Maternal Risk Factors and Outcomes of Low Birth Weight

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Abstract

Background:
Low birth weight babies carry a relatively higher risk of perinatal and neonatal mortality and retarded growth and development subsequently.

Objective:
The general objective of this study was to find out the maternal risk factors & outcome (morbidity and mortality) of LBW babies.

Methods:
This case-control study was carried out in the Department of Obstetrics and Department of Pediatrics at Sir Salimullah Medical College and Mitford Hospital, Dhaka, from Febuary 2014 to July 2014. Among 50 newborns,75 cases (newborns with low birth weight, LBW) and 75 controls (healthy newborns). Statistical analysis was carried out by using the statistical package for social sciences (SPSS) for Windows version 22. The differences between groups were analyzed by unpaired t-test or chi-square test and also the odd ratio was used for testing risk factors associated with low birth weight. A p-value < 0.05 was considered as significant.

Results:
Important maternal risk factors were primi parity(40% in cases Vs 27% in control), age < 20 years (53% Vs 27%), hypertension (26% Vs 9%), preeclampsia (14% Vs 4%), prolonged rupture of membrane (14% Vs 9%), APH (20% Vs 14%), multiple births (7% Vs 4%), anemia (9% Vs 7%). All these were statistically significant (p<0.05). The commonest morbidities of the LBW babies during hospital stay were feeding problems 53%, temperature instability 13, septicemia 7%, hyperbilirubinemia 13%, apnea of prematurity 7%, the overall survival rate was 67%, No infant with birth weight <1000 grams survived.

Conclusions:
The study revealed significant maternal factors associated with low birth weight (LBW) in infants. Younger maternal age (under 20 years), lower weight (`40 kg), and BMI (<18.5 kg/m) are strongly linked to higher LBW rates. Additionally, shorter maternal height (141-150 cm), lower socioeconomic status, and less education increase LBW risk. Inadequate antenatal care and pre-term births (≤36 weeks) are more common in the LBW group. Antepartum issues, such as premature rupture of membranes and pre-eclampsia, further contribute to LBW.

Keywords: Low birth weight, Risk factor, Morbidity, Mortality

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Introduction:

Birth weight is probably one of the most sensitive and precise indicators of the health status of a population.[1] Weight below 2500gm at birth irrespective of gestation is considered low birth weight (LBW).[2] It should be ideally measured within the first hour of life to avoid significant post-natal weight loss.[3] More than 20 million infants worldwide representing 15.5% of all births born with low birth weight, 95.6% of them in developing countries. The majority of LBW in developing countries is due to Intrauterine growth

restriction (IUGR). While most LBW in industrialized countries is due to preterm birth.[4] Though the health situation of Bangladesh has improved substantially over the years, the LBW rate is still high. In Bangladesh, the rate of LBW newborns is 36%.[5] In general, the health and nutrition of mothers are key factors. Maternal socio-demographic factorsplay an important role in birth weight such as (under 16 and over 35 years). Weight, height, socioeconomic condition (because in low socio-economic status health care of women is decided by her husband), education, other risk factors are physical work, smoking, alcohol consumption, drugs, acute or chronic medical illness, and some fetal factors such as fetal distress, multiple gestation has been related to the birth weight outcome. certain obstetric complications cations, such as premature rupture of membrane, placenta previa, abruptio placenta, incompetent cervix, and hypertension in pregnancy including preeclampsia, and eclampsia are important causes of LBW.[2] Causes of IUGR are complex and multiple, but center on the fetus, the placenta, the mother, and a combination of all three. The maternal environment is the most important determinant of birth weight and factors that prevent normal circulation across the placenta cause poor nutrition and oxygen supply to the fetus, restricting growth.[6] It is well recognized that LBW babies are more susceptible to conditions like perinatal asphyxia, hypothermia, feeding difficulties, infection, hyperbilirubinemia, respiratory distress syndrome (RDS), intraventricular hemorrhage, necrotizing enterocolitis, hypoglycemia that contribute to their high perinatal and neonatal mortality and morbidity.[5] The causes and effects of LBW are complex and best considered within the life cycle conceptual framework. Poor nutrition often begins in the intrauterine environment and extends throughout the lifecycle. LBW is an intergenerational problem where LBW infants grow up to be undernourished and shunted children and adolescents ultimately undernourished women of childbearing age and undernourished pregnant women who deliver LBW infants. This amplifies risks to the individual's health and perpetuates the cycle of poverty, undernutrition, and disease. This is especially true when adolescents become pregnant before their growth is completed, leaving little to fulfill their own or their infant's nutritional requirements.[4] The reduction of LBW is an important contribution to the achievement of the Millennium Development Goal (MDG) for reducing child mortality.[3] As a consequence of this rapid rate of decline Bangladesh has achieved its MDG 4 target for under-five mortality of 48 deaths per thousand live births by 2015.[3] This study aimed to assess the risk factors and outcomes of low birth weight.

Methods:

This case-control study was carried out in the Departments of Obstetrics and Pediatrics, Sir Salimullah Medical College and Mitford Hospital, Dhaka, during the period from February to July 2014. 150 newborns were chosen, which included 75 cases (LBW newborns with birth weight <2500g) and 75 controls (normal newborns with birth weight ≥2500g). The mothers of LBW newborns who had major congenital malformations or were not willing to participate were excluded. Data were collected by structured questionnaires, which comprised socio-demographic, medical, reproductive, and obstetric histories of the mothers and their newborns. Gestational age was determined by the mother's last menstrual period. Birth weight was recorded using a standard weighing machine, and crown-heel length and head circumference using non-elastic tape. Complete blood count, oral glucose tolerance test, serum electrolytes, blood culture, CSF study, and C-reactive protein levels were laboratory investigations. Statistical analysis was conducted by SPSS version 22, and continuous variables were expressed as means and standard deviations and categorical variables as frequencies and percentages. Comparisons between groups were conducted by unpaired t-tests or chi-square tests, and odds ratios were estimated for identifying risk factors for LBW. A p-value of <0.05 was considered to be statistically significant. Informed consent was obtained from all participants, and ethical approval was granted by the hospital's ethics committee.

Results:

Table-I revealed significant maternal risk factors for low birth weight (LBW). Young maternal age (<20 years) was more prevalent in the LBW group (53.3%) than in the control group (26.7%) (p=0.001). Mothers with LBW had lower mean age (22.0±4.7 vs. 25.4±6.1 years, p=0.009), weight

(41.1±4.5 vs. 47.3±6.4 kg, p=0.001), height (147.6±5.0 vs. 154.1±4.3 cm, p=0.001), and BMI (17.3±1.6 vs. 19.9±2.6 kg/m , p=0.001). Housewives were more common in the LBW group (86.7% vs. 73.3%, p=0.041). One mother (1.3%) in the LBW group was a smoker, though this was not significant (p=0.500).

Table-I: Distribution of the study patients by maternal basic characteristics (N=150)

Basic characteristics	LBW (n=75) no.(%)	Control (n=75) no.(%)	OR (95% CI)	p-value
Maternal age (year)				
<20	40(53.3)	20(26.7)	3.14(1.50-6.61)	[a]0.001[s]
≥20	35(46.7)	55(73.3)		
Mean± SD	22.0±4.7	25.4±6.0	-	[b]0.009[s]
Range (min-max)	17-36	17-38		
Weight (kg)				
≤40	50(66.7)	20(26.7)	5.50(2.58-11.84)	[a]0.001[s]
>40	25(33.3)	55(73.3)		
Mean± SD	41.1±4.5	47.3±6.4	-	[b]0.001[s]
Range (min-max)	37-51	38-58		
Height (cm)				
141-150	60(80.0)	10(13.3)	26.0(10.06-69.38)	[a]0.001[s]
151-160	15(20.0)	65(86.7)		
Mean± SD	147.6±5.0	154.1±4.3	-	[b]0.001[s]
Range (min-max)	141-160	142-160		
BMI (kg/m2)				
<18.5 (Underweight)	52(69.3)	29(38.7)	3.59(1.73-7.48)	[a]0.001[s]
18.5-24.9 (Normal)	23(30.7)	46(61.3)		
Mean± SD	17.3±1.6	19.9±2.6	-	[b]0.001[s]
Range (min-max)	15.5-20.3	16.4-24.8		
Occupation				
Housewife	65(86.7)	55(73.3)	2.36(0.95-5.96)	0.041[s]
Service holder	10(13.0)	20(26.7)		
Smoking /Tobacco chewing				
Yes	1(1.3)	0(0.0)	2.01(1.71-2.37)	0.500[ns]
No	74(98.7)	75(100.0)		

s= significant
[a]P value reached from the chi-square test
[b]P value reached from unpaired t-test

It was discovered that 46.7% of mothers in the LBW group and 26.7% in the control group had completed elementary education (p=0.001). Lower education is a risk factor for LBW, with illiteracy tripling the risks (OR=2.00, p=0.001). It was significant to highlight that moms with secondary higher education have the least LBW kids. Lower socioeconomic level strongly corresponds with LBW, with four times the risks (OR=4.00, p=0.001). In the LBW group, 66.7% of women came from lower-class families, whereas in the control group, 33.3% do (p=0.001) (Table-II).

Table-II: Distribution of the study patients according to maternal veducation, and socio-economic status (N=150)

Variables	LBW (n=75) no.(%)	Control (n=75) no.(%)	OR (95% CI)	p-value
Maternal education				
Illiterate	25(33.3)	5(20.0)	2.00(0.92-4.38)	
Primary	35(46.7)	20(26.7)	2.33(1.14-4.76)	0.001[s]
SSC & HSC	15(20.0)	40(53.3)	1 (Reference)	
Socioeconomic status				
Lower (<5000 BDT)	50(66.7)	25(33.3)	4.00(1.86-8.58)	
Middle (5001-20000 BDT)	20(26.7)	40(53.4)	1.00(Reference)	0.001[s]
Upper (>20000 BDT)	5(6.6)	10(13.3)	1.00(0.29-3.47)	

s= significant
P value reached from the chi-square test
BDT= Bangladeshi Taka

In the LBW group, 33.3% of mothers obtained <4 prenatal checks, compared to 26.7% in the control group (p=0.001). Additionally, not receiving ANC increases the risk of LBW by 2.67 times compared to regular ANC (p=0.002). Regular (>4 ANC visits) has the lowest LBW (Table-III).

Table-III: Distribution of the study patients according to antenatal checkup (N=150)

Antenatal checkup	LBW (n=75) no.(%)	Control (n=75) no.(%)	OR (95% CI)	p-value
No ANC	30(40.0)	15(20.0)	2.67 (1.22-5.81)	
Irregular (<4 visit)	25(33.3)	20(26.7)	1.67(0.76-3.65)	0.002[s]
Regular (≥4 visit)	20(26.7)	40(53.3)	1 (Reference)	

p-value reached from the chi-square test

In the present study, 60.0% of mothers were gestational age ≤36 weeks in the LBW group and

8(10.7%) were gestational age 37-40 weeks in the control group (p=0.001). Mean gestational age was found 34.4±4.1 weeks in the LBW group and 38.6±2.0 weeks in the control group (Table-IV).

Table-IV: Distribution of the study patients according to gestational age (N=150)

Gestational age (weeks)	LBW (n=75) no.(%)	Control (n=75) no.(%)	OR (95% CI)	p-value
Preterm (≤36 weeks)	45(60.0)	8(10.7)	13.37(5.30-33.74)	0.001s
Term (37-40 weeks)	29(38.7)	58(77.3)	1(Reference)	
Postdated (>40 weeks)	1(1.3)	9(12.0)	0.31(0.02-1.58)	
Mean±SD	34.4±4.1	38.6±2.0		-
Range (min-max)	28-41	32-41		

s= significant
P value reached from unpaired t-test

It was observed that 26.7% of mothers had premature rupture of the membrane in the LBW group and 9.3% in the control group (p=0.005). 13.3% of mothers had a history of eclampsia or pre-eclampsia in the LBW group and 4.0% in the control group (p=0.042) but other antepartum problems were not statistically significant (p>0.05) between the two groups. PROM (OR=3.54, p=0.005) and eclampsia/pre-eclampsia (OR=2.45, p=0.042) significantly increase LBW risk, while idiopathic cases are far more common in controls (OR=0.07, p=0.001) (Table-V).

Table-V: Distribution of the study patients according to antepartum problem (N=150)

Antepartum problem	LBW (n=75) no.(%)	Control (n=75) no.(%)	OR (95% CI)	p-value
Premature rupture of membrane	20 (26.7)	7(9.3)	3.54 (1.34-9.35)	0.005s
APH	15(20.0)	10(13.3)	1.63(0.67-3.93)	0.273ns
Chronic hypertension	10(13.3)	7(9.3)	1.50(0.50-4.33)	0.440ns
Eclampsia or Pre-eclampsia	10 (13.3)	3(4.0)	3.37(0.76-15.18)	0.042s
Anaemia	7(9.3)	5(6.7)	1.43(0.40-5.06)	0.547ns
Malpresentation	3(4.0)	0(0.0)	2.45(0.46-13.03)	0.122ns
Dietetes mellitus	2(2.7)	0(0.0)		0.248ns
Heart disease	1(1.3)	0(0.0)		0.500ns
Idiopathic/No cause	7(9.3)	43(57.3)	0.07(0.03-0.20)	0.001s

s= significant, ns=not significant
P value reached from the chi-square test

Table-VI showed 70.7% of patients had LUCS in the LBW group and 24.0% in the control group (p=0.001). It was observed that 66.7% of babies were alive in the LBW group and 100.0% in the control group (p=0.001).

Table-VI: Distribution of the study patients according to mode of delivery and outcome (N=150)

Mode of delivery	LBW (n=75) no.(%)	Control (n=75) no.(%)	p-value
Vaginal	22(29.3)	57(76.0)	0.001s
LUCS	53(70.7)	18(24.0)	
Outcome			
Alive	50(66.7)	75(100.0)	0.001s
Newborn death	25(33.3)	0(0.0)	

s= significant, ns=not significant
P value reached from the chi-square test

Discussion:

The study comes with maternal determinants of low LBW. Low maternal age (<20 years) was very much associated with LBW (53%) with an increased risk (OR=3.14), in contrast with previous studies.[7] Women who are grand multipara over 35 years are at higher risk of having short gestation and complications due to malnutrition.[8-10] Maternal weight and height were significantly associated with birth weight, with a positive correlation. LBW was also more common in mothers with ≤40 kg body weight (66% vs. 26% controls, OR=5.50), and 80% of LBW infants were born to mothers of 140-150 cm height.[7,8,11,12] Smoking was rare in the study, limiting its effect assessment, but is a known LBW risk factor.[7] Socioeconomic determinants also came into play, with more LBW in more deprived groups due to malnutrition and infection, as in international studies.[8] Antenatal care was another significant factor; 40% of LBW mothers had no antenatal checks compared with 53% of control mothers who had received regular checks. Some of the maternal complications that contributed to LBW include toxemia (13.3%), hypertension (13.3%), premature rupture of membranes (26.7%), anemia (9.3%), malpresentation (4%), diabetes (2.7%), and heart disease (1.3%). Conversely, 57% of control mothers had no antepartum complications, even though some developed hemorrhage (13.3%) and hypertension (9%).[13,14] Neonatal outcomes

indicated 33.3% mortality among LBW infants, with death enhanced in cesarean births. Most of the deaths (29.3%) at ≤36 weeks' gestation confirmed the correlation of birth weight with survival.[14-17] It is in harmony with previous evidence, reaffirming the role of maternal health and prenatal visits in preventing LBW occurrence and establishing auspicious neonatal outcomes.

Limitations:
The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

Conclusion:
The study revealed significant maternal factors associated with low birth weight (LBW) in infants. Younger maternal age (under 20 years), lower weight (≤40 kg), and BMI (<18.5 kg/m) are strongly linked to higher LBW rates. Additionally, shorter maternal height (141-150 cm), lower socioeconomic status, and less education increase LBW risk. Improvement in maternal nutrition, socioeconomic status, education, and availability of quality antenatal and intranatal care is paramount in the prevention of LBW. Long-term measures must focus on food insecurity, poor health care, poor sanitation, gender discrimination, and poverty to prevent LBW occurrence in developing nations.

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