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Research Article

Effect of low birth weight on neonatal mortality in preterm and small for gestational age babies in a tertiary neonatal intensive care unit in India

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ABSTRACT

Background: Neonatal mortality is an increasingly important public health issue in developing countries. Low birth weight is the single most important factor affecting neonatal mortality. Globally low birth weight accounts for 10% of neonatal mortality. The purpose of our study was to find out the impact of low birth weight on neonatal mortality and its effect on preterm and small for gestational age babies in a tertiary care center in India.
Methods: 173 consecutive, low birth weight neonates weighing less than 2.5 kilograms referred to a tertiary care center over a period of one year were included. Age, gender, gestational age, birth weight, comorbid conditions and clinical outcome were recorded prospectively. Neonates were divided into two groups. 83 preterm low birth weight neonates (<37 weeks of gestation, New Ballard score) and 90 term small for gestational age neonates (<10th percentile of gestational age, IAP charts). Mortality data was analyzed using SPSS version 11.5 and Chi square test result with P<0.05 was considered as significant.
Results: Preterm neonatal mortality was 32.5 percent (27 neonates). Neonatal mortality was 18.9 percent (17 neonates) in term small for gestational age babies. Major causes of death in low birth weight neonates were prematurity and its associated causes (43%) followed by congenital anomalies (34%) and birth asphyxia (14%). Other minor causes include inborn errors of metabolism.
Conclusions: Preterms are more susceptible to death compared to small for gestational age babies in a tertiary intensive care unit.

Keywords: Preterm, Small for gestational age, Low birth weight, Neonatal mortality

INTRODUCTION

Neonatal mortality is an increasingly important public health issue in developing countries like India.[1] The low-birth-weight neonate is at a higher risk of death than the neonate with normal birth weight.[2] Low birth weight (LBW) is defined as a birth weight of less than 2.5 kilograms and is a single most important determinant of neonatal mortality.[1] Low birth weight can be a confounding factor in both, preterm births (i.e., neonates of less than 37 weeks gestation) and small for gestational age (SGA, term neonates with birth weight less than 10th percentile as per IAP chart).

Preterm and small for gestational age neonates with low birth weight are at increased risk of death because of underdeveloped or poorly developed organs and/or organ systems and the inability to physiologically respond to their external environment. Worldwide 15.5% of neonates are born with low birth weight, 95.6% of them in the developing countries.[4] Prematurity accounts for 10% of neonatal mortality globally.

According to a study conducted in Bangladesh, the neonatal mortality rate was 53.5 per 1000 live births, 30% of which was due to low birth weight.[3] According to a retrospective study conducted in north central Nigeria among 278 neonates managed in special care baby unit of Jos university teaching hospital, the birth weight specific mortality was 126 per 1000 for preterm low birth weight and 5 per 1000 for term babies. Neonatal sepsis was a common denominator among the babies that died.[4] According to another prospective study conducted in Bangladesh, 103 neonatal deaths occurred among 773 low birth weight neonates of which 43 occurred within 48hours of birth and 87 occurred within the first 6 days. In 45% of the cases, no other causes other than LBW or preterm delivery could be identified. Birth asphyxia was identified as cause of death in 34% of the cases and infection (generalized sepsis and pneumonia) in 9% of the cases. Also, preterm neonates were 5 times as likely to die as term neonates.[1]

According to another retrospective study conducted among low birth weight neonates in tertiary health care center in Nigeria, out of 535 LBW admissions, 124(23.2%) died. The birth weight specific mortality rate for the <1000 g neonates was 818 per 1000, 451 per 1000 for the 1000-1499 g, 216 per 1000 for the 1500-1999 g, and 67 per 1000 for the 2000-2499 g neonates. Primary indications for admission were neonatal sepsis (25.2%), perinatal asphyxia (23.0%) and neonatal jaundice (19.6%) with case fatality rates of 20.0%, 34.1% and 10.5% respectively. Significant risk factor associated with mortality was low birth weight. Sex and mode of delivery had no significance influence on mortality.[5]

With regards to another prospective study conducted in Iran in 2004, during one year 8.4% (507 out of 6016 births) of all the newborns two third (95/143) of all neonatal deaths occurred in LBW. Neonatal mortality rate among LBW was 23 times more than that of normal birth weight neonates. 31% (161/507) of all LBW were preterm and 69% of them were term neonates. The main cause of mortality among LBW was respiratory distress syndrome (59%), asphyxia (20%), septicemia (12%), and congenital malformation (9%).[8]

In accordance to another study conducted in Shimla, 27.8% of the babies were low birth weight (LBW) and contributed to 79.5% of all neonatal deaths. Neonatal mortality was ten times higher in LBW babies in comparison to normal birth weight babies. Likewise mortality among preterm was fifteen times compared to term babies. The major causes of neonatal deaths was birth asphyxia (31.1%), infections (23.3%) and immaturity (17.8%).[9]

We wanted to study the influence of low birth weight on the neonatal mortality and the predominant causes of death in the preterm and small for gestational age critically ill neonates referred to our tertiary referral intensive care center.

METHODS

This study was conducted in the neonatal Intensive Care Unit (NICU), Regional Advanced Paediatric Care Centre (RAPCC), Mangalore. The approval of institutional research and ethics committees were obtained. Consecutive low birth weight neonates referred to the intensive care unit from September 2014-August 2015 were considered for enrolment in the study. Neonates with age >28 days are excluded from the study.

173 neonates were enrolled prospectively into the study. They were divided into two groups. Group A-preterm neonates with less than 37 weeks of gestation and group B-small for gestational age according to Indian Paediatrics Charts (<10th percentile of gestational age, IAP charts). Details of, date of birth, gestational age as per New Ballard scoring, gender, reason for referral, comorbid conditions and clinical outcome if discharged or succumbed to death were collected. In case of death, cause of death was noted.

The collected data was analysed using statistical package, SPSS version 11.5 and qualitative analysis by statistical chi square test and a p value<0.005 was considered to be significant.

RESULTS

Gender

Out of the 173 neonates in the study population 75 were female neonates and 98 were male neonates.

Gestational age

Among the study population 90 (52%) were term SGA and 83 (48%) were preterm neonates.

Neonatal mortality rate

In our study group of 173 low birth infants 44 (25%) died and 129 (74.5%) were discharged.

Relationship between clinical outcomes, gestational age

Out of 90 term SGA neonates, 73 (81.1%) got discharged and 17 (18.9%) of them expired; and among 83 preterm neonates 56 (67.5%) were discharged and 27 (32.5%) expired.

Table 1: Relationship between clinical outcomes and gestational age.

	Discharged		Expired		Total	
	Count	%	Count	%	Count	%
Term SGA	73	81.1	17	18.9	90	100
Preterm	56	67.5	27	32.5	83	100

Mortality was thus more among preterm neonates in comparison with term SGA neonates (p=0.04). This shows that there is significant relationship between gestational age and neonatal mortality.

Causes of mortality

In our study, the highest mortality among neonates is attributed to prematurity and its associated causes like respiratory distress syndrome (RDS), necrotizing enterocolitis (NEC), sepsis, disseminated intravascular coagulation constituting (43%) followed by congenital anomalies (34%) and birth asphyxia (14%). Other minor causes include inborn errors of metabolism.

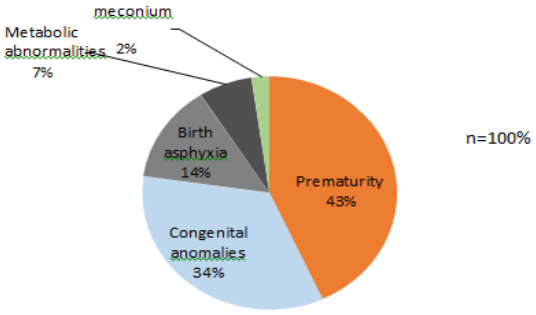

Figure 1: Causes of mortality.

DISCUSSION

Infant mortality is one of the most sensitive indicators of health status of a country and reflects the overall health scenario of a country.[11] In India the infant mortality rate has been steadily declining and is 38 in the year 2015. 40 to 60 percent of infant mortality is contributed by neonatal mortality in India. As per the National center for Health Statistics a significant amount of this infant mortality is due to low birth weight babies. Hence it is of utmost importance to study the relationship of neonatal mortality to low birth weight and the causes of mortality in this this group of neonates

Out of the 173 neonates taken into consideration, 98 (56.6%) were males and 75 (43.4%) were females. As we can see there is a slight male preponderance in the study population. Similar male preponderance was seen in another study conducted among low birth infants in Iran, 48% of all the low birth weight births were girls and 52% were boys.[7]

When the outcome was analysed according to gender, neonatal deaths in boys and girls were 23.5% and 28% respectively (p=0.498) in our study mortality was slightly more in boys compared to girls (p=0.16). It was statistically insignificant showing that there was no gender bias as regards neonatal mortality. Similarly, gender was not significant contributor to neonatal mortality in another study conducted in North central Nigeria, which recorded 25.2 deaths per 1000 for boys and 18.0 for girls.[4]

In our study, death among preterm neonates was more constituting 32.5% as opposed to 18.9% in term neonates (p=0.04) may be because in the preterm, due to immaturity of their organs have more difficulty in adaptation to extra-uterine life. A similar observation was made in another study conducted in Shimla which showed that mortality among preterm (18.1%) was 15 times higher (1.2%) compared to term babies (p= 0.001) where as in another study conducted in north Nigeria, gestational age was not a significant predictor of neonatal mortality.[11] Though the effect of gestational age was positive on neonatal mortality, this was not statistically significant.[4]

In our study, the major cause of neonatal deaths was prematurity and its associated causes like respiratory distress syndrome (RDS), necrotizing enterocolitis (NEC), sepsis, disseminated intravascular coagulation constituting 43% followed closely by congenital malformation contributing 34%, birth asphyxia constituting 14%, metabolic anomalies like congenital hyperbiliribinemia constituting 7% and meconium aspiration 2%. A study conducted in Bangladesh showed the major cause of death being sepsis (32%), asphyxia (26%), tetanus (15%), followed by RDS and others.[4] In another study conducted in Shimla, birth asphyxia (23%) was the major contributor followed by infections, immaturity, congenital malformation and others.[10] Another study in Nigeria showed asphyxia as the major cause followed by sepsis and neonatal jaundice.[5] The reason for higher rate of congenital anomalies in our study population could be due to the fact that they were referral cases to a tertiary center for intensive treatment and possible surgical intervention.

CONCLUSION

Low birth weight is a significant contributor of neonatal mortality. This study showed that low birth weight preterm neonates were more susceptible to death compared to term small for gestational age neonates. Presence of congenital malformation also has a strong impact on neonatal mortality among neonates the low birth weight neonates.

Preterm babies are more susceptible to sepsis. So, stringent aseptic measures have to be taken like establishment of proper aseptic NICU (neonatal intensive care units), proper hand washing practices, and training of personnel.

In this study, importance is mainly given to neonatal death and their cause of death. On the other hand, those neonates who had a favourable outcome and were discharged did not imply that the neonates were healthy. Tracking their morbidity and mortality later in life was

however beyond the scope of this study. So, there is a need for long term follow-up studies.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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