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Role of Maternal & Fetal Factors in Relation to Low Birth Weight

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Abstract

Introduction: *Low birth weight (LBW) continues to remain a major public health problem worldwide. There are numerous factors contributing to LBW both maternal and fetal. The mortality of low birth weight can be reduced if the risk factors are detected early and managed by simple techniques.* **Objective:** *To identify the maternal and fetal factors associated with low birth weight.* **Materials and Methods:** *This case control study was conducted in Department of Pediatrics, Khulna Medical College& Hospital from January 2019 to June 2019. After delivery of the baby weight of the newborn was measured with digital weighing scale. Mothers of babies with birth weight <2500 gm were enrolled as cases and mothers of babies with birth weight ≥2500 gm were enrolled as controls.* **Results:** *Total 96 mothers were enrolled in this study and 48 mothers in each group. All the information was recorded in a pretested questionnaire. Statistical analysis was done by SPSS. Primipara mother had 3.153 times more likely to deliver LBW baby. Patients having anemia had 3.316 times more likely to deliver LBW baby. Patients having hypertension had 4.120 times more likely to deliver LBW baby. Preterm delivery had 28.927 times more likely to deliver LBW baby. Primipara, anemia, hypertension and preterm delivery were significantly associated with LBW. In multivariate analysis, preterm had 20.619 times more likely to deliver LBW.* **Conclusion:** *Primipara, anemia, hypertension and preterm delivery were significantly associated with LBW.*

Keywords: *Neonatal mortality, Preterm delivery, Primipara.*

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Introduction:

Low birth weight (LBW) is defined by World Health Organization (WHO) as birth weight less than 2,500 gm at birth, irrespective of the region, community or culture[1].

LBW is a major public health problem worldwide especially in the developing countries. According to WHO, the prevalence of low birth weight is 15 .5 % globally & 96.5% of low birth weight infants are born in developing countries[2].

Despite consistent efforts to improve the quality of maternal and child health, more than twenty million low birth-weight babies are born every year throughout the world. Though, the health situation of developing country has improved substantially over the years, the low birth-weight rate is still high[3].

Regardless of gestational age, LBW is a multifaceted public health problem with significant individual and societal impact worldwide, especially in developing countries[4]. LBW infants are at a disproportionately higher risk of poor growth, and impaired psychomotor and cognitive development[5]. These LBW infants are also disadvantaged when they become adults, as they are more susceptible to hypertension, type 2 diabetes mellitus and coronary heart disease[6].

Considering the implications for child mortality significant reduction in prevalence of LBW is necessary to achieve Sustainable Developmental Goal (SDG) which is a major concern of health policy makers[2].

Substantial research effort is needed to assess and identify the

determinants of LBW[7].The objective of this study is to identify the maternal and fetal factors associated with low birth weight by taking relevant history regarding maternal risk factors & by examining the studied newborns for identifying fetal factors associated with LBW in KMCH.

Materials and Methods:
It was a Case control study conducted in Department of Pediatrics, Khulna Medical College Hospital, from January 2019 to June 2019.Study population constituted of mothers who delivered at the Gynecology & Obstetrics department of Khulna Medical College Hospital during the study period, taken by purposive sampling. Total 48 cases and 48 controls were included in this study.

Inclusion criteria

Mothers who delivered at KMCH during the study period & their babies were included in this study.

Exclusion criteria

Deliveries with incomplete records, Still births & Diabetic mothers were excluded from the study.

All data were collected by using a questionnaire. The questionnaire included the variables: gestational age, maternal weight and height, parity, tobacco consumption, socioeconomic and socio-demographic factors like maternal education and household income, mother's health and nutrition status. The interviews were carried out within 12 hours after delivery. Clinical records were also reviewed to verify information given by the mothers. The newborns were examined to identify congenital anomalies. The information obtained from the clinical records & examinations were used to fill in the questionnaire forms. After delivery of the baby weight of the newborn was measured with digital weighing scale. Mothers of low birth weight babies were enrolled as cases and mothers of normal birth weight babies were taken as controls. Then comparisons of all parameters were done between cases and controls.

Data was processed and analyzed using SPSS software version 23. Continuous data was presented as mean standard deviation and Categorical data was presented as number percentage. The summarized data was presented in the table and chart. The chi- square test and student "t" test was used to identify statistical significance. Univariate and multivariate logistic regression analysis was performed for risk factors. P value < 0.05 is considered to be significant.

Before starting this study, ethical clearance was taken from Institutional Review Board (IRB) of KMCH. Data taken from the participants were coded and regarded as confidential. Due respect was given to all the subjects.

Results:
Mean birth weight was found 1677.5±447.1 gm in case group and 2959.4±354.1 gm in control group. Mean age of the mother was found 25.7±5.6 years in case group and 26.8±4.9 years in control group. According to pregnancy related factor wanted pregnancy was 41(85.4%) in case group and 42(87.5%) in control group. Mother's pregnancy weight gain 6-9 kg was found 24(50.0%) in case group and 20(41.7%) in control group. Most of the mothers received antenatal care 3-5 times. Bad obstetric history was found 10(20.8%) in case group and 8(16.7%) in control group. Two third (66.7%) mothers were primipara in case group and 16(33.3%) in control group. Majority mothers received iron & folic acid supplementation in both groups. Primipara was significantly (p<0.05) higher in case group than control group. According to pregnancy related complication majority 28(58.3%) mothers had anemia in case group and 17(35.4%) in control group. Nineteen (39.6%) mothers had hypertension in case group and 7(14.6%) in control group. Eleven (22.9%) mothers had urinary tract infection in case group and 3(6.3%) in control group. Anemia, hypertension and urinary tract infection were significantly higher in case group than control group. Smoking or tobacco exposure was found same 4(8.3%) mothers in case and control groups. Parental disharmony & parental separation was found in 5(10.4%) & 1(10.4%) mothers respectively in case group and not found in control group. Thirteen (27.1%) mothers did heavy physical work in case group and 18(37.5%) in control group. These differences were not statistically significant (p>0.05) between two groups. In case group more than half 26(54.2%) babies were male and in control group 22(45.8%). More than three fourth (77.1%) babies were preterm in case group and 5(10.4%) in control group. Ten (20.8%) babies were multiple pregnancy in case group and 3(6.3%) in control group. Preterm delivery and multiple pregnancy were significantly higher in case group than control group.

In univariate analysis, patients having primipara had 3.153 (95% CI 1.134 to 8.764) times more likely to develop LBW. Patients having anemia had 3.316 (95% CI 1.188 to 9.258) times more likely to develop LBW. Patients having hypertension had 4.120 (95% CI 1.328 to 12.782) times more likely to develop LBW. Patients having preterm had 28.927 (95% CI 9.207 to 90.888) times more likely to develop LBW. Primipara, anemia, hypertension and preterm delivery were significantly associated with LBW.

In multivariate analysis, preterm had 20.619 (95% CI 6.141 to 69.228) times more likely to develop LBW. Preterm delivery was significantly associated with LBW.

Table - I: Distribution of the study patients on pregnancy related factors (n=96)

Pregnancy related factors	Case group (n=48)		Control group (n=48)		P value
	n	%	n	%	
Type of pregnancy					
Wanted	41	85.4	42	87.5	0.500
Unwanted	7	14.6	6	12.5	
Pregnancy weight gain					
<6 kg	10	20.8	7	14.6	
6-9 kg	24	50.0	20	41.7	0.318
>9 kg	14	29.2	21	43.8	
Antenatal care					
<3	8	16.7	5	10.4	
3-5	27	56.3	30	62.5	0.654
>5	13	27.1	13	27.1	
Bad obstetric history					
Present	10	20.8	8	16.7	0.601
Absent	38	79.2	40	83.3	
Parity					
Primi para	32	66.7	16	33.3	0.001
Multi para	16	33.3	32	66.7	(significant)
Iron & folic acid supplementation					
Received	46	95.8	43	89.6	0.218
Not received	2	4.2	5	10.4	

Table - II : Distribution of the study patients according to complications (n=96)

Complications	Case group (n=48)		Control group (n=48)		P value
	N	%	n	%	
Anemia	28	58.3	17	35.4	0.020 (significant)
Per vaginal bleeding	6	12.5	5	10.4	0.566
Hypertension	19	39.6	7	14.6	0.005 (significant)
Urinary tract infection	11	22.9	3	6.3	0.020 (significant)
Malaria	0	0.0	1	2.1	0.500
Febrile illness	8	16.7	7	14.6	0.500

Table - III: Distribution of the study patients according to other factors (n=96)

Other factors	Case group (n=48)		Control group (n=48)		P value
	N	%	n	%	
Smoking or tobacco exposure	4	8.3	4	8.3	1.000
Parental disharmony	5	10.4	0	0.0	0.071
Parental separation	1	2.1	0	0.0	0.500
Heavy physical work	13	27.1	18	37.5	0.191

Table - IV: Distribution of study patients according to fetal factors (n=96)

Fetal factors	Case group (n=48)		Control group (n=48)		P value
	N	%	n	%	
Infant sex					
Male	26	54.2	22	45.8	0.270
Female	22	45.8	26	54.2	
Gestational age					
Preterm (<37 weeks)	37	77.1	5	10.4	0.001 (significant)
Term (≥37 weeks)	11	22.9	43	89.6	
Multiple pregnancy					
Present	10	20.8	3	6.3	0.035 (significant)
Absent	38	79.2	45	93.8	

Table - V: Univariate regression analysis for risk factors of low birth weight

	OR	95% Interval	Confidence	P value
		Lower	Upper	
Primipara	3.153	1.134	8.764	0.028(significant)
Anemia	3.316	1.188	9.258	0.022(significant)
Hypertension	4.120	1.328	12.782	0.014(significant)
Urinary tract infection	4.035	0.849	19.179	0.079
Preterm	28.927	9.207	90.888	0.001(significant)
Multiple pregnancy	2.339	0.486	11.269	0.289

Table - VI: Multivariate regression analysis for risk factors of low birth weight

	OR	95% Confidence Interval		P value
		Lower	Upper	
Primipara	2.325	0.745	7.255	0.146
Anemia	3.075	0.970	9.752	0.056
Hypertension	2.150	0.571	8.098	0.258
Preterm	20.619	6.141	69.228	0.001(significant)

Discussion:

The study was carried out with an aim to identify the maternal and fetal factors associated with low birth weight in KMCH which is the main referral center in southern part of Bangladesh.

In this study it was observed that mothers age is not significantly associated with LBW. And it is similar to other studies[8,9,10,11,12].

The difference of wanted & unwanted pregnancy was not statistically significant between two groups. But in a Taiwanese study unwanted pregnancy was significantly associated with LBW[18].

In my study most of the mothers received antenatal care 3-5 times. It was not a significant risk factor. But in some studies, unbooked status of mother was a significant risk factor for LBW babies[19,20].

Bad obstetric history was not found statistically significant

between two groups. But other studies found bad obstetric history as a significant contributory factor towards LBW babies[8,20]. Perhaps genetic factors and socioeconomic factors were the reasons for this phenomenon leading to repeat adverse obstetric outcome.

In this current study primipara was significantly higher in case group than control group. Other studies also found primipara as a significant risk of delivering LBW babies [12,21]. Birth weight increase with parity up to 4-5 births but declines thereafter[11] . This may be attributed to unprepared & inexperienced pregnancy in primipara[20].

Iron & folic acid supplementation was not found as a protective factor in this study Rizvi et al.[10], Khan et al.[13] reported that intake of iron supplements during pregnancy have a protective effect with respect to LBW. Iron supplementation prevents anemia because the required amounts may not be supplied from dietary intake during this period.

Anemia, hypertension and urinary tract infection were significantly higher in case group than control group. Substantial iron deficiency anemia is associated with an increased incidence of LBW. The mechanism by which anemia could produce this effect is unknown, but other nutrient deficiencies are important contributing factors[16,22]. Rizvi et al[10] also stated a strong relationship between anemia and LBW. Coutinho et al.[9] and Pawar et al[12] found that hypertension is significantly associated with LBW. Hypertension in pregnancy may be associated with IUGR as a result of vasospasm which leads to a decrease in utero-placental perfusion[23]. Preterm delivery can result from an attempt to save the life of the mother with severe pregnancy induced hypertension[24]. Acute or chronic infections such as urinary tract infection during pregnancy result in direct intrauterine growth restriction leading to LBW[13].

Exposure to smoking or tobacco, parental disharmony, marital separation, heavy physical work during pregnancy are not significant risk factors. But one study showed smoking during pregnancy leads to low birth weight. It may be due to decreased oxygen transport capacity of carboxyhemoglobin, vasoconstriction, decreased plasma volume, increased need for vitamin B[12,23] In a study, heavy physical work was significantly associated with LBW[25].

This study showed that sex of the baby is not a risk factor & it is consistent with Choudhary et al.[14] But Ndu et al.[21], Tshotetsi et al.[26] found incidence of LBW with a female preponderance. It is hypothesized that the activity of androgen causes difference, or genetic material on the Y chromosome carries genetic material for fetal growth. Preterm gestational age and multiple pregnancy was significantly higher in case group than control group. It is

consistent with other studies[15,25,26].

Regarding univariate analysis primipara, anemia, hypertension and preterm delivery were significantly associated with LBW. In multivariate analysis, preterm delivery was significantly associated with LBW.

Conclusion:

In conclusion parity, anemia, hypertension, urinary tract infection, preterm delivery, multiple pregnancy was significantly associated with low birth weight compared to normal birth weight. Further studies can be undertaken by including large number of mothers & mothers delivering at home.

Conflict of Interest: None.

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