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Original Research Article

Pattern of gestational complications and low birth weight: a cross sectional study

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ABSTRACT

Background: Complications of pregnancy and childbirth are the leading causes of disability and death among women of reproductive age in developing countries. The adverse events that occur during pregnancy influence the health of the child that may result in the neonatal outcome.
Method: The analytical cross-sectional study was performed to assess the association between gestational complications and low birth weight (LBW) among woman of reproductive ages at Mohammadpur fertility services and training centre,100 bedded Mother and child health hospital in Dhaka city from January to March, 2018. After taking informed written consent, data was collected about gestational complication factors, socio-demographic factors and maternal factors through questionnaire and reviewing medical documents and data was analyzed in R software.
Results: Out of total 400 live births, 114 (28.5%) babies were born with LBW. The results of the unadjusted analysis by the $\chi 2$ test indicate that sex of birth (boy or girl) ($p \leq 0.001$), household monthly income ($p=0.004$), preterm baby ($p=0.005$), duration of sleep hours ($p=0.005$) and mode of delivery ($p=0.015$), premature rupture of membrane (PROM) ($p \leq 0.001$), preterm labour ($p=0.019$), and overall maternal complications ($p=0.004$) are the significant variables to develop LBW among the mothers. Multivariable logistic regression model was fitted and stepwise regression was done.
Conclusions: Despite government has taken many pragmatic steps, LBW is still prevailing in Bangladesh. Therefore, this study is expected to help government further to review their policies, strategies and recommendations pertaining to reduce LBW in Bangladesh.

Keywords: Gestational complications, LBW, Preterm labour

INTRODUCTION

Low birth weight (LBW) is a multifaceted public health problem regardless of gestational age with significant individual and social impact worldwide; especially in developing countries.[1] Globally about 20 million LBW infants are born each year, with over 18 million of these in developing countries. It is considered as an important risk factor for neonatal and infant mortality and morbidity.[2] It is one of the most serious concerns in maternal and child health.[3] Prevalence of LBW children is 16% worldwide and 28% of them are in South Asia, with 22% in Bangladesh (UNICEF, 2015).[2] Highest rates of LBW in children are in Asian and African countries followed by Latin America and Caribbean countries; while lowest rates is in Oceania and Europe.[4] In developing countries about 72% of LBW infants are born in Asia and 22% are born in Africa. In Asia India alone accounts for 40% of LBW births.[5] In decreasing child mortality reducing prevalence of LBW can play vital role, which is one of important concerns of millennium development goals (MDGs).

Bangladesh has achieved considerable progress in child mortality as one of the signatories of MDGs by 2014.[6]

LBW has been defined by the WHO as weight at birth of less than 2,500 grams (5.5 pounds) in 1st hour of delivery.[7] This cut-off for international comparison is based on epidemiological observations that infants weighing less than 2,500 gm are approximately 20 times more likely to die than heavier babies. LBW is either caused by preterm birth or intrauterine growth restriction (IUGR).[8] The baby born before 37 weeks of gestation called as preterm, otherwise remaining one are small for gestational age (SGA) due to intrauterine growth retardation (IUGR). A weight below 10th percentile of expected weight for population suggests IUGR.[9] In the developed countries, predominant cause of LBW is preterm birth whereas in most developing countries it is IUGR.[10] LBW increases the morbidity and mortality in newborns and largely contributed to high neonatal mortality rates (NMR).[10,11] The incidence of LBW is about 16.5% (ranges from 5 to 33%) in developing countries of which is more than double rate in developed regions that is about 7%.[12] In developing countries it may be difficult to determine actual incidence where health care is inaccessible and newborns are not routinely weighed.[13,14] Half of all perinatal and one third of all infant deaths are directly or indirectly related to LBW.[15] Though major and primary determinant of birth weight is gestational age there are other secondary factors directly or indirectly have effect on determining the weight of a baby at birth.[16,17] These are maternal weight gain, maternal age, pre-pregnancy weight, maternal height, parity, marital status, placental malfunction, smoking, heredity, and gender of baby, working hours, and various socio-economic factors.[8,18,19] In developing countries, racial origin, nutrition, low pre-pregnancy weight, short maternal stature, and maternal age, low socio-economic status and inadequate antenatal care also considered as determinants of LBW.[20,21] Several studies in developing countries have reported different maternal risk factors such as primiparity, maternal hypertension, antepartum haemorrhage, preterm rupture of fetal membranes and anaemia in pregnancy, short inter-pregnancy interval and maternal malnutrition. Appropriate interventions will be helpful to reduce incidence of LBW deliveries and improve neonatal survival outcomes.[21] Death and disability among women of reproductive age in developing countries due to complications of pregnancy and childbirth are accounting for at least 18% of the global burden of disease.[22] The third trimester of pregnancy is a crucial phase for baby's weight gain where certain obstetric and medical problems can develop. Common complications that may affect during 3rd trimester are pregnancy-induced hypertension, gestational diabetes, anaemia, placental malposition, preterm labour, premature rupture of membrane, and so forth.[23] It reported that preterm birth causes about 70-80% of all neonatal mortality and morbidity.[24] Infants born to women with complications in pregnancy are at increased risk for adverse birth outcomes.[25,2] In Bangladesh, researchers have established a relationship between LBW children and mother's nutrition, teenage pregnancy, poor antenatal care, mother's education, maternal age, gestational age, interval between pregnancies, parents' educational status, parity, violence during pregnancy, lack of antenatal care and socio-economic status.[27-29]

Evidence highlighting determinants of LBW in children have been discussed above, but most of the studies were conducted in specific settings such as community or rural based with small study population. Moreover, the major determinants of LBW across a country may not have been taken into account in some of these studies. As children are considered as the future builders and developers of a particular country due to their unique role in the future of the nation special attention should be paid to children's health. So, it is important to investigate the relationship between the LBW in children and gestational complications in order to ensure remedial measures are undertaken. Therefore, this study was designed to determine the maternal risk factors and to assess the association between LBW and gestational complications.

METHODS

Study conducted from January to March, 2018 at Mohammadpur fertility services and training centre, 100 bedded Mother and child health hospital in Dhaka city. This was an analytical cross sectional study performed on 400 woman of reproductive ages between 18-49 years who gave live birth at least 28 weeks of gestation at the hospital.

Current study was based on primary data (e.g., structured questionnaire- participants and medical documents). A structured questionnaire was used as a data collection tool in study. To ensure adequacy, appropriateness and quality of questionnaire pre-testing was done. After taking written informed consent, data was collected through questionnaire and reviewing medical documents.

Data management and analysis

The information collected in the questionnaires was reviewed and inconsistencies was investigated and clarified. After editing and coding, test results and data was entered in R software. Statistical analysis was made and $p<0.05$ was considered as significant and value <0.001 as highly significant. The descriptive statistics was measured and appropriate statistical tests were used.

Descriptive statistics (frequency, mean, standard deviation) will be used to describe variables, inferential statistics- Chi-square analysis, Odds ratio and multivariate logistic regression, stepwise regression.

RESULTS

Descriptive statistics

The data comprised of 400 women aged 18-40 years who delivered a child with mean age of 23.09 years. Out of total 400 live births, 114 (28.5%) were babies were born with

LBW and among them 36 (19.05%) were boys and 78 (36.97%) were girls.

Table-I shows distribution of sociodemographic characteristics across LBW and Normal birth weight (NBW) babies. There was no statistical difference between LBW and NBW in terms of maternal education, mother's occupation. However, sex of birth (Girl or boy) and household monthly income (<20000, 20000-30000, ≥30000) were significantly different (p≤0.001 and 0.004, respectively) between LBW and NBW babies.

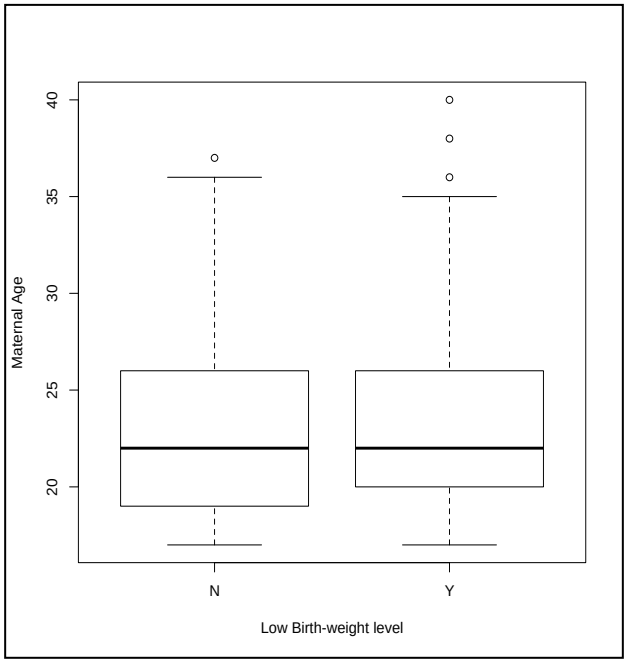

Figure 1: Maternal age among mothers of NBW and LBW.

The boxplot (Figure 1) represents the age of mothers of NBW and LBW babies. 2 boxes are overlapping one another and comparing the median of NBW and LBW groups, it lies in the same plane. So, there is no difference between the 2 groups. Interquartile range and variability of data was almost same, slightly more in NBW group than LBW group.

Inferential statistics

Table 2 shows distribution of maternal and obstetric characteristics across LBW and NBW babies. There was a significant difference between mothers with LBW and NBW babies in terms of preterm birth (p=0.005), duration of sleep hours (p=0.005) and mode of delivery (p=0.015).

Table 3 shows distribution of maternal complications across LBW and NBW babies. There was a significant difference in terms of PROM (p≤0.001), preterm labour (p=0.019), and overall maternal complications (p=0.004). No significant difference was observed in terms of anaemia, GDM, gestational HTN, antepartum haemorrhage and history of abortion/stillbirth.

Relationship between covariates and LBW

Table 4 shows determinants of LBW based on multivariable logistic regression analysis. Sex of birth (Girl versus boy, adj. OR 2.92; 95% CI 1.79-4.86), family income (≥30000 versus <20000; adj. OR 0.41; 95% CI 0.17-0.94), (20000-30000 versus <20000; adj. OR 0.40; 95% CI 0.21-0.76), duration of sleep hours (≥6 versus<6; adj. OR 0.52; 95% CI 0.31-0.85) were significantly associated with LBW.

Table 5 shows determinants of LBW based on stepwise regression analysis. Sex of birth (Girl versus boy, adj. OR 2.91;95% CI 1.80-4.78), family income (≥30000 versus <20000; adj. OR 0.37; 95% CI 10.19-0.72), (20000-30000 versus <20000; adj. OR 0.38; 95% CI 0.20-0.69), duration of sleep hours (≥6 versus<6; adj. OR 0.51; 95% CI 0.31-0.82), mode of delivery (NVD versus caesarian; adj. OR 0.65; 95% CI 0.36-1.15) and overall maternal complications (Adj. OR 1.71; 95% CI 1.04-2.83) were significantly associated with LBW.

Table 1: Sociodemographic characteristics among mothers of NBW and LBW (unadjusted analysis).

Variables	Categories	LBW, n (%)		χ^2	P value
		No (286)	Yes (114)		
Sex of birth	Boy	153 (80.95)	36 (19.05)	14.84	<0.001
	Girl	133 (63.03)	78 (36.97)		
Educational level	Higher-secondary and above	120 (75.47)	39 (24.53)	4.59	0.10
	Illiterate	75 (64.10)	42 (35.90)		
	Primary/ secondary	91 (73.39)	33 (26.61)		
Occupation	Housewife	206 (70.79)	85 (29.21)	0.54	0.76
	Students	34 (70.83)	14 (24.17)		
	Working	46 (75.41)	15 (24.59)		
Family income (INR)	<20000	42 (56)	33 (44)	10.89	0.004
	≥30000	89 (74.79)	30 (25.21)		
	20000-30000	155 (75.24)	51 (24.76)		

Table 2: Maternal characteristics among mothers of NBW and LBW (unadjusted analysis).

Variables	Categories	LBW, n (%)		χ^2	P value
		No (286)	Yes (114)		
Number of ANC visits	Inadequate	27 (60)	18 (40)	2.68	0.10
	Adequate	259 (72.96)	96 (27.04)		
Preterm birth	No	266 (73.68)	95 (26.32)	7.60	0.005
	Yes	20 (51.28)	19 (48.72)		
Parity	≥3	41 (68.33)	19 (31.67)	1.87	0.39
	1	158 (69.91)	68 (30.09)		
	2	87 (76.32)	27 (23.68)		
Duration of sleep hours	<6	143 (65.60)	75 (34.40)	7.57	0.005
	≥6	143 (78.57)	39 (21.43)		
Tea consumption/ day habit	Irregular	75 (65.22)	40 (34.78)	2.70	0.09
	Regular	211 (74.04)	74 (25.96)		
Mode of delivery	Caesarian	183 (67.53)	88 (32.47)	5.92	0.015
	NVD	103 (79.84)	26 (20.16)		

Table 3: Gestational complication characteristics among mothers of NBW and LBW (unadjusted analysis).

Variables	Categories	LBW, n (%)		χ^2	P value
		No (286)	Yes (114)		
Anaemia	No	274 (72.30)	105 (27.70)	1.56	0.21
	Yes	12 (57.14)	9 (42.86)		
Gestational DM	No	271 (71.88)	106 (28.12)	0.20	0.65
	Yes	15 (65.22)	8 (34.78)		
Gestational hypertension	No	248 (72.94)	92 (27.06)	1.86	0.17
	Yes	38 (63.33)	22 (36.67)		
Antepartum haemorrhage	No	256 (73.14)	94 (26.86)	3.09	0.07
	Yes	30 (60)	20 (40)		
Premature rupture of membrane	No	261 (74.57)	89 (25.43)	11.78	<0.001
	Yes	25 (50)	25 (50)		
Preterm labour	No	278 (72.77)	104 (22.23)	5.45	0.019
	Yes	8 (44.44)	10 (55.56)		
History of abortion/ stillbirth	No	227 (70.94)	93 (29.06)	0.13	0.71
	Yes	59 (73.75)	21 (26.25)		
Overall maternal complications	No	196 (76.56)	60 (23.44)	8.27	0.004
	Yes	90 (62.5)	54 (37.5)		

Table 4: Adjusted relationship between covariates and LBW that is analyzed using multivariate logistic regression.

Variables	References	Estimate	OR	CI	P value
Sex of birth-Girl	Boy	1.06	2.92	1.79-4.86	<0.001
Educational level					
Illiterate	Higher-secondary and above	0.33	1.39	0.66-2.94	0.37
Primary/secondary	Higher-secondary and above	-0.02	0.97	0.48-1.97	0.94
Occupation					
Students	Housewife	0.13	1.14	0.49-2.60	0.74
Working	Housewife	0.21	1.23	0.51-2.96	0.63
Family income (INR)					
-≥30000	<20000	-0.88	0.41	0.17-0.94	0.03
20000-30000	<20000	-0.91	0.40	0.21-0.76	0.005
Number of ANC visits- ≥4	<4	-0.19	0.82	0.39-1.77	0.61
Preterm baby-Yes	No	0.44	1.56	0.39-1.77	0.26
Parity					
1	≥3	-0.06	0.93	0.45-1.95	0.85
2	≥3	-0.45	0.63	0.28-1.40	0.25
Duration of sleep hours- ≥6	<6	-0.64	0.52	0.31-0.85	0.01

Continued.

Variables	References	Estimate	OR	CI	P value
Tea consumption day habit-Yes	No	-0.16	0.84	0.49-1.46	0.55
Mode of delivery-NVD	Caesarian	-0.42	0.65	0.36-1.15	0.14
History of abortion/stillbirth-Yes	No	-0.23	0.79	0.41-1.47	0.47
Overall maternal complications-Yes	No	0.44	1.56	0.89-2.73	0.11

Table 5: Adjusted relationship between covariates and LBW that is analyzed using stepwise regression.

Variables	References	Estimate	OR	CI	P value
Sex of birth-girl	Boy	1.06	2.91	1.80-4.78	<0.001
Family income (INR)					
≥30000	<20000	-0.98	0.37	0.19-0.72	0.003
20000-30000	<20000	-0.96	0.38	0.20-0.69	0.001
Duration of sleep hours-≥6	<6	-0.66	0.51	0.31-0.82	0.005
Mode of delivery- NVD	Caesarian	-0.49	0.61	0.34-1.05	0.083
Maternal complications-Yes	No	0.54	1.71	1.04-2.83	0.03

DISCUSSION

This study assessed the potential maternal complications that affected the mother during pregnancy period and its effect on neonatal birth weight. It is important to identify the risk factors early in the prenatal period so that appropriate interventions are established to ensure the well-being of the mother and child. In present study, out of total 400 live births, 114 (28.5%) were babies were born with LBW. The prevalence was similar to the UNICEF report in which the prevalence of LBW children is 22% in Bangladesh in 2015.[2] A study in a hospital of Dhaka showed almost the similar magnitude (21.29%) of LBW.[30] Gender wise, 36 (19.05%) boy and 78 (36.97%) girl babies were LBW respectively and the association between birth weight and sex of the babies was found statistically significant (p≤0.001) in the study. The girl babies are 2.91 times more likely to be LBW than boy babies. Kumar et al and Bugssa et al reported the similar significant association where higher proportion of LBW girl babies than boy babies.[31,32] In the current study, the proportion of LBW was 25.21% in mothers whose income was >30000 taka while proportion of LBW was 24.76% in whose family income was between 20000-30000 taka but highest proportion of LBW was 44% reported in mothers having income level less than 20000 takas. The association between family income and LBW was statistically significant (p=0.004). The mothers having >30000 and between 20000-30000 family income are 63% and 62% less likely to be LBW respectively (OR=0.37 and OR=0.38) than less than 20000 income families. These findings are consistent with those of some previous studies where low monthly family income were significantly associated with LBW babies.[30,33] The present study also observed an increased proportion (34.40%) of LBW among mothers with less than 6 hours of sleep-in comparison to mothers having LBW (21.43%) who used to sleep more than 6 hours. The mothers who slept >6 hours are 49% less likely to develop LBW (OR=0.51) than who slept less than 6 hours. Only a few studies have evaluated maternal sleep with LBW. Compared with women who reported no napping, the multivariate-adjusted ORs for LBW were 0.83 (95% CI 0.58-1.18) and 0.61 (0.44-0.83) for those who reported ≤1 h and >1 h of napping, respectively (p<0.001) in a study by Song et al.[34] However, present study findings are in contrast with another study by Morokuma et al where no significant results were observed for sleep duration. Neither the amount nor the quality of mothers' sleep was associated with the risk of LBW.[35] The present study revealed that babies born by NVD are 39% less likely to be LBW compared to babies born by caesarian section. The results were comparable to studies where delivery using lower segment caesarian section was found to have more risk in developing LBW compared to infants delivered via vaginal delivery. However, this association should be interpreted with caution as most of the mother needs to deliver by LSCS were complicated cases. They may need to undergone emergency LSCS due to threatened maternal condition but still in premature gestation such as severe pre-eclampsia, eclampsia and bleeding placenta praevia.[36,37]

In the present study, preterm labour and PROM were significantly associated with LBW (p=0.019 and p≤0.001 respectively). Mishra and Joshi, and Feresu et al observed similar findings.[38,39] Overall maternal complications were significantly associated with LBW (p=0.03) in the present study. Mothers with maternal complications were 1.71 times more likely to deliver LBW than the mothers who do not have maternal complications. These findings are consistent with a previous study where mothers with pregnancy complication have a chance to give LBW infant by 1.31 than those who did not experience complication (adjusted odds ratio 1.731, 95% CI 1.473-1.948. p=0.000).[40] Joshi et al also observed in a study where the association between maternal complication during present pregnancy and LBW was found to be statistically significant (Z=4.22, p<0.001).[41] This study highlighted the common gestational complications, socio-demographic

factors and maternal factors which are associated with LBW. It identified some critical information for Government concerning organization for understanding on the current situation about LBW and its preventive practices.

Limitations

A convenient sampling was used to choose the participants, which limits the generalizability of these results.

CONCLUSION

This finding of this study depicted that LBW is still a public health problem in the study area. This study revealed some hidden facts and information. In a developing country like ours, occurrence of LBW is still very alarming, although it is preventable. Appropriate measures must be taken to improve this condition. Early identification and prompt treatment for maternal complications and health education during routine antenatal visits will help in substantial reduction of LBW outcome. Efforts should be made to strengthen the health facilities and to impart health and nutrition education by health functionaries to antenatal mothers and early detection high risk pregnancy and timely referred to higher institutions. Thus, the issue of LBW should not be concern of health sectors only but should also be concerned of other social sectors.

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