International Journal of Contemporary Pediatrics
Sandhya A et al. Int J Contemp Pediatr. 2021 Jun;8(6):1064-1069
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291
DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20212049

Original Research Article

A study to assess clinico-epidemiological profile and outcome of low birth weight babies admitted to neonatal intensive care unit of a tertiary care hospital

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Received: 28 March 2021
Revised:10 May 2021
Accepted: 11 May 2021

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ABSTRACT

Background: Low birth weight (LBW) contributes substantially to neonatal, infant and childhood morbidity as well as mortality. Across the world neonatal mortality is 20 times more likely for low birth weight babies compared to heavier babies (>2.5 kg). Proportion of LBW babies at birth in Rajasthan is 14%. The present study is proposed to explore the determinants of LBW in babies admitted at tertiary care hospital. The objective of the study was to study the clinic-epidemiological profile and outcome of LBW neonates; to study various factors associated with LBW.
Methods: This study was a hospital based descriptive cross-sectional study, carried out at NICU of MBGH, R.N.T Medical College, Udaipur, Rajasthan. The study population comprised of all LBW babies delivered in medical college attached hospital and admitted in NICU, for duration of one year from September 2019 to august 2020. Total 350 babies were enrolled in study as per calculated sample size.
Results: LBW was found to be associated with low maternal age, low level of mother education, maternal anemia, less BMI, stature of mothers, number of ANC visits, poor maternal weight gain during pregnancy, per-capita income, etc. Most common cause of mortality was found in LBW was septicemia and of morbidity was RDS.
Conclusions: The identified risk factors in our study were modifiable and many were preventable. Maternal age, education of mothers, nutrition of mothers, anaemia status, number of ANC visits by mothers are preventable causes. Demographic profile, socio-economic status; many medical and obstetric factors are modifiable.

Keywords: LBW, Antenatal care, RDS, MAS, VLBW, ELBW

INTRODUCTION

Low birth weight (LBW) babies have been defined by WHO as weight at birth less than 2.5 kg regardless of gestational age.[1] Sub-categories include very low birth weight (VLBW) which is less than 1.5 kg-1 kg, and extremely low birth weight (ELBW) which is less than 1 kg. LBW contributes substantially to neonatal, infant and childhood mortality as well as morbidity. Across the world neonatal mortality is 20 times more likely for LBW babies compared to heavier babies (>2.5 kg).

Infants with LBW have health issues at various stages of their lives. During the neonatal period (28 days of life), LBW is a key predictor of neonatal and infant mortality. Neonates with LBW are more likely to have congenital anomalies and are more prone to serious complications like sepsis (spread of infection through the blood), respiratory distress syndrome and metabolic disturbances.[2]

Factors contributing to LBW include socio-demographic characteristics and psychosocial status of the mother. Maternal factors contributing to LBW are antenatal care (ANC), reproductive behaviour, birth order, mother's height and weight, maternal age, physical work, maternal addictions, the timing and frequency of ANC, nutritional status, toxic exposures, access to health care services, maternal morbidity during pregnancy, anaemia status etc.

Additionally, neonatal factors such as gestational age, premature rupture of membranes, premature birth, number of previous LBW babies, and multiple births can also have impact on birth weight. From 2005-2006 to 2015-2016, the LBW prevalence in India decreased from 21.5% (NFHS-3) to 18.2% (NFHS-4).[3,4] The NFHS-4 (2015-2016) found neonatal mortality rate of 30 per 1,000 live births. Of all the infants that died in their neonatal period, 48.1% were LBW and preterm. Proportion of LBW babies at birth in Rajasthan is14%. There was significant decline (40%) in proportion of LBW from base year 2015-2016 (25.5%) to reference year 2017-2018 (14%).[5] In Rajasthan, this decline is attributed due to measures such as early registration of pregnancy, early detection and management of high-risk pregnancies and regular monitoring during pregnancy.

METHODS

Present study was a hospital based descriptive cross-sectional study, carried out at NICU of MBGH, R.N.T Medical College, Udaipur, Rajasthan. The study population comprised of LBW babies (birth weight <2.5 kg) delivered in obstetric department of the hospital and admitted in NICU for a, duration of one year from September 2019 to August 2020. The sample size for the study was calculated based on LBW prevalence according to study done by Ajay Sethi in Jaipur, Rajasthan. Estimated sample size was 350 cases. The collected data were entered in MS-excel sheet and processed, then were analyzed and statistically evaluated using SPSS-17 version.

Inclusion criteria of our study were all the admitted newborn in NICU (inborn nursery unit) who were meeting the criteria of LBW as per WHO definition of LBW baby and admitted on every Monday and Thursday of week. Exclusion criteria were LBW babies whose parents did not give consent and the babies referred from peripheral centers and directly from community.

Intervention

After obtaining written consent, detailed clinico-epidemiological information was gathered by interviewing the parents/close relatives through a predesigned structured questionnaire and recorded in pre-structured Performa. Information regarding socio demographic profile (included age, sex, religion, caste, residence, occupation, socio-economic class) of parents was recorded.

Mother's detailed obstetric history about gravida, parity, birth order, birth interval, any h/o abortion, stillbirth, previous h/o LBW baby, any h/o infant death, any complication during antenatal and postnatal period (like oligohydramnios, polyhydramnios, preeclampsia, eclampsia, ante partum haemorrhage, abruption placenta) was taken. ANC status included the timing of the first ANC visit, number of ANC visits, tetanus injection during pregnancy, place of ANC'S, and service accessibility, anaemia status of mothers, history of substance abuse (alcohol, tobacco, smoking) was taken. There after detailed clinical history of mothers, nutritional assessment, and general physical and systemic examination was done. Anthropometric measurements of mothers including maternal height, weight, BMI was taken by using standard equipment.

Thereafter, information about the LBW baby was collected regarding their birth weight, gestational age (according to New Ballard scoring), detailed birth history, Apgar score and condition at the time of admission in NICU and anthropometric measurement of babies was noted.

The indication for admission in nursery, course during NICU stay, sepsis profile of baby (on basis of CRPq and blood culture), duration of hospital stay, outcome, causes of death (in case of death) and final diagnosis were recorded in pre-designed performa.

RESULTS

Total 350 LBW babies were included in this study, majority of mothers of these babies belonged to age group 20-35 years. More women from rural background were of age less than 20 years at time of delivery than from urban areas (39% vs 1.7%). Mean age of mothers at time of birth of babies was also significantly less in rural mothers.

When we compared sociodemographic profile of rural and urban mothers, we noticed that mothers from rural areas were lagging from their urban counterparts in education status, economic profile, work status etc. Illiteracy rate in rural ladies was very high and their economic status was poor. Most of the rural mothers were housewives or unskilled workers.

Physical examination and anthropometry of mothers revealed that more mothers from rural areas were short stature, malnourished, anaemic and had poor weight gain during pregnancy as compared to urban ladies.

There was poor access to health facilities in rural areas which was depicted by less number of antenatal visits by them and also poor birth spacing.

There was no significant difference in obstetric complications in rural and urban group (Table 1).

Table 1: Maternal characteristic in urban and rural area.

Characteristics	Category	Urban (N=119) (%)	Rural (N= 231) (%)	Total (N=350) (%)	P value
Maternal age (years)	<20	2 (1.7)	90 (39)	92 (26.2)	0.0002
	20-35	88 (73.9)	118 (51.1)	206 (58.9)	
	>35	29 (24.5)	23 (9.9)	52 (14.9)	
Education level	Illiterate	5 (4.2)	99 (42.9)	104 (29.7)	0.0001
	Primary	22 (18.5)	48 (20.8)	70 (20)	
	Secondary	24 (20.2)	49 (21.2)	73 (20.8)	
	Higher secondary	18 (15.1)	23 (9.9)	41 (11.8)	
	Graduated & above	50 (42)	12 (5.2)	62 (17.7)	
Socio-economic status	I	87 (73.1)	22 (9.5)	109 (31.1)	0.003
	II	20 (16.9)	21 (9)	41 (11.7)	
	III	11 (9.2)	111 (48.1)	122 (34.9)	
	IV	1 (0.8)	72 (31.2)	73 (20.9)	
	V	0 (0.00)	5 (2.2)	5 (1.4)	
Occupation	Working women	27 (22.7)	15 (6.5)	42 (12)	0.001
	Housewife	92 (77.3)	216 (93.5)	308 (88)	
BMI of mother (%)	Under weight (<18.5)	24 (20.2)	151 (65.3)	175 (50)	0.04
	Normal (18.5-24.9)	69 (58)	77 (33.3)	146 (41.7)	
	Over weight (25.0-29.9)	26 (21.8)	3 (1.3)	29 (8.3)	
Height of mothers (cm)	≤145	16 (13.4)	78 (33.8)	94 (26.9)	0.003
	>145	103 (86.6)	153 (66.2)	256 (73.1)	
Weight gain of mothers (kg)	<7	23 (19.3)	36 (15.6)	59 (16.9)	0.01
	7-10	78 (65.5)	123 (53.2)	201 (57.4)	
	>10	11 (9.2)	4 (1.7)	15 (4.3)	
	Not documented	7 (5.9)	68 (29.5)	75 (21.4)	
Anemia	No anemia	9 (7.6)	4 (1.7)	13 (3.7)	0.02
	Mild	95 (79.8)	146 (63.2)	241 (68.9)	
	Moderate	13 (10.9)	71 (30.8)	84 (24)	
	Severe	2 (1.7)	10 (4.3)	12 (3.4)	
ANC visits	0	0 (0.00)	10 (4.4)	10 (2.9)	0.005
	1-2	15 (12.6)	95 (41.1)	110 (31.4)	
	3-4	96 (80.7)	122 (52.8)	218 (62.3)	
	>4	8 (6.7)	4 (1.7)	12 (3.4)	
Birth interval (months)	<24 months	30 (25.2)	71 (30.7)	101 (28.9)	0.54
	>24 months	21 (17.6)	40 (17.4)	61 (17.4)	
	Not applicable	68 (57.2)	120 (51.9)	188 (53.7)	
Obstetric complication	Yes	31 (26.1)	59 (25.5)	90 (25.7)	0.91
	No	88 (73.9)	172 (74.5)	260 (74.3)	

Looking into the reasons for NICU admissions we found that RDS was most common cause of NICU admission (44%), followed by low birth weight itself in 21%. As admission criteria in our NICU was to admit babies less than 1.8 kg at birth even without any complication. Other important causes being birth asphyxia (8%), neonatal jaundice (6.3%), hypoglycemia (4.3%) and congenital malformations (7.1%) (Table 2).

66 neonates (18.85%) expired during hospital stay out of 350. Percentage of expired babies in LBW, VLBW and babies were 11.3%, 21.8% and 68.2% respectively (Table 3).

Most common causes of death among LBW were septicemia (33.3%) and 2nd most common causes was RDS (22.8%). Birth asphyxia, congenital malformations, meconium aspiration syndrome were other important causes (Table 4).

Also, when we compared gestational age wise mortality, highest case fatality rate was of babies born before 28 weeks of gestation (47%), followed by that of 28-32 weeks of gestation (26.4%), then of 32 to 35 weeks (12.5%). Best

outcome was from near term babies, where mortality was only 8.8% (Table 5).

Table 2: Morbidity profile of LBW babies.

Morbidity profile	N (%)
RDS	154 (44)
Birth asphyxia	28 (8)
Low birth weight	71 (21.2)
Neonatal jaundice	22 (6.3)
Congenital malformation	25 (7.1)
Hypoglycemia	15 (4.3)
Others	32 (9.1)
Total	350

Table 3: Outcome of LBW babies according to their gestational age.

Gestational age (weeks)	Outcome (%)		Total
	Discharge	**Death**	
≤28	18 (53)	16 (47)	34
29-32	78 (73.6)	28 (26.4)	106
33-35	84 (87.5)	12 (12.5)	96
>35	104 (91.2)	10 (8.8)	114
Total (N)	284	66	350

Table 4: Mortality profile of LBW babies.

Mortality profile	N (%)
RDS	15 (22.8%)
Birth asphyxia	10 (15.2%)
Septicemia	22 (33.3%)
MAS	2 (3%)
Congenital malformation	8 (12.1%)
Others	9 (13.6%)
Total	66

Table 5: Outcome of LBW babies according to their birth weight.

Birth weight (kg)	Outcome (%)		Total
	Discharge	**Death**	
1.5-2.49	173 (88.7)	22 (11.3)	195
1-1.49	104 (78.2)	29 (21.8)	133
<1 kg	7 (31.8)	15 (68.2)	22
Total (N)	284 (81.15)	66 (18.85)	350

DISCUSSION

Low birth weight remains a significant cause of morbidity and mortality among neonates and children, current study investigated the predictors of LBW in southern part of Rajasthan which is mainly tribal belt. It explores the various factors that increase the risk of LBW babies.

Age of mother is one of the most important risk factors for LBW babies. In this study, Table 1 shows that 26.2% mothers were of age <20 years while 14.9% mothers of age >35years at the time of delivery. This could be explained by early marriage of girls in this part of India, illiteracy and ignorance being the underlying causes. Similar finding was found in the study done by Taywade in wardha district where he found that age less than <20 years and >30 years have significant correlation (p value<0.001) with LBW.[6]

Majority of mothers (29.7%) were illiterate, 20% educated till primary level, 20.8% secondary level education, 11.8% mothers were educated till high school and only 17.7% were graduates. Similar finding found by Ramesh Verma in his study, were he found maternal education had significant association with increasing risk of LBW.[7] Reason behind this finding might be lack of education leads to early marriage of girls, more chances of teen age pregnancies further increase incidence of LBW.

In this study most of mothers were housewife (88%), and only 12% mothers were working women, this is because majority were from rural background. In the study done by M.L. Taywade in Wardha district found that almost three fourth of mothers were housewives.[6] Among the cases, 25.7% of the mothers were working against 21.5% of the controls. Occupation of mothers was not found statistically significant for LBW babies in their study. But in present study we found occupation of mother were statically significant (p value<0.001) with LBW babies.

The present study shows most of subjects (34.9%) belonged to middle class, 31.1% belong to upper class, 20.9% belong to lower middle class and only 4.1% belong to lower class. There was significant relation between LBW and per-capita income. Though a case-control study on risk factor associated with LBW babies in Eastern Nepal done by Ravi Kumar Bhaskar, were found insignificant (p value=0.48).[8]

Current study revealed that 28.9% mothers have <24 months birth interval between two pregnancy, whereas 17.4% mothers have >24 months birth interval, p value was not significant in this study. However, a study done by Chandra S. Metgud in Rural Karnataka PHC, found that less interpregnancy interval <24 months have significant (p value=0.001) effect on LBW babies.[9]

BMI of mother also a risk factor for LBW. Out of a total of 350 mothers 175 (50%) mothers were malnourished and having BMI<18.5%. This can be explained by malnutrition in girl child and women being highly prevalent in this area leading to birth of LBW babies and the cycle repeats. The study done by Pradip Kumar Bhue in V.S.S Medical college and Hospital, Burla, Western Odisha found that majority (72.84%) of mothers had a normal BMI between 18.5-24.99. Mothers having BMI≥25 had higher proportion (37.50%) of LBW in comparison to mothers having normal (21.79%) and low BMI (25.36%), the association found was statistically not

significant.[10] However other study contradicting this result and found a significant association of BMI and birth weight. A study done by Shobha Rao at rural hospital Talegaon, Maharashtra, observed that 32% mothers have BMI was below 18.5%.[11]

The study revealed that out of 350 mothers 94 (26.9%) mothers were short stature having height <145 cm, in this study there was significant correlation between maternal height and birth weight of baby. But in study done by Ayesha khan in Lyari General Hospital, Karachi found that in 37% patient with LBW, maternal height was less than five feet.[12] There is increased risk of LBW of newborn in women of short height so maternal height found as significant factor in this study.

Majority of mothers were having some degrees of anaemia, 68.9% mothers were having mild degree of anaemia, 24% were having moderate anaemia, 3.4% were having severe anaemia. We found significant (p value<0.001) association between LBW and anaemia status of mother. Similar study done by Ganesh Kumar conducted in Lady Goschen hospital; Southern Karnataka found that one third of cases and 15% of controls were anemic showing significant p value.[13]

25.7% mothers had some medical or obstetric complication during pregnancy; we did not find any significant association between maternal complication and birth weight in this study. But a study done by Ravi Kumar Bhaskar in B.P. Koirala institute of health science, Birat Nagar, in east Nepal, found that any complication during pregnancy was significantly associated with LBW (p value<0.05).[8]

Most of mothers (63.2%) had 3-4 ANC visits, only 12 (3.4%) mothers have >4 ANC visits during their pregnancy, again statistically significant (p value<0.0001). Similar study was done by Nirmal Gugoi in Guwahati Medical College Hospital (GMCH), Assam found significant association (p value<0.03) between birth weight of newborn and numbers of ANC visits (<4 visit).[14] Women who had less than 4 antenatal visits are more likely to deliver LBW babies than women who have had more than four ANC visits. So, antenatal care is beneficial to the health of the pregnant women. Good quality of prenatal care may reduce the incidence of LBW.

Out of 350 total mothers included in study most of mothers (57.4%) had 7-10 kg weight gain during pregnancy, 16.9% mothers had <7 kg weight gain and only 4.3% mothers had >10 kg weight gain which was adequate. This is because they were not having proper ANC visits. In this study we found statically significant result (p value<0.0002) in between maternal weight gain during pregnancy and birth weight of newborn. A study done by Pradip Kumar Bhue at V.S.S medical college & Hospital, Burla found association between weight gain during pregnancy and LBW was highly significant (p value<0.05).[10]

Current study shown that most common cause of hospital admission in LBW babies was RDS (44%) followed closely by prematurity (21.2%) itself. Only minor fractions of patients were admitted due to neonatal jaundice, birth asphyxia and congenital malformations. This might be explained due to high incidence of RDS in these babies due to less use of antenatal steroids in babies delivered at peripheral centers and referred to tertiary care hospital like ours.

This study shown the mortality profile of LBW (Table 4) that most common cause of death was septicemia (33.3%), second commonest cause was RDS (22.2%), birth asphyxia accounting for (15.3%) deaths and congenital malformations for 12.1% deaths, only 3% from MAS. This is because most of LBW babies were preterm thus more chances of RDS and septicemia due to long NICU stay and MAS most common occurs in term babies.

Table 3 and 5 reveals that as the birth weight and gestational age increases, the neonatal mortality decreases. Our study proves that gestational age and birth weight both are inversely proportional to neonatal mortality. Similarly, a study done by Ishtiyaq found that birth weight affects the outcome of LBW babies, in his study there were 100% mortality in ELBW neonates.

Also, he found that sepsis was the most common cause of death in LBW neonates like our study.[15]

Limitations

As our study did not include out born LBW babies, the exact morbidity and mortality profile of this babies could not be calculated. We could not compare the socio-demographic profile of mothers giving birth to ELBW, VLBW and others LBW babies separately. Pre-pregnancy weight couldn't be assessed in most babies due to poor antenatal record.

CONCLUSION

Almost all the identified risk factors in our study are modifiable and thus preventable to some extent. Maternal age, education of mothers, nutrition of mothers, height of mother, anaemia, per capita income of family, ANC visits by mothers are some important risk factors associated with LBW.

More stress on educating female child, delaying adolescent marriages and health awareness programs, improving health facilities at rural and remote areas can help in dealing with LBW problem to large extent. RDS can largely be reduced by use of antenatal steroids.

Major cause of death is neonatal sepsis needs to be detected and treated early along with all aseptic precautions during managing neonates in NICU.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Sanadhya A, Asif M, Meena P, Mehrotra JM. A study to assess clinico-epidemiological profile and outcome of low birth weight babies admitted to neonatal intensive care unit of a tertiary care hospital. Int J Contemp Pediatr 2021;8:1064-9.