

## Socio-demographic and nutritional determinants of birth weight.

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### Abstract

**Global high prevalence of low birth weight (LBW) is a major public health concern leads to high neonatal and infant deaths. This study was conducted to find out the prevalence of low birth weight and to effect of associated socio-demographic and nutritional predictors. A total of 200 respondents were approached from January 2016 to June 2016. Data were collected on socio-demographic and nutritional factors by interviewing pregnant mothers. Hemoglobin level and blood pressure data were recorded from mothers' antenatal care card. Descriptive data revealed that the prevalence of low birth weight was 17%. Correlation matrix showed age and hemoglobin concentration significantly associated with birth outcome. Regression analysis portrayed that one unit increased age and hemoglobin corresponds to the respectively 0.017 and 0.050 unit increased birth weight of the child. To be concluding, teenage mothers and low hemoglobin level were the important risk factors for low birth weight in the study area.**

**Keywords:** Low birth weight, Factors, Nutritional determinants

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### Introduction

Low birth weight (LBW) is a major determinant of morbidity, mortality and disability in infancy and childhood [1]. It is associated with the age of the mothers [2,3] marital age and parity [4-7] maternal education [8] family income, poverty and employment status Hemoglobin (Hb) and blood pressure (BP) also affected the LBW [3,9]. Maternal hypertension increased intrauterine growth restriction and LBW [3,10,11]. Prevalence of LBW is quite high in developing countries. In Bangladesh, there is a high prevalence of low birth weight babies and high morbidity and mortality among the under five children [12]. No research data are available for the study areas. Rates and associated factors might be varying here for quite different socio-demographic and ethnic composition of mother. More over researchers have shown inconsistent results in other areas of Bangladesh. The study was conducted to find out the prevalence of LBW and associated factors in the study area.

### Materials and Methods

#### Study design

A hospital based descriptive cross-sectional study design was used in conducting this study. The study hypothesized that socio-demographic and nutritional factors affect the birth outcome.

#### Study area

This study was conducted in Sadar area Rangamati district. The Rangamati district is located in the south-eastern area of Bangladesh. It is the largest district of the country about 350 kilometers from capital Dhaka.

#### Study population

The total population in this study was 200. The study population comprised of pregnant mothers. The women were approached from Rangamati Matrimongol center, a non-government maternal care center.

#### Questionnaire design

The study instruments constitute a questionnaire emphasizing on socio-demographic data like name, address, age, occupation, husband's occupation, education and maternal nutritional others data such as hemoglobin status, anemia, parity, gravitas, blood group, blood pressure, oedema, urine sugar, HbsAG and child data (date of delivery, gestational age, sex, birth weight). This study was conducted through an in-depth interview by administration of questionnaires.

#### Data collection

Relevant information for the hospital based survey was gathered using a structured questionnaire. All the participants were interviewed at an arranged time, through a questionnaire that asked for maternal predictors. Another source of information that was used from the pregnant woman's ANC card, which served as backing for gathering information such as blood pressure measurements, hemoglobin status, gestational age, number of parity and blood parameters. The value lower than 11 g/dL was considered anemia as recommended by the World Health Organization for a pregnant woman [13].

#### Statistical analysis

Means and standard deviations (SD) were calculated for all

maternal anthropometric parameters, gestational age, and birth weight. The degree of correlation was measured between birth weight and maternal characteristics including hemoglobin status. Linear and logistic regression models were used to analyze data. Linear regression model was applied to observe the relationship between birth weight of child and maternal characteristics. Binary Logistic Regression model was used to estimate the probability of a binary response (birth weight, < 2500 gm=under normal and ≥ 2500 gm=normal) based on maternal characteristics, it allows say that the presence of a risk factor increases the probability of a given outcome by a specific percentage. Statistical analysis was performed using the software SPSS 16.0 and SAS 9.3 considering significance level 5%.

## Results

### Descriptive statistics of maternal characteristics

Maternal characteristics where almost 40% mother belongs to less than 20 years group. High educated mother was 3.5% and 38.5% suffering from illiteracy. About 49 percentage mothers were married at teenage, on the contrary, there was no saying percentage above thirty years. The primipara mother's percentage was 58.5% whereas the third gravida mothers were only 2.5%. Most of the gestational age was ≤ 37 weeks. Buddhist mothers comprise the 98% of the study population and, 86.5% mother was unemployed. On the other hand, 33.5% husband was unemployed. B+ blood group mother was 41% and the next 25% blood group was O+, clinically anemic mother was 75%, and nulliparous mother was 54% in this study. All participants were free from sugar, HbsAg and VDRL and the low birth outcome was 17% (Table 1).

### Averages of maternal characteristics and birth weight

Maternal characteristics and birth weight, It showed that mother age range between 18 and 38, where maximum mother age was 25, and most of them were married in age 20 years. The systolic and diastolic blood pressure range was 90 to 170 and 60 to 120. The average hemoglobin level was 10.57 mg/dl. Most of the gestational age was 37 weeks. The minimum and maximum birth weight of child was 1.8 kg and 4.4 kg (Table 2).

### Correlation of predictors with birth weight

The correlation between maternal characteristics and birth weight with p-value. It portrayed that all the parameters were insignificant except age of mother (P value=0.041) and hemoglobin (P value=0.038). There is a positive correlation between birth weight and age of mother. The means birth weight increases with age. There is positive relationship among gestational age, parity and birth weight. It also bears a negative relation between blood pressure and birth weight. That means one more reduction one will increase (Table 3).

### Effects of determinants on birth weight

The linear regression model was performed with backward selection method significance level staying 0.10 for all maternal characteristics and birth weight. The final model contains only two parameters and fits the model (F=1.39, p-value=0.11). It was observed from the Table 4 describes Parameter estimate of

linear regression model that age and hemoglobin were positively related to birth weight. One unit increases in the age of mother and hemoglobin level corresponds to the 0.017 and 0.050 unit increased birth weight of the child. None of the other parameters were found significant in logistic regression model.

## Discussion

In this study, the prevalence of LBW was 17%. This result is almost consistent with [14] in Nigeria where it was 14% in their study. But the survey of South Asian countries (2003-2004) showed that the prevalence was 36% in Bangladesh, 30% in India, 21% in Nepal, 15% in Bhutan and, 22% in Maldives. That differences with Bangladesh data may be due to this was a hospital based study and conducted in a different ethnic society where 98% was chakma mothers. Mean birth weight

Table 1. Descriptive statistics of maternal characteristics.

Characteristics	Frequency ( N=200)	Percentage (%)
<b>Age</b>		
< 20 yrs	80	40
20-30yrs	109	54.5
>30 yrs	11	5.5
<b>Religion</b>		
Buddhist	196	98
Hindu	4	2
<b>Education</b>		
Illiteracy	77	38.5
Primary education	72	36
High school	44	22
Graduate and above	7	3.5
<b>Profession of mother</b>		
Employed	173	86.5
Unemployed	27	13.5
<b>Age at marriage</b>		
< 20 yrs	99	49
20-30yrs	100	50
>30 yrs	1	0.5
<b>Gravida</b>		
G <sub>1</sub>	117	58.5
G <sub>2</sub>	78	39
≥G <sub>3</sub>	5	2.5
<b>Gestational age of the newborn</b>		
≤37 wks	19	9.5
38-40 wks	151	75.5
>40 wks	8	4
<b>Birth weight</b>		
< 2.5 kg	34	17
2.5 -3.5 kg	136	68
>3.5 kg	20	10
<b>Hb Concentration, g/dl</b>		
≤10.9	117	58.5
≥11	50	25

Table 2. Averages of maternal characteristics and birth weight.

Variables	Mean	Std Dev	Mode	Minimum	Maximum
Age of mother	25.12	4.54	25	18	38
Age of marriage	20.08	3.71	20	11	33
Blood pressure (sys)	121.98	17.31	120	90	190
Blood pressure (dias)	80.31	11.84	80	60	120
Hemoglobin mg/dl	10.57	1.16	10.8	6.6	15.7
Gestational age (WKS)	36.77	1.89	37	27	42
Weight of child (kg)	3	0.45	3000	1.8	4.4

**Table 3.** Pearson correlation between maternal characteristics and birth weight.

Variables	Child Weight	Age of mother	Age of marriage	BP systolic	BP diastolic	Hb level	Gestational age
Weight of child	1						
Age of mother	0.147**	1					
Age of merry	0.069	0.516	1				
BP systolic	-0.048	0.059	-0.049	1			
BP diastolic	-0.097	-0.005	-0.058	0.792	1		
Hemoglobin	0.115**	0.076	0.047	0.150	0.130	1	
Gestational age	0.020	0.019	0.062	-0.177	-0.085	0.031	1

**Table 4.** Parameter estimate of linear regression model.

Parameters	Estimate	St. Error	t Value	P-value
Intercept	3.111	0.359	8.66	<.0001
Age of mother	0.017	0.008	2.17	0.0313
Hemoglobin	0.050	0.030	1.65	0.0411

was found 3000 gms. In the study which was very similar 2961 gm by reported by Deshmukh JS et al. [15] in Bangladesh and a bit lower 2669 gms by Manyeh AK et al. [16] in India. In this study, there was a significant association between the age of the mothers and low birth weight. Similar types of results were found by Bugssa G [17] in Ghana and by Johnson D [18] in Northern Ethiopia. But opposite information described for Georgia, where low birth was insignificantly associated maternal age. Findings of the relation of LBW with gestational age and educational level were not found to be statistically significant. But significant associated found by Ahankari A et al. [19]. Also correlate with the observation in Pakistan [20]. But significant association observed by John G [21]. Although, no association noticed by the study done by [22]. An inverse relationship between birth weight and blood pressure was also found in this study, which was supported by the studies of other researchers [23,24]. Even though, significant relationship reported [25].

## Conclusion

This study suggests that there is several factors interplay which leads to low birth weight babies in the study area. Socio demographic factors like maternal age, educational level, economic status, nutritional status, and anemia are very important. The results of this study suggest that for reducing low birth weight, the strategy needs to focus attention on nutrition education to facilitate better weight gain during pregnancy encouraging wider birth interval and discouraging teenage pregnancy.

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## Ethical Approval

The study was approved by the Medical Ethical Committee of the Rangamati Matrimongol center, headed by the director of clinic. All procedures performed in studies were in accordance

with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## Informed Consent

Informed consent was obtained from all individual participants included in the study. Author disclosure. All authors contributed substantially to, the design and drafting of work, critical review, and approved the final version of the manuscript for submission.

## Conflict of Interest

All authors declare that they have no conflicts of interest.

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