To study the morbidity and mortality pattern of outborn neonates admitted in neonatal intensive care unit of Indore

Preeti Malpani, Manju Biswas, Ravi Shankar Uikey

From Department of Pediatrics, Mahatma Gandhi Memorial Medical College, Indore, Madhya Pradesh, India

Correspondence to: Manju Biswas, Department of Pediatrics, Mahatma Gandhi Memorial Medical College, Indore, Madhya Pradesh, India. E-mail: drmanjubiswas@gmail.com

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ABSTRACT

Introduction: About 50% of infant deaths occur within the 1st month (neonatal period) of life; of these, more than half die during the first 24–48 h after birth. Despite various advances in the newborn care, the neonatal mortality and morbidity remain high, especially, in the developing countries. **Objective:** The objective of this study is to analyze the factors and the patterns associated with the morbidity and mortality of the newborns. **Materials and Methods:** This retrospective study was conducted from August 2014 to September 2016. Medical records of 500 outborn neonates admitted in the neonatal intensive care unit of a medical college of Central India were reviewed. The morbidity and mortality pattern of neonate was studied and correlated with birth weight, gestational age, sex, chief complaint, and the underlying cause. **Results:** There was male preponderance in the study group (60.2%) and male-to-female ratio was 1.5:1 ($p<0.05$); preterm babies accounted for 48.6% and term babies 51.40% of neonatal death. The outcome of hospitalized newborn showed that 62% of the newborns were discharged, 28.4% newborn expired, and 9% newborn left against medical advice. Respiratory distress syndrome (RDS) (46.4%) was the leading cause of death, followed by neonatal sepsis (21.9%) and prematurity (15.49%) **Conclusion:** The major causes of neonatal death were found to be RDS, neonatal sepsis, prematurity, low birth weight, and birth asphyxia. Hence, it is the need of the hour to improve the health of the mother, to give birth to healthy babies.

Key words: *Neonatal morbidity, Neonatal mortality, Neonatal sepsis, Preterm*

Newborn or neonates are infants between birth and first 28 days of life. The newborn period is the most critical phase of life as they are prone to various diseases. The neonatal morbidity and mortality vary in different countries as well as in different areas of the same country. Current neonatal mortality rate in India is 39/1000 live births, and neonatal deaths account for nearly 77% of all infant deaths (57/1000) and nearly half of under-five year child deaths (74/1000) [1]. Preterm and low birth weight (LBW) babies are at increased risk of perinatal mortality and morbidity.

The major causes of newborn deaths in India are pre-maturity (35%), neonatal infections (33%), intrapartum complications/ birth asphyxia (20%), and congenital malformations (9%) [1]. Sepsis, prematurity, and birth asphyxia were the major causes for admission in neonatal intensive care unit (NICU). All these etiologies are preventable up to some extent and, if detected earlier, can be effectively treated to reduce morbidity and mortality.

About 50% of infant deaths occur within the 1st month (neonatal period) of life, of these more than half die during the first 24–48 h after birth. Neonates are prone to develop health problems due to structural and functional immaturity of various body organs. Neonatal death shows the loss of thousands of potential citizens each year. This, apart from being a grievous economic and social loss, is a source of immeasurable grief to thousands of parents. Hence, this is a field full of challenging enigmas to pediatricians [2]. We planned to study the pattern of morbidity and mortality in neonate (0–28 days) admitted to NICU of a tertiary care hospital of Central India.

MATERIALS AND METHODS

This was a retrospective record-based study conducted in the NICU of a tertiary care hospital of Central India between August 2014 and August 2016. Medical records of 500 outborn neonates admitted in NICU were reviewed. The data on outborn admission, sex, gestational age, weight for gestation, indications for admission, duration of hospitalization, complications encountered, investigation done during hospitalization, and outcome were extracted. Referring place was noted as those referred from other hospitals as well as home deliveries. Antenatal history regarding high-risk pregnancy and maternal risk factors was asked. Natal history included place, duration, and mode of delivery. In postnatal history, the following points were noted: First, cry immediately after birth, resuscitation if required, and its modes and medication if any was enquired.

Gestational age was assessed according to the New Ballard scoring and last menstrual period and categorized as preterm, term, and post-term. Birth weight was recorded within at 1 h

of admission and categorized as - appropriate for date, small for date, or large for date with respect to their gestational age. General examination findings were recorded for all the babies with special reference to meconium staining, cyanosis, icterus, hypothermia, icterus, sclerema, dehydration, and any congenital malformation. Similarly, detailed systemic examination findings were also recorded. Final outcome whether discharged, expired, absconding and leave against medical advice (LAMA) and duration of hospital stay were recorded. All the cases divided into four groups - 0–24 h, 1–3 days, 3–7 days, and 7–28 days.

RESULTS

Most of the neonates were males (60.2%), and the male-to-female ratio was 1.51:1. Proportional mortality rate (27.24%) in females was higher than in males (30.15%) ($p>0.05$). A total of 22.4% neonates were term (>37 weeks) and 77.6% were preterm (<28 weeks and 28–37 weeks). Preterm babies accounted for 48.6% and term babies 51.40% of the neonatal death. Proportional mortality rate was higher (65.17%) in term newborns and was statistically significant ($p<0.01$). Most of the neonates were referred to hospital within 24 h of birth, and mortality was higher in neonates admitted within 24 h of life ($p<0.05$). Most of the babies were delivered vaginally (94.2%), whereas 5.8% delivered by lower segment cesarean section, but the difference was not statistically significant (Table 1).

The major causes for morbidity in newborn were neonatal septicemia (32.8%) and prematurity (31.4%) followed by birth asphyxia (15.2%) and neonatal hyperbilirubinemia (9%) (Table 2).

Nearly 40% of the babies had two or more problems at the time of admission. The major causes of death in this study were RDS (46.4%), neonatal sepsis (21.9%), followed by prematurity (15.4%) and hypoxic-ischemic encephalopathy (9.2%) (Table 3).

The outcome of hospitalized neonate showed that 310 (62%) of the newborns were discharged, 142 (28.4%) newborns expired, 45 (9%) newborns LAMA, and 0.6% were referred to other hospitals. In the study, 70% babies were LBW, and proportional mortality was highest (100%) in extremely LBW babies. Proportional mortality was also significantly high (53.01%) in LBW (1–1.5 kg) baby ($p<0.05$). Of 500 newborns, most of the neonates were referred to hospital within 24 h of birth. Proportional mortality rate was higher in neonate admitted within 24 h of life ($p<0.05$).

DISCUSSION

Most of neonates who were admitted in our hospital with various complaints during the study period were males (60.2%), and male-to-female ratio was (1.5:1); proportional mortality rate in females was higher than males, but statistically there was no association of mortality with the gender. Contradictory findings were observed by a study done by Okposio and Ighosewe in 2016 [3], where a total of 122 deaths were recorded during the study period, of which 78 were males while 44 were females giving a male: female ratio of 1.7:1. However, there was no significant association between gender and mortality. In another study, Singh and Haider [4] showed mortality higher in males 53.8% as compared to females 46.15%.

In this study, 22.4% were term babies (>37 weeks newborn) and 77.6% were preterm (<28 weeks). Proportional mortality rate was more (65.17%) in term newborns than the preterm babies (25%), and the difference was statistically significant. In a study by Okposio and Ighosewe [3], 18.7% of the neonates were preterm with a mean gestational age of 35.6±3.9 weeks while 3.7% were post-term. A similar study was done by Singh *et al*. [5], where mortality was more (92.7%) in preterm newborns than the term newborns (49.3%). Sarna *et al*. [6] observed 100% proportional mortality in <28 weeks gestational, 95.1% in 29–30 weeks newborn, and 61% in 31–32 weeks newborn. In a study by Rather *et al*. [7], late preterm infants were at significantly higher risk for overall morbidity due to any cause ($p<0.0001$), respiratory morbidity ($p<0.0001$), mechanical ventilation ($p=0.0002$), jaundice ($p<0.0001$), hypoglycemia ($p<0.0001$), and sepsis ($p<0.0001$).

In the study, 70% of babies were LBW and proportional mortality was highest (100%) in extremely LBW babies. Similar results were reported by Singh *et al*. [8] in very LBW group (<1000 g −84.6%, 1000–1250 g - 68.7%, and 1251–1500 g - 45.7%). A study conducted by Saminathan *et al*. showed that of 3582 babies, the incidence of LBW was 44% [9]. Of 500 newborns, most of the neonates were referred to hospital within 24 h of birth. Proportional mortality rate was higher in neonate admitted within 24 h of life ($p<0.05$). The high mortality rate may be due to the reason that severely sick newborns were referred to this hospital just after delivery. In a study done Okposio and Ighosewe in 2016 [3], most of the neonates were admitted after 24 h of life with a mean age at admission of 5.7±5.9 days.

In this study, neonatal septicemia (32.8%) and prematurity (31.4%) were the two most common reasons for newborn morbidity. In a study by Ekwochi *et al*. [10], a total of 261 neonates were admitted during the study period and the common causes of admissions seen from the study were perinatal asphyxia (30.7%), LBW (24.5%), neonatal sepsis (16.9%), and neonatal jaundice (0.06%). Singh and Haider [4] showed that birth asphyxia was found in 75% of cases, neurological complication in 51%, pulmonary problem in 36%, and neonatal septicemia in 18%, and the major congenital malformation in 11.19% of the newborns. A study by Bhalla *et al*. [11] reported that the maximum morbidity was due to neonatal infection (31.4%) and asphyxia (27.4%). In another study, the leading causes of admissions were neonatal sepsis, prematurity, perinatal asphyxia, hemorrhagic disease of the newborn, and neonatal jaundice [3]. RDS (21.9%), sepsis (19%), perinatal asphyxia (16.37%), and jaundice (12.9%) were the chief morbidities as reported by Rakholia *et al*. in their study [12]. Saminathan et al. studies the morbidity profile of newborns and found that 43% had birth asphyxia, 41% had prematurity and its complications, and 34% admitted with RDS [9].

Table 1: Neonatal mortality and morbidity according to sex, gestational age, age at admission, and mode of delivery

Parameters	Admission n (%)	Mortality n (%)	Proportional mortality rate (%)	p value (Chi-square)
Sex				
Male	301 (60.2)	82 (57.7)	27.24	p>0.05 (0.49)
Female	199 (39.8)	60 (42.3)	30.15	
Gestational age (weeks)				
<28	16 (3.2)	4 (2.81)	25	*p<0.01 (56.37)
28–32	120 (24)	18 (12.67)	15	
32–37	252 (50.4)	47 (33.09)	12.65	
>37	112 (22.4)	73 (51.40)	65.17	
Age at admission				
<24 h	282 (56.4)	97 (68.30)	34.39	*p<0.05 (16.9)
24–72 h	63 (12.6)	7 (4.92)	19.44	
3–7 days	67 (13.4)	13 (9.15)	19.40	
>7 days	88 (17.6)	25 (17.60)	28.40	
Mode of delivery				
Vaginal	471 (94.2)	139 (97.88)	29.51	p>0.05 (4.93)
LSCS	29 (5.8)	3 (2.11)	10.34	

***P Value - Statistically Significant, LSCS: Lower segment cesarean section**

Table 2: Reasons for morbidity of newborns

Causes of morbidity	Number of cases 500 (%)
Neonatal septicemia	164 (32.8)
Prematurity	157 (31.4)
Birth asphyxia	76 (15.2)
Neonatal hyperbilirubinemia	45 (9)
Meconium aspiration	27 (5.4)
Major congenital malformation	22 (4.4)
RDS	9 (1.8)
Total	500 (100)

RDS: Respiratory distress syndrome

Table 3: Reasons for mortality of newborns

Causes of mortality	Number of cases 351 (%)
RDS	60 (46.4)
Neonatal sepsis	30 (21.9)
Prematurity	22 (15.49)
HIE	13 (9.2)
Extremely LBW	6 (4.2)
Meconium aspiration syndrome	2 (1.4)
Congenital pneumonia	1 (0.7)
Congenital heart disease	1 (0.7)
Congenital malformation	1 (0.7)
Total	142 (100)

RDS: Respiratory distress syndrome, HIE: Hypoxic-ischemic encephalopathy, LBW: Low birth weight

The major etiological cause of death in this study was found to be RDS (46.4%) followed by NNS (21.9%). In one of the studies conducted by Ekwochi *et al*. [10], a total of 37 (14.2%) deaths were recorded during the period, and the leading causes of deaths were severe form of perinatal asphyxia (52.9%), neonatal sepsis (29.4%), and very LBW (0.06%). Sarna *et al*. [6] reported that RDS and prematurity (29.3%), sepsis (24.4%), and asphyxia (16.2%) contribute to neonatal death. In a study conducted by Rakholia *et al*. [12], the chief causes of mortality among newborns were prematurity (25.6%), sepsis (21.6%), perinatal asphyxia (19.5%), and RDS (17.3%). In this study, the newborn mortality rate was 28.4%, which was slightly higher as compared to a study done by Okposio and Ighosewe in 2016 [3], where they found newborn mortality rate to be 20.3%. Much lower mortality rate was reported by Eke *et al*. in Nnewi and by Ekwochi *et al*. [10,13].

In the present study, the outcome of hospitalized neonate showed that 62% of the newborns were discharged, 28.4% newborns expired, 9% newborns LAMA, and 0.6% were referred to other hospitals. In a study done by Rakholia *et al*. [12], most of the neonates admitted were survived (66.57%), the percentage of the admitted neonates, who went on LAMA, was 8.32%, while referred neonates were 4.58% and 20.53% neonates were died. Saminathan *et al*., in their study, showed the outcome of babies. Of 3582 babies admitted, 89% (3216) of babies were discharged well and 6.72% (241) babies died in a period of 1 year [9].

Several limitations exist in the present study. First of all, the study was of retrospective nature and the official records were the only method to determine the extent and depth of information related to newborn death, so the exact cause of death was not determined. Second, newborns admitted in general ward and those referred due to non-availability of beds were not studied and could hence modify the results, and finally, maternal details were not studied in the present study.

CONCLUSION

In the present study, it was found that neonatal septicemia and prematurity were the leading reason for the newborn morbidity. Therefore, suitable measures should be taken to reduce the preterm delivery. Apart from this, strengthening perinatal care, treatment of genitourinary infection, interval of pregnancy,

emergency obstetric services, and enhancement of neonatal resuscitation should be kept in mind to enhance the chances of neonatal survival. Neonatal mortality cannot be reduced by slogans alone; it demands pragmatic decision-making and firm action to achieve this goal.

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