Original Research Article

NEONATAL MORTALITY OUTCOME AND TRENDS: A ONE-YEAR RETROSPECTIVE ANALYSIS FROM A TERTIARY HOSPITAL IN BUNDELKHAND REGION OF UTTAR PRADESH

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ABSTRACT

Background: India contributes to a significant number of neonatal mortality in the world, around 25% of the world total. In India neonatal mortality rate contributes significantly to Infant mortality rate and therefore under five mortality rate. Region and cause specific interventions should be planned after detailed analysis of outcome trends in newborn and feedback from healthcare workers to reduce neonatal mortality. This study aimed to find out the outcome and mortality pattern and its causes in Level II special care neonatal Unit in a medical college to plan targeted interventions further.

Materials and Methods: This is a retrospective study done on 1950 newborns who were admitted in special newborn care unit over one-year period of time (30/09/2023 to 30/09/2024) in department of Paediatrics of Rani Durgawati medical college (UP).

Results: 1950 neonates (Male: Female,1:1.15) were admitted over 1-year period in which 350 Inborn and 1600 outborns were admitted,750(38%) of newborns were premature (delivery before term and low birth weight). The trends in mortality showed a decline over year (The decline was more in outborn than inborn neonates), Among them respiratory distress syndrome and Prematurity being a big contributor to mortality. Rate of successful discharges showed an inclined trend. However, the trends in etiology of death was uniform over the year with respiratory distress syndrome (45%), Perinatal Asphyxia/HIE (25%), prematurity (20%), Sepsis (5%) and congenital malformations (5%) being the chief contributor Extremely preterm newborn had highest case fatality rate around 70%.

Conclusion: Our study shows the trends are encouraging but only for term newborns but they also may be insufficient to meet the target of SDG 3.2. For extremely preterm/very low birth weight and newborns having hyaline membrane disease, the trends are not encouraging and these High-risk newborns need to receive better management with advance targeted interventions.

Keywords: neonatal mortality, SNCU, preterm, SDG, perinatal asphyxia.

INTRODUCTION

Newborn period (first 28 days of life) are very crucial as it is the most vulnerable phase of life. Newborns have different sort of health problems depending upon their gestational age and weight. In India around 62% of infant mortality rate is being contributed by neonatal mortality rate and around 51% under five mortality rate is contributed by NMR1.Despite many new initiatives launched by the government of India to bring down the NMR (neonatal mortality rate) of the country the results are not satisfactory. Many of the initiatives launched

in the early phases were able to substantially reduce the IMR to 25.80/1000 live birth by 2024(3%reduction from 2023) and NMR to 16/1000 live birth by 2024(0.2%reduction from 2023), however the decline has not been uniform in all states and mortality rates seems to have reached a plateau. Beyond this it will need some major changes at the health care policy level to bring the mortality rates to a level which is satisfactory. Sustainable development goals (SDG) 3.2 adopted in 2015 target an NMR of 12 per 1000 live births and under five mortality rate of 25 per 1000 live birth by 2030. The SDG targets cannot be met without reducing the NMR7.The NMR shows a wide fluctuation ranging from highest in Madhya Pradesh to lowest in Kerala. Without tackling this inequity in india, achieving SDG goals seems a dream to achieve.

Due to the large size of India's population (more than 50% belonging to low socio-economic class) it has the obvious distinction of being the country responsible for a fourth of neonatal deaths, the single largest contributor, followed by Nigeria >Pakistan> Ethiopia and so on. In India too there is a wide variability in NMR rate as well as its causes among states, Kerala's performance proves that targeted interventions being properly implemented and higher literacy rate can help a developing country like India to achieve SDG 3.29.

Targeted interventions for high-risk newborns, improving survival can be planned only after understanding and identifying the cause and trends specific for each region as each geographic area has own specific problems, more in low socio economic and poor literacy rate areas, which must be tackled if strategies are to be successful. Our study aims to study the outcome and mortality pattern and its causes in Level II special care neonatal Unit in a medical college to plan targeted interventions further.

MATERIALS AND METHODS

We did a retrospective analysis of newborns admitted in Special Neonatal Care Unit (SNCU) of department of Paediatrics, Rani Durgawati Medical College, Banda (UP) over a period of one year (2023- 2024).

We included all newborns (1950) admitted in SNCU during study period in our analysis irrespective of delivery place i.e. delivered within hospital (inborn=350) or delivered elsewhere (outborn=1600). We extracted place of birth (home or health care facility), period of gestation (term or preterm), birth weight (low or appropriate), outcome, cause of death, record from patient case sheets. The outcomes were classified into four groups **A.** Expired (died during the management), **B.** Discharged (discharged after successful treatment), **C.** LAMA (left against medical advice) and **D.**

Referred (referred to higher centre for further management).

The definitions used for the purpose were:

- **LBW (low birth weight)-** was defined as weight < 2500 gm[5].
- **Very low birth weight)-**was defined as weight<1500gm[12].
- **Extremely low birth weight)-**was defined as weight<1000gm[12].
- **Hyaline membrane disease)-**a breathing disorder in newborn caused by immature lungs because of insufficient amount of surfactant.[12]
- **HIE/Hypoxic ischemic encephalopathy)-** it is a type of brain dysfunction due to brain injury that usually occurs when the brain experiences a decrease in oxygen or blood flow. HIE can occur before birth, during birth, after birth. The amount of time the brain spends without oxygen or blood flow, impacts how severely the brain will be damaged.[12]
- **Respiratory distress syndrome)-**a breathing disorder which is more common in premature newborns born six weeks or more before their due dates and MSL newborns, It usually develops within the first 24 hours after birth[5].
- **Congenital malformations-** These were diagnosed on clinical features and diagnostic facilities like ultrasound, echocardiography, X rays, and Electrocardiography (ECG).[5]
- **Intrapartum-related complication of birth (birth asphyxia/perinatal asphyxia)** was diagnosed clinically (Apgar score <7 at 5 minutes) or clinical features suggestive of hypoxic ischemic encephalopathy in a child with history of delayed cry.[5]
- **Sepsis)-**Neonatal sepsis is an infection involving the bloodstream in infants under 28 days old.[12]

Patient's identifiers removed in data analysis to maintain confidentiality. Descriptive analyses were done using frequency, percentages, bar chart and line chart in MS Excel.

RESULTS

Close to 2000 (1950) neonates were treated in SNCU of department of Paediatrics, medical college over last 1 years with a mean death rate of 17.44% (340), 73.84% (720) successful discharges,5.64% (110) refer to higher centre ,3.08% (60) LAMA (leave against medical advice). Mortality was observed more in outborns 95.30% (324 out of 340 total death) compared to inborn 4.70% (16 out of 340 total death).
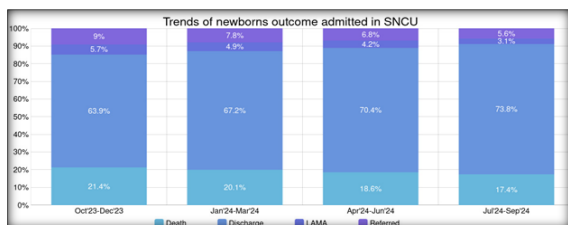
Figure 1: Trends of newborns outcome admitted in SNCU

The outcome of newborns admitted in our SNCU showed significant improvement across years in the form of increased discharge rate from 64% in 2023 to 73.84% in 2024. Similar trends were also observed in death rate which declined from 21.40% to 17.44%, LAMA declined from 5.72% to 3.08% and referral reduced from 8.97% to 5.64%. [Figure 1]
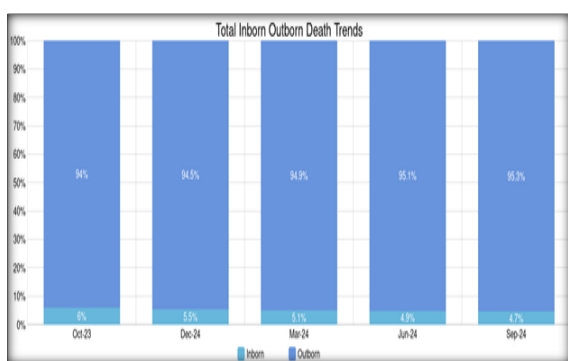

Figure 2: Trends of inborn/ outborn neonatal deaths admitted in SNCU
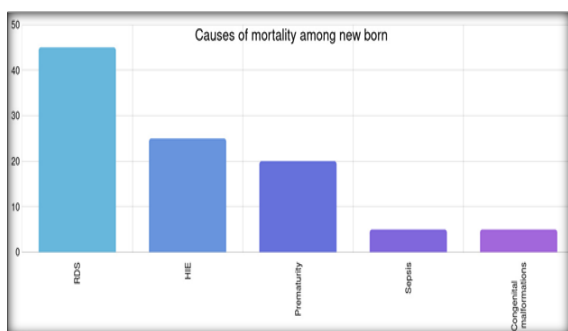

Figure 3: Causes of mortality among newborns admitted in SNCU

Respiratory distress syndrome (45%)> Perinatal Asphyxia/ HIE (25%)> Prematurity (20%)>Sepsis=Congenital malformations (5%). [Figure 3]

DISCUSSION

There were total of 1950 newborns were admitted in SNCU, about 30% were born by caesarean section and about 70% by vaginal (NVD) and instrumental deliveries. There was a slight female predominance in our study and in respect to birth weights of neonates admitted, mostly neonates belonged to LBW (60%) followed by normal birth weight (25%)

and VLBW (15%). About 47% of neonates were preterm (early and late including) (due to lower maternal age and repeated childbirth with less spacing), Most common indications of SNCU admission in our study were respiratory distress syndrome and birth asphyxia. HMD, RDS, TTN (transient tachypnea of newborn), pneumonia and MAS (meconium aspiration syndrome) were considered as the most common contributers of death. Out of the 195 countries committed to the SDG goals, 116 have achieved the reduced target of NMR, 16 are on way to achieve it and 63 are likely to miss the goal. around 2.5 million neonates die each year worldwide in which 0.7 million neonates die each year in India, these deaths can be significantly reduced if SDG targets can be met. A lot of these deaths can be prevented if India achieves the SDG target as India alone accounts for 28% of all neonatal deaths.[1,7]

A marked reduction has occurred in NMR but it is still not satisfactory, new assessment, further evaluation and intensified focused analysis of the causes behind it must be done again if India wants to achieve the target. Uttar Pradesh which is a poor performing and state located in central India with 75 districts has its own set of problems related to large population, low socio-economic status, low literacy rate, poor health care services, lack of awareness and highly populated villages with poor access to basic health facilities. It has a population of about 25 crore with a predominantly 65% rural and 35% urban based population. The people depend predominantly on government facilities in rural areas which are very poorly staffed, poorly managed and transport to a referral centre always take a long time here. The state NMR, IMR and U5MR are 20,28,35which are worse than the national average. However, states like Kerala, Punjab and even Delhi are doing better. It is equipped with a decent number of SNCUs (Special Newborn Care units) at district hospitals where deliveries are more than 3000 and at medical colleges, Approx 75 NBSU (Newborn stabilization units located at all first referral units) for managing selected neonatal conditions and stabilization of referred neonates and around 160 NBCC (Newborn care corners located at all delivery points). The medical college SNCU which has services of level II NICU caters to not just inborn of referred mothers but also referred neonates from SNCU in Bundelkhand region and nearby places apart from critically sick neonates from private set ups.

#What are the Causes of neonatal mortality

Respiratory distress syndrome (40%), perinatal asphyxia (27%), Prematurity and it's complications (25%), sepsis (5%) and congenital malformations (3%) are the chief causes of neonatal mortality in india over 2023-2024 year as per WHO and as per several other studies from geographically and economically similar countries. Data from developed countries like United States show congenital malformations contributing to 47% and

immaturity and its complications to be responsible for 40% deaths6. This is similar to trend in better performing states like Kerala (prematurity 20.95%, RDS 22.5%) and even countries from Sub Saharan Africa which have a low NMR and low neonatal mortality in SNCU (Eritrea RDS 45%, ELBW 37.5%, VLBW 28.5%).[1,6] Countries and states with higher NMR like our SNCU shows RDS 45%, Perinatal Asphyxia 25%, Prematurity 20%, sepsis 5%, congenital malformations 5%. It is evident that as the mortality rates decrease the relative proportion of deaths due to prematurity and congenital malformations increases as birth asphyxia and infection/sepsis related deaths are avoided.

It is evident that deaths due to sepsis and intra partum related complications can be further decreased easily just by taking aseptic precautions and proper antenatal screening & care and should be the focus if NMR is to be further decreased.[9]

Recommendations

Intra partum related complications of birth and Low birth weight can be reduced by proper antenatal care, monitoring during ante and intra partum period, encouraging appropriate age for childbearing, encouraging good nutrition to reproductive age females, improving economic status education of mother, promoting birth spacing. Ensuring all pregnancies are followed closely by grassroot level workers and each delivery is held in a health care setup, attended by a person trained in neonatal resuscitation. Strict adherence to hygienic delivery practices, exclusive breastfeeding and early recognition and adequate treatment of neonatal infections is need of hour. protocols on noninvasive ventilator modes like CPAP (continuous positive airway pressure) may help in reducing mortality due to RDS. More focus on antenatal steroids for preterm deliveries and MgSo4 therapy to mother are also needed. Capacity building of health care workers in remote underprivileged areas (Neonatal resuscitation and NBSU training) has shown a great impact by reduced mortality of outborn neonates.[9]

CONCLUSION

Our study concluded that the socio-economic status, literacy rate, mother's age, place of birth, past obstetric factors, present maternal and obstetric factors, and neonatal and fetal factors were the significant risk factors associated with neonatal mortality. Knowing these factors is must for healthcare workers to develop an risk assessment strategy to prevent these mortalities in healthcare setup. It will also aid the health care professionals in taking action towards decreasing these risk factors, ultimately contributing to achieving Sustainable Development Goal (SDG) 3 to end preventable deaths of newborns and thereby reducing the neonatal mortality. Community-based intervention programs must teach health care professionals to identify and reduce the modifiable risk factors, thereby contributing to achieving SDG 3.[7]

The trends in neonatal mortality and outcome are encouraging (specially in term neonates). Even so the needful interventions, policies, health care setup must be maintained and accelerated and special focus needed for preterm newborn and extremely preterms need even more specialised focus, as it may not be sufficient for India to achieve SDG target of 12 deaths per 1000 live births or single digit NMR by 20305. How it addresses the issue of preventable neonatal deaths-birth asphyxia/perinatal asphyxia/HIE, sepsis/infection and prematurity in states like Uttar Pradesh (along with underperforming states like MP, Bihar, Chattisgarh) will determine the success or failure of our country. Better performing states like Kerala, Delhi, Punjab and North Indian states have shown it is possible.

Newer strategies like family centric care involving grassroot level health care workers, to maintain this continuity could be additional measures to fasten the reduction in NMR alongside prior existing strategies like reproductive health, preconception and antenatal care, care during childbirth, immediate newborn care, care of healthy newborn, special care of small or sick newborn care beyond newborn survival.[9]

Need of the hour for Uttar Pradesh for achieving satisfactory is to educate families about right age of childbearing, family planning, self-care, good obstetric practice, all health care workers trained in Neonatal resuscitation, newborn care, exclusive breastfeeding, timely follow up, universal screening coverage.

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