Study of Neonatal Morbidity and Mortality Profile in Neonatal Care Unit at a Tertiary Health Care Institute in Agartala, North East India, Tripura, India

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ABSTRACT

BACKGROUND

In India, 26 million babies are born every year and 1.2 million die in the newborn period, which accounts for a quarter of global neonatal death. Tripura is a hilly state in the north eastern part of India with minimum budget allocation in its health care. The national Neonatal Mortality Rate (NMR) is 22.73/1000 live births in 2018. But no authentic publication on NMR of Tripura is available as of date. The neonatal care unit of Agartala Government Medical College (AGMC) was started in the year 2005 where patients from all over the state are being referred and cared. Therefore, a retrospective study was carried out to study the profile of morbidity and mortality in the admitted newborns for identifying problem areas which will in turn help in developing policies.

METHODS

All live newborns weighing 500 grams or more and with gestational age of 24 weeks or more, admitted in the neonatal care unit during the period between 1/1/19 and 31/12/19 in the Department of Paediatrics, AGMC, Agartala were included in the study. Data in terms of gender, ethnicity, religion, place of delivery, mode of delivery, birth weight, gestational age, primary diagnosis and outcome were tabulated and analysed.

RESULTS

A total of 2157 neonates were enrolled with a slight male preponderance. The incidence of low birth weight (LBW) was 74.68% of the total enrolled cases. The common causes for morbidity were perinatal asphyxia (31.15%), neonatal sepsis (23.22%), neonatal hyperbilirubinemia (18.08%), HMD/RDS (9.17%) and MAS (6.67%). The overall mortality was 18.49% of the total enrolled cases. Perinatal asphyxia, neonatal sepsis, HMD/RDS and MAS contributed maximally to the mortality (33.08%, 27.80%, 14.03% and 07.01% of total death respectively). However, the morbidity and mortality profile among the intramural and extramural groups were not statistically significant.

CONCLUSIONS

Perinatal asphyxia, neonatal sepsis, prematurity and its complications are the leading causes of morbidity and mortality in this study which are preventable to a considerable extent. The high incidence of low birth weight (LBW) neonates reflects high rate of referral of LBW neonates to this institute. Therefore, improvement of obstetric care and scaling up of neonatal care skill at all levels should be priorities in policies to achieve reduction in neonatal mortality.

KEYWORDS

Newborn, Mortality, Morbidity, North East, India

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BACKGROUND

The growth and development of any nation is reflected in its health indicators especially the neonatal and child health indicators. Globally 2.5 million children died in the first month of life in 2018, approximately 7 000 newborn deaths every day with about one third dying on the day of birth and close to three quarters dying within the first week of life.[1] In India, 26 million babies are born every year and 1.2 million die in the newborn period, which accounts for a quarter of global neonatal death. India thus faces the biggest newborn health challenge in the world.[2] The present Infant Mortality Rate (IMR) in India is 32 per 1000 live births and in Tripura it is 24 per 1000 live birth.[3] The highest contributor of infant and under 5 mortality is neonatal mortality. Approximately 75% of the neonatal death occurs in the first week of life and at least 50% occurs in the first day of life.[4] Initiatives taken in the last two decades, especially under Millennium Development Goal, has resulted in some progress. Under 5 mortality rate dropped by 58% (93 /1000 live birth in 1990 to 39/1000 live birth in 2017), infant mortality dropped by 42% (80/1000 live birth in 1990 to 32/1000 live birth in 2017) and neonatal mortality dropped by 58% (57/1000 live birth in 1990, to 23.7/1000 in 2017).[5] The interplay of demographic, educational, socioeconomic, biological, genetic, environmental and care seeking factors is responsible for the high burden of neonatal mortality. Therefore, all measures to reduce IMR and Under Five Mortality Rate (U5MR) essentially must focus on steps to curb neonatal mortality through facility and community based neonatal care.

The common causes of neonatal mortality in India are low birth weight, perinatal asphyxia and sepsis. High number of neonatal deaths are reported from African countries and South East Asian countries due to their poor socioeconomic condition and population burden.[6] The national NMR is 22.73/1000 live births in 2018.[7] But no authentic publication on NMR of Tripura is available as of date. In alignment with the Global Every Newborn Action Plan (ENAP) India Newborn Action Plan (INAP) was launched in September 2014 with a goal of ending preventable Newborn Deaths to achieve "Single Digit NMR" by 2030, with all the states to individually achieve this target by 2035. The neo-natal deaths in India are expected to reduce to below 2.28 lakh annually by 2030, once the goal is achieved.[8] Government of India is exploring its health resources to reduce the NMR in collaboration with NNF, IAP, IMA WHO and other agencies to achieve the goal. Tripura is a hilly state in the North eastern part of India with minimum budget allocation in its health care. The State is characterised by geographical isolation, poor infrastructural facilities, communication bottlenecks, inadequate exploitation of natural resources (natural gas, rubber, forest etc.), higher incidence of poverty, low capital formation, backward in industrialisation and high level of un-employment. Total population of the state is about 37 lacs with a per capita income of Rs. 1, 13, 467 only.[9] There are two medical colleges, one government owned and one private established in the year in 2005 and 2006 respectively. Postgraduate teaching facility is available at Agartala Government Medical College only. A three tier facility based newborn care was started in India which is also partially followed in Tripura to reduce the neonatal morbidity and mortality. Level I Newborn stabilization unit (NBSU) at selected PHCs, Level II special newborn care units (SNCU) at district hospitals and Level III Neonatal Intensive Care Unit (NICU) at medical colleges and state hospitals form the skeleton of facility based newborn care delivery system in Tripura. The neonatal care unit of Agartala Government Medical College (AGMC) was started in the year 2005 with 10 bedded intramural NICU, 10 bedded extramural NICU and 20 bedded step-down nursery cared round the clock by postgraduate residents and registrars under supervision of paediatrician. Patients from all over the state are being referred and cared here. It provides services for advance life support like, mechanical ventilator, CPAP, parenteral nutrition, phototherapy, exchange transfusion and management of sepsis, jaundice, low birth weight, prematurity and other neonatal problems. A study on neonatal morbidity and mortality profile will help in analysing problem areas which will in turn help developing policies for further reduction in NMR in the state. Therefore, this study was carried out to study the profile of morbidity and mortality in the admitted newborns.

METHODS

This hospital-based cross-sectional study was conducted in the neonatal care unit, Department of Paediatrics, Agartala Government Medical College, a tertiary care teaching hospital of Agartala during the period between 1/1/19 and 31/12/19.

Inclusion Criteria

All live newborn weighing 500 grams or more and gestational age 24 weeks or more, admitted in the neonatal care unit, Department of Paediatrics, AGMC, Agartala were included in the study.

Exclusion Criteria

Parents who refused to give consent were excluded from the study.

Study Tools

i. Case record form. ii. Patient profile records (Bed head tickets).
iii. Neonatal care unit registers.

Methodology

Data related to morbidity and outcome were collected from neonatal care unit registers and bed head tickets. The relevant data were entered in the case record form in terms of demography (gender, ethnicity, religion, place of delivery,

mode of delivery etc.), birth weight, gestational age, primary diagnosis and outcome (discharged, expired, LAMA and referred).

Statistical Analysis

Frequency distribution table of collected data was done using Microsoft excel worksheet. Descriptive analysis is presented in the form of frequencies and proportions.

RESULTS

A total of 2157 neonates (n) were admitted during the study period out of which 1152 (53.40%) were males and 1005(46.59%) were females. Intramural admissions were 1485(68.84%) and extramural admission were 672 (31.15%). Among total admission 1443(68.89%) were Bengali and 714 (31.15%) were Tribal. By religion 1265 (58.64%) were Hindu, 552 (25.59%) were Muslim, 240 (11.12%) were Christian and 100(6.83%) were Buddhist.

Gender	Male	1152	53.40%
	Female	1005	46.59%
Admission	Intramural	1485	68.84%
	Extramural	672	31.15%
Ethnicity	Bengali	1443	68.89%
	Tribal	714	33.10%
Religion	Hindu	1265	58.64%
	Muslim	552	25.59%
	Christian	240	11.12%
	Buddhist	100	4.63%

Table 1. Baseline Characteristics of Newborns (n=2157)

Based on birth weight neonates were divided into four groups: (a) 2500 gms or more, (b) 1500 gms to 2499 gms, (c) 1000 gms to 1499 gms and (d) 500 gms to 999 gms. In this study 546(25.31%), 933(43.25%), 504 (23.36%) and 174(8.06%) neonates fell into a, b, c and d group respectively. As per gestational maturity neonates were divided in to three groups of which 1350(62.58%) were preterm (24-37 weeks), 684 (31.17%) were term (37-42 weeks) and remaining 123 (5.70%) were post term (>42 weeks). Of all the neonates 1314 (60.91%) were born by normal vaginal delivery, 645 (29.90%) were born by Caesarean section and remaining 198 (9.17%) neonates were born by Instrumental delivery.

Birth Weight	>2500 gms	546	25.31%
	1500-2499 gms	933	43.25%
	1000-1499 gms	504	23.36%
	500-1000 gms	174	8.06%
Maturity	Preterm(24-37 weeks)	1350	62.58%
	Term(37-42 weeks)	684	31.71%
	Post term (>42 weeks)	123	5.70%
Mode of Delivery	Normal Vaginal	1314	60.91%
	Caesarean Section	645	29.90%
	Instrumental Delivery	198	9.17%

Table 2. Birth Weight and Gestational-Age-Wise Distribution (n =2157)

Morbidity profile based on primary diagnosis of the admitted neonates shows 672(31.15%) neonates had perinatal asphyxia, 501(23.22%) had Neonatal sepsis, 390(18.08%) had neonatal hyperbilirubinemia, 198(9.17%) had Hyaline Membrane Disease/Respiratory Distress Syndrome (HMD/RDS), 144(6.67%) had Meconium Aspiration Syndrome (MAS), 132(6.11%) had congenital anomaly(excluding CHD), 66(3.05%) had Congenital Heart Disease (CHD), and remaining 54(2.50%) had Necrotising Enterocolitis (NEC). Among all enrolled neonates 399 died out of which 132(33.08%) died of Perinatal Asphyxia, 111(27.80%) died of Neonatal sepsis, 56(14.03%) died of HMD/RDS, 28(7.01%) died of MAS, 20(5.01%) died of CHD, 40 (10.02%) died of extreme prematurity (24-28 weeks) and remaining 12 (3.00%) neonates died of Congenital Anomaly (excluding CHD). Condition wise morbidity amongst intramural and extramural neonates were compared and tested by a two-tailed chi-square test and the difference was found to be insignificant (p-value>0.05). Similarly comparison of mortality profile between the intramural and extramural group yielded a p-value >0.05 indicating the difference was not significant.

Morbidity(n=2157)					Mortality (n=399)				
Condition	**Intramural (n=1485) (%)**	**Extramural (n=672) (%)**	**Total (%)**	**P Value**	**Condition**	**Intramural (n=243) (%)**	**Extramural (n=156) (%)**	**Total (%)**	**P Value**
Perinatal Asphyxia	492(33)	180(27)	672(31.15)	0.90	Perinatal Asphyxia	78(32)	54(35)	132(33.08)	0.55
Neonatal Sepsis	348(24)	153(23)	501(23.22)	0.90	Neonatal Sepsis	65(27)	46(30)	111(27.80)	0.55
Neonatal Hyperbilirubinemia	253(17)	137(20)	390(18.08)	0.90	HMD/RDS	37(15)	19(12)	56(14.03)	0.55
HMD/RDS	136(9)	62(9)	198((9.17)	0.90	Extreme Prematurity	25(10)	15(10)	40(10.02)	0.55
MAS	90(6)	54(8)	144(6.67)	0.90	MAS	16(7)	12(8)	28(7.01)	0.55
Congenital Anomaly(excluding CHD)	86(6)	46(7)	132(6.11)	0.90	CHD	14(6)	6(3)	20(5.01)	0.55
CHD	44(3)	22(3)	66(3.05)	0.90	Congenital Anomaly (excluding CHD)	8(3)	4(2)	12(3.00)	0.55
NEC	36(2)	18(3)	54(2.50)	0.90					

Table 3. Morbidity and Mortality Profile

During the study period 1614 (74.82%) neonates were discharged, 399 (18.84%) neonates expired, 72 (3.34%) neonates went on LAMA and remaining 72 (3.34%) neonates were referred to higher centre for advanced management (Table-4).

Discharged	1614	74.82%
Expired	399	18.49%
LAMA	72	3.34%
Referred	72	3.34%

Table 4. Outcome (n=2157)

Mortality was high in preterm than in term neonates (62.15% versus 37.84%). Mortality in neonates with birth weight >2500 gms were 10.77%, birth weight between 1500-2499 gms were 19.04%, birth weight between 1000-1499 gms were 31.57% and those with birth weight 500-1000 gms had highest mortality 38.59%. (Table-5).

Mortality According to Gestational Age (n=399)		
24- 37 weeks	248	62.15%
>37 weeks	151	37.84%
Mortality According to Birth Weight (n=399)		
>2500 gms	43	10.77%
1500-2499 gms	76	19.04%
1000-1499 gms	126	31.57%
500-1000 gms	154	38.59%

Table 5. Mortality According to Gestational Age and Birth Weight

DISCUSSION

AGMC caters a substantial number of intramural and extramural neonates. The ratio of intramural and extramural cases was found to be 2.21:1. The Male to Female ratio was 1.14:1. Studies in different developing countries also revealed male predominance as in Pakistan 63%, in South Africa & Nigeria 58%.[10, 11, 12]

The incidence of low birth weight (LBW) was 74.68% of all live births. The ratio of LBW to normal birth weight was 0.74:1. Similar incidence was found in studies conducted in Bhopal, South India, and Uttarakhand.[13, 14, 15] It is higher as compared to the national average of LBW of India (30%) in India. This high incidence of LBW babies is likely to be the result of increase in the rate of hospitalization of high risk pregnancies both through direct admission and admission on referral. So also there is increase in the rate of transfer of extramural LBW cases to this institution for tertiary level care. Low socioeconomic status, early marriage, frequent pregnancy, nutritional anaemia, malnutrition and maternal illness are the known major contributors of low birth weight and preterm births in this region of the country.

The common causes for morbidity were perinatal asphyxia (31.15%), neonatal sepsis (23.22%), neonatal hyperbilirubinemia (18.08%), HMD/RDS (9.17%) and MAS (6.67%). The incidence of perinatal asphyxia is 2 per 1000 births in developed countries.[16] The higher incidence of Perinatal Asphyxia could be due to limited availability of facility-based care centres, economic backwardness and above all the challenging communication and difficult terrain of Tripura. Incidence of neonatal sepsis was at par with other studies conducted in Gujarat, Pakistan, South Africa, Bhopal and Bihar.[6,10,11,13,17] The higher incidence of HMD/RDS is nothing but the expression of its linear relationship with the increased incidence of preterm deliveries. However a two-tailed chi-square test showed that there was no difference in the proportion of the conditions between the intramural and extramural group.

The overall mortality was 18.49% of total enrolled cases. Perinatal Asphyxia and Neonatal Sepsis contributed maximally to the mortality (33.08% and 27.80% of total death respectively). HMD/RDS (14.03% of total death) and MAS (07.01% of total death) ranks thereafter. The studies of Demisse AG et al (2017), Hoque M, Haaq S, Islam R (2016) and Aiyer CR (2015) et al found rates comparable with our studies.[11, 14, 18] Thus, Perinatal Asphyxia and Neonatal Sepsis are two identified areas of high neonatal Mortality. Test of significance of the difference of proportions in the leading conditions did not differ significantly between the intramural and extramural groups. Policy must be adopted to prevent neonatal deaths in these areas by enhancing institutional deliveries, improving quality of antenatal care, effectively implementing Home Based Neonatal Care, early initiation of breast feeding and above all enforcing strict aseptic practices in the hospitals. Simultaneously obstetric care should also be updated encompassing modern monitoring techniques and by judicious use of oxytocic's. HMD/RDS, NEC related mortality and morbidity can be reduced by use of antenatal glucocorticoids, regular supply and use of Surfactant and promotion of breast feeding practices. In this study Perinatal Asphyxia, Neonatal Sepsis, Prematurity and its complication like -HMD/RDS, MAS, NEC were the major causes of morbidity and mortality in the newborn.

The main limitations of this study lies in the fact that this study was conducted in a tertiary care centre and the figures in this study does not reflect the actual scenario of the community. The outcome of those newborn left against medical advice and referred outside the state is not known. These are some limitations of the study.

CONCLUSIONS

Perinatal asphyxia, neonatal sepsis, prematurity and its complications are the leading causes of mortality in this study. Effective policies must be adopted to include early in-utero referral, maintaining strict asepsis, following hospital antibiotics policy, early initiation of breast feeding, practice of Kangaroo Mother Care (KMC), use of antenatal corticosteroid etc. Improvement of obstetric care and scaling up of neonatal care skill through NSSK, IMNCI, FIMNCI and FBNC programs are also priorities to achieve reduction in neonatal mortality.

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