Original Research Article

Study of neonatal morbidity and mortality pattern in NICU in LBW neonates over a five-year period at a rural tertiary care teaching hospital in South-West Bihar

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Abstract

Introduction: Preterm birth is a major cause of mortality and morbidity for newborns and imposes a considerable burden on limited health care resources. Even though the incidence of preterm birth is rising worldwide due to the continued innovation in neonatal intensive care unit facilities, the survival of preterm neonates has significantly increased. **Aim and objectives:** 1. To study the morbidity and mortality pattern in low birth weight neonates.
2. To analyze the risk factors of mortality in low birth weight neonates. **Methodology:** This was a retrospective record-based study conducted in the neonatal intensive care unit of a tertiary care teaching hospital situated in rural South Bihar, India. The medical record of a total of 1222 neonates belonging to the Rohtas district and admitted in the NICU of Narayan Medical College & Hospital, Sasaram between April 2015 and April 2020 were reviewed. The data on admission, sex, gestational age, birth weight, indications for admission, primary diagnosis and associated medical condition, duration of hospitalization, complications encountered, investigations during hospitalization, and outcome over-extracted and analyzed. **Results:** The data analysis for the morbidity showed that neonatal hyperbilirubinemia (NNH) was the most common cause of admission to NICU, followed by early-onset sepsis (EOS), perinatal hypoxia-ischemia (birth asphyxia), prematurity (admitted for preterm care, no complications on admission), respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS) and late-onset sepsis (LOS), in that order. **Conclusion:** This study identified neonatal hyperbilirubinemia (NNH), early-onset sepsis (EOS), perinatal hypoxia-ischemia (birth asphyxia), prematurity, respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), and late-onset sepsis (LOS) as the major causes of neonatal morbidity in the NICU of our institute in rural South Bihar. The major causes of neonatal deaths were perinatal hypoxia-ischemia, prematurity, EOS, RDS, LOS, and MAS. Prematurity, LOS, RDS, birth asphyxia, MAS, and NEC were the most lethal diseases in terms of case fatality rates.

Key Words: NICU, Neonatal Morbidity, Neonatal Mortality, Rohtas, Bihar.

Introduction

Preterm birth is a major cause of mortality and morbidity for newborns and imposes a considerable burden on limited health care resources. Even though the incidence of preterm birth is rising worldwide due to the continued innovation in neonatal intensivecare unit facilities, the survival of preterm neonates has significantly increased. Preterm birth is a major public health problem. According to the World Health Organization (WHO), prematurity is the leading cause of death among newborns and it comes in second between children below five years old, after pneumonia. Prematurity is not only an important cause of mortality, but it also increases the risk of serious lifetime disabilities.[2]In India, LBW (low birth weight) constitutes about 30% of all live births, i.e., nearly 3 million LBW babies are born per year in India. According to WHO, 33% of infant mortality in India is associated with LBW. A similar observation is found by a recent survey in India. National Family Health Survey (NFHS)-3 in which among children for whom birth weights were reported, 23% weighed <2.5 kg. The percentage of LBW babies was higher in rural areas (24.5%) than in urban areas (21%).[3] The rate of neonatal mortality varies widely among the different states of India, ranging from 5 per 1000 live births in

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Kerala to 41 per 1000 live births in Uttar Pradesh. The neonatal mortality rate in Bihar 35 per 1000 live birth as per NFHS-4 is more than that of the national figure due to the lack of health infrastructures. Preterm birth is one of the major clinical problems in obstetrics and neonatology, as it is associated with increased perinatal mortality and morbidity.[4]Several factors have been linked with the increase in premature births: new fertilization methods have increased the number of twin and multiple pregnancies; an increasing number of women are having children after the age of 35; and there is an increasing number of medical indications for interrupting pregnancy, which is a result of increased use of technology to monitor pregnancies. Survival of extremely premature infants has increased significantly during the last two decades. Complications of prematurity are becoming more common as more survivors are spending time in the Neonatal intensive care unit (NICU).[5]Most preterm infants need advanced neonatal care to survive. Although advances in neonatal care have improved their survival and quality of life in the developed countries, preterm morbidity and mortality are still at their peak in the developing and underdeveloped countries. In high-income countries, 95% of preterm babies survive, of which 90% develop no impairments, but in many low-income countries, almost all of the very premature births die due to lack of basic care. On the other hand, most of the middle-income countries suffer from long-term consequences and disabilities caused by preterm births, especially extremely preterm births.[6]While gestational age at birth is the strongest predictor of adverse neonatal outcomes, the subtype of preterm birth is also important. Preterm infants born to women with spontaneous onset of labor have a better prognosis than infants born following clinician-initiated delivery[7]. The objectives of this study were to describe the demographic characteristics, the probable cause of premature delivery, various morbidity patterns developed during the clinical course, and to identify the causes of mortality of preterm babies admitted to NICU.

Aims & Objective

1. To study the morbidity and mortality pattern in low birth weight neonates.
2) To analyze the risk factors of mortality in low birth weight neonates.

Methodology

This retrospective descriptive study was done at the neonatal intensive care unit of Narayan medical college and hospital, South Bihar. The study population comprised of neonates admitted to NICU with gestational age less than 37 completed weeks over a period of five years from April 2015 to April 2020. In this retrospective study, data were collected from the medical records department, medical records of the low birth weight babies admitted in NICU were reviewed. Data regarding the number of preterm deliveries, various morbidity, and mortality patterns, and treatment provided in the NICU were reviewed. Relevant details were collected which includes maternal details like their age, address, socioeconomic status, educational status, maternal weight, risk factors (Hypertension, Anemia, Gestational Diabetes mellitus, Multiple gestations, Chronic medical illness, Hypothyroidism, HIV status, Hepatitis B, Maternal fever), the order of birth, gestational age, Antenatal steroids, premature rupture of membranes, mode of delivery and Baby's details include their sex, need of resuscitation, Apgar score, gestational age, birth weight, and their illness, the need of mechanical ventilation and surfactant therapy were recorded.We collect data on several conditions associated with prematurity. Respiratory distress syndrome (RDS) was diagnosed according to the European Consensus Guidelines on the Management of Neonatal Respiratory Distress Syndrome: PaO2 < 50 mmHg in room air, central cyanosis in room air, need for supplemental oxygen to maintain PaO2 > 50 mmHg or to maintain a pulse oximeter saturation > 85% within the first 24 hours of life; and as well as the classical chest radiograph (including a ground-glass appearance and air bronchogram).

Results

Table 1: Distribution of low birth weight babies as per their body weight

LBW babies as per birth weight in kg	Total no of babies (%)	No of Male LBW babies (%)	No of Female LBW babies (%)	P-value
1.5-2.499	497 (91.02)	191 (38.43)	306(61.57)	0.24
1-1.499	44 (8.05)	18(40)	26(60)	
<1	5 (0.93)	5(100)	0	
Total	546	226(41.46)	320(58.54)	

The total number of deliveries during the study period was 1222. The number of stillbirths in this study period was 32. The total no of live births was 1190, after excluding stillbirths. Out of 1190, 546 were live LBW

babies, out of which 284 (52.01%) were preterm and 262 (47.99%) were Term IUGR. The incidence of LBW babies in this study was 25.46%. Among the 546 live LBW babies, 497(91.06%) were in the 1.5-2.499 kg group, 44(8.13%) babies in the 1-1.499 kg (Very Low Birth Weight-VLBW) group, and only 5 (0.93%) was in < 1kg birth weight (Extremely Low Birth Weight-ELBW) group. Overall female to male ratio was 1.41:1. The male to female ratio was 0.70:1 in the 1.5-2.499 kg group. On applying chi-square, we found a statistically non-significant difference with a p-value of 0.24 (Table 1).

Table 2: Distribution of LBW baby as per gestation

LBW babies	Total no of babies (%)	%
Term IUGR	261	47.71
Preterm AGA	195	35.77
Preterm SGA	90	16.52
Total LBW	546	100

In the total 546 babies, 261(47.71%) were Term IUGR, 195(35.77%) were preterm appropriate for gestational age whereas the rest 90 (16.52%) were small for gestational age preterm(Table 2).

Table 3: Morbidities in Preterm and Term LBW babies in the early neonatal period

Morbidities	Total LBW babies 546	Preterm-LBW No. (%) (Total =284)	Term IUGR-LBW No. (%) (Total=262)	P-value
NNH	204	148 (72.55)	56(27.45)	0.123
EOS	176	128(72.73)	48(27.27)	
Birth asphyxia	112	96 (85.71)	16 (14.29)	0.037
Respiratory distress	108	92 (85.18)	16(14.82)	0.0001
LOS	68	48(70.59)	20(29.41)	
Meconium aspiration syndrome	40	24(60)	16(40)	
Sepsis	24	20 (83.33)	4 (16.67)	0.0004
AOP	20	20 (100)	0(0)	0.0001
NEC	12	8 (66.67)	4 (33.33)	0.284
Septic Ileus	8	4 (50)	4(50)	1
Polycythemia	8	4(50)	4(50)	1
AKI	5	5 (100)	0(0)	0.498
Congenital anomalies	36	24(66.67)	12 (33.33)	0.787

Morbidities in preterm and term IUGR low birth weight babies. The most common morbidities found in LBW babies were neonatal Hyperbilirubinemia followed by EOS, Birth asphyxia, respiratory distress, LOS, and MAS. Preterm-LBW babies were significantly more affected than Term IUGR-LBW by these morbidities and the difference was significant statistically.

The respiratory distress, birth asphyxia, sepsis, AOP was more common in the Preterm baby than in term baby which was statistically significant (Table 3)

Table 4: Causes of early neonatal mortality in LBW babies

Causes in LBW	No. of deaths among 284 Preterm-LBW	No. of deaths among 262 Term -LBW	No of deaths (%)
Birth asphyxia	16	4	20 (41.67)
HMD	12	0	12 (25)
Aspiration of feeds	4	4	8 (16.67)
Sepsis	4	4	8 (16.67)
Total	36 (75)	12(25)	48(100)

Mortality in the early neonatal period among LBW. Among the 546 LBW babies, 48 deaths were seen in the neonatal period. Neonatal mortality in the present study was 2.4 per 1000 live births. 75% of early

neonatal deaths were contributed by Preterm LBW babies and the rest by Term IUGR babies.The most common cause of early neonatal deaths in Preterm LBW babies was Birth asphyxia (41.67%), followed by Hyaline membrane disease (25%) and Sepsis (16.67%) as shown in Table 4. Mortality was 100% for babies <1 kg in birth weight, 20% in the VLBW group, and 8.03% in the 1.5-2.499 kg group.

Discussion

The strategies in the past five-year plans like National Health Mission, Millennium Development Goals, India's Newborn Action Plan, and now the recent Sustainable Development Goals (SDG) are to reduce the perinatal mortality, Infant mortality rate, and LBW. SDG 2017 has a target to reduce LBW incidence by 30% by 2025 to reach world health assembly nutrition target levels. In the present study, the incidence of LBW babies was 25.46% which was comparable to the incidence reported by NFHS-3 (22%) of India. In an earlier study from our institute in 2012, the incidence of LBW babies, in preterm was 64.8% and in the term, babies were 24.1%[4]. However, in this study, among the LBW babies, preterm was 52.04% and Term IUGR was 47.96%. Our findings are similar to other studies that reported that half of the LBW babies were contributed by preterm. Prematurity is one of the leading causes of neonatal deaths in India[9,10].This study showed that the majority of the preterm neonates were in the gestational age of 30-34 weeks and had birth weight between 1500 and 2000 grams. These findings are supported by another cross-sectional study which showed that the gestational age of preterms between 31 to 34 weeks was 44% and 23% of preterms had birth weight between 1500 and 2000 grams[11]. A study conducted by Karegoudar in 2014 in Belgaum showed that the birth weight of 41.61% premature babies was between 1501 and 2000 grams[12]. In a study conducted in Ethiopia, the prevalence of preterm birth was 25.9%, whereas in the present study the proportion of preterm birth among the NICU admissions was higher[13]. The female to male LBW ratio was 1.4:1; similar female predominance was reported in studies by Agarwal N et al[14], and Felke Y et al[15].LBW is an important predictor of newborn health and survival. Among LBW babies in the present study, neonatal jaundice was the most common morbidity in LBW neonates which is similar to a study done by Sangamam R et al[16].

The incidence of hyperbilirubinemia in severe and moderate preterm babies was 60% in this study, in contrast to a study done in a similar population at BP Koirala Institute of Health Sciences; Dharan, which was as high as 73.6%. The incidence of hyperbilirubinemia in late preterm was 26% in this study, higher compared to 14% in a study in Taiwan [17] HMD was the leading cause of respiratory distress among Preterm babies. Our findings were consistent with a study by Hasthi UR et al[18]. The early neonatal mortality rate in this study was 9.76 per 1000 live-born LBW babies. Preterm babies contributed to more than 75% of deaths in the present study. Birth Asphyxia (41.67%) and HMD (25%) were the top two causes of death and contributed to 75% of deaths in LBW babies in our study. Our findings are similar to the study by Saminathan D et al[12]. In a previous study from our institute by Kumar MK et al[4], it was reported that the overall neonatal mortality rate among patients admitted in NICU was 13.6 % (32/236) and in LBW was 11 (34.8%). There was no statistically significant difference in the outcome between the male and female neonates.

Conclusion

The present study revealed that preterm babies contributed 52.29% to the incidence of LBW babies. Morbidity and mortality in LBW babies were inversely related to birth weight and gestational age. Our study shows neonatal hyperbilirubinemia (NNH) (204) as the most common neonatal morbidity requiring admission to the NICU. Early-onset sepsis (EOS) (176), perinatal hypoxia-ischemia (birth asphyxia) (112), respiratory distress syndrome (RDS) (108), meconium aspiration syndrome (MAS) (40) and late-onset sepsis (LOS) (68) were the other important causes of NICU admission. Common causes of neonatal mortality in the NICU were perinatal hypoxia-ischemia (birth asphyxia) (41.67%), prematurity (22.46%), early-onset sepsis (EOS) (15.22%), HMD (25%), aspiration of feeds (16.67%), and sepsis (16.67%). Much of the morbidity and subsequent mortality can be prevented by developing infrastructure and training staff for providing effective antenatal and peripartum obstetric care, and neonatal care and resuscitation.

Limitations of the study: This was a hospital-based study and may not truly represent the neonatal morbidity and mortality statistics in the community. As this was a record-based study, examination of study subjects was not possible and it relied on the case notes and reports in the medical records.

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