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**Original Research Article**

# Neonatal outcome in new-borns admitted in NICU of tertiary care hospital in central India: a 5-year study

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## ABSTRACT

**Background:** Neonatal mortality rate contributes significantly to under five mortality rates. Data obtained from pattern of admission and outcome may uncover various aspects and may contribute and help in managing resources, infrastructure, skilled hands for better outcome in future.
**Methods:** This retrospective study was done on 1424 neonates who were admitted at LN Medical College and JK Hospital, Bhopal in neonatal intensive care unit (NICU) in the Department of Paediatrics from January 2013-December 2017.
**Results:** 1424 newborns admitted within 24 hours of birth were included in the study. About 767 were male neonates, (Male: female1.16:1). The low birth weight babies were 54% in our study. Among the various causes of NICU admission, Respiratory distress was present in 555 (39%) of neonates, Respiratory distress syndrome (Hyaline membrane disease) being the most common cause of respiratory distress. Neonatal sepsis accounted for morbidity in 24% of neonates, with Klebsiella being the most common organism grown in the blood culture. The incidence of congenital anomalies was 2.5%. The neonatal mortality was found to be 11% in our study. Prematurity with Respiratory distress syndrome (Hyaline membrane disease) and perinatal asphyxia were the two most common causes of neonatal mortality in the study. Extremely low birth weight neonates had the highest case fatality rate in the study, which indicates the need to develop an efficient group of professionals in teaching hospitals who will provide highly specialized and focused care to this cohort of vulnerable neonates.
**Conclusions:** Present study has shown respiratory distress, perinatal asphyxia, and sepsis as the predominant causes of neonatal morbidity. All three are preventable causes, and our health-care programs should be directed toward addressing the risk factors in the community responsible for the development of these three morbidities. The preterm and low birth weight babies had significantly high mortality even with standard intensive care; therefore, a strong and effective antenatal program with extensive coverage of all pregnant females specifically in outreach areas should be developed which will help in decreasing preterm deliveries and also lower the incidence of low birth weight babies.

**Keywords:** Neonatal outcome, New-born, NICU

## INTRODUCTION

Every year globally, four million neonates die in the first 4 weeks of life.[1] Neonatal period is the most vulnerable period of life due to different diseases, especially in preterm and low birth weight babies. Among these approximately 98% deaths occur in developing countries and are caused by infections, asphyxia, complications of

prematurity and low birth weights.[2] Neonatal mortality accounts for nearly two-thirds of infant mortality rate and one-third of under-five mortalities worldwide.[3-5] Within the first month, one quarter to one-half of all the death occur within first 24 hour of life and 75% occur in the first week.

First 48 hours immediately following birth is the most crucial period for newborn survival.[6] The primary outcome of this study was to know the spectrum of diseases leading to Morbidity and Mortality Patterns of Neonates and the commonest cause of the same. The secondary outcome was to list the measures to prevent the various causes of morbidity and mortality of a neonate.

## METHODS

This retrospective study was done on 1424 neonates who were admitted at LN Medical College and JK Hospital, Bhopal in neonatal intensive care unit (NICU) in the Department of Paediatric from January 2013 to December 2017. A pretested proforma with standard definitions from National Neonatology Forum was used to register the cases after Institutional Ethical Committee cleared the study. According to already designed proforma data of all admitted babies were listed out and categorized on basis of age during admission, mode of delivery, sex, birth weight, gestational age, inborn or out-born delivery, indication for admission, bacteriological profile, investigations and outcome after hospitalization in NICU.

Standard definitions from National Neonatology Forum was used to register the cases after Institutional Ethical Committee cleared the study. Sepsis and meningitis were diagnosed on clinical grounds along with C-reactive protein (CRP), complete blood count (CBC), positive blood culture and cerebrospinal fluid (CSF) examination. Congenital heart disease was diagnosed with Chest X-Ray and then confirmed by echocardiography. Birth Asphyxia was diagnosed clinically and hypoxic ischemic encephalopathy (HIE) by Sarnat and Sarnat Staging.[7] Diagnosis of prematurity was based on the WHO definition for prematurity (live born neonates delivered before 37 weeks from 1st day of last menstrual period) and using new Ballard scoring.[8] Neonatal respiratory distress was diagnosed with the presence of one or more symptoms of tachypnea, intercostal muscle retraction, grunting, nasal flaring and cyanosis.[9] Low birth weight was defined as when birth weight was less than 2500 grams, very low birth weight babies were defined when birth weight was less than 1500 grams and extremely low birth weight when birth weight of less than 1000 grams. The study period was 5-years.

### *Inclusion criteria*

All inborn neonates admitted to NICU within 24 hours of birth.

### *Exclusion criteria*

Newborns who were admitted at >24 hours of life.

The data were statistically analyzed using the SPSS 18 (SPSS Inc., Chicago).

## RESULTS

A total of 1424 neonates were admitted in NICU during study period. Out of 1424 newborn ,433 (30.4%) were born by caesarean sections (LSCS) and 991(69%) by vaginal(NVD) and instrumental deliveries.

**Table 1: Gender wise distribution.**

| Admission | Inborn(<24 hours) |
|---|---|
| Male | 767 |
| Female | 657 |
| Total | 1424 |

Among 1424 newborn, 767 (54%) were male and 657 (46%) were female. According to gestation age, 701 (49%) babies were term, 524 (37%) were preterm and 199 (15%) were post term. According to birth weight, low birth weight (LBW) babies were 768 (54%), very low birth weight (VLBW) babies were 91 (6%), Extremely low birth weight (ELBW) babies 17 (1.2%), normal birth weight was 548 (38.4%) and intra uterine growth restricted (IUGR) babies were 69 (4.8%).

**Table 2: Distribution of organisms isolated from blood.**

| Organism | Number |
|---|---|
| Klebsiella | 80 (39%) |
| *E. coli* | 45 (22%) |
| Pseudomonas | 28 (13.5%) |
| Enterobacter | 22(10.3%) |
| Acinitobacter | 15 (7.5%) |
| Burkuldhoria | 9 (4.6%) |
| Enterococcus | 7 (3%) |
| Total | 206 (13%) |

The major cause of morbidity observed was respiratory distress 555(39%) neonatal sepsis 347 (24%), neonatal hyperbilirubinemia 188(13%) followed by birth asphyxia 42 (3%) and congenital anomaly (2.5%). Hypoglycemia, cardiac anomaly, and NEC each contributed 2% to morbidity. In sepsis, the blood culture was positive in 206(59%). Most common organism grown was Klebsiella (39%), *E coli* (22%) followed by Pseudomonas (13%), Enterobacter (10.3%), Acinitobacter (7.5%) Burkuldhoria (4.6%) and Enterococci (3%). 3% babies were admitted with birth asphyxia. Among all birth asphyxia, HIE stage 1 was present in 60%, HIE stage 2 in (26%) and HIE stage 3 in (14%). Respiratory distress due to different etiologies was present in 39% of neonates. Respiratory distress syndrome (RDS) was the etiology of respiratory

distress in 30% of neonates; Transient tachypnea of newborn was the cause of respiratory distress in 22% of newborns Meconium aspiration syndrome as the cause of respiratory distress accounted for 18% of cases, followed by congenital pneumonia (15%). Other causes contributing for respiratory distress was 25%.

**Table-3: Morbidity profile.**

| Morbidity profile | Admission | % |
|---|---|---|
| Respiratory distress | 555 | 39 |
| Sepsis | 347 | 24 |
| Neonatal hyperbilirubinemia | 250 | 13 |
| Birth asphyxia | 160 | 11 |
| Congenital anomaly | 35 | 2.5 |
| Cardiac anomaly | 25 | 2.5 |
| Necrotizing enterocolitis | 28 | 2 |
| Hypoglycemia | 14 | 1 |

The overall mortality rate was (11%) in NICU admission. Prematurity with respiratory distress syndrome was the most common cause of mortality accounting for 47.57% of cases followed by birth asphyxia (HIE stage 3) (24%) and Neonatal sepsis (20%) followed by congenital anomaly (congenital diaphragmatic hernia) (5%).

**Table 4: Distribution of diseases leading to death.**

| Disease | Number(%) |
|---|---|
| Prematurity with RDS | 74 (48%) |
| Perinatal asphyxia | 36 (24%) |
| Sepsis | 30 (20%) |
| Congenital anomaly (congenital diaphragmatic hernia) | 7 (5%) |
| Congenital heart disease | 6 (3%) |
| Others (SIDS) | 2 (1%) |
| Total | 155 (11%) |

The case fatality rate was highest with extremely low birth weight (ELBW) babies. Of the total 145 neonatal deaths, 50% were preterm. Out of total deaths, 75%were early neonatal deaths. Discharge rate was found to be 70%in the study.

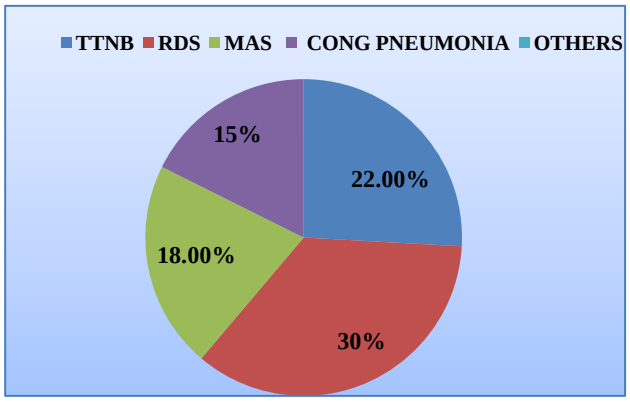


**Figure 1: Causes of respiratory distress.**

## DISCUSSION

There were total of 1424 (37%) babies were admitted in NICU.433 (30.4%) were born by caesarean sections (LSCS) and 991(69%) by vaginal(NVD) and instrumental deliveries. There was a slight male predominance (M:F ratio-1.16:1) in our study which was also documented by Kant M et al.[9-11] With regard to birth weights of neonates admitted, maximum number of neonates belonged to LBW (54%) followed by normal birth weight and VLBW (6%). Similar findings were observed in studies done by Bhagat et al and Prasad V et al.[12,13] About 37%of neonates were preterm, Similar observations were found in studies done by Bhagat et al, Elizabeth U et al, and Narayan et al.[12,14,15] Most common indications of NICU admission in our study were neonatal respiratory distress (NRD). Similar observation was found by Tochie et al.[16] In Parkash's et al. study, RDS, TTN, pneumonia and MAS were considered as the most common causes of hospitalization for NRD.[17]

Neonatal sepsis was the cause of morbidity in 24% of admitted neonates. Different institution-based studies have found the incidence of neonatal sepsis ranging from 17.7% to 70%.[18,19] Blood culture positivity rate was 59%. *Klebsiella pneumoniae* was isolated from 39% of cultures, followed by *E. coli* and Pseudomonas. Klebsiella has been found as a predominant organism in study done by Viswanathan et al.[20]Mortality rate in our study is 11% which is comparable with the study done by Narayan R.[15] Mortality rate of any neonatal intensive care unit depends different factors apart from clinical condition of the baby such as the infrastructure, manpower and trained person on duty etc. Hence the mortality rate reports vary widely in different studies from different regions. The incidence of early (<7 days of age) neonatal death was 75% in our study. In a study done by Udo et al most of the deaths occurred within first 7 days of life.[21]

With respect to the outcomes, the present study found that 48% died of prematurity with respiratory distress syndrome. Adebami et al. reported that 36.6% of infants with Neonatal Respiratory Disease died of the disease who found sepsis and RDS as the most common causes of hospitalization stated that 24.5% of infants died due to neonatal infection, prematurity and RDS.[21,22] Prevention of morbidity and mortality related to prematurity will significantly reduce overall morbidity and mortality. Appropriate antenatal care, good obstetric practices, proper referral, improvement of facilities for caring for preterm babies as well as proper newborn care practices have been found to reduce morbidity and mortality from prematurity.

## CONCLUSION

In today's scenario, prematurity is still the most common cause of mortality. Prematurity with sepsis increases the mortality of new-born. So, prevention of sepsis is most

important step in neonatal death. Hand washing and strict infection control in NICU unit and judicious use of antibiotic can prevent sepsis in NICU. Such approaches would be safe and cost-effective strategy especially in developing countries like INDIA. Good antenatal care, proper nutrition to pregnant women, timely referral, prevention of preterm delivery are important steps to decrease neonatal morbidity and mortality. In spite of high number of admission our tertiary care hospital has good survival rate of new-born.

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## REFERENCES

1. Jehan I, Harris H, Salat S, Zeb A, Mobeen N, Pasha O, McClure EM, Moore J, Wright LL, Goldenberg RL. Neonatal mortality, risk factors and causes: a prospective population-based cohort study in urban Pakistan. Bull World Health Org. 2009;87(2):130-8.
2. Black RE, Morris SS, Bryce J.Where and why are 10 million children dying every year? Lancet. 2003;361(9376):2226-34.
3. World Health Organization. Mother–baby package: implementing safe motherhood in countries. Maternal Health and Safe Motherhood Programme. Geneva, WHO 1994. (WHO/FHE/MSM/94.11).
4. Save the children federation. Saving newborn lives: state of the world's newborns. Washington DC, 2001:pp 1-49.
5. World Health Organization. Management of Sick Newborn. Report of a technical Working Group, Ankara.
6. Children: reducing mortality, WHO media centre [internet].2012 June. Available at http: //www.who.int / mediacentre / factsheet / fs178/ en /index.html.
7. Sarnat HB, Sarnat MS. Neonatal encephalopathy following fetal distress. A clinical and electroencephalographic study. Arch Neurol. 1976;33(10):696-705.
8. Ballard JL, Khoury JC, Wedig K, Wang L, Eilers-Walsman BL, Lipp R. New Ballard Score, expanded to include extremely premature infants. J Pediatr. 1991;119(3):417-23.
9. Tochie JN, Choukem SP, Langmia R N, Barla E, Koki-Ndombo P. Neonatal respiratory distress in a reference neonatal unit in Cameroon: an analysis of prevalence, predictors, etiologies and outcomes. Pan African Med J. 2016;24:152.
10. Kumar MK, Thakur SN, Singh BB. Study of the Morbidity and the mortality patterns in the neonatal intensive care unit at a tertiary care teaching hospital in Rohtas District, Bihar, India. J Clin Diagn Res. 2012;6(2):282-5.
11. Kumar S, Ahmed M, Anand S. Morbidity and mortality patterns of neonates admitted to neonatal intensive care unit in tertiary care hospital, Bhopal. Pediatr Rev: Int J Pediatr Res. 2016;3(11):776-8.
12. Baghel B, Sahu A, Vishwanadham K. Pattern and admission and outcome of neonates in NICU of Tribal region Bastar, India. Int J Med Res Prof. 2016;2(6):147-50.
13. Veena Prasad and Nutan Singh. Causes of morbidity and mortality admitted in Government Medical College Haldwani in Kumoun Region Uttarakhand India. JPBMS. 2011;9(23):1-4.
14. Ike Elizabeth U, Modupe O, Oyetunde. Pattern of diseases and care outcomes of neonates admitted in special Care Baby Unit of University College Hospital, Ibadan, Nigeria from 2007 To 2011, IOSR J Nurs Health Sci. 2015;4(3):62-71.
15. Narayan R, Singh S. A study of pattern of admission and outcome in a neonatal intensive care unit at Rural Haryana, India. Int J Pediatr Res. 2017;4(10):611-6.
16. Tochie JN, Choukem SP, Langmia RN, Barla E, Koki-Ndombo P. Neonatal respiratory distress in a reference neonatal unit in Cameroon: an analysis of prevalence, predictors, etiologies and outcomes. Pan Afr Med J. 2016; 24:152.
17. Parkash A, Haider N, Khoso ZA, Shaikh AS. Frequency, causes and outcome of neonates with respiratory distress admitted to Neonatal Intensive Care Unit, National Institute of Child Health, Karachi.J Pak Med Assoc. 2015;65(7):771-5
18. Omoigberale AI, Sadoh WE, Nwaneri DU. A 4 year review of neonatal outcome at the University of Benin Teaching Hospital, Benin City. Niger J Clin Pract. 2010;13:321-5.
19. Okechukwu AA, Achonwa A. Morbidity and mortality patterns of admissions into the Special Care Baby Unit of University of Abuja Teaching Hospital, Gwagwalada, Nigeria. Niger J Clin Pract. 2009;12:389-94.
20. Viswanathan R, Singh AK, Mukherjee S, Mukherjee R, Das P, Basu S. Aetiology and antimicrobial resistance of neonatal sepsis at a tertiary care centre in Eastern India: A 3-year study. Indian J Pediatr. 2011;78:409-12.
21. 21 Udo JJ, Anah MU, Ochigbo SO, Etuk IS, Ekanem AD. Neonatal morbidity and mortality in Calabar, Nigeria: A hospital-based study. Niger J Clin Pract. 2008;11:285-9.
22. Adebami OJ, Joel-Medewase VI, Agelebe E, Ayeni TO, Kayode OV, Odeyemi OA, et al. Determinants of outcome in new-borns with respiratory distress in Osogbo, Nigeria. Int J Res Med Sci. 2017;5:1487-93.

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