International Journal of Contemporary Pediatrics
Adikane H et al. Int J Contemp Pediatr. 2018 Jul;5(4):1403-1408
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20182536

Original Research Article

A prospective observational study of morbidity and mortality profile of neonates admitted in neonatal intensive care unit of secondary care centre in central Maharashtra, India

Hemant Adikane[1], Kishor Surwase[2]*, Vishal Pawar[3], Kalidas Chaudhari[4]

[1]Department of Community Medicine, Government Medical College, Gondia, Maharashtra, India
[2]Medical Officer, District Hospital, Parbhani, Maharashtra, India
[3]Paediatrician, [4]Medical superintendent, Women's Hospital, Parbhani, Maharashtra, India

Received: 08 March 2018
Accepted: 27 April 2018

***Correspondence:**
Dr. Kishor Surwase,
E-mail: drkishorsurwase@gmail.com

ABSTRACT

Background: Globally, 2.6 (2.5-2.8) million newborns died in 2016-i.e. nearly 7,000 every day. Neonatal deaths accounted for 46 % of all under-five deaths, increasing from 41 % in 2000. 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, Parbhani. Study period was Jan 2017 to Dec 2017. All the admitted babies to NICU were included into study. Data was collected by interview method using a predesigned, semi-structured questionnaire. Various morbidities and reasons for mortality were included.
Results: There were total 2471 admission during year of 2017. There was slightly higher admission rate for Males 1432 (57.95%) than females 1039 (42.05%). Pre-term admissions were 501 (20.28%). Majority of admissions were due to low birth weight 1170 (47.35%).
Conclusions: In the year of 2017, total 2472 NICU admissions took place. Out of these, 126 (5.09%) died. Respiratory distress syndrome, low birth weight, birth asphyxia were accounting for mortalities. The neonatal jaundice, preterm and low birth weight babies had significantly high mortality even with standard intensive care.

Keywords: Neonatal morbidity, Neonatal mortality, Neonatal intensive care unit, Respiratory distress syndrome, Secondary care centre

INTRODUCTION

A baby is a fathomless blessing and bother. The perinatal and neonatal period, in spite of its shortness, are considered as most critical phases of life. It reflects the general health and the various socio-biological features of mothers and infants.[1] The neonatal period i.e. the first 28 days of life carries the maximum risk of mortality per day than any other period during the childhood. The daily risk of mortality in the first 4 weeks of life is nearly 30 times higher than the post-neonatal period.[2]

Globally, 2.6 (2.5-2.8) million newborns died in 2016-i.e. nearly 7,000 every day. Neonatal deaths accounted for 46 % of all under-five deaths, increasing from 41 % in 2000. The largest number of newborn deaths occurred in Southern Asia (39 %), followed by sub- Saharan Africa (38 %). Five countries accounted for half of all newborn

deaths: India, Pakistan, Nigeria, the Democratic Republic of the Congo and Ethiopia.[3]

The global burden of neonatal death is primarily concentrated in developing countries, where care of neonates is practically less helpful.[4] Deaths occurring in NICUs have a major influence on infant mortality. Understanding the causes of death in NICUs and the modifiable factors associated with death has the potential to decrease infant mortality.[5] NFHS 4 data suggests that neonatal mortality rate (NMR) declined to 30 deaths per 1,000 live births.[6] 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.[7]

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.[8]

Problems of delaying in receiving treatment are solved with the enhancement of transport facility (like 108,102). With help of referral services, a large number of cases have been referred from peripheral health care centres to NICU's. So, there is increasing load of cases in NICU specifically in secondary health care units like district hospitals. Where in spite of giving quality care, we are providing quantity care as well, but insufficient heath care providers in district hospitals are hindering services.[9]

To plan how to eliminate preventable infant deaths, information is needed about the current distribution of causes of infant deaths which has changed in recent decades. There is a paucity of information regarding determinants of mortality for new-borns in settings with heavy burden of neonatal intensive care unit admission. There is limited information about neonatal outcome from developing countries.

Present study aims to find morbidities and causes of poor outcome in a secondary care neonatal unit of central Maharashtra. So, the knowledge about spectrum of neonatal diseases and proper management of common neonatal problems will lead to better outcome and improved quality of life among survivors.

METHODS

The present prospective observational study was conducted in Neonatal Intensive Care Unit (NICU) of a secondary care centre, district hospital, Parbhani in central Maharashtra. This NICU is currently a 20 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 region of marathwada of Maharashtra are being admitted.

Prospective observational study design was adopted to conduct the study. The data was collected from 1 January 2017 to 31 December 2017. Data was collected on daily basis.

Inclusion criteria

- The babies born in all over the district and nearby areas of parbhani district, those who were referred to the hospital
- All the admitted babies to NICU, were included into study.

Exclusion criteria

- Those parents who were not giving consent.

Measure

Data was collected by interview method using a predesigned, semi-structured questionnaire. Neonatal variables used were total number of admissions, gender, 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. 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.

Statistical analysis

Data was analyzed using STATA version 13.1. Continuous data was presented as mean and standard deviation (SD), categorical data was presented as frequency and percentage. Risk of mortality was calculated using odds ratio (OR) and 95% confidence interval.

RESULTS

There were total 2471 admission during year of 2017 of which inborn neonates were 1429 (57.83%), who were higher than outborn neonates 1042 (42.17%). There was slightly higher admission rate for Males 1432 (57.95%) than females 1039 (42.05%).

Pre-term admissions were 501 (20.28%). Majority of admissions were due to low birth weight 1170 (47.35%), as compared to normal birth weight 1097 (44.39%). Majority of neonates were admitted till 3 days 1706 (69.04%).

Majority of neonates were discharged after medical treatment 2110 (85.39%), while 126 (5.10%) were died, 71 (2.87%) were left against medical advice, 164 (6.64%) were referred to higher centres.

Table 1: Various characteristics of admission to NICU.

Characteristics		Frequency	Percent
Birth Place	inborn	1429	57.83
	outborn	1042	42.17
Gender	male	1432	57.95
	female	1039	42.05
Gestation	term	1970	79.72
	pre-term	501	20.28
Birth weight	normal	1097	44.39
	LBW	1170	47.35
	VLBW	170	6.88
	ELBW	34	1.38
Duration of hospital stays	< 1 day	158	6.39
	1-3 days	1548	62.65
	4 -7 days	539	21.81
	> 7 days	226	9.15
Outcome	discharge	2110	85.39
	referral	164	6.64
	LAMA	71	2.87
	died	126	5.10

Out of total admissions, most common morbidity was neonatal jaundice 723 (29.25%) followed by Respiratory distress syndrome 425 (17.19%). While mortality due to respiratory distress syndrome 72 (57.14%) was highest followed by ELBW neonates 22 (17.46%).

Table 2: Morbidity pattern of NICU patients.

Morbidity	Frequency	Percent
Neonatal Jaundice	723	29.25
RDS of newborn	425	17.19
Prematurity	374	15.13
Birth Asphyxia	277	11.21
Low Birth Weight	241	9.75
Neonatal aspiration of Meconium	172	6.96
Neonatal Sepsis	96	3.88
Congenital malformation	69	2.79
Convulsions of newborn	43	1.74
E.L.B.W.	34	1.38
Others	18	0.73
Total	2472	100

Table 4 shows, Mortality rate among inborn 72 (57.14%) was higher than outborn 54 (42.86%), also in males 67 (53.17%) were higher than females 59 (46.83%).

Pre-term 91 (72.22%) were having higher mortality rate. Low Birth Weight admissions 51 (40.48%) were highest followed by VLBW 40 (31.75%).

Table 3: Mortality pattern of NICU patients.

Mortality	Frequency	Percent
Respiratory distress syndrome	72	57.14
E.L.B.W.	22	17.46
Moderate-Severe birth asphyxia	13	10.32
Major congenital malformation	6	4.76
Meconium aspiration syndrome	5	3.97
Sepsis	5	3.97
Meningitis	3	2.38
Total	126	100

Duration between the time of admission and Death was highest upto 3 days 102 (80.95%). Majority of mortality of neonates having age less than 1 day 107 (84.92%).

Table 4: Characteristics of neonates with mortality.

Characteristics		Frequency	Percent
Birth Place	inborn	72	57.14
	outborn	54	42.86
Gender	male	67	53.17
	female	59	46.83
Gestation	term	35	27.78
	pre-term	91	72.22
Birth weight	normal	13	10.32
	LBW	51	40.48
	VLBW	40	31.75
	ELBW	22	17.46
Duration between the time of admission and Death*	< 1 day	33	26.19
	1-3 days	69	54.76
	4-7 days	13	10.32
	> 7 days	11	8.73

*Mean duration of hospital stays days mean±SD= 0.75±3.26

Table 5 depicts, Mortality rate among inborn 72 (5.04%) and outborn 54 (5.18%) were similar in the study, there was no significant difference in death rates of inborn and outborn neonates (chi value = 0.02). Mortality rate among males 67 (4.68%) and females 59 (5.68%) were similar in our study. Also, there was no significant differences (chi value = 1.21).

Pre-term neonates 91 (18.16%) were having high mortality rate which was found statistically significant (chi value = 36.14).

Similarly, Low birth weight neonates (<2500 gms) were also having higher mortality rate (8.22%), it was significant finding with chi square value = 56.89. Hospital stay less than 3 days seems to be protective (chi value = 8.04).

Table 5: Characteristics of neonates with mortality.

Characteristics		Total patients	Mortality N (%)	Chi square	OR 95% CI	p value
Birth place	inborn	1429	72 (5.04)	0.02	1.03 (0.71-1.47)	0.7
	outborn	1042	54 (5.18)			
Gender	male	1432	67 (4.68)	1.21	1.21 (0.84-1.74)	0.29
	female	1039	59 (5.68)			
Gestation	term	1970	35 (1.78)	36.14	3.93 (2.42-6.37)	< 0.001
	pre-term	501	91 (18.16)			
Birth weight	> 2.5	1097	13 (1.19)	56.89	6.94 (3.99-12.88)	< 0.001
	< 2.5	1374	113 (8.22)			
Hospital stay	< 3 days	1706	102 (5.98)	8.04	0.53 (0.33-0.82)	0.002
	> 3 days	765	24 (3.14)			

DISCUSSION

In present study author's tried to present neonatal morbidity pattern and outcome parameters from secondary care neonatal centre in a developing country. Inequities in child mortality across and within countries remain large. As compared to developed countries, neonatal mortality is still high in developing countries. A child in Southern Asia is nine times more likely to die in the first month than a child in a high-income country. 3 As our NICU is overburdened with a lot of admission rate, many studies of neonatal care have shown a high mortality rate in hospitals with higher volumes of patients than in those with lower volumes.[10]

Present study have more neonates from inborn 1429 (57.83%) similar result was found by Malik S et al (57.21%), Saharia et al (59.32%).[7,9] Our study had gender distribution of (M=57.95% Vs F=42.05%), study conducted by Saini et al found similar results (M=54.56% Vs F=45.44%).[8] In present study, 1970 (79.72%) were term neonates, similarly Saharia et al found (65.66%) and Modi et al found (54.31%).[1,9] LBW were majority 1170 (47.35%) in present study while higher result was obtained by Modi et al (54.24%), and Shridhar et al found (40.55%) neonates were belonging to L.B.W.[1,11] Majority neonates were discharged within 3 days 1706 (69.04%), Adhikari et al found neonates (47.91%) were admitted upto 7 days.[12]

Present study have survival to discharge was (85.39%) in the NICU. Lower results were found by Ranjan et al (76.62%).[13] Adhikari et al found survival rate 82.61%.[12] The neonatal jaundice (29.25%) was most common indication for NICU admission. Saharia et al found NICU admission due to neonatal jaundice in (26.61%) of neonates while Malik et al had found (14.91%) for neonatal jaundice with sepsis (45.09%) as leading cause.[7,9] Prasad et al found neonatal jaundice (19.84%) of neonates while Sridhar P et al found (7.02%).[11,14]

Mortality rate in our study was 5.09%. While in literature, it is reported different from different places. Malik et al have found 26.66% in Bhopal, Modi et al found 9.42% in Gandhinagar 1, Sridhar et al found 7.16% in Mandya 11, Saharia et al found 13.77% in Gauhati 9, Prasad et al found 18.69% in Haldwani 14, Ranjan et al found 23.40% in Patna 13. The Respiratory Distress Syndrome (57.14%) was most common reason for mortality in our study.[1,7,9,11,13,14] Saharia et al have most common reason for mortality was Hypoxic Ischaemic Encephalopathy 57.79%, Malik et al found neonatal sepsis 47.57%, Sridhar et al found Respiratory distress syndrome (RDS) 43.42%, Prasad et al found Prematurity with RDS 37.74%, Ranjan et al found birth asphyxia 20.84%.[7,9,11,13,14]

Mortality rate among inborn 72 (57.14%) and outborn 54 (42.86%) were in present study, while higher results were obtained by Shridhar et al (In=67.01% Vs Out=32.99%), While Modi et al found lower mortality rates among outborn (19.77%) as compared to inborn (80.23%) neonates.[1,11] Proportion of male neonatal mortality 67 (53.17%) was slightly higher as compared to female 59 (46.83%). Similar results were obtained by Shridhar et al (M=59.23% Vs F=40.77%) in Karnataka, Adhikari et al (M=65.21% Vs F=34.79%) in Nepal, while Ranjan et al studied in Patna and found male mortality was upto 65.30%.[11-13]

Pre-term neonatal deaths were 91 (72.22%), while Saharia et al found (17.99%), Saini et al found (11.69%),

Malik et al found higher (42.63%) preterm mortality proportion.[7-9] Low birth weight neonates 113 (89.68%) had mortality in our study, while Modi et al found (36.05%), Prasad et al (22.89%), Adhikari et al (34.78%).[1,11,14] The mortality rate in ELBW and VLBW was 64.71% and 23.53%. Prasad et al found mortality rate in ELBW and VLBW group respectively 63.16% and 31.38%.[14] Saharia et al found mortality rate in ELBW and VLBW group respectively 89.29% and 55.10% which was higher than our study.[9]

Duration of time between admission and death was highest between 1 to 3 days 54.76%. Sridhar et al found 40.21%, Aggrawal et al found 60.00% of deaths had occurred within first 24 hrs of admission.[11,15] Most of neonates, those were having poor outcome, were belonging to premature and LBW group. Prematurity and birth weight are important factors in determining survival of neonates in NICU, as in present study, preterm neonates had roughly 4 times risk of mortality compared with term neonates (OR = 3.93). Similar findings were found by Malik et al (OR=3.86) and Adhikari et al (OR=2.17).[7,12] Also, birth weight < 2500 gms was also having roughly 7 times risk of mortality compared with term neonates (OR = 6.94). Malik et al found OR=2.68 7 and Adhikari et al (OR=3.08).[7,12] Future national programmes for improving neonatal care should be having component of addressing of LBW in addition to continuing care for NBW neonates.

The findings of current study should be deduced keeping in view the subsequent 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 excluded from study and could hence modify the results. 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 community as a whole. Maternal details were not studied in the present study. In present study, authors did not divide the deaths into early and late neonatal period. Authors were unable to diagnose inborn errors of metabolism due to lack of diagnostic facilities.

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

CONCLUSION

In the year of 2017, total 2472 NICU admissions took place. Out of these, 126 (5.09%) died. Respiratory distress syndrome, low birth weight, birth asphyxia were accounting for mortalities. The Neonatal jaundice, preterm and low birth weight babies had significantly high mortality even with standard intensive care. This pattern is different from national data. There is need to obtain regional data too. There is an interplay of different demographic, educational, socioeconomic, biological and care-seeking factors, which are responsible for the disparities and the high burden of neonatal mortality.

Recommendations

Maternal and neonatal health care policies should be further strengthened for prevention of complications related to birth. Primary and secondary level neonatal care is utmost crucial for further 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. Moreover, community services should be stressed upon for early detection and referral to prevent complications.

ACKNOWLEDGEMENTS

Authors would like to thank Department of Community Medicine, Gondia and study participants who voluntarily took part in the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Adikane H, Surwase K, Pawar V, Chaudhari K. A prospective observational study of morbidity and mortality profile of neonates admitted in neonatal intensive care unit of secondary care centre in central Maharashtra, India. Int J Contemp Pediatr 2018;5:1403-8.