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Original Research Article

Morbidity and mortality of low birth weight babies in early neonatal period in a rural area teaching hospital, Telangana, India

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ABSTRACT

Background: A baby's weight at birth is a strong indicator of newborn health and nutrition. Low birth weight (LBW) babies are more susceptible to morbidities and mortality in early neonatal period than normal birth weight (NBW) babies. Among neonatal deaths, 80% occurs in LBW / preterm babies and 75% of total neonatal deaths occur in early neonatal period. The present study was undertaken to know the incidence and early neonatal outcome of LBW babies in rural area.
Methods: Prospective observational study was conducted in babies born with <2.5 kg (LBW) birth weight.
Results: The incidence of LBW babies was 25.07% with almost an equal contribution from preterm (50.46%) and Term Intra Uterine Growth Restricted (IUGR) (49.53%) babies. The most common morbidity found in LBW babies was Jaundice (40.09%) followed by respiratory distress (18.16%), sepsis (8.72%) and apnea (4.48%). Preterm-LBW babies had more morbidities in terms of apnea (100%), birth asphyxia (88.88%), respiratory distress (87.01%%), sepsis (80.55%) and jaundice (67.64%). Early neonatal mortality was 21.22 per 1000 live births. Mortality was 100% for babies <1 kg in birth weight, 16% in 1-1.499 kg group and 0.75% in 1.5-2.499 kg group in early neonatal period. According to gestational age, mortality in preterm-LBW babies was 88.88% and 11.11% in Term IUGR-LBW babies. The most common cause of death in LBW babies was birth asphyxia (44.44%) followed by hyaline membrane disease (HMD) (33.33%).
Conclusions: The present study revealed that preterm babies contributed 50% to incidence of LBW babies. Morbidity and mortality in LBW babies were inversely related to birth weight and gestational age.

Keywords: Low birth weight, Preterm, Morbidity, Mortality

INTRODUCTION

LBW is defined as weight <2500 grams (5.5 pounds) at birth by World Health Organization (WHO). The incidence of LBW is 15-20% globally as per UNICEF 2014 data.[1] More than 95 per cent of low birthweight babies are born in developing countries.[2] South Asia had the highest incidence of 28% in terms of regional variations. India had the third highest LBW babies percentage in South Asia after Mauritania (35%), Pakistan and Yemen (each country 32%).[3] Nearly 30% of neonates-7.5 million-are born with a LBW (<2500 g) in India. This accounts for 42% of the global burden, the largest for any country. According to National Family Health Survey-3 (NFHS-3, 2005-06), the prevalence of LBW was 22% in India.[4]

LBW babies are mainly as a result of preterm birth (born before 37 weeks of pregnancy) and Intra Uterine Growth Restriction (IUGR). About 40% are premature births and 60% of the LBW infants are born at Term after fetal growth restriction in India.[5] Preterm birth is truly global problem but more than 60% of preterm births occur in Africa and South Asia. As a result of increasing preterm births, a raising rate of Preterm-LBW babies is found. A recent study from India, revealed that among LBW babies, 52.7% were preterm babies and 42.3% were Term IUGR babies.[6]

Neonatal mortality rate (NMR) of India fell gradually from 49 deaths per thousand live births in 1997 to 25.4 deaths per thousand live births in 2016, which ranks it at 12 among 52 lower middle-income countries in terms of risk for new born as per first-ever report on the new born mortality, published by UNICEF on Tuesday, 20th Feb, 2018. A pooled analysis of the data from three studies on the timing of neonatal deaths indicates that about three-fourths of total neonatal deaths occur in the first week of life.[5]

A baby's weight at birth is a strong indicator of newborn health and nutrition. Being undernourished in the womb increases the risk of death. LBW babies are at 11-13 times increased risk of dying than NBW infants as per community based studies in India. Indeed, 80% of total neonatal deaths occur among LBW/preterm neonates.[5] The most common early neonatal complications among LBW babies are neonatal jaundice, birth asphyxia, septicaemia, respiratory distress, hypothermia, hypoglycaemia, etc.[7]

The NMRs are not uniform in India, there is a rural-urban difference. The NMR in rural areas is twice that in urban areas (31 vs 15 per 1000 live births). In Andhra Pradesh, Assam, Jharkhand and Kerala, the discrepancy is more marked-difference of 60% or more.[5]

The present study was designed to find incidence of low birth weight babies and their early neonatal outcomes in a rural area teaching hospital, Telangana, India.

Objectives

- To estimate the incidence of low birth weight (LBW) babies
- To identify the percentage contribution of preterm and term IUGR babies to LBW
- To identify the morbidities in preterm and term IUGR LBW babies in early neonatal period
- To estimate early neonatal mortality in LBW babies.

METHODS

A prospective observational hospital-based study was conducted in Obstetrics and Gynaecology (OBG) and Neonatal Intensive Care Unit (NICU) of Mediciti Institute of Medical Sciences, Telangana, India over a period of one year (2017-2018) after obtaining consent from hospital ethical committee. All babies were weighed soon after birth on digital weighing machine with ±10 grams difference in weight. Informed consent was taken once the mothers of LBW(<2.5 kg) babies were comfortable after delivery. The information required for the study was taken by detailed history and from the hospital documents as per the proforma.

The LBW babies who require admission immediately after birth were shifted to NICU and rest LBW babies were monitored in early neonatal life in post-natal wards every day and were admitted in NICU if need arose later during the early postnatal period. Gestational age was calculated as per modified New Ballard Score. Based on the score obtained babies were classified into Preterm (born before <37 completed weeks of gestational age) and term babies (born in between 37-42 weeks of gestation age). The weight of preterm LBW babies was plotted in 2013 sex specific Fenton preterm growth charts. Preterm LBW babies were classified as Appropriate for gestational age (AGA) if weight of babies fell between 10^{th} to 90^{th} centile and as small for gestational age (SGA) if the weight was below 10th centile in growth charts. Babies who were born >37 wks of gestation with birth weight <2.5 kg were taken as Term IUGR. (IUGR refers to a condition in which a fetus is unable to achieve its genetically determined potential size).

The relevant blood, urine, cerebrospinal fluid and radiological investigations were done for admitted LBW babies as needed, for their illness after admission in NICU. The stable LBW babies without any illness, were discharged on 3rd day of life along with the mother. They were called for review on 7^{th} day of life to the pediatric outpatient department and if needed were admitted in NICU and work up was done.

Statistical analysis

The data was tabulated into proportions and Pearson's Chi-square test was used to see significance between the proportions. A $p < 0.05$ was considered statistically significant. The sample size was 1700 consecutive deliveries.

A prevalence of 22% for low birth weight as per NFHS 3 was taken into consideration (4). A sample size at 95% confidence limits was calculated applying the formula below.

Formula: $n=(Z2pq)/L2$

Where, n=Desired sample size
Z=Z score for 95%Confidence interval (CI) (1.96)
P=prevalence (0.22)
q=1-p= 0.78
L=desired margin of error:0.02
So, sample size (n) was 1700

Inclusion criteria

Among the 1700 consecutive deliveries, Babies weighing <2.5 kg (LBW) born in OBG unit of Mediciti Hospital were included in the present study.

Exclusion criteria

- Mothers who were not willing to participate in the study.
- Out born LBW babies.

RESULTS

The total number of deliveries during the study period was 1700 (including 26 pairs of twin gestation). The number of babies delivered were 1726. The number of still births in this study period were 27. The total no of live births was 1699 after excluding still births. Out of 1699, 426 were live LBW babies, out of which 215 (50.46%) were preterm and 211 (49.53%) were Term IUGR. The incidence of LBW babies in this study was 25.07% with 95% CI (23.01-27.13).

Among the 426 live LBW babies, 400 (93.89%) were in 1.5-2.499 kg group, 25 (5.8%) babies in the 1-1.499kg (Very Low Birth Weight-VLBW) group and only 1 (0.23%) was in < 1kg birth weight (Extremely Low Birth Weight-ELBW) group. Overall female to male ratio was 1.3:1. The male to female ratio was 0.75:1 in 1.5-2.499kg group. The difference was statistically significant (Table 1).

Table 1: The knowledge about the disease caused by dog bite (N=111).

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	400 (93.89)	172 (43)	228 (57)	0.0001
1-1.499	25 (5.8)	11 (44)	14 (56)	0.396
<1	1 (0.23)	1 (100)	0	*
Total	426	184 (43.19)	242 (56.80)	

*insufficient observations to calculate p value

Table 2: Distribution of admitted and not admitted LBW babies as preterm AGA, preterm SGA and term IUGR.

LBW babies	Total no of babies (%)	No of admitted babies (%)	No of not admitted babies (%)	P value
Preterm AGA	148 (34.90)	87 (58.78)	61 (41.21)	0.003
Preterm SGA	65 (15.33)	47 (72.3)	18 (27.69)	<0.001
Term IUGR	211 (49.76)	62 (29.38)	149 (70.6)	<0.001
Total LBW	424	196 (46.22)	228 (53.77)	0.028

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

Morbidities	Total LBW babies 424(%)	Preterm-LBW No. (%) (Total =213)	Term IUGR-LBW No. (%) (Total=211)	P value
Jaundice	170(40.09)	115 (67.64)	55 (32.35)	0.0001
Respiratory distress	77(18.16)	67 (87.01)	10(12.98)	0.0001
Sepsis	37(8.72)	29 (80.55)	8 (21.62)	0.0004
Apnea	19(4.48)	19 (100)	0	0.0001
Birth asphyxia	9(2.12)	8 (88.88)	1 (11.11)	0.037
Hypoglycemia	8(1.88)	6 (0.75)	2 (0.25)	0.284
Hyperglycemia	2(0.47)	2 (100)	0	0.498
NEC	4(0.94)	4 (100)	0	0.123
Early HDN	1(0.23)	1 (100)	0	1
Polycythemia	1(0.23)	1(100)	0	1
Congenital anomalies	14(3.3)	8 (57.14)	6 (42.85)	0.787
PDA	2(0.47)	2 (100)	0	0.498

In the present study two LBW babies were excluded in view of major congenital anomalies requiring immediate pediatric surgical intervention and referral to higher center. In the remaining 424 babies, 228 (53.77%) LBW

babies were healthy and 196 (46.22%) babies required hospital admission in early neonatal period. In Preterm AGA and Preterm SGA groups, number of admitted babies was higher than non-admitted babies while it was reverse in Term IUGR group. This observation was statistically significant (Table 2).

Table 4: Morbidities among Preterm-LBW babies in early neonatal period.

Morbidities	No. of preterm (%) (Total =213)	No. of preterm AGA (%) (Total=148)	No. of preterm SGA (%) (Total =65)	P value
Jaundice	115 (53.99)	76 (66.08)	39(33.91)	0.296
Respiratory distress	67 (31.45)	37 (55.22)	30 (44.77)	0.003
Hyaline Membrane disease (HMD)	26 (38.80)	21 (80.76)	5 (19.23)	0.001
Transient Tachypnea of Newborn (TTNB)	25 (37.31)	10 (40)	15 (60)	0.07
Congenital pneumonia	13 (19.04)	5 (38.46)	8 (61.53)	0.22
Sepsis	29 (13.61)	21 (72.41)	8 (27.58)	0.829
Apnea	19 (8.92)	15 (78.94)	4 (21.05)	0.44
Birth asphyxia	8 (3.75)	5 (62.5)	3 (37.5)	0.702
Hypoglycemia	6 (2.81)	3 (50)	3 (50)	0.372
Hyperglycemia	2 (0.93)	(0)	2 (100)	0.09
NEC	4 (1.87)	1 (25)	3 (75)	0.085
Early HDN	1 (0.46)	(0)	1 (100)	0.305
Polycythemia	1 (0.46)	1 (100)	(0)	1
Congenital anomalies	8 (3.75)	4 (50)	4 (50)	0.25
Congenital heart disease	2 (0.93)	(0)	2 (100)	0.09

Morbidities in preterm AGA, preterm SGA and term IUGR low birth weight babies

The most common morbidities found in LBW babies were neonatal jaundice followed by respiratory distress, sepsis and apnea. Preterm-LBW babies were significantly more affected than Term IUGR-LBW by these morbidities and the difference was significant statistically (Table 3). The most common morbidities in preterm-LBW babies were jaundice followed by respiratory distress, sepsis and apnea. The respiratory distress was more common in Preterm AGA than Preterm SGA which was statistically significant. HMD was significantly more a cause of Respiratory distress in Preterm AGA than in Preterm SGA babies as shown in Table 4. Morbidities in Term-IUGR LBW were jaundice (32.35%), sepsis (21.62), respiratory distress (12.98%) and birth asphyxia (11.11%) (Table 3).

Table 5: Causes of early neonatal Mortality in LBW babies.

Causes in LBW	No. of deaths among 213 Preterm-LBW	No. of deaths among 211 Term -LBW	No of deaths (%)	P value
Birth asphyxia	4		4 (44.44)	
HMD	3		3 (33.33)	
Aspiration of feeds		1	1 (11.11)	
Sepsis	1		1 (11.11)	
Total	8 (88.88)	1(11.11)	9 (100)	0.0371

Mortality in early neonatal period among LBW

Among the 424 LBW babies, 9 deaths were seen in early neonatal period. Early neonatal mortality in present study was 21.22 per 1000 live births. 88.88% of early neonatal deaths were contributed by Preterm LBW babies and the rest by Term IUGR babies which was statistically significant (Table 5).

The most common cause of early neonatal deaths in Preterm LBW babies was Birth asphyxia (44.44%), followed by Hyaline membrane disease (33.33%) and

Sepsis (11.11%) as shown in Table 5. Mortality was 100% for babies <1 kg in birth weight, 16% in VLBW group and 0.75% in 1.5-2.499 kg group.

DISCUSSION

The strategies in the past five year plans, National Health Mission, Millennium Development Goals, India's Newborn Action Plan and now the recent Sustainable Development Goals 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 25.07% with 95% CI (23.01-27.13) which was comparable to the incidence reported by NFHS-3(22%) of India.[4] Among the LBW babies, preterm were 50.16% and Term IUGR were 49.53% in present study. Authors findings are similar to other studies who reported that half of the LBW babies were contributed by preterm.[8,9] The female to male LBW ratio was 1.3:1; similar female predominance was reported in studies by Agarwal N et al, and Felke Y et al.[10,11] LBW is an important predictor of newborn health and survival. Among LBW babies in present study, 62.9% of preterm and 30% of term IUGR babies were admitted in NICU for various illness. Admission rates were high for Preterm LBW babies compared to Term IUGR babies in present study. This was consistent with a previous study.[12] Neonatal jaundice was the most common morbidity in LBW neonates similar to a study done by Sangamam R.[13] HMD was the leading cause of respiratory distress among Preterm AGA babies compared to Preterm SGA babies. Authors findings were consistent with a study by Hasthi UR et al.[14] The early neonatal mortality rate in this study was 22.1 per 1000 live born LBW babies. Preterm babies contributed to more than 85% deaths in present study. Birth Asphyxia (44.4%) and HMD (33.3%) were the top two causes of death and contributed to 75% of deaths in LBW babies in our study. Author's findings are similar to study by Saminathan D et al.[15]

CONCLUSION

The present study revealed that preterm babies contributed 50% to incidence of LBW babies. Morbidity and mortality in LBW babies were inversely related to birth weight and gestational age.

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