



# Maternal and Neonatal Risk Factors of Low Birth Weight in Guwahati Metro, Assam, Northeast India



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**Submission:** January 07, 2018; **Published:** May 22, 2018

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## Abstract

**Introduction and objectives:** Birth weight is an important determinant of child survival and development. Low birth weight is an index of our status of public health, maternal health and nutrition. The major challenge in the field of public health is to identify the factors influencing low birth weight and to institute remedial measures. The study was attempted to assess prevalence of low birth weight and its risk factors affecting low birth weight was conducted among 300 mothers and their respective live born baby in GMCH, Guwahati metro, Assam.

**Materials and methods:** A cross sectional study design was carried out in a government hospital among 300 mothers using interviewer administered questionnaire. All 300 postnatal mothers who delivered in the hospital during study period were included in the study except still births. All babies were weighted on standard beam balance within 24 hours of delivery and mother's height was measured by height measuring stand. Bivariate and multivariate logistic regression was employed to identify the predictors at  $p < 0.001$  and  $p < 0.05$ .

**Results and analysis:** The prevalence of low birth weight was found as 26.0% (95% CI=21.36-31.24) in 300 samples. Low birth weight was significantly associated with maternal age  $< 18$  years (OR=3.06 95% CI=1.24-3.52), height of the mother  $< 145$  cm (OR=2.72 95% CI=1.61-4.62), history of ANC visit  $< 3$  (OR=1.90 95% CI=1.03-3.52), history of high risk behavior (use of tobacco) (OR=8.84 95% CI=0.91-86.28), multiple pregnancy (OR=5.95 95% CI=1.07-33.13), gestational age  $< 37$  weeks (OR=10.00 95% CI=4.53-22.09), normal mode of delivery (OR=2.09 95% CI=1.24-3.52). Female child (OR=1.02, 95% CI=0.61-1.72) and preterm birth (OR=10.00, 95% CI=4.53-22.09), weight gain during pregnancy  $< 6$  kg (OR=1.98 95% CI=0.88-4.44) were found to be higher risk of LBW.

**Discussion and conclusion:** The prevalence of low birth weight was found to be very high and it was associated with many risk factors related to maternal health and services. Hence it is recommended to improve maternal health through strengthening the existing maternal services at the basic level of community.

**Keywords:** Low birth weight; Maternal age; Parity; ANC visit; HB% level; Gestational age; High risk behavior; GMCH.

## Introduction

Birth weight is an important determinant of child survival and also growth and development. Low birth weight is a major public health problem in developing countries including in India. Low birth weight has been defined by the World health organization as birth weight of less than 2500 gm. (WHO 1984) [1]. The prevalence of LBW in any population reflects its socio-economic development and status of public health. It is an indicator of future health and survival of child.

LBW contributes to 60%-80% of all neonatal death. The global prevalence of LBW is 15.5% which amount to about 20 millions LBW born each year, 95.5% of them in developing countries [2]. India is one of the countries with the highest incidence of LBW, which has nearly 7.5 millions LBW babies annually [3]. According to UNICEF estimate, almost every third newborn (30%) in India is LBW [4]. Perinatal mortality among LBW infants is about eight

times higher than that in infants weighing more than 2.5 kg [5]. LBW is not only major predictor of prenatal mortality and morbidity, but recent studies have found that LBW also increases risk for non-communicable diseases such as diabetes and cardiovascular disease later in life [6,7].

The primary cause of LBW is premature birth, being born before 37 weeks of gestation; and another cause of low birth weight is intrauterine growth retardation. However, there are other factors that can also contribute to the risk of low birth weight. These includes: race, mother's age, multiple birth, mother's health, low socio-economic status [8].

The best way of prevention of low birth weight is prevention of preterm births. Prenatal care is a key factor in preventing preterm births and low birth weight babies. Maternal health like proper nutrition and weight gain are linked with fetal weight gain and

birth weight. Mother should avoid alcohol, cigarettes and illicit drugs, which can contribute to poor fetal growth, among other complications.

**Materials and Methods**

A cross sectional study design was carried out in a tertiary care hospital, Guwahati Medical College Hospital (GMCH), Assam in 2016 from October to December. The study was conducted in the post-natal ward among 300 mothers delivering live born neonates in the hospital. The sample size 300 was calculated taking minimum 25% prevalence of low birth weight with 20% of permissible error. Consecutive non-random sampling technique was used for selecting samples. Ethical permission was obtained from the hospital authority and verbal consent was taken from each sample. The babies were weighed on standard beam weighing machine up to 20gm accuracy within 24 hours of the birth. LBW was defined as a birth weight of <2500gm. Mother's height was measured up to the accuracy of 0.5cm by height measuring stand. A predesigned and pretested structured interview schedule related to socio-demographic variables and the maternal risks factors of LBW among post-natal mothers were

used for collecting information. The mothers whose were critically ill at the time of data collection and whose mothers had still birth baby were excluded from the study sample. The data collected was compiled, tabulated and subjected to statistical analysis wherever applicable. Statistical analysis was done using SPSS for windows, version 18.0. Bivariate and multivariate logistic regression was employed to identify the predictors at P<0.001, and p<0.05.

**Results and Discussion**

The prevalence of LBW in GMCH, Guwahati metro during the study period was 78 out of 300 cases corresponding to estimated prevalence 26% (95% CI: 21.36%-31.24%). The normal baby was 74% (95% CI: 68.76%-78.64%). (Figure 1) The prevalence of low birth weight in the present study was 26.00% (95% CI: 21.36%-31.24%) where as overall, it is estimated 15% to 20% of all births worldwide are LBW. A similar prevalence (27.2%) was reported by UNICEF global data base 2012 in Bihar. [9] Several supportive studies conducted in different part of the Assam reported 28.40% by Krishnatreyal et al. [10], 21.8% by Bora [11] 14.22% by Baruah [12] and also reported the higher prevalence of low birth weight (31.3%) in west Bengal [13] 40.0% in Uttar Pradesh [14].

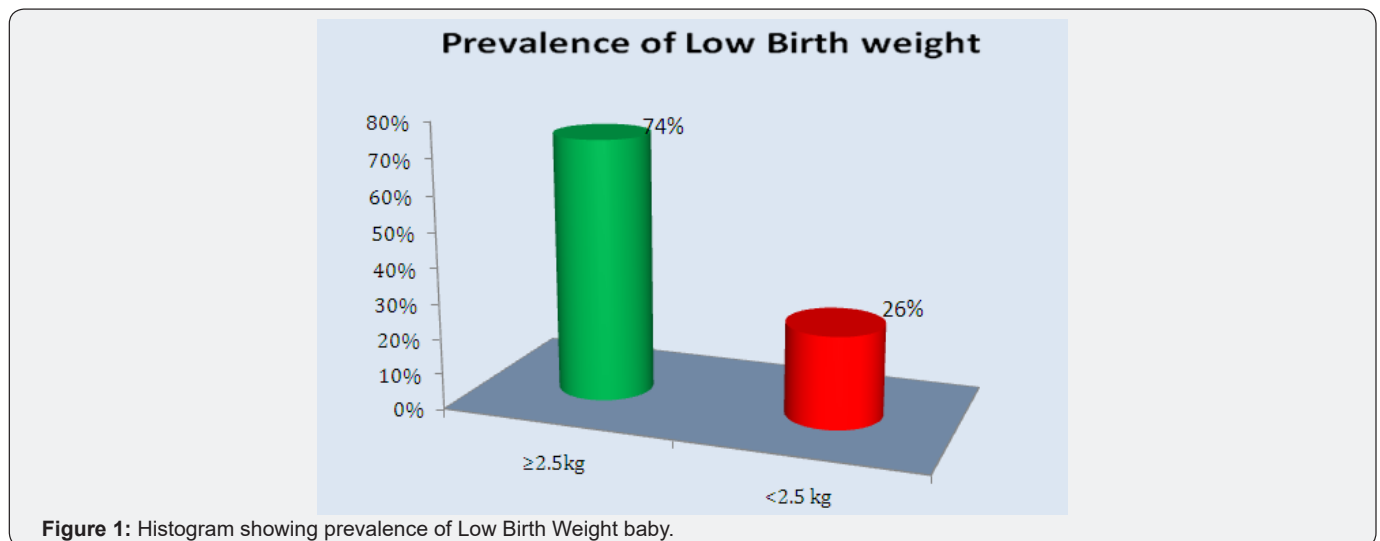


Figure 1: Histogram showing prevalence of Low Birth Weight baby.

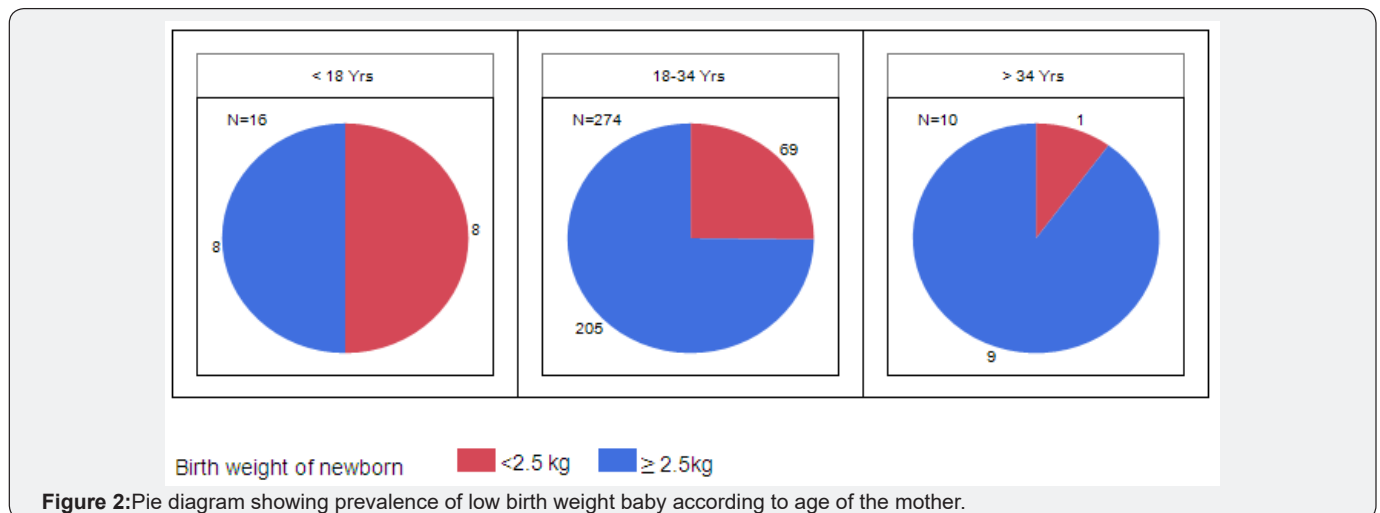


Figure 2: Pie diagram showing prevalence of low birth weight baby according to age of the mother.

In place of residence, 81.00% of mothers from rural and 19.00% from urban. In regards of mother’s educational status, 51.67% of mothers were literate, 48.33% were illiterate. As a indicator of socio-economic status, majority of respondents (47.33%) had monthly income were Rs. 5001-10,000. Prevalence of low birth weight baby according to age of the mother, it was found that 2.7 % (16) newborns belongs to the mothers of age group <18 years, 47 % (74) newborns belongs to the mothers

of age group 18-34 years and 1.3 % (10) newborns belongs to age group above 35 years. The prevalence of LBW 50% in the age group of <18 years, 25% in the age group of 18-34 years and 10% at the age group of above 35 years (Figure 2). It is observed that the age of the mother affected the rate of LBW considerably. Incidence rate is highest among the younger mothers. This finding supported by Rahul et al. [15] Velankar [16] and Anand et al. [17].

**Table 1:** (ANOVA Table) Hb% level during delivery with respect to birth weight of newborn.

	Sum of Squares	df	Mean Square	F	P-value
Between Groups	1.844	1	1.844	0.814	0.368
Within Groups	674.924	298	2.265		
Total	676.768	299			

**Table 2:** Bivariate cross frequency of Maternal Risk Factors influencing low birth weight and chi square Test of Association.

Variables		Birth weight of newborn		Total	χ <sup>2</sup> Value	df	P-value
		<2.5 kg	≥2.5kg				
Maternal age	< 18Yrs	8	8	16	6.216	2	0.045*
	18-34Yrs	69	205	274			
	> 34Yrs	1	9	10			
Birth interval	< 2	8	19	27	4.948	2	0.084 <sup>NS</sup>
	≥3	19	85	104			
		51	118	169			
Parity	Primipara	52	122	174	3.250	1	0.071 <sup>NS</sup>
	Multipara	26	100	126			
Height of the mother	≥145cm	35	153	188	14.267	1	< .001**
	< 145cm	43	69	112			
History of abortion	Yes	13	33	46	.144	1	0.704 <sup>NS</sup>
	No	65	189	254			
History of chronic diseases	Gestational hypertension	17	27	44	4.363	2	0.113 <sup>NS</sup>
	Gestational diabetes	2	5	7			
	None	59	190	249			
History of ANC visit	≥4	57	186	243	4.299	1	0.038*
	< 4	21	36	57			
Iron and calcium consumption	Yes	75	216	291	.259	1	0.611 <sup>NS</sup>
	No	3	6	9			
Weight gain during delivery	>6	67	205	272	2.833	1	0.092 <sup>NS</sup>
	< 6	11	17	28			
History of high risk behaviour	Tobacco	3	1	4	5.059	1	0.024*
	None	75	221	296			
Status of previous birth	LBW	5	8	13	5.901	2	0.052 <sup>NS</sup>
	Normal	22	96	118			
		51	118	169			
Type of pregnancy	Single	74	220	294	5.263	1	0.022*
	multiple	4	2	6			
Total	78	222	300				

An analysis of variance showed that the effect of birth weight of newborn was insignificant on Hb% level of mother during delivery,  $F(1,298)=0.814$ ,  $P = .368$  (Figure 2). In other words, mother of low birth weight of newborn ( $M=10.23$ ,  $SD=1.52$ , Range: 6.70-14.20) had same Hb% level of mothers with normal birth weight of newborn, ( $M=10.41$ ,  $SD=1.50$ , Range: 5.10-14.90),  $t(298)=0.903$ ,  $P =0.368$  (two tailed). It seems that overall Hb% level of mothers both with low birth weight of newborn and with normal birth weight of newborn is very low (Table 1). A study by Kavitha B et al. reported that about 35.28% of mothers with low birth weight HB% level was 10.9% and it was about two-third of the mothers were anemic [18].

A chi-square test of independence was performed to examine the relation between birth weight of newborn and maternal risk factors. The relation between birth weight of newborn was significant for maternal age,  $\chi^2(2, N = 300)=6.216$ ,  $P =0.045$ , for height of the mother,  $\chi^2(1, N = 300)=14.267$ ,  $P <0.001$ , history of ANC visit,  $\chi^2(1, N = 300)=4.299$ ,  $P =0.038$ , history of high risk behavior,  $\chi^2(1, N = 300)=5.059$ ,  $P =0.024$  and type of pregnancy,  $\chi^2(1, N = 300)=5.263$ ,  $P =0.022$ . However, rest of the variables viz. birth interval, parity, history of abortion, history of chronic diseases, iron and calcium consumption, weight gain during delivery, and status of previous birth were insignificantly related to birth weight of newborn ( $P > .05$ ) (Table 2).

Similarly associations of Neonatal risk factors with Birth weight of newborn were also studied by chi square ( $\chi^2$ ) test. It found gestational age at birth was significantly correlated to

birth weight of newborn,  $\chi^2(1, N = 300)=5.059$ ,  $P <.001$ , while sex of child,  $\chi^2(1, N=300) =0.008$ ,  $P=0.929$ , and any congenital malformation present  $\chi^2(1, N=300)=0.511$ ,  $P=0.475$  were insignificantly related.

The relative risk estimate is a measure of association between the presence or absence of a risk factor and the occurrence of an event (LBW). The relationship between maternal factors and LBW was examined in the following (Table 3). The relative risk of LBW was more than thrice as high among  $< 18$ Yrs than among  $\geq 18$ Yrs. The odds ratio was 3.06 (95% CI :1.24 - 3.52) and the 95% CI for the relative risk ratio does not include 1, indicating that there is a significant difference in the occurrence of LBW between  $< 18$ Yrs and  $\geq 18$ Yrs.

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**Table 3:** Bivariate cross frequency of Neonatal Risk Factors influencing low birth weight and chi square Test of Association.

Neonatal Risk Factors		Birth weight of newborn		Total	$\chi^2$ Value	df	P-value
		<2.5 kg	$\geq 2.5$ kg				
Sex	Male	41	118	159	0.008	1	0.929NS
	Female	37	104	141			
Gestational age at birth	>37weeks	53	212	265	42.501	1	< .001**
	< 37weeks	25	10	35			
Any congenital malformation present	Yes	1	6	7	0.511	1	0.475NS
	No	77	216	293			
Total		78	222	300			

\*\*Highly significant at  $P(<.001)$ , NS =Not Significant.

**Table 4:** Risk Estimates and Odd Ratios Analysis in maternal risk factors for LBW.

Maternal risk factors	Odd of outcome for LBW		OR	95%CI	
				Lower	Upper
Maternal age	< 18Yrs	1.00	3.06*	1.24	3.52
	$\geq 18$ Yrs	0.33			
Birth interval	< 2	0.42	1.88	0.72	4.94
	$\geq 3$	0.22			
Parity	Primipara	0.43	1.64	0.96	2.81
	Multipara	0.26			
Height of the mother	< 145cm	0.62	2.72*	1.61	4.62
	$\geq 145$ cm	0.23			

History of abortion	Yes	0.39	1.15	0.57	2.31
	No	0.34			
History of chronic diseases	Gestational hypertension	0.63	1.57	0.27	9.04
	Gestational diabetes	0.40			
History of ANC visit	< 4	0.58	1.90*	1.03	3.52
	≥4	0.31			
Iron and calcium consumption	No	0.50	1.44	0.35	5.90
	Yes	0.35			
Weight gain during delivery	< 6	0.65	1.98	0.88	4.44
	≥6	0.33			
History of high risk behaviour	Tobacco	3.00	8.84	0.91	86.28
	None	0.34			
Status of previous birth	LBW	0.63	2.73	0.81	9.14
	Normal	0.23			
Type of pregnancy	Multiple	2.00	5.95*	1.07	33.13
	Single	0.34			

Birth interval having <2 had higher OR than that of ≥3 (OR=1.88, 95%CI: 1.24-3.52), Similarly, Primipara Parity had higher OR than that of multipara (OR=1.64, 95%CI: 0.96-2.81). Similar interpretation was found in case of height of the mother (OR=2.72, 95%CI: 1.61-4.62), history of abortion (OR=1.15 , 95%CI: 0.57-2.31), history of chronic diseases (OR=1.57 , 95%CI: 0.27-9.04), history of ANC visit (OR=1.90, 95%CI: 1.03-3.52), iron and calcium consumption (OR=1.44 , 95%CI: 0.35-5.90), weight gain during delivery (OR=1.98, 95%CI: 0.88-4.44), history of high risk behaviour (OR= 8.84, 95%CI: 0.91-86.28), status of previous birth (OR=2.73, 95%CI: 0.81-9.14), type of pregnancy (OR=5.95, 95%CI: 1.07-33.13). (Table 4).

### Conclusion

Globally, more than 20 million infants are born with Low Birth Weight. The major challenge in the field of public health is to identify the factors influencing low birth weight and to institute remedial measures. The study was attempted to assess prevalence of low birth weight and its risk factors affecting low birth weight.

The prevalence of low birth weight was found to be very high and it was associated with many risk factors related to maternal health and services. Among these, Low birth weight was significantly associated with maternal age <18years (p<0.045\*), height of the mother <145cm (< .001\*\*), history of ANC visit <3 (p<0.038\*), history of high risk behavior (use of Tobacco) (p<0.024\*), multiple pregnancy (0.022\*), gestational age <37weeks (p< .001\*\*), normal mode of delivery (p<0.005\*\*).

Hence it is recommended to improve maternal health through strengthening the existing maternal services such as maternal nutrition, and education, at the basic level of community.

### Acknowledgement

I deeply acknowledge Dr A. Bhattacharya, Professor and head, Department of Obstetrics and Gynaecology, Guwahati Medical College Hospital, Assam and Authority of the hospital and Ethical committee of Assam down town University for giving permission to conduct this study.

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DOI: [10.19080/AJPN.2018.06.555754](https://doi.org/10.19080/AJPN.2018.06.555754)

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