases were included in this study. HIE/moderate-severe birth asphyxia (41.2%) was the major contributor of death in inborns but in outborns the most common contributor of death was sepsis/pneumonia/meningitis (34.8%). Prematurity and low birth weight were the most common associated risk factors in both the groups.
Conclusions: This study delineating the mortality patterns and associated risk factors of neonates in a rural tertiary care hospital of West Bengal which is unique in its kind. Outcome analysis showed that neonatal mortality rate for outborn babies was higher than in relevant recent studies.

Keywords: Neonatal mortality, Contributors, Birth asphyxia, Sepsis, Prematurity

INTRODUCTION

The first 28 days of life- the neonatal period- is the most vulnerable time to a child's survival. Children face the highest risk of dying in their first month of life at an average global rate of 17 deaths per 1000 live births in 2020, down by 54 per cent from 37 deaths per 1000 live births in 1990.[1] UNICEFs focus on equitable reduction of neonatal deaths is in line with the government of India's India New-born action plan, for which UNICEF is a key partner. The action plan aims to significantly reduce preventable newborn deaths and still births to bring down neonatal mortality and stillbirth rate to a "single digit" by 2030.[2] The neonatal period accounts for very high mortalities across all over India with current neonatal death rate 20 per 1000 live birth in 2022. An estimated 130 million neonates are born each year globally, 4 million of these die in first 28 days of their life.[3] The neonatal mortality rate (NMR) in India has decreased from 38 deaths (34.2-41.6) in 2000 to 23.5 deaths (20.1-27.8) per 1000 live births in 2017.[4] Mortality statistics of neonates are sensitive indicators of the utility,

convenience and effectiveness of maternal child health service in the community.[5] Government of India initiated different health programs for survival of neonates but despite extreme effort and vigilance neonatal mortality in India continues to be quite high and we are still lacking behind from our NMR goal in keeping with the sustainable development goal by 2030. Under the national rural health mission (NRHM) government of India created several newborn care corners (NBCCs), newborn stabilization units (NBSUs) and special newborn care units (SNCUs) but despite all establishments and expenditure it seems like a mirage for reducing the neonatal deaths. So, it is very important to find out the missing links between the utilization of health care facility and outcome analysis in order to provide a more constructive, feasible and effective newborn care. This study will be a unique one in this geographical area to find out the mortality profile of neonates in this SNCU and NICU which has been taken up with the objective to understand the patterns of neonatal mortality and associated risk factors.

METHODS

This was retrospective cross-sectional record-based study done in SNCU and NICU of North Bengal Medical College and Hospital, Darjeeling, West Bengal, India for 3 years (1st January 2019 to 31st December 2021).

Inclusion criteria included all neonates admitted before 28 days of life in this hospital and exclusion criteria denotes those babies whose parents did not gave consent in this study. Data of the expired babies were collected by analysing the case sheets from the records section of the hospital and the centralised SNCU and NICU online software database. The data was collected as inborn or out born, sex, gestational age, birth weight, age at presentation, indications for admission, duration of stay, and outcome. The primary disease was considered to be the final diagnosis and WHO definitions were used for term, preterm, low birth weight (LBW), very low birth weight (VLBW), extreme low birth weight (ELBW) and congenital malformations. Data were collected by the pediatric residents working in the SNCU and NICU under the supervision of the faculty. Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Data was thereafter summarized by routine descriptive statistics, namely mean and standard deviation for numerical variables and counts and percentages for categorical variables. Ethical permission has been taken from the institutional ethics committee.

RESULTS

A total of 7143 inborn and 6595 outborn neonates were admitted to the SNCU and NICU during this period with male and female babies being 53%(inborn), 63% (outborn) and 46% (inborn), 37% (outborn) respectively. A detailed demographic profile is shown in Table 1. Majority of the babies were more than 2500 gm (63.4% inborn, 50.7% outborn), while 49.3% of the outborn babies were low birth weight compared to 36.6% inborns. Diagnosis included respiratory distress syndrome, meconium aspiration syndrome, HIE/moderate-severe birth asphyxia, sepsis/pneumonia/meningitis, major congenital malformation, jaundice requiring phototherapy, hypothermia, hypoglycaemia and others. Majority inborns (86.8%) and outborns (68.4%) were discharged while 9.4% inborns and 19.5% outborns expired (Table 2). HIE/moderate-severe birth asphyxia (41.2%) and sepsis/pneumonia/meningitis (18.6%). was the major cause of death in inborns but in outborns the most common cause of death sepsis /pneumonia/ meningitis (34.8%) followed by birth asphyxia (31.3%). The contributors of mortality of neonates is illustrated in Figure 1. One of the important findings in this study that majority of the newborn deaths occurred were preterms-62.4% inborns and 51.4% outborns. Another important finding in this study that the mortality rate is very high in preterm babies (22.1%) in respect to term babies (9.7%) and fatality rate is inversely proportionate to the birth weight of the neonates (Table 3). Mortality pattern in relation to gestational age and birth weight were depicted in Figure 2 and 3. In both inborn and outborn babies maximum deaths occurred within 1-3 days of admission and the majority of neonates were within 1-6 days of age.

Table 1: Demographic profile of neonates admitted in the SNCU.

Variables	Inborn, (n=7143)		Outborn, (n=6595)	
	N	%	N	%
Total admission in the unit				
Male	3873	54.2	4152	63.0
Female	3270	45.8	2443	37.0
Birth weight (gm)				
≥2500	4528	63.4	3342	50.7
1500-2499	2026	28.4	2440	37.0
1000-1499	466	6.5	660	10.0
<1000	122	1.7	153	2.3
Gestation (Weeks)				
>37	5299	74.2	3577	54.2
34-37	829	11.6	1431	21.7
<34	1014	14.2	1587	24.1

Continued.

Variables	Inborn, (n=7143)		Outborn, (n=6595)	
	N	%	N	%
Morbidity profile				
Respiratory distress syndrome	291	4.1	984	14.9
Meconium aspiration syndrome	45	0.6	64	1.0
Other causes of respiratory distress	11	0.1	3	0.0
HIE/moderate-severe birth asphyxia	766	10.7	1153	17.5
Sepsis/pneumonia/meningitis	237	3.3	751	11.4
Major congenital malformation	112	1.6	340	5.2
Jaundice requiring phototherapy	4626	64.8	1366	20.7
Hypothermia	15	0.2	32	0.5
Hypoglycemia	16	0.2	41	0.6
Others	1018	14.3	1860	28.2
Outcome				
Discharge	6198	86.8	4510	68.4
Referral	22	0.3	134	2.0
LAMA	252	3.5	668	10.1
Died	670	9.4	1284	19.5
Duration of stay (Day)				
< 1	330	4.6	551	9.0
1-3	4980	69.7	2964	44.9
4-7	1295	18.1	1842	27.9
> 7	539	7.5	1194	18.1
Average duration of stay	3.19		4.83	

Table 2: Demographic and mortality profile of the newborn deaths.

Variables	In-born, (n=670)		Out-born, (n=1284)	
	N	%	N	%
Total number of deaths	670		1284	
Mortality profile (Cause of death)				
Respiratory distress syndrome	73	10.8	183	14.3
Meconium aspiration syndrome	21	3.1	15	1.2
HIE/ moderate-severe birth asphyxia	276	41.2	402	31.3
Sepsis/ pneumonia/ meningitis	125	18.6	447	34.8
Major congenital malformation	37	5.6	84	6.5
Prematurity	117	17.4	120	9.3
Others	21	3.1	33	2.6
Cause not established	0	0.0	0	0.0
Duration between the time of admission and death (Days)				
<1	203	30.2	324	25.2
1-3	347	51.7	711	55.4
4-7	75	11.4	154	12.0
>7	45	6.7	95	7.4
Age at death (Day)				
<1	141	21.0	43	3.3
1-6	453	67.6	787	61.3
≥7	76	11.4	454	35.4
Birth weight/ admission weight (gm)				
≥2500	179	26.8	527	41.0
1500-2499	229	34.2	490	38.2
1000-1499	161	23.9	183	14.3
<1000	101	15.0	84	6.5
Gestation				
Term	250	37.4	619	48.2
Preterm	419	62.4	660	51.4
Post term	1	0.2	5	0.4

Table 3: Percentage of mortality according to birth weight and gestational age.

Variables	Admission (inborn +outborn)	Death (inborn +outborn)	Percentage of death (%)
Birth weight (gm)			
>2500	7870	706	8.97
1500-2499	4466	719	16
1000-1499	1126	344	30.5
<1000	275	185	67.2
Gestational age (Weeks)			
>37	8876	869	9.7
34-37	2260	1079	22.1
<34	2601		

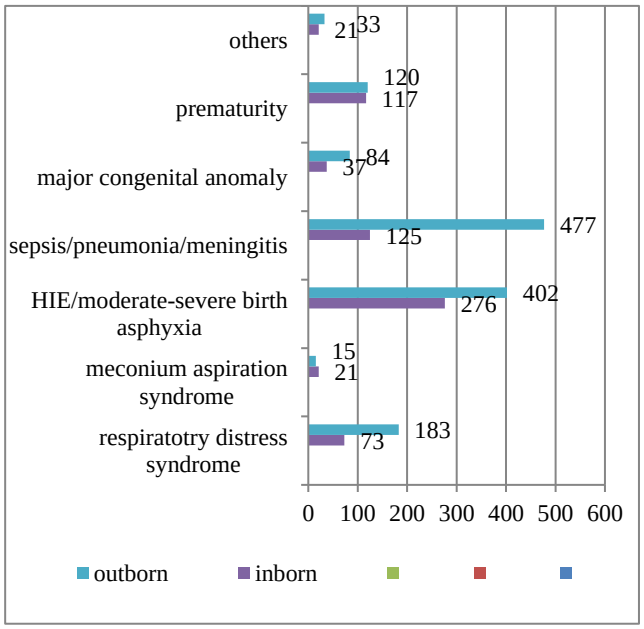

Figure 1: Causes of mortality according to etiology.

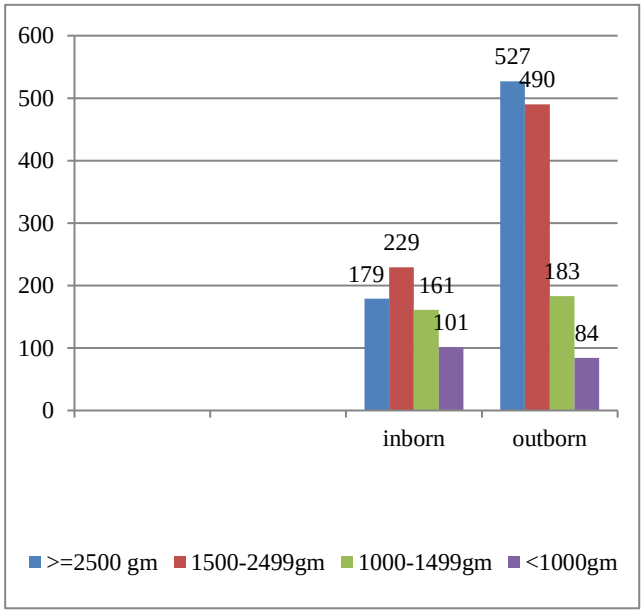

Figure 2: Mortality of the babies according to birth weight/weight at admission.

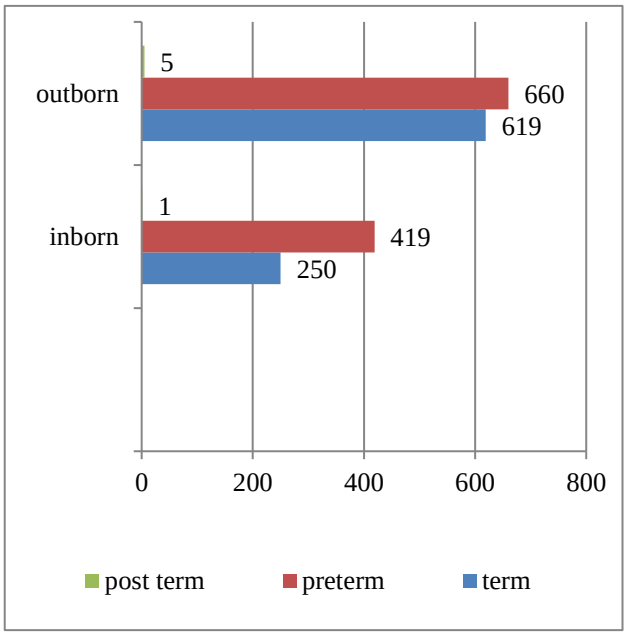

Figure 3: Mortality of the babies according to gestational age.

DISCUSSION

This study is the first of its kind from the Sub Himalayan region of West Bengal. Our tertiary care hospital caters to a population spanning across the North Eastern states and even countries like Nepal, Bangladesh and Bhutan. In this study it was found that HIE/moderate-severe birth asphyxia (41.2%) and sepsis/pneumonia/meningitis (18.6%). was the major cause of death in inborns but in outborns the most common cause of death were sepsis/pneumonia/ meningitis (34.8%) followed by birth asphyxia (31.3%). In a study conducted by Uppal et al in the SNCU of the District Hospital, Nalgonda, the authors studied a total of 958 neonates. They showed that the mortality rate in their study was 5.53% and the major contributors to the neonatal mortality were RDS (47.16%),prematurity (16.98%), and birth asphyxia (11.32%).[6] Another study from Sambalpur, Odisha conducted by Ashish Kumar Mishra et al also found in their study the leading cause of death was infection.[7] Rakesh Kumar et al in his study titled "Morbidity and

mortality profile of neonates admitted in special newborn care unit of a teaching hospital in Uttarakhand, India" also showed birth asphyxia was the major cause of mortality, followed by sepsis and prematurity. Mortality was more in out born babies 14.67% compared to inborn babies 9.80%.[8] This-findings supports the findings of this study. Important associated factors found in this study was that, mortality rate is very high in preterm babies (22.1%) in respect to term babies (9.7%) and fatality rate is inversely proportionate to the birth weight of the neonates. This findings is supported by other literature that have identified low birth weight as reliable predictor of neonatal mortality.[13]

A study in Bangladesh reported that approximately 75% of neonatal deaths associated to preterm birth rather than small for gestational age neonates.[14,15]According to ICMR reports, sepsis (32.8%) is the major cause for neonatal mortality followed by birth asphyxia (22.3%) and prematurity(16.8%).[9] Even foreign studies show that proportion of facility-based neonatal mortality was 20% (95% CI:16.7-23.8%), where the causes of death were primarily due to complications of preterm birth (28.58%), birth asphyxia (22.45%), neonatal infection (18.36%), meconium aspiration syndrome (9.18%), respiratory distress syndrome (7.14%), and congenital malformation (4.08%).[10] The disease profile for morbidity and mortality remained more or less same worldwide.[11,12] Mortality in inborns was 9.4% that corroborated with the study by Rakesh Kumar et al [8], but outborn were higher in comparison.

Limitations of our study include that despite a long duration of study of 3 years it is quite difficult to comment about the scenario of other areas of North Bengal for which large multicentre study required.

CONCLUSION

This study is the first of its kind depicting the mortality patterns of neonates and associated risk factors in a tertiary care hospital in the Sub Himalayan region. Birth asphyxia/HIE and sepsis contributed to a major portion of mortality probably suggesting to a need for availability of better resuscitation facilities at the time of delivery or judiciously timed Caesarean sections and also delivery of each baby with strict aseptic care /aseptic baby transport. Antenatal care should be strengthened to minimize the preterm delivery and occurrence of sepsis. Outcome analysis of the study showed that neonatal mortality rate was higher than in relevant recent studies. Thus, emphasising on the importance of timely referral and the need of more such set ups in the region.

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