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MORBIDITY AND MORTALITY PROFILE OF NEWBORNS ADMITTED TO THE NEONATAL INTENSIVE CARE UNIT OF A TERTIARY CARE TEACHING HOSPITAL OF HIMACHAL PRADESH

Paediatrics

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ABSTRACT

Introduction: Neonatal deaths constitute a big fraction of under-five mortality in children. India is one of the countries with higher neonatal mortality rates across the globe. To combat this problem, it is important to recognize the pattern of mortality and morbidity in newborns so, as to formulate appropriate strategies to cut this fraction. **Objective:** To analyse the pattern of mortality and morbidity of newborns admitted in neonatal intensive care unit (NICU) at Kamla Nehru hospital (KNH). **Methods:** A retrospective analytical study was conducted at NICU of a tertiary care centre of Himachal Pradesh from April 2019 to February 2020 and information pertaining to illness and mortality profile of newborns admitted in NICU was recorded on a predesigned proforma. **Results:** A total 965 babies were admitted in NICU during study period with a male to female ratio of 1.3:1. Majority of the babies (51.30%) had low birth weight and 38.97% were preterm. Respiratory distress, birth asphyxia, infections, anaemia, hypothermia, jaundice and hypoglycaemia were found to be the common morbidities affecting newborns. Around 15.85% of babies had expired. Prematurity was the most important cause of mortality. Other causes included perinatal asphyxia, sepsis, congenital anomalies and respiratory distress. ELBW babies had highest proportions of deaths and late neonatal deaths were more common. **Conclusion:** This study highlighted the major causes of neonatal mortality in our NICU. The results of present study can be utilized to frame the new strategies and protocols and to strengthen the existing health services to improve the outcomes of neonatal care in KNH.

KEYWORDS

NICU, Morbidity, Mortality, KNH, Prematurity.

INTRODUCTION

Neonatal period is the most vulnerable period during childhood.(1) Neonatal deaths amount to the highest proportion of under five deaths. Worldwide, nearly 44% of under five children deaths are contributed by deaths in the newborn period.(2) In the year 2019, as per data UNICEF data, the global neonatal mortality rates (NMR) was 17 per thousand live births which was nearly 50% of global under 5 mortality rate in the same year i.e. 38 per 1000 live births.(3)(4) Thought out world, around 4 million babies die every year in the first 4 weeks of life. The middle and low-income countries bear the 99% burden of this proportion. Sub-Saharan Africa and south-central Asian countries have the highest neonatal mortality rates.(5) India, being a developing nation also bear a huge toll of this proportion.(6) In the year 2013, India lost about 0.75 million babies in the neonatal period, one of the highest figure for any country across the globe. (2).

The major factors contributing to the neonatal mortality are prematurity (27%), infections (26%), perinatal asphyxia (23%) congenital anomalies (7%), others (7%), tetanus (7%), and diarrhoea (3%).(5) Not only neonatal mortality, but the morbidity in the neonatal period is also a huge burden to the society as well as the health system of the country.(7) Hypothermia, jaundice, fever, diarrhoea, septicaemia, pneumonia, conjunctivitis, umbilical and skin infections etc. are major causes of morbidity in neonatal period.(8)(9) A study by Bang et al report a mean incidence of 2.2 morbidities per newborn in rural parts of India. A few of these morbidities were reported to have case fatality rate of more than 10%. (9)

These mortality and morbidity rates in newborn are not uniform across the nation. Kerala and Tamil Nadu have low NMR (20 per 1000 live births); Odisha, Uttar Pradesh and Madhya Pradesh have very NMR (>35 per 1000 live births). (7) The variation in these rates is a result of multiple factors like heterogeneity in coverage of health services, literacy rate and socio- economic factor status per capita income of a particular state. Besides, these geographical factors like climate, humidity etc also result in differences of mortality rates.(7)(10) Himachal Pradesh has a NMR of nearly 25 per 1000 live births. (7) Though, not very high but still it is far away from the global NMR. Since, there are significant geographical variations, hence, it is important to study the morbidity and mortality profile of local population. This will help in planning appropriate interventions and generation of specific treatment protocols which in turn would help in bringing down the death rate and improving the quality of life of survivors.

As, there is no previous data elucidating the morbidity and mortality patterns of Himachal Pradesh, so, this study was planned with the aim of describing the mortality and morbidity profile of neonates born at a tertiary care Institute in Shimla, Himachal Pradesh.

Study Methods

This observational retrospective study was carried out at the neonatal intensive care unit (NICU) of Kamla Nehru Hospital (KNH), Indira Gandhi Medical College, Shimla, Himachal Pradesh. KNH caters to the inborn babies of the institute. This is level III , 24 bedded NICU and serves as a referral centre for the other districts of Himachal. Besides, NICU has 10 warmers; 4 ventilators, 5 bubble CPAP and 7 phototherapy units.

Babies who were 0-28 days old, born at KNH from April 2019 to February 2020 and admitted to NICU were included in the study. Data was collected from admission and discharge registers. A pre-structured proforma was used to compile the data. Information pertaining to date of birth (DOB), gestational age, gender, birth weight, illnesses and causes of mortalities, duration of hospital stay, cause of death and the final outcome in terms of discharge, death, referral or left against medical advice (LAMA) was collected.

The babies were grouped on basis of their gestational age into term, born >37 weeks period of gestation (POG); preterm, born <37 weeks POG and early preterm, born before 34 weeks POG. The babies were also grouped on basis of their birth weight into low birth weight (LBW), having birth weight <2500 grams; very low birth weight (VLBW), having birth weight <1500 grams and extremely low birth weight (ELBW), having birth weight <1000 grams.

Data was compiled analysed using Microsoft excel sheets and statistics were reported as proportions.

RESULTS

A total of 965 babies were admitted in NICU from April 2019 to Feb 2020. Among these, 426 (44.14%) were females with male to female ratio of 1.3: 1. A total of 589 (61.03%) babies were born at term. Out of 376 preterm babies, 129 (34.30%) were early preterm. None of the

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babies were post-dates. LBW babies constituted 51.29% (495 out of 965) of the cohort, out of which 76 (15.35%) were VLBW and 25 (5.05%) were ELBW babies. (Table 1)

Out of the total 965 babies admitted to NICU, 746 (77.30%) were discharged to home, 32 (3.33%) were referred to higher centre, 34(3.52%) died and 153 (15.85%) were taken from the hospital against the medical advice (Table 2).

A note was also made of the various morbidities suffered by the babies during their stay in ICU. It was found that 241 (24.97%) had developed respiratory distress syndrome (RDS); meconium aspiration syndrome (MAS) was diagnosed in 66 (6.83%) babies and 45 (4.67%) babies developed respiratory distress due to other causes. Around 105 babies (10.88%) had experienced perinatal asphyxia and 233 (24.14%) babies were treated as either sepsis, pneumonia or meningitis.

A total 352 (36.47%) babies developed pathological jaundice requiring phototherapy, however, none of them developed cholestasis. Sixty-eight (07.04%) babies developed hypoglycaemia during their stay in ICU, hypothermia was observed in 108 (11.19%) babies and 308 (31.91%) babies developed anaemia. Out of these 308, 95 (30.84%) babies required blood transfusion at least once during their hospital stay. A total of 360 (37.30%) babies received antibiotics and oxygen therapy was required in 405 (41.96%) babies.

Thirty-nine (4.04%) babies had one or the other congenital anomaly and 28 (2.90%) babies suffered from other non-specific illnesses like conjunctivitis, cellulitis, calcium burns etc. Table 3 summarizes the morbidity profile of the enrolled babies.

The duration of stay in hospital was also recorded for all the babies and it was found that among babies who had not expired in NICU, nearly 154 (18.97%) babies had stayed in hospital for less than a day. A total of 269 (33.12%) babies stayed for 1-3 days; 150 (18.47) babies had a hospital stay of 4-7 days and 239 (29.43%) babies stayed for more than a week at KNH (Table 4).

Out of the babies admitted in NICU during the study period, around 153 (15.85 %) babies had expired. Prematurity (23.5%) was found to be the most common cause of mortality. Others causes of neonatal mortality reported were RDS, MAS, perinatal asphyxia and congenital anomalies.

Majority of the babies who expired were preterm (132 / 153) and only 21 (13.7%) of them were born at term or it could be interpreted that 3.5% of term babies 35.10% of preterm babies admitted in NICU had died. Largest proportion of the babies who expired had birth weight <1000 grams (16/25). Fourteen babies (2.9%) with weight >2500 grams, thirty four (44.7%) VLBW babies and 89/394 (9.22%) LBW babies had expired. Most of the babies died after first week of life (68/153). Out of the rest 85 babies, 22 were those who expired on day one of life itself. Table 5 summarizes the mortality profile of the babies.

Table 1. Baseline characteristics of babies admitted in NICU

	n= 965 (%)
Sex	
Male	539 (55.85)
Female	426 (44.14)
Birth weight	
>2500 grams	470 (48.70)
1500- 2499 grams	394 (40.83)
1000- 1499 grams	76 (7.87)
<1000 grams	25 (2.59)
Gestational age	
≥37 weeks	589 (61.03)
<37 - ≥34 weeks	247 (25.59)
<34 weeks	129 (13.36)

Table 2. Final outcome of the enrolled babies

	n = 965 (%)
Discharged	746 (77.30)
Referral	32 (3.33)
LAMA	34 (3.52)
Died	153 (15.85)

Table 3. Morbidity profile of babies admitted in NICU

	n= 965 (%)
RDS	241 (24.97)
MAS	66 (6.83)
Others causes of respiratory distress	45 (4.67)
HIE/ Perinatal asphyxia	105 (10.88)
Sepsis/ pneumonia/ meningitis	233 (24.14)
Anaemia	308 (31.91)
Hypothermia	108 (11.19)
Hypoglycaemia	68 (7.04)
Congenital anomalies	28 (2.90)
Treatment received	95 (30.84)
Blood transfusion	405 (41.96)
Oxygen therapy	360 (37.30)
Antibiotics	352 (36.47)
Phototherapy (pathological jaundice)	

RDS - Respiratory distress syndrome; MAS - meconium aspiration syndrome;
HIE – hypoxic ischaemic encephalopathy.

Table 4. Duration of hospital stay of babies admitted in NICU (excluding the babies who expired)

Duration of hospital stay	n= 812 (%)
< 1 day	154 (18.97)
1-3 days	269 (33.12)
4-7 days	150 (18.47)
>7 days	239 (29.43)

Table 5. Mortality profile of babies admitted in NICU

	n (%)
Total number of babies expired (N= 965)	153 (15.8)
Cause of mortality (N = 153)	
Prematurity	41 (26.79)
RDS	36 (23.52)
MAS	10 (6.53)
HIE/ Perinatal Asphyxia	14 (9.15)
Sepsis/ pneumonia/ meningitis	23 (15.03)
Congenital anomalies	41 (26.79)
Others	20 (13.07)
Age at death (N = 153)	
< 1 day	22 (14.37)
1-3 days	30 (19.61)
4-7 days	33 (21.57)
>7 days	68 (44.44)
Birth weight of expired babies (N = 153)	
>2500 grams	14 (9.15)
1500 – 2499 grams	89 (58.17)
1000 – 1499 grams	34 (22.22)
<1000 grams	16 (10.40)
Gestation at the time of death (N = 153)	
Term	21 (13.72)
Preterm	132 (86.27)

N = number of babies that form the denominator in that category; n – number of babies expired; RDS- Respiratory distress syndrome; MAS - meconium aspiration syndrome; HIE – hypoxic ischaemic encephalopathy; LAMA – left against medical advice.

DISCUSSION

A total of 965 babies were admitted in NICU at KNH during our study period. All these were inborn babies. There was a male predominance, with male to female ratio of 1:3. Studies by Malik et al., Patel et al., Anupama et al., Bhatt et al. and several other researchers have reported a higher proportion of male babies amongst newborn ICU admissions (11)(12)(13)(14)(15). This could be possibly explained by the higher preference for male babies in our society or may be due to inherent vulnerability of male babies to perinatal infections and illnesses. (16)

Preterm babies constituted 51.3% of our NICU admissions and 39% of the babies were low birth weight. Mani Kant et al. reported similar proportion of LBW NICU admissions, however, the proportion of preterms was lower in their study.(12) Our findings are consistent with the fact that preterm babies are at higher risk perinatal complications than term babies. This is possibly due the incompletely mature immune and organ systems that are not yet ready to support life in extra uterine environment. (17)

The analysis of morbidity profile of the study cohort lead to the inference that anaemia (31.91%) was the most common illness witnessed by the neonates; followed by respiratory distress syndrome (24.97%) and neonatal sepsis or meningitis (24.14%). Other common morbidities suffered by newborns were jaundice, perinatal asphyxia, hypoglycaemia, hypothermia, congenital anomalies, meconium aspiration and other miscellaneous causes leading to respiratory distress. These are common with the illnesses reported by the studies from neonatal ICUs of several other regions of the country. (18)(19)(20)

The mortality profile of our ICU admissions showed that nearly 15.85% babies had expired and nearly 77% were discharged to home. These mortality fractions are higher than figures reported by Mani Kant et al., Deka et al. and Kotwal et al.(13) (21)(15). However, study by Rakholia et al from Uttrakhand have reported a higher mortality rate of 20.53%. (22) A probable reason of high mortality rate in our study is that KNH being the largest referral centre for the entire Himachal, gets a large proportion of sick and complicated antenatal cases.

Majority of the babies who expired had LBW (90.85%). The most important cause of neonatal mortality in our cohort was found to be prematurity (41%). This is close to the global figure of 35%, reported recently by Walani et al.(23) Other important causes of neonatal mortality found were respiratory distress, perinatal asphyxia, congenital malformations etc.

Most of the babies who expired had a hospital stay of more than a week, however, nearly 14% babies expired on day 1 of life. These, early deaths were predominantly due to HIE or congenital malformations. A study by Chavan et al from south western Maharashtra also reported similar factors responsible for early newborn deaths.(24) Respiratory distress and sepsis were found to be the predominant causes of death, post one week of life. These findings are similar to the results of study by Welaga et al. who reported infections as the most common cause late neonatal deaths (25). However, the study by Deka et al. reported larger number of deaths in early neonatal period with perinatal asphyxia being the predominant cause of early deaths. (13)

Thus, the results of present study highlights that the NICU at KNH witnesses high proportions of late neonatal deaths which embarks the need to further improve the ventilation strategies and to strengthen and reinforce the antibiotic stewardship and further necessitates the need to generate the data for local microbial sensitivity. Along with this better obstetric care of mothers at peripheries and early referral will help in bringing down rates of prematurity, perinatal asphyxia and thus the early neonatal deaths in our region.

CONCLUSION

NICU at KNH is the largest in the region. The present study has described the disease and mortality pattern of newborns admitted in KNH NICU and thus, would assist the health care providers in framing policies and in planning appropriate interventions to cut down these mortality figures.

The present study highlighted the burden of prematurity leading to neonatal mortality and thus, the need of improving maternal health and early referral. Besides, a higher proportion of late neonatal deaths also elucidates the need of improving antibiotic stewardship and ventilation strategies.

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