Original Article

Study of the Morbidity and the Mortality Pattern in the Neonatal Intensive Care Unit at a Tertiary Care teaching Hospital in Gandhinagar District, Gujarat, India

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ABSTRACT

Background: Neonates are vulnerable and fragile beings. Many of them would fall sick despite precautions and care, especially in resource poor home settings. The early identification of serious illness and seeking care are key areas in averting neonatal morbidity and mortality. So, if we aware of morbidity and mortality pattern it is helpful to divert resources in proper direction.

Aim: Study the morbidity and mortality patterns in a NICU of a tertiary care teaching hospital.

Materials and Methods: This hospital based retrospective study was carried out in the NICU, at Civil Hospital, Gandhinagar, for a period of 1 year. After tacking ethical permission from Institutional Ethical Committee and administrative permission from medical superintendent, medical files of the neonates were retrospectively reviewed.

Results: Male (56.36%) and female (43.36%) neonates ratio was 1.29: 1. Five hundred and fifty seven babies (67.51%) were born in this hospital and 288 (32.49%) babies were referred from peripheral hospitals and nursing homes. The chief causes of admission in NICU were RDS (31.64%) followed by MAS (24%), jaundice (16.73%) and sepsis/pneumonia/meningitis (11.64%). Out of the 86 deaths, 13 deaths (15.12%) occurred in the normal birth weight group, while 73 deaths (84.88%) occurred in the less than 2.5kg birth weight group.

Conclusion: Respiratory distress syndrome, Meconium Aspiration Syndrome, neonatal sepsis, neonatal hyperbilirubinemia, and HIE as the major causes of morbidity. With Low Birth Weight and prematurity being the commonest contributors of death, attempts to prolong the pregnancy each week might improve the neonatal outcome considerably.

Key words: Neonatal morbidity, Neonatal mortality, Neonatal Intensive Care Unit, Tertiary care hospital

INTRODUCTION

A baby is an inestimable blessing and bother. The peri-natal and neonatal period, in spite of its shortness, is considered as most critical phases of life. [1] It reflects the general health and the various socio-biological features of mothers and infants. [2-3] Neonates are vulnerable and fragile beings. Many of them would fall sick despite precautions and care, especially in resource poor home settings. The early identification of serious illness and seeking care are key factors in averting neonatal morbidity and mortality. Of the 130 million babies born every year, about 4 million die in the first four weeks of life-the neonatal period. [4] Most neonatal deaths (99%) arise in low-income and middle-income countries. [5]About a quarter of global neonatal deaths occur in India. [6] According to the SRS Statistical report 2013, the current neonatal mortality rate (NMR) in India is 28 and ranges from 15 in urban areas to 31 in rural areas. The percentage of neo-natal deaths to total infant deaths is 68.0 per cent at the National level and varies from 56.4 per cent in urban areas to 69.9 per cent in rural areas. Among the bigger States, neo-natal mortality ranges from 37 in Odisha to 6 in Kerala. [7]The neonatal mortality rate in Gujarat (26 per 1000 live birth) is less than that of the national figure but still there is scope of improvement due to the proper health infrastructures and good availability of transport facility.

The major direct causes of the neonatal deaths were preterm birth, infections, and asphyxia. In a report which was published in The Lancet, the major direct causes of the deaths were pre-term

birth (27%), infection (26%), asphyxia (23%), congenital anomalies (7%), others (7%), tetanus(7%) and diarrhea (3%). [5] Several studies in India reported same underlying causes of neonatal deaths. [8-11]there are limited reports with special focus on morbidity and mortality pattern of neonates in Gujarat. The objective of the study was to study the morbidity and mortality patterns in an NICU of a tertiary care teaching hospital which was located in the Gandhinagar district of Gujarat.

MATERIAL AND METHODS

This hospital based retrospective study was carried out in the neonatal intensive care unit (NICU), Department of Pediatrics, at Civil Hospital, Gandhinagar, Gujarat, India, for a period of 1 year from January 2014 to December 2014. Our hospital caters mainly to rural and semi-urban patients, with a significant number of them being below the poverty line (BPL) income group patients. This government hospital provides maternal and child health care services in the city, in addition to high percentage of referral of high-risk pregnancies and sick newborns from other peripheral hospitals. With ethical permission from Institutional Ethical Committee and administrative permission from medical superintendent of civil hospital, Gandhinagar, medical files of the neonates were retrospectively reviewed.

Inclusion criteria: All new-borns< 28 days of life admitted in NICU from January 2014 to December 2014.

Exclusion Criteria: (a) Babies who left the hospital against medical advice. (b) Neonates whose medical records were incomplete.

New-borns admitted in the hospital but referred to other hospital due to any reason. The calculation of the survival was done after subtracting them from the total admission, as their outcome was not known.

These new-borns were categorized as inborn if delivered by any route in the Teaching Hospital and outborn if born outside. The data were recorded from record files of neonates in Proforma and definitions used for the purpose are:

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

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

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

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

• Neonatal infections (sepsis, pneumonia, and meningitis)—These were diagnosed on clinical grounds along with appropriate tests, which include sepsis screen, blood culture, chest radiograph, and cerebrospinal fluid analysis. Invasive infections have been grouped together due to similar and overlapping presentation and management.

• Meconium aspiration syndrome (MAS)—this was diagnosed both radio graphically and clinically based on history of being born through meconium-stained amniotic fluid, chest radiograph, and respiratory distress persisting beyond 24 hours.

• Congenital malformations—these were diagnosed on clinical features and diagnostic facilities like ultrasound, echocardiography, X rays, and Electrocardiography (ECG)

• Neonatal jaundice—this was diagnosed after assessment of serum bilirubin and found to be in pathological zone in age, weight, and gestation-specific range.

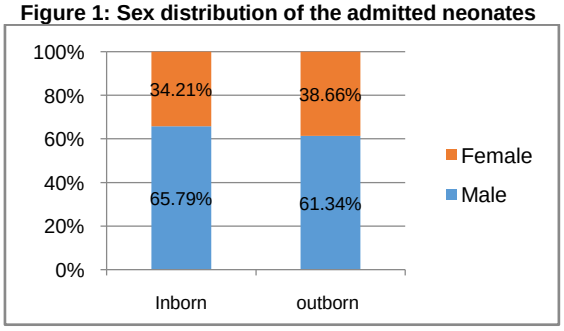
Statistical analysis

The data were collected from the record files of admitted neonates, compiled and entered in MS Excel, and analysed using appropriate statistical tools in Epi info 7.1.5

RESULTS

A total of 913 babies were admitted to our NICU, of these 913 babies, 88 babies who left the hospital against medical advice (LAMA) were excluded from the study. A total of 825 neonates were included for the data analysis. The ratio of the male (56.36%) and female (43.36%) neonates was 1.29: 1. Five hundred and fifty seven babies (67.51%) were born in this hospital and 288 (32.49%) babies were referred from peripheral hospitals and nursing homes.

Figure 1: Sex distribution of the admitted neonates



As seen in Table 1, most of the neonates admitted in the NICU weighed < 2.5 kg (72%). The percentage of low and very low birth weight babies was almost similar in outborn (30.22%) and inborn

neonates (26.92%). Greater percentage of inborn neonates (48.65%) were preterm than outborn neonates (39.55%).

The chief causes of admission in NICU were RDS (31.64%) followed by MAS (24%), jaundice (16.73%) and sepsis/pneumonia/meningitis (11.64%). Morbidity profile is not similar for inborn and outborn neonates. Respiratory distress syndrome was the major morbidity found in inborn (36.45%) while Sepsis/pneumonia/meningitis was present in major outborn neonates (29.49%).

Table 1: Weight & Gestation period of inborn and outborn neonates admitted at NICU

Variable	Inborn (n=557)	Outborn (n=268)	Total
Sex			
Male	300 (53.85)	165 (61.57)	465 (56.36)
Female	257 (46.15)	103 (38.43)	360 (43.63)
Weight of neonates			
≥ 2.5 Kg	150 (26.92)	81 (30.22)	231 (28)
1.5 - 2.499 Kg	287 (51.52)	144 (53.73)	431 (52.24)
1 – 1.499 Kg	97 (17.41)	39 (14.55)	136 (16.48)
≤ 1 Kg	23 (4.12)	04 (1.49)	27 (3.27)
Gestation period			
≥ 37 Weeks	286 (51.35)	162 (60.45)	448 (54.31)
< 37 Weeks	271 (48.65)	106 (39.55)	377 (45.69)

(Figures in parentheses showing percentage)

Other major morbidity among inborn neonates were MAS (30.34%), jaundice (12.03%) and birth asphyxia with HIE (10.69%). [Table 2]

Table 2: Morbidity profile of the inborn and outborn neonates admitted in NICU

Type of Morbidity	Inborn (n=557)	Outborn (n=268)	Total
Respiratory distress syndrome	203 (36.45)	58 (21.64)	261 (31.64)
Meconium aspiration syndrome	169 (30.34)	29 (10.82)	198 (24)
Respiratory distress (other causes*)	26 (4.67)	4 (1.49)	30 (3.64)
Birth asphyxia with HIE	59 (10.69)	13 (4.85)	72 (8.73)
Sepsis/pneumonia/meningitis	16 (2.87)	80 (29.49)	96 (11.64)
Jaundice	67 (12.03)	71 (26.49)	138 (16.73)
Major congenital anomaly	3 (0.54)	5 (1.84)	8 (0.97)
Hypothermia	2 (0.36)	1 (0.37)	3 (0.36)
Hypoglycaemia	10 (1.8)	4 (1.49)	14 (1.68)
Other	2 (0.36)	3 (1.12)	5 (0.61)

(Figures in parentheses showing percentage)

As seen in Table 3, most of the neonates admitted in NICU survived (88.98%) more being 93.43% in outborn and 86.78% in inborn neonates. For comparison of deaths in inborn and outborn neonates as seen in Table 3, the percentages of neonates that went LAMA (*N* = 88, 8.32%) and referred (*N* = 44, 5.33%) have been excluded.

Table 3: Survival outcome of the admitted neonates at the NICU*

Outcome	Inborn	Outborn	Total
Discharged	453 (86.78)	242 (93.43)	695 (88.98)
Death	69 (13.22)	17 (6.57)	86 (11.02)

***Neonates who were referred to other hospital were excluded for calculation of survival outcome**
(Figures in parentheses showing percentage)

Out of 86 neonates who died, the outborn neonates (*N* = 17, 6.57%) were less than inborn neonates (*N* = 69, 13.22%) and this difference in the death rates of inborn and outborn neonates is found to be statistically significant (*P* < 0.005).

Out of the 86 deaths, 13 deaths (15.12%) occurred in the normal birth weight group, while 73 deaths (84.88%) occurred in the less than 2.5kg birth weight group. On comparing the survival among the different weight groups, it was seen that there were significant differences between the VLBW group and the normal birth weight group (p<0.0002), and between the ELBW group and the normal birth weight group (p< 0.0001). However, there was no statistically significant difference between the LBW group and the normal group (p=0.4421)**.** The relative risk of the deaths in the VLBW and the ELBW groups as compared to the normal birth weight group was 3.77 and 28.5 times respectively. [Table - 4]

Table 4: Survival outcome of the admitted neonates as per their birth weight

Weight of neonates	Number of neonatal death N=86 (Proportion of total death)	Odds Ratio (CI)
≥ 2.5 Kg	13 (15.12)	1
1.5 - 2.499 Kg	31 (36.05)	1.29 (0.67-2.53)
1 – 1.499 Kg	26 (29.07)	3.77 (1.84-7.67)
≤ 1 Kg	17(19.77)	28.50 (10.90-74.51)

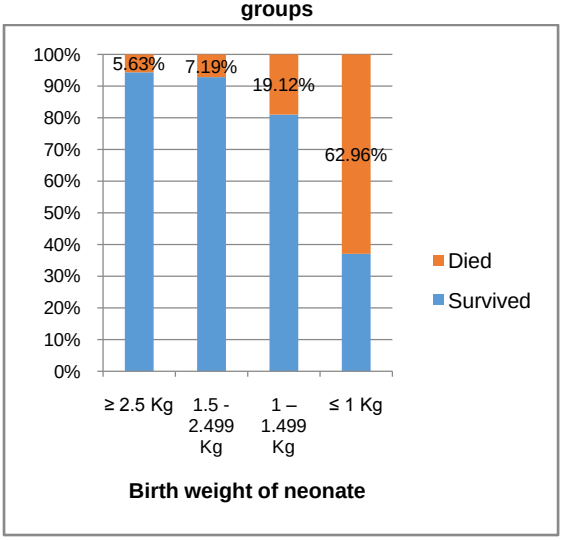
(All Figures in percentage)

Mortality rate for different weight group was different. In Figure – 2 it was clear that mortality rate was increases as birth weight of neonate's decreases. Mortality rate among normal weight was much less (5.63%) compared to ELBW neonates (62.96%).

DISCUSSION

In our study admissions of male babies were more than those of females. The sex distribution of population in this study is in concordance to National Neonatal-Perinatal Database (NNPD) and other studies of rural India. [12-14]these may be due to gender bias prevalent in India where male children are given more care or a greater tendency of male children to face neonatal complications. Outborn versus inborn neonates (32.49% vs. 67.51%) were different from study by Rakholiya*et al*. [15] in Uttarakhand (53.54% vs. 46.46%).

Figure 2: Treatment outcome in different birth weight groups



In the present study, the commonest causes of admission were respiratory distress (RDS contributing 31.64% and other causes 3.64%), sepsis/pneumonia/meningitis were responsible for 11.64%, perinatal asphyxia 8.73%, and neonatal jaundice 16.73%. Studies from Africa show more admissions due to sepsis, jaundice, and tetanus. [16-18]In the developed countries, the scenario is different with extreme prematurity, asphyxia, and congenital anomalies being the chief causes as seen a study in Canada by Simpson *et al*. [19] The commonest causes of admission out born neonates were sepsis/pneumonia/meningitis (29.49%), jaundice (26.49%) and respiratory distress syndrome (21.64%). The findings are similar to NNPD where systemic infections (28.4%), hyperbilirubinemia (27.9%), and ischemic encephalopathy (8.3%) were common morbidities observed. Birth asphyxia is an important cause of neonatal morbidity and mortality. The incidence of moderate to severe grade birth asphyxia with HIE was observed in 8.73% neonates in the present study, less than finding of Manikant et al. (18.2%). [20]

Referral rate (5.33%) and the rate of LAMA (9.63%) in this study was similar to Rakholiya*et al*. [15] (4.58% & 8.32%) and other studies in medical colleges hospital elsewhere [21, 22] but much lower than studies in other hospital of North India. [23]

The mortality rate of 11.02% in the current study is higher than developed countries like Canada (7.6%) which are equipped with better facilities like Extra Corporeal Membrane Oxygenation (ECMO), total parenteral nutrition (TPN), and a higher doctor to patient and nurse to patient ratio. [19] Our mortality rate is same as other developing country like Sudan (11%). [24] The mortality rate is slightly better than countries like Nepal (26.6%) and Kenya (18.7%). [25, 26]

Low birth weight (LBW) deaths accounted for 36 % of the total deaths in our study. In a study from a sub-district level hospital from India, Kumar et al reported a similar mortality rate. [23]Our study also showed that preterm babies with a birth weight which was less than 1500g were strongly associated with high mortality. Yasmin et al from Bangladesh also reported that VLBW and lower gestational age (<32weeks) carried a high mortality risk. [27]

CONCLUSION

This study identifies respiratory distress syndrome, Meconium Aspiration Syndrome, neonatal sepsis, neonatal hyperbilirubinemia, and HIES as the major causes of morbidity. With Low Birth Weight and prematurity being the commonest contributors of death, attempts to prolong the pregnancy each week might improve the neonatal outcome considerably. Perinatal asphyxia and infection are important preventable causes of mortality, which must be urgently addressed, if India hopes to achieve Millennium Development Goal 4.

LIMITATION

Because of retrospective nature of the study, cause of death was determined by the extent and depth of information in the official records. As it was a hospital based study and as most of the patients had a low socio-economic status, the results of this study may not reflect the true burden which is prevalent in the community as a whole. Maternal details were not studied in the present study.

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