

Pattern of Morbidity and Mortality of Neonates Admitted in NICU**Rajeev Kumar Thapar¹, Sudhanshu Tiwari², Saksham Srivastava³, R K Singh⁴**¹Professor & Head of Department, Pediatrics Department, School of Medical Sciences & Research, Sharda Hospital, Sharda University. Greater Noida. Uttar-Pradesh²Assistant Professor, Department of Pediatrics, T S Misra Medical College, Anora, Near Amausi Railway Station, Lucknow³Department of Pediatrics, TS Misra Medical College, Anaura, Near Amausi Railway Station, Lucknow (UP)⁴Associate Professor, IQ City Medical College Durgapur

Received: 25-12-2023 / Revised: 23-01-2024 / Accepted: 26-02-2024

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Conflict of interest: Nil

Abstract:**Background:** Neonatal period is the most vulnerable period of human life for diseases and most of these are preventable. Globally important causes of neonatal mortality (NNM) are prematurity, birth asphyxia and sepsis in low income countries whereas, prematurity and malformations are leading causes of death in developed countries.**Aims:** The present study was aimed to describe the current clinical spectrum of morbidity and mortality of neonates admitted in NICU of a service hospital.**Material and Methods:** The study was a hospital based prospective observational study conducted over a period of one year from May 2015 to June 2016 in Department of Neonatology in which 195 Neonates admitted in NICU of our hospital during the study period were included in study.**Results:** Common morbidity seen was respiratory distress (57.4%), neonatal jaundice (28.7%), Neonatal sepsis (16.9%), NEC (4.1%), birth asphyxia (14.9%), hypoglycemia (5.1%), apnoea (9.2%), neonatal seizures (9.7%), congenital heart disease (12.8%), Retinopathy of prematurity (5.6%) and surgical intervention (7.2%).**Conclusion:** respiratory distress in preterm neonates, neonatal jaundice, and Sepsis & birth asphyxia are leading causes of morbidities in neonates. Maternal history of preterm delivery, bad obstetric history, Rh Isoimmunization should be discussed among Obstetrician and Pediatrician and planned accordingly. Outcome of birth asphyxia cases can be favorable causing less of mortality with timely and appropriate neonatal resuscitation interventions.**Keywords:** NICU Admission, Morbidity, Mortality, Birth Asphyxia.

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Introduction

Neonatal period is the most vulnerable period of human life for diseases and most of these are preventable. Moreover, a neonate is 500 times more likely to die on first day of life than at one month of age [1]. Globally important causes of neonatal mortality (NNM) are prematurity, birth asphyxia and sepsis in low income countries whereas, prematurity and malformations are leading causes of death in developed countries [2].

In the neonatal period, 72.9% (3/4) of all neonatal deaths occur in first week of life, 13.5% in second week, and 13.5% in third and fourth week. The first 24 hours account for more than one-third (36.9%) of deaths that occur in entire neonatal period [3].

Birth weight is a key factor for neonatal mortality. It has been proved by WHO reports that birth weight <2.5 Kg is indirectly related to neonatal

mortality and its share in neonatal mortality is about 15%. Low birth weight contributes to neonatal mortality ranging from 6% in high income countries to 30% in low income countries and main etiology is prematurity with its complications [4]. In developing countries prematurity, birth asphyxia and sepsis are preventable causes of neonatal mortality [5].

The objective of this study was to describe the current clinical spectrum of morbidity and mortality of neonates admitted in NICU of a service hospital. The availability of facilities in service hospitals being comparable to developed countries, the data so collected will be compared with the National data and key areas of implementable focus will be identified.

Materials and Methods

Study design, settings and participants: It was a hospital based prospective observational study conducted over a period of one year from May 2015 to June 2016 in Department of Neonatology of a tertiary care hospital in North India. 195 Neonates admitted in NICU of our hospital during the study period were included in study.

Data collection: The unit is equipped with central monitoring facility, phototherapy units; laminar flow facility for preparation of parenteral fluids & nutrition, neonatal transport incubator for transport of high risk babies. The unit has capability to undertake exchange transfusion and surfactant instillation. Facility for ROP screening is available in NICU and further intervention (laser photocoagulation) if required.

Data was collected from neonates' and mothers' medical records and supplemented with additional information as per daily intervention using a structured MS excel sheet covering the variables of interest. The maternal and gestational variables studied were: age (years), number of pregnancies, mode of conception (spontaneous or assisted); type of delivery (normal, caesarean or assisted); intercurrent clinical conditions observed during gestation - diabetes, hypertension, hypothyroidism, urinary infections at any point during pregnancy, syphilis, human immunodeficiency virus (HIV), heart disease, hepatitis B; premature rupture of membranes (PROM) for longer than 18 hours and Rh Incompatibility.

The neonatal variables studied were: sex; birth weight; GA (calculated from date of last menstruation, admission to NICU; resuscitation in the delivery room; hypoglycaemia (glucose below 40 mg/dL); hyperbilirubinemia requiring phototherapy; mechanical ventilation; respiratory pathologies - hyaline membrane disease (HMD), transient tachypnoea of the newborn (TTNB), pneumonia, meconium aspiration syndrome (MAS); apnea of prematurity; infection; days of NICU stay, and deaths and their causes.

Statistical analysis: Data were analyzed and statistically evaluated using SPSS software, version 17 (Chicago II, USA). Quantitative data was expressed in mean, standard deviation while qualitative data were expressed in percentage.

Ethical issues: All caregivers were explained about the purpose of the study. Confidentiality was assured to them along with informed written consent. The study was approved by the Institutional Ethical Committee.

Observation & results: Out of total 195 NICU admissions, 129 were male and 66 were female. 52.3% were term and 47.7% were pre-term. Total 18 (9.2%) deaths were observed during the study period out of which 13(72.2%) were preterm babies and 05(27.8%) were term babies.

Common morbidity seen in NICU are shown in table 1. Neonatal seizures were seen in 19 (9.7%) cases. Cause of neonatal seizures were birth asphyxia (n=7), hypoglycaemia (n=4), sepsis (n=5), sepsis with ICH (n=1) and hypocalcaemia (n=1).

Table 1: Morbidity pattern seen in NICU admission (n=195)

	No.	%
Respiratory morbidity (n=112)		
Hyaline membrane disease	50	25.6%
Meconium aspiration syndrome	08	4.1%
Transient tachypnoea of newborn	22	11.3%
Congenital pneumonia	08	4.1%
CVS related	10	5.1%
*Minimal free flow oxygen requirement for less than 2 hrs	14	7.2%
Neonatal Jaundice	56	28.7%
Neonatal sepsis	33	16.9%
NEC	8	4.1%
Birth asphyxia	29	14.9%
Hypoglycaemia	10	5.1%
Apnoea	18	9.2%
Neonatal seizures	19	9.7%
Congenital heart disease	25	12.8%
Retinopathy of prematurity	11	5.64%
Surgical intervention	14	7.2%

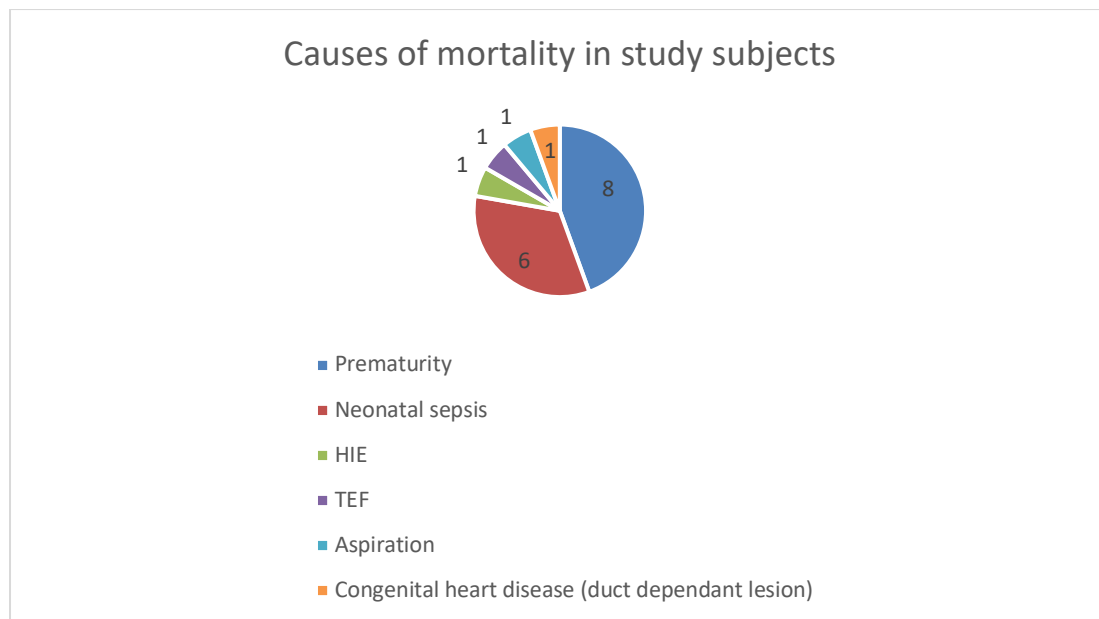


Figure 1: Causes of mortality in study subjects

Discussion

Accurate data on the morbidity and mortality are useful for many reasons. It is important for the providers of primary care, investigators, local and national health administrators, and for decision makers to design interventions for prevention and treatment and to implement and evaluate health care programs. The neonatal mortality in developed countries has fallen dramatically; however developing countries continue to experience unacceptably high neonatal mortality. The variations in mortality probably reflect local and national differences in care pattern of newborn babies [6].

In our study, out of total 195 babies admitted in NICU, 112 (57.4%) had respiratory distress, 72(36.9%) babies required CPAP support and 33(16.9%) babies were put on mechanical ventilation for various indications. Common reason of respiratory morbidity was HMD (25.6%), MAS (4.1%), TTNB (11.3%), Cong Pneumonia (4.1%), and CVS related (5.1%). Our incidence of HMD (25.6%) and MAS (4.1%) was comparable to a study done by Sridhar, et al where incidence of HMD was 23.85% and of MAS was 5.47% [7]. In a similar study conducted in Karnataka by Patil et al, the commonest specific morbid reason for admission in NICU was respiratory distress syndrome (37.3%) [8].

Neonatal jaundice was diagnosed in 56 (28.7%) babies. Relatively high incidence of jaundice was noticed in our study probably because of emphasis on exclusive breast feeding. However, Kunle-Olowu et al also noticed a much higher incidence of jaundice (68.1%) in their study [9]. Incidence of sepsis found in our study was 25.4 per 1000 live

birth (33/1300) which is lesser than the incidence of neonatal sepsis according to the data from National Neonatal Perinatal Database (30 per 1000 live births) [10].

NEC was seen in 8 (4.1%) cases, 06(75%) were preterm and 02(25%) were term. Five babies were in NEC stage I and three babies had NEC stage II. In a study done in Nigeria pattern of case fatality was highest in necrotizing enterocolitis and seizures (66.7%) followed by respiratory problems (63.2%) and bleeding disorders [9]. In a study from Pakistan [11] total of 196 preterm neonates were studied and 28 (14%) were diagnosed with NEC which was much higher than our incidence of NEC in preterm (6.4%). Case fatality rate in preterm babies of NEC in our study was found to be 50% which was higher than outcome in study from Pakistan (39.28%) (11).

Incidence of birth asphyxia in our study was found to be 14.9% and case fatality rate was 3.4%. Bikisu et al studied determination of prevalence, risk factors and outcome of perinatal asphyxia in his study and noticed a higher incidence of birth asphyxia 30.1% and a case fatality rate of 25.5% [12]. In our study total incidence of hypoglycaemia noticed was 5.1%. Dorina Rodica Burdan et al noticed similar incidence of 4.61% in their study [13]. Dorina Rodica Burdan et al in their study found that neonates at term represent 45.53%, preterm infants 52.84%, and the post term infants represent 1.63% of total incidence of hypoglycaemia [13], similar to our observations. Both these studies had large sample size as compared to our study.

In our study total incidence of Apnoea was noticed to be 9.2%. Incidence as per gestation was 71.5%

in babies less than 29 weeks, 30% in babies with 29 weeks to 31 week 6 days, 12.9% in babies with 32 weeks to 33 week 6 days period of gestation. Apnoea was not observed in preterm babies beyond 34 weeks in our study. Martin et al observed incidence of apnoea in seven percent of neonates born at 34 to 35 weeks gestation, 15% at 32 to 33 weeks, 54% at 30 to 31 weeks [14], whereas study by Robertson et al showed that nearly all infants born at <29 weeks gestation or <1,000 g exhibit AOP [15]. In our study 9.7% cases had neonatal seizures out of which 36.8% was due to perinatal asphyxia, 26.3% due to metabolic disturbances, 26.3% due to infections and 5.2% due to intracranial bleed. In a study conducted in Central India most common etiology similar to our study was perinatal asphyxia (54.2%) followed by metabolic disturbances (19.54%), infections (19.54%) and intracranial bleed (2.30%) [16].

In the present study, congenital heart disease was diagnosed clinically in 25 babies (12.8%) & further confirmed on Echocardiography. Various cardiac lesions diagnosed were - VSD 12%, ASD 28%, ASD+PDA 28%, PDA 10%. Complex congenital heart disease was diagnosed in 4%. In my study total 34 babies qualified for ROP screening out of which ROP screening was done for surviving 25 babies in this group. Various stages of ROP were diagnosed in 11(44%) babies and these babies successfully completed ROP screening and only one baby required laser coagulation. Almost similar results were found in a study from North East where out of 50 neonates screened, 22(44%) developed retinopathy of prematurity [17].

In our study 5.1 % of NICU admission was due to neonatal surgical conditions. It was higher as compared to 3.6% observed in a study conducted in Gujarat [18] while Ugwu RO et al found this incidence to be 6.2% (19). In our study, total 18(9.2%) deaths were observed during the study period out of which 13(72.2%) were preterm babies and 05(27.8%) were term babies. Prematurity (44.4%) and neonatal sepsis (33.3%) were the main causes attributable to mortality. Patil et al also found Prematurity (42.1%) as commonest cause for mortality in his study [8].

Conclusion & recommendations:

According to this study it can be concluded that respiratory distress in preterm neonates, neonatal jaundice, Sepsis & birth asphyxia are leading causes of morbidities in neonates. Promotion of institutional deliveries is need of hour. Antenatal monitoring of high-risk pregnancies should be done. Maternal history of preterm delivery, bad obstetric history, Rh Isoimmunization should be discussed among Obstetrician and Pediatrician and planned accordingly. Outcome of birth asphyxia cases can be favorable causing less of mortality

with timely and appropriate neonatal resuscitation interventions.

References

1. UNICEF. The state of Worlds children 2008: UNICEF. 2008; 4-114.
2. Lawn JE, Cousens S, Zupan J. Lancet Neonatal Survival Steering Team. 4 million neonatal deaths: When? Where? Why? Lancet. 2005; 365:891-900.
3. Sankar MJ, Neogi SB, Sharma J, Chauhan M, Srivastava R, Prabhakar PK, et al. State of newborn health in India. J Perinatol. 2016 Dec; 36(s3):S3-S8.
4. Blanc AK, Wardlaw T. Monitoring Low Birth weight: An evaluation of International estimates and updated estimation procedure; Bull world Health Organ. 2005; 83(3):161-240.
5. Jehan I, Harris H, Salat S, Zeb A, Mobeen N, Pasha O et al. Neonatal mortality: risk factors and causes: a prospective population based cohort study in urban Pakistan. Bull World Health Organ. 2009; 87:130-8.
6. Abdalatif M, Ali R, Ghareba M. Neonatal Mortality Rate in the Special Care Baby Unit. J Medical Sci Clin Res. 2013; 1(5):195-208.
7. Sridhar PV, Thammanna PS, Sandeep M. Morbidity Pattern and Hospital Outcome of Neonates Admitted in a Tertiary Care Teaching Hospital, Mandya. Int J Sci Study. 2015; 3(6):126-9.
8. Patil RB, Koppad R, Benakanal S. Clinical Profile and Outcome of Babies Admitted to Neonatal Intensive Care Unit (NICU), Mc Gann Teaching Hospital Shivamogga, Karnataka: A Longitudinal Study. Sch J Appl Med Sci. 2014; 2(6G):3357-60.
9. Kunle-Olowu, O, Peterside O, Adeyemi O. Prevalence and Outcome of Preterm Admissions at the Neonatal Unit of a Tertiary Health Centre in Southern Nigeria. Open J Pediatr. 2014; 4:67-75.
10. NNF; Report of the National perinatal database, 2002-2003, New Delhi 2004.
11. Shah S, Saleem M, Mehmood T, Ahmed T. Frequency and outcome of Necrotizing Enterocolitis in Preterm Neonates. J Ayub Med Coll Abbottabad. 2015; 27(1):85-7.
12. Bilkisu G I, Muhammad SA, Abdullahi M, Muyeideen BA, Akeem OA, Taofik K. Prevalence and Risk Factors for Perinatal Asphyxia as Seen at a Specialist Hospital in Gusau, Nigeria. Sub-Saharan Afr J Med. 2015; 2:64-9.
13. Burdan D, Botiu V, Teodorescu D. Neonatal hypoglycemia. The incidence of the risk factors in Salvator Vuia Obstetrics-Gynecology hospital. TMJ. 2009; 59(1):77-80.
14. Martin RJ, Abu Shaweesh JM, Baird TM. Apnoea of prematurity. Paediatr Respir Rev. 2004;5(Suppl 1):S377-S382

15. Robertson CM, Watt MJ, Dinu IA. Outcomes for the extremely premature infant: what is new? And where are we going? *Pediatr Neurol.* 2009; 40(3):189-96.
16. Dagar J, Ingale S, Aundhakar C, Koppad A, Singh S. Etiology and outcome of neonatal seizures in NICU, KIMS, Karad. *Int J Recent Trends Sci Technol.* September 2015; 16(2):344-7.
17. Chattopadhyay M, Pradhan A, Singh R, Dutta S. Incidence and Risk Factors for Retinopathy of Prematurity in Neonates. *Indian Pediatrics.* 2015; 52:157-8.
18. Shah Z, Kalathia M, Patel S, Parikh Y. Profile of Congenital Surgical anomalies in neonates admitted in Tertiary Care Neonatal Intensive Care Unit of Saurashtra region. *National J Med Res.* 2016; 6(2):168-70.
19. Ugwu RO, Eneh AU. Mortality in the special care baby unit of University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria: Why and when do newborns die? *Niger J Paediatr.* 2008; 35:75-81.