

Morbidity & Mortality Profile of Neonates Admitted in Neonatal Intensive Care Unit of District Hospital in Gadchiroli, Maharashtra: A Prospective Observational Study

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Abstract: *Background:* Globally, 2.6 (2.5 - 2.8) million newborns died in 2016 – i.e. nearly 7,000 every day. In India, around 25 million babies are born every year. India contributes to one-fifth of global live births and more than a quarter of neonatal deaths. Five countries accounted for half of all newborn deaths including India. NFHS 4 data suggests that neonatal mortality rate (NMR) declined to 30 deaths per 1,000 live births. *Methods:* Present observational study was conducted at district hospital, Gadchiroli. Study period was 1 April 2016 to 31 March 2018. All the admitted babies to NICU were included into study. Data was collected by interview method using a pre-designed, semi-structured questionnaire. Various morbidities and reasons for mortality were included. *Results:* There were total 4068 admission during study period. There was slightly higher admission rate for Males 2251 (55.33%) than females 1817 (44.67%). Pre-term admissions were 1627 (40.00%). Majority of admissions were due to Low birth weight 2387 (58.68%). *Conclusions:* In the study duration, total 4068 NICU admissions took place. Out of these, 459 (11.28%) died. Moderate-Severe Birth Asphyxia, Sepsis were accounting for morbidities. The preterm and low birth weight babies had significantly high mortality even with standard intensive care.

Keywords: Gadchiroli, Neonatal morbidity, Neonatal mortality, Neonatal Intensive Care Unit, Secondary care centre, Respiratory Distress Syndrome

1. Introduction

Neonatal period is the most vulnerable period of human life as it accounts for very high morbidities and mortalities and most of these are preventable. (1) The perinatal and neonatal period, in spite of its shortness, is considered as most critical phases of life. Neonates are vulnerable and fragile beings. Many of them would fall sick despite precautions and care, especially in resource poor home settings. (2)

Globally, 2.6 (2.5--2.8) million newborns died in 2016 – 7,000 every day. The largest number of newborn deaths occurred in Southern Asia (39%). Five countries that accounts for nearly half of all newborn deaths includes India. (3) As India is the second most populous country in the world with many pressing health problems that, in fact, hugely determine the global health statistics. Maternal, neonatal, child health and nutrition together contribute to the largest burden of disease in India. (4) The Millennium Development Goals (MDGs) 2015 have not been achieved, which focused on decreasing NMR of India to <10. Although the time frame to achieve the MDGs has been extended, a significant work has been done in the area of improving neonatal mortality in India. (5)

In India, around 25 million babies are born every year. (6) India contributes to one-fifth of global live births and more than a quarter of neonatal deaths. (7) National Family Health Survey Ver. 4 data suggests that neonatal mortality rate (NMR) declined to 30 deaths per 1,000 live births. The rate of the neonatal mortality varies widely among the different states of India, at national level 29.5, ranging from 4.4 per

1000 live births in Kerala to 45.1 per 1000 live births in Uttar Pradesh. (8) The decline is contributed to different national programs, which were introduced to curb neonatal as well as infant mortality. Integrated Management of Neonatal and Childhood Illness (IMNCI), Janani Suraksha Yojan, Janani Shishu Suraksha Karyakram, RMNCH+A, Navjat Shishu Suraksha Karyakram, India Newborn Action Plan, Rashtriya Bal Suraksha Karyakram, are few of them.(9)

Neonatal mortality statistics serve as sensitive indicators of the availability, utilization, and effectiveness of maternal child health service in the community. The incidence of neonatal mortality rate is variable from place to place and is also different from hospital to hospital and home born babies. Data derived from hospital record do not truly represent neonatal mortality rate and its various causes in the community at large but has the advantage of being more reliable in term of causes of death and reflect the quality of service available. (10)

Some difficulties we face are with the improvement of transport facility (like 108,102). A large number of cases have been referred from peripheral care to SCNU's and NICU's. So there is increasing burden of cases in SCNU and NICU specifically in secondary care facility like district hospitals. Where in spite of giving quality care we are providing quantity care as well, but insufficient infrastructure and health care providers available in present hospitals are hampering our work for better outcome. (11)

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Knowledge about variety of neonatal morbidity and their mortality will be assistances in proper management of common neonatal problem which will lead to better outcome and enriched quality of life among survivors. Data on neonatal morbidity and outcome in district hospital dealing with large population are scarce. A very few published studies depicts data on these topics from tribal population. Therefore, we planned to assess the pattern of neonatal morbidity and mortality in Gadchiroli district hospital which is providing secondary health care facilities.

Study Setting

The present prospective observational study was conducted in Neonatal Intensive Care Unit (NICU) of a secondary care centre, District hospital, Gadchiroli in eastern Maharashtra. Gadchiroli district is socially disadvantaged because of left extremist activities and major proportion of tribal and rural population. This NICU is currently situated in campus of district hospital Gadchiroli and having 24 bedded unit with two neonatal ventilators, two continuous positive airway pressure (CPAP) machines with facilities for surfactant administration. Inborn neonates as well as outborn cases referred from all over district in the eastern region of Maharashtra are being admitted.

Study Population

The babies born all over the district and nearby areas of Gadchiroli district, who were referred to the hospital.

Subjects

Those babies admitted to NICU in present institution.

Design

Prospective observational study design was adopted to conduct the study.

Sample size & Sampling procedure/technique

All the admitted babies to NICU, were included into study.

Exclusion criteria: Those parents who were not giving consent.

Data collection

Data was collected by interview method using a predesigned, semi-structured questionnaire. Neonatal variables used were total number of admissions, sex, birth weight, gestational age, diagnosis at admission, final outcome & duration of stay. Neonates were divided into two groups of inborn and out born unit admission. These newborns were categorized as inborn if delivered by any route in the present Hospital and outborn if born outside and referred to NICU for management. Final outcome was recorded as discharged, left against medical advice (LAMA), referred for paediatric surgical indications to super speciality centre and death during hospital course. The reasons for admission were determined from the admission notes in the infant's case papers. Mortality data was collected, in the form of cause of death, duration between time of admission and death.

The data was recorded in questionnaire and following definitions were used for the purpose:

Preterm was defined as Live born neonate delivered before 37 weeks from 1st day of last menstrual period (LMP) and confirmed clinically after delivery.

Low birth weight (LBW) —was defined as birth weight of 1500 grams to 2499 grams.

Very Low Birth Weight (VLBW) -- birth weight of 1000 grams to 1499 grams.

Extremely Low Birth Weight (ELBW) -- birth weight < 1000 grams.

Data collection period

The data was collected from 1 April 2016 to 31 March 2018. Data was collected on daily basis.

Ethical consideration

Intitutional Ethics committee's approval was taken prior to start of the study. The consent from parent/ guardian was taken prior to start of the study.

Data analysis

Data was entered in Epi Info ver. 7.1.2 and analyzed using STATA version 13.1. Continuous data was presented as mean and standard deviation (SD), categorical data was presented as frequency and percentage. The magnitude of mortality was presented in proportion. Risk of mortality was calculated using odds ratio (OR) and 95% confidence interval.

2. Results

Total 10,381 deliveries were conducted in the centre, out of which 9,963 were live births. Out of these live births 4,068 neonates were admitted to NICU for various indications. Table no. 1 shows some of epidemiological characteristics of the admitted neonates. Nearly equal distribution among inborn (50.52%) and outborn (49.98%) were observed. Slightly higher number of males (55.33%) was admitted to NICU than females (44.67%). While comparing gestational age, term neonates (60.10%) were higher than preterm neonates (60.00%). More than half of neonates (58.68%) were belonging to low birth weight followed by normal weight (27.58%). The stay of neonates in NICU was maximum for 4 to 7 days (36.23%) followed by 1 to 3 days (35.25%). The survival rate of neonates was observed to be (78.12%) while 11.28 % were died. Referral for further management was advised to 7.40% of neonates but 3.20% neonatal parents were left against medical advice.

Table 2 displays morbidity pattern of NICU admitted neonates. Moderate-Severe Birth Asphyxia (42.46%) was highest followed by sepsis (21.60%). Table 3 shows some of epidemiological characteristics associated with neonatal mortality. Slightly higher mortality was observed among inborn (53.59%) as compared to outborn (46.41%). Slightly higher number of male neonates (57.52%) were died while female neonates were (42.48%). Most of Preterm neonates (59.48%) were succumb to death. While comparing among birth weight categories, LBW (42.27%) were found to be highest, followed by VLBW (30.07%). Around (17.43%) normal birth weight neonates were died. Nearly three fourth

of mortality event (76.04%) was found to occur in first 3 days of admission.

Table 4 shows mortality pattern of NICU admitted neonates. The moderate to severe birth asphyxia was main culprit in neonates (25.27%) followed by Respiratory Distress syndrome in (23.75%). Sepsis cases were (20.70%). Other causes were inclusive of hypothermia, hypoglycaemia. Table no 5 shows bivariate analysis between some neonatal characteristics and mortality event. Though inborn neonates and male sex was having higher mortality rate but there was no significant difference observed. Preterm neonates have significant higher death rates compared to term neonates (OR=2.21). Likewise LBW carried roughly two times more risk of neonatal mortality compared to normal birth weight (OR =1.81). The significant difference was observed in total number of days of stay in hospital.

Table 1: Various characteristics of admission to NICU

Sr. No	Characteristics	Frequency	Percentage	
1	Birth Place	Inborn	2055	50.52
		Outborn	2013	49.48
2	Sex	Male	2251	55.33
		Female	1817	44.67
3	Gestation	Term	2441	60.00
		Pre-term	1627	40.00
4	Birth weight	Normal	1122	27.58
		LBW	2387	58.68
		VLBW	499	12.27
		ELBW	60	1.47
5	Duration of Hospital Stay	< 1 day	230	5.65
		1 – 3 days	1434	35.25
		4 – 7 days	1474	36.23
		> 7 days	930	22.86
6	Outcome	Discharge	3178	78.12
		Referral	301	7.40
		LAMA	130	3.20
		Died	459	11.28

Table 2: Morbidity pattern of NICU neonates

Sr. No	Morbidity	Frequency	Percentage
1	Moderate-Severe Birth Asphyxia	1718	42.46
2	Sepsis	874	21.60
3	Jaundice requiring phototherapy	648	16.02
4	Meconium aspiration syndrome	356	8.80
5	Respiratory Distress syndrome	254	6.28
6	Major Congenital Malformation	144	3.56
7	Hypothermia	42	1.04
8	Other causes of respiratory distress	16	0.40
9	Hypoglycemia	16	0.40
	Total	4068	100.00

Table 3: Characteristics of neonates with mortality

Sr. No	Characteristics	Frequency	Percentage	
1	Birth Place	Inborn	246	53.59
		Outborn	213	46.41
2	Sex	Male	264	57.52
		Female	195	42.48
3	Gestation	Term	186	40.52
		Pre-term	273	59.48
4	Birth weight	Normal	80	17.43
		LBW	194	42.27
		VLBW	138	30.07
		ELBW	47	10.24

5	Duration between the time of admission and Death*	< 1 day	138	30.07
		1 – 3 days	211	45.97
		4 – 7 days	59	12.85
		> 7 days	51	11.11

Table 4: Mortality pattern of NICU neonates

Sr. No	Mortality	Frequency	Percentage
1	Moderate-Severe Birth Asphyxia	116	25.27
2	Respiratory Distress syndrome	109	23.75
3	Sepsis	95	20.70
4	Prematurity	60	13.07
5	Others	40	8.71
6	Meconium aspiration syndrome	21	4.58
7	Major Congenital Malformation	18	3.92
	Total	459	100.00

Table 5: Bivariate analysis of neonatal characteristics with mortality

Sr. No	Characteristics	Total Patients	Mortality n (%)	Chi square	OR 95% CI	p value	
1	Birth Place	Inborn	2055	246 (11.97)	1.56	1.13 (0.93-1.37)	0.21
		Outborn	2013	213 (10.58)			
2	Sex	Male	2251	264 (11.73)	0.80	1.09 (0.90-1.32)	0.37
		Female	1817	195 (10.73)			
3	Gestation	Term	2445	186 (7.61)	64.46	2.21 (1.81-2.68)	< 0.001
		Pre-term	1628	273 (16.77)			
4	Birth weight	> 2.5	1126	80 (7.10)	22.05	1.81 (1.41-2.33)	< 0.001
		< 2.5	2947	379 (12.86)			
5	NICU stay	< 3 day	1648	349 (21.18)	208.19	0.22 (0.17-0.27)	< 0.001
		> 3 day	2398	110 (4.59)			

3. Discussion

Neonatal mortality is still high in developing countries compared to developed world. (3) We have presented neonatal morbidity pattern and outcome parameters from a secondary care neonatal centre situated in a remote tribal, naxalite affected district of developing country. Present findings are not surprising and similar to many other under-resourced settings and developing countries. Our cohort was diversified group of neonates inborn and out born referred from other centres in same district as well as surrounding districts in this region.

Present study had nearly equal admission rate between inborn and outborn, while study conducted by other have found higher inborn admissions. (5,11) Considering sex of child, higher rate for male neonates (55.33%) was observed in our study, similar observation were found by Saini et al in Jalandhar. (10) Present study had 60 % of term neonates while study conducted by Modi R et al in Gandhinagar found 54.31%. (2) LBW (58.68%) were found in majority for admissions to NICU, while lower results were obtained by Modi R et al (54.24%), and Shridhar P et al found (40.55%) in Mandya. (2,12)

Nearly (77.13%) of neonates were discharged within 7 days, while Adhikari S et al in nepal found neonates (75.51%) were discharged within 7 days. (13) Survival to discharge rate in our study was 78.12%, similar results were observed by Rajan A (76.62%) while Adhikari et al (82.61%) found higher result. (13,14) Moderate-Severe Birth Asphyxia (42.46%) was most common indication for NICU admission. Malik S et al found similar observations (43.94%) in Bhopal, while Sahariya et al found (30.20%) in Guwahati. (5,11)

While considering various variables associated with neonatal mortality, nearly equal admission rate was observed among inborn and outborn neonates and similar results obtained by Adhikari et al. (13) Proportion of male mortality (57.52%) was higher as compared to their female counterpart, similar result were obtained by other authors. (12–14) Pre-term neonatal deaths were (59.48%), while sahariya N et al had (45.42%), while Malik S et al (71.08%) and Adhikari S et al (64.32%) had higher preterm mortality rates. (5,11,13)

Low birth weight neonates (42.27%) had mortality in our study, while Modi R et al found (36.05%), Prasad V et al (22.89%) , Adhikari S et al (34.78%). (1,2,13) Out of total mortality strata, Death of VLBW and ELBW neonates was 30.07% and 10.24% in our study. Prasad V et al found mortality rate in ELBW and VLBW group respectively 32.90% and 7.74%, and Saharia N et al found respectively 25.97% and 9.74%. (1,11) Time interval between admission and death was highest in 1-3 day group (45.97%) while Sridhar P et al found 40.21%. (12)

In our study there was no significant difference observed among mortality rate in inborn and out born, male and female neonates. Significant number of neonatal mortality events were associated with premature and LBW group. As in our study, these factors found significant in determining survival of neonate. Preterm neonates had 2 times risk of death compared with term neonates (OR=2.21) Higher finding was observed by Malik S et al (OR =3.8). (5) Similar result was obtained by Adhikari S et al (OR=2.17). (13) Also LBW (<2500 gms) was having roughly 2 times risk of mortality, compared with normal weight neonates (OR=1.81). Higher findings were observed by Malik S et al (OR=2.68), Adhikari S et al (OR=3.08). (5,13) NICU Stay less than three days was found protective as compared to longer duration (OR=0.22).

4. Limitations

The findings of current study should be deduced keeping in view the following limitations. Neonates, who were referred to other centres due to non-availability of NICU beds, left against medical advice and in need of surgical intervention were not included in the study and hence may alter true picture. As it was a government hospital based study and as most of the patients had a low socio-economic status, the results of this study may not give representativeness of the true disease burden which is prevalent in the district as a whole. Maternal details were not studied in the present study. In our study, we did not divide the deaths into early and late

neonatal period. We were unable to diagnose inborn errors of metabolism due to lack of diagnostic facilities.

5. Strengths

The enormous sample size is major strength of our study. We have enrolled neonates prospectively. Thorough follow up was maintained for every neonate. Precise data regarding mortality and morbidity pattern for NICU admission can be useful for upcoming studies and programmatic implications.

6. Conclusion

In the time interval of April 2016 to March 2018, total 4068 admissions took place. Moderate-Severe Birth Asphyxia, Sepsis, Jaundice requiring phototherapy was most common indication for NICU admissions. Out of total admissions, 459 (11.28%) died. Moderate-Severe Birth Asphyxia, Respiratory Distress syndrome, Sepsis accounted for mortality. The preterm and Low birth weight neonates had significantly higher mortality rates even with standard intensive care. The pattern observed in our data is different from national data which signifies need of regional data. There is a complex interplay of different demographic, educational, socioeconomic, biological and care-seeking factors, which are responsible for the disparities and the high burden of neonatal mortality.

7. Recommendations

Primary and secondary level neonatal care is greatest importance for additional reductions in NBW and LBW neonatal morbidities and mortality. Priority, is to make people aware of it and augment existing antenatal and neonatal facilities with modern gadgetries and equipment. Interventions should be planned and implemented at different levels of community to prevent and reduce preterm delivery, low birth weight and birth asphyxia, which are leading causes of neonatal deaths. Maternal and neonatal health care strategies should be further reinforced for prevention of complications related to birth. Moreover, community services should be strengthened for early detection and referral to prevent complications.

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9. Declarations

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Conflicts of interest: There are no conflicts of interest.

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