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Original Research Article

Prevalence of Low Birth Weight and Associated Maternal Risk Factors among the Term Neonates during Normal Deliveries in Jammu, J&K

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ABSTRACT

Introduction: Weight of a neonate at the time of birth remains a significant factor which indicates its survival and growth. The present study has tried to focus in determining the prevalence and associated factors of low birth weight.

Methods: A cross-sectional hospital based survey was conducted. The study participants consisting of 330 postnatal women including term single live birth at a government Hospital, Jammu for the study period of September 2016 to July 2017. Binary logistic regression was used to find the association between dependent variable (LBW) and independent variables. Hosmer and Lemeshow Test is used for the model accuracy test in binary logistic regression. Pseudo R-square was used to find the strength of binary logistic regression.

Results: Out of 330 respondents, the prevalence of LBW was 28.8%. LBW was associated with the risk factors like maternal age, rest received in the afternoon during pregnancy and gestational anaemia. The likelihood of having LBW babies was 2.37 times higher among the postnatal women with age group < 20 and ≥30, 2.53 times higher among those who had taken less than two hours of rest in the afternoon during pregnancy and 1.50 times higher among those women who suffered from gestational anaemia. The variability in LBW due to these risk factors was found to be 14.9% to 27.0%.

Conclusion: Prevalence of low birth weight in our study was found out to be high. The occurrence of low birth weight can be reduced by increasing the literacy rate among the females.

Keywords: Low Birth Weight, Maternal Risk Factors, Neonates, Postnatal and Prevalence.

INTRODUCTION

Birth weight is an important indicator of health condition of a new born and is a prime factor that ascertains the baby's survival, physical and mental growth and it is also an indicator of the mother's health status. [1]

Low birth weight is one of the most serious challenges in maternal and child health in both developed and developing countries. It is an essential determinant of mortality, morbidity and disability in infancy and childhood and also has a long-term impact on health outcomes in adult life. [2] LBW babies in the developing world are born in India. The birth weight of an infant is the most important determinant of its chances of survival, healthy growth, and development and is dependent on many maternal factors. [3] Generally it is believed that babies with lower birth weight remains unhealthy throughout the life. These babies develop a higher risk of having lung, heart and digestive problems and later in life they can be exposed to diabetes too.

World health organization has defined the low birth weight as a birth weight of a new born baby less than or equal to 2.4 kg (i.e. 2499g or less) irrespective of the gestational age. The

measurement of low birth weight is taken exactly after delivery, that is, within the first hour of life.

India accounts more than 40% of the global burden of low birth weight babies with 7.5 million babies being born with a birth weight of less than 2500 grams. Of these 7.5 million babies, 60% are born at term after fetal growth restriction, while the remaining 40% are born preterm constituting a quarter of the global burden of preterm births. [4] The Newborn Mortality Rate in India is 24/1000 live births which translates into approximately 9.6 lakhs under-5 child deaths, annually. Newborn deaths contribute to 61% of the Under-5 deaths in our country. [5]

Preterm birth is the most common direct cause of neonatal mortality. Every year, 1.1 million babies die from complications of preterm birth. LBW is not only a major predictor of prenatal mortality and morbidity, but it is found to also increase the risk for non-communicable diseases such as diabetes and cardiovascular disease later in life. [6] The low birth weight of a new born is either the result of restricted foetal growth or preterm birth, that is, before 37 weeks of gestation. [7]

In the Indian context; age, height, weight (pre-pregnancy and pregnancy weight gain), nutritional anemia, socio-economic status, ANC checkup, education (maternal and family), parity, maternal morbidity, bad obstetric history, physical labour, tobacco exposure, infections all influence the new born weight. In addition fetal defects due to genetic conditions or environmental factors limit the normal development of the fetus. [6]

The World Health Organization (WHO) stressed that acceptable progress to reduce maternal and perinatal mortality will not be realized until the governments make a full commitment to lower maternal deaths. About 529,000 women in the world die each year from pregnancy related causes and almost half of these deaths occur in the Western Pacific and South-East Asia Regions. [4]

Low Birth Weight of a new born can be categorized into three types:

Low birth weight (LBW): A LBW new born weighs less than 2.5 kgs.

Very low birth weight (VLBW): A VLBW new born weighs less than 1.5 kgs.

Extremely low birth weight (ELBW): An ELBW new born weighs less than1.0 kgs.

Thus, the objective of this study was aimed at determining the prevalence of low birth weight babies and its association with socioeconomic and other maternal risk factors in Jammu with the goal that it will be useful for enhancing maternal well-being approaches.

MATERIALS AND METHODS

The present study was hospital based cross-sectional among postnatal women along with single live birth at a government hospital in Jammu for the study period of May 2017 to Feb 2018. The size of the sample was obtained using formula $n = (z^2 \times pq)/e^2$. The ratio of newborn's low birth weight in India was taken as 17% [10] so, p =0.17 and q =0.83. The value of z-score was 1.96 for two tail test at 5% level of significance and 4% standard error. So, the sample size required for this study was 338. For the sake of convenience, we consider the sample size to be 330. The data for the present study was collected using the simple random technique. The study population comprised of 330 postnatal women who were admitted in the postnatal ward of hospital during the study period.

Inclusion Criteria: All mothers who delivered in between 37 weeks to 40 weeks of gestational age with single live birth were included.

Exclusion Criteria: Mothers who delivered twins or triplets were excluded in this study. Also postterm, preterm delivery and stillbirth were not taken into consideration under this study.

Ethical approval was obtained from the University of Jammu and also the permission to conduct the survey was taken from the administration of the hospital. After explaining the purpose of the study,

written consent was obtained either from mothers or their spouse. For the purpose of data collection, a pre-tested questionnaire was used. Variables under the study were maternal age, education of mother, place of residence, religion, type of family, family monthly income, parity, history of abortion, history of previous birth, frequency of ANC visits, gestational anaemia, hypertension, height of mothers, rest received in the afternoon, dietary intake during pregnancy, consumption of iron and folic acid and sex and birth weight of neonate.

STATISTICAL ANALYSIS:

The collected data were coded and entered in to the SPSS version 24 for the analysis. Mean and standard deviation was computed for low birth weight. Firstly, the proportion of low birth weight was computed and then proportion of low birth weight associated with each factors was calculated by chi-square test. The statistically significant ($p \leq 0.05$) variables were selected for the further analysis. Binary logistic regression was used to find the association between and dependent variable of low birth weight and other independent variables.

RESULTS

General Characteristics of Postnatal Women:

A total of 330 postnatal women were included in this study, out of which 12(3.6%) were <20 years of age, 183(55.5%) were between the age group of 20-29 and 135(40.9%) were above 30 years of age. More than half of the women were graduates i.e. 187(56.7%), 38(11.5%) were post-graduates and above and rest 105(31.8%) were qualified upto higher secondary. 227(68.8%) of the total participants belonged to urban areas and rest 103(31.2%) belonged to rural areas. Regarding religion of the mothers, 189(57.3%) were Hindu, 76(23.0%) were Sikh and 65(19.7%) belonged to Muslim, 198(60.0%) of the total women belonged to joint families and rest of the 132(40.0%) women were from nuclear families. The highest percentage of 47.3%(156) of respondents had family monthly between 21,000 to 50,000, 29.7%(98) had family income of less than equal to 20,000, 20.0%(66) had income between 51,000 to 1 lakhs and only 3.0%(10) of women had income of above 1 lakh.

Table 1: General Characteristics of the Postnatal Women For n=330

Characteristics	Frequency	Percentage
Age of mothers (in years)		
<20 & ≥30	147	44.5
20-29	183	55.5
Maternal Education		
Upto Hr. Sec.	105	31.8
Graduate	187	56.7
Post-Graduate and above	38	11.5
Place of Residence		
Rural	103	31.2
Urban	227	68.8
Religion		
Hindu	189	57.3
Muslim	65	19.7
Sikh	76	23.0
Family Type		
Nuclear	132	40.0
Joint	198	60.0
Family Monthly Income		
≤20,000	98	29.7
21,000-50,000	156	47.3
51,000-1,00,000	66	20.0
1 lakh and above	10	3.0
ANC Visits		
Adequate (≥4)	311	94.2
Inadequate (<4)	19	5.8
Parity		
P1	233	70.6
P2	86	26.1
≥P3	11	3.3
History of Previous Birth		
Low Birth Weight	45	13.6
Normal	52	15.8
Not Applicable	233	70.6
History of Abortion		
Yes	114	34.5
No	216	65.5
Gestational Anaemia		
Anaemic	236	71.5
Non-anaemic	94	28.5
Gestational Hypertension		
Hypertensive	37	11.2
Non-hypertensive	293	88.8
Height of Mothers		
<150 cm	10	3.0
≥150 cm	320	97.0
Rest Received In The Afternoon		
< 2hours	176	53.3
≥ 2hours	154	46.7
Dietary Intake During pregnancy		
Less than/same as before	51	15.5
More than before	279	84.5
Consumption of IFAS		
Yes	304	92.1
No	26	7.9

Almost all the participants 311(94.2%) had adequate ANC visits and only 19(5.8%) of them had inadequate ANC visits. The

majority 233(70.6%) of women were para 1, 86(26.1%) were para 2 and only 11(3.3%) were para 3 and above. Out of multipara, 45(13.6%) of mothers had previous low birth delivery. 114(34.5%) of the mothers had a history of abortion. Also the majority of the respondents 236(71.5%) suffered from gestational anaemia. Only 37(11.2%) of the mothers were hypertensive and 293(88.8%) were non-hypertensive. As far as the height of mothers is concerned, only 10(3%) of the mothers were having the height of below 150cm and rest 320(97%) were having the height of 150cm and above. One hundred and seventy-six mothers reported that they had taken afternoon rest less than 2 hours in pregnancy and rest 154(46.7%) mothers took afternoon rest of greater than equal to 2 hours. 84.5%(279) of the respondents. Majority of the women 279(84.5%) had taken the dietary intake more than before during pregnancy. Almost all the mothers 304(92.1%) had taken iron and folic acid supplementation and only 26(7.9%) had not taken IFAS (Table 1).

History of Neonates:

Among all the neonates born for the study period, 53.6%(177) were males and 46.4%(153) were females (Table 2).

Table 2: History of Neonates

For n=330

Characteristics	Frequency	Percentage
Birth Weight		
Low Birth Weight	95	28.8
Normal	235	71.2
Sex of Neonate		
Male	177	53.6
Female	153	46.4

Prevalence of Low Birth Weight:

In the present study, the prevalence of low birth weight was 28.8% with 95% CI of 23.9% to 33.7% (Table 2, Figure 1). The overall mean birth weight of neonates obtained was 2.89 ± 0.303 kg. The mean of birth weight among low birth weight babies was 2.17 ± 0.020 kg.

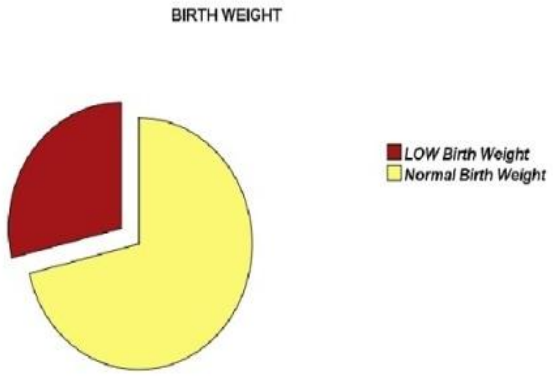

Figure 1: Prevalence of Low Birth Weight

Association Between Low Birth Weight and Different Variables:

Now further we apply chi-square test to find out the risk factors associated with low birth weight which shows that maternal age (p-value<0.05), gestational anaemia (p-value<0.05) and rest received in the afternoon during pregnancy (p-value<0.05) were statistically significant with low birth weight (Table 3).

Table 3: Association Between Low Birth Weight And Different Variables . For n=330

Characteristics	Number	LBW n (%)	χ^2	P-value
Age of Mothers (in years)				
<20 & ≥30	147	59(40.1%)	16.652	0.000
20-29	183	36(19.7%)		
Maternal Education				
Upto H.S.	105	26(24.8%)	2.068	0.356
Graduate	187	55(29.4%)		
P.G. & Above	38	14(36.8%)		
Place of Residence				
Rural	103	28(27.2%)	0.188	0.665
Urban	227	67(29.5%)		
Religion				
Hindu	189	60(31.7%)	3.031	0.220
Muslim	65	19(29.2%)		
Sikh	76	16(21.1%)		
Family Type				
Nuclear	132	39(29.5%)	0.062	0.804
Joint	198	56(28.3%)		

Table 3 to be continued…				
Family Monthly Income (In Rupees)				
≤20,000	98	31(31.6%)	3.158	0.368
21,000-50,000	156	38(24.4%)		
51,000-1,00,000	66	22(33.3%)		
Above 1,00,000	10	4(40.0%)		
ANC Visits				
Adequate (≥4)	311	89(28.6%)	0.077	0.782
Inadequate (<4)	19	6(31.6%)		
Parity				
P1	233	70(30.0%)	0.623	0.732
P2	86	22(25.6%)		
≥P3	11	3(27.3%)		
History of Previous Birth (n=97)				
Low Birth Weight	45	10(22.2%)	0.053	0.457
Normal	52	15(28.8%)		
History of Abortion				
Yes	114	33(28.9%)	0.002	0.963
No	216	62(28.7%)		
Gestational Anaemia				
Anaemic	236	58(44.6%)	7.169	0.007
Non-anaemic	94	37(19.4%)		
Gestational Hypertension				
Hypertensive	37	12(32.4%)	0.270	0.603
Non-hypertensive	293	83(28.3%)		
Height of Mothers				
<150cm	10	2(20.0%)	0.388	0.533
≥150cm	320	93(29.1%)		
Rest Received in the Afternoon				
<2hours	176	61(34.7%)	6.342	0.012
≥2hours	154	34(22.1%)		
Dietary Intake During Pregnancy				
Less than/same as before	51	17(33.3%)	0.608	0.436
More than before	279	78(28.0%)		
Consumption of IFA				
Yes	304	91(29.9%)	2.473	0.116
No	26	4(15.4%)		
Sex of Neonate				
Male	177	52(29.4%)	0.065	0.799
Female	153	43(28.1%)		

Test of Multicollinearity:

Table 4: Test of Multicollinearity

Characteristics	Collinearity Statistics	
	Variance Inflation Factors	Tolerance
Age Of Mothers	1.046	0.956
Rest Received In The Afternoon	1.019	0.981
Anaemia	1.029	0.972

Multicollinearity is a condition of high inter correlations or association among the independent factors. If multicollinearity is present in the data then the results made may not be reliable which causes a type of disturbance in the data. Multicollinearity can also be determined with the help of variance inflation factor (VIF). If the value of VIF is 10 and above, then the multicollinearity is troublesome. So in our study, multicollinearity does not exist between the independent variables as all the variance inflation factors were less than 10 (Table 4).

Binary Logistic Regression:

The statistically significant variables were further analyzed to see how strongly each independent factor associated with low birth weight by finding odd ratios using binary logistic regression.

The probability of low birth weight children were higher among those postnatal women who were aged below 20 years and above 29 years of age as compared to those aged between 20-29 (OR=2.365, with 95% CI 1.223 to 3.597), this result found to be statistically significant (p-value=0.000). In the same manner mothers who took rest of less than two hours in the afternoon during

pregnancy have higher odds of low birth weight as compared to those who received rest more than two hours in the afternoon during pregnancy (OR=2.534, with 95% CI 1.327 to 4.873). This result was found to be statistically significant (p-value=0.012). Similarly, mothers who suffered from gestational anaemia have higher odds of low birth weight (OR=1.502, with 95% CI 0.802 to 3.835). This result was also found to be statistically significant (p-value=0.002) (Table 5).

Table 5: Binary Logistic Regression

Characteristics	B	d.f	P-value	OR	95% CI for OR	
					Lower	Upper
Age of Mothers <20 & ≥30 20-29	-1.007	1	0.000	2.365	1.223	3.597
Rest Received in the Afternoon <2 hours ≥2 hours	-0.627	1	0.012	2.534	1.327	4.873
Gestational Anaemia Anaemia Non-anaemia	-0.689	1	0.008	1.502	0.802	3.835

Model Adequacy Test:

In the present study, we use Hosmer and Lemeshow Test for the model adequacy test in the binary logistic regression. Under this test, a model is said to be poor fit if the P-value is less than 0.05. Here for low birth weight, the value of chi-square is 1.130 with 5 degree of freedom and P-value is 0.934, indicating that there is no significant difference between observed and predicted values which implies that the model fits the data at a satisfactory level (Table 6).

Table 6: Contingency Table for Hosmer and Lemeshow Test

Low Birth Weight		Normal Birth Weight		Total	χ^2	d.f	P-value
Observed	Expected	Observed	Expected				
16	17.758	14	12.242	30	1.130	5	0.934
28	27.503	41	41.492				
13	11.298	19	20.702				
15	13.739	33	34.261				
8	7.944	24	24.056				
8	9.544	47	45.456				
7	7.214	57	56.786				

Pseudo R-Square Value:

Pseudo R-square value is used to compute the strength of logistic regression. The result in the below table reveals that the value are 0.149 and 0.270 respectively suggesting that between 14.9% and 27.0% variation in response variable is explained by the set of independent variables (Table 7).

Table 7: Pseudo R-square Table for Low Birth Weight

-2 log likelihood	Cox & Snell R square	Nagelkerke R square
379.498	0.149	0.270

DISCUSSION

The prevalence of low birth weight in this research was obtained as 28.8%. Two other studies by Gogoi [8] in Assam, India and Kumar et al. [9] in West Bengal, India showed almost similar proportion of LBW. On the other hand other, studies like Dayanithi [6] and Aggarwal et al. [10] found higher proportion of low birth weight. In the present study the overall mean birth weight found was 2.89±0.303 kg and among LBW babies the mean birth weight was 2.17±0.020 kg. In our study, maternal age, gestational anaemia and rest received in the afternoon during pregnancy are significantly associated with low birth weight.

In this study, we found that 183 (55.5%) of mothers belonged to age group 20-29 years and 147 (44.5%) of belonged to <20 and ≥30 age group. The mean age of postnatal women was 27.75±0.238 years. The ratio of low birth weight babies was more in <20 and ≥30 years (40.1%) as compared to 20-29 years age group of mothers (19.7%). A significant association

was found between age of the mother and low birth weight babies (p-value <0.05). Mothers aged between <20 and ≥30 have higher odds of low birth weight (OR=2.365, with 95% CI 1.223 to 3.597). Similarly, Oladeinde et al. [11] and Yadav et al. [12] also found association between maternal age and low birth weight. This can be justified by the fact that there is lack of higher education in early pregnancies. It is also believed that anaemia in pregnancy increases with rising parity and maternal age. Besides the general body weakness with advanced maternal age, older women are expected to be multigravida. Multigravida may induce anaemia by reducing maternal iron reserves at every pregnancy and by causing blood loss at each delivery. [13]

Out of 330 mothers in this study, 154 (46.7%) mothers took rest ≥2 hours in the afternoon during pregnancy whereas 176 (53.3%) mothers took rest <2 hours in the afternoon. The percentage of low birth weight was high (34.7%) in mothers who took < 2 hours rest in afternoon during pregnancy as compared to mothers ≥ 2 hours rest (22.1%). A significant association was found between rest received in afternoon during pregnancy and low birth weight (p-value <0.05). Those who have received <2 hours rest in the afternoon have higher odds of low birth weight as compared to those who have received rest ≥ 2 hours in the afternoon (OR=2.534, with 95% CI 1.327 to 4.873). This result was found to be statistically significant (p-value=0.012). Similar results have been obtained by Yadav et al. [12]

In the present study majority of the mothers (71.5%) were anaemic. The proportion of low birth weight babies was high (44.6%) in mothers who suffered from gestational anaemia as compared to mothers with normal Hb during pregnancy (19.4%). A significant association was found between gestational anaemia and low birth weight babies (p-value <0.05). Mothers suffered from gestational anaemia have higher odds of low birth weight (OR=1.502, with 95% CI 0.802 to 3.835). Similar results have been observed by Aggarwal et al. [10] and Oladeinde et al. [11] It is recommended that every woman should follow proper diet and take iron supplements during the course of pregnancy.

CONCLUSION

Prevalence of term low birth weight in this study was almost similar to the results of other studies. In this study our findings indicate that maternal age, rest received in the afternoon during pregnancy and gestational anaemia is significant determinants of low birth weight. Therefore, it is suggested that proper consideration should be given to providing sufficient rest and nutritional diet to all pregnant women so that they become healthy and give birth to a healthy baby with suitable birth weight. Emphasis should be laid down on educating the females so that they understand the negative impacts of teenage pregnancy.

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