Original Article

Maternal Health Related Characteristics and Economic Condition as Impacting Factors for the Low Birth Weight of Children in Bangladesh

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Abstract

Background: Low birth weight (LBW) is a leading concern for public health in many developing countries, including Bangladesh. ***Objective:*** To identify the association of mothers' health related characteristics and family economic condition with low birth weight of children in Bangladesh with a countrywide data. ***Methods:*** A total of 2204 child data were used from Bangladesh demographic and health survey (BDHS) 2017. Descriptive analyses were performed for social and demographic characteristics. Logistic regression model was used to present mothers' health related characteristics and family economic condition with low birth weight and results were described in terms of odds ratio (OR) with 95% CI for both adjusted (aOR) and unadjusted (uOR) models. ***Results:*** Odds of having low birthweight is 37% higher (aOR=1.37, 95% CI= 0.75, 2.46) among the unplanned children. Odds of having low birthweight for children is also higher among the children when mother received iron and vitamin supplementation during their childbirth. However, those associations were not statistically significant in both adjusted and unadjusted model. In addition, odds of having low birthweight are higher among the children of that mother who has low BMI. However, this association was also not statistically significant. Prevalence of low birthweight was 21.7% among the children from middle class families, while it was 12.71% in rich families. The difference was statistically significant. Odds of having low birthweight in children is less among the poorer is 41% less (aOR= 0.59, 95% CI= 0.37, 0.95) and among the richest is 48% less (aOR= 0.52, 95% CI= 0.31, 0.89) as compared to the children from poorest economic status. All of those associations in adjusted and unadjusted model were significant (P<0.05) for poorer and richest family. Prevalence of low birthweight is 21.26% vs 14.11% among the unwanted and wanted children in the rural area and this difference is statistically significant. ***Conclusion:*** The prevalence of low birthweight among children is high in the poor community in comparison to rich families in Bangladesh. Unplanned children are at risk of having low birth weight in comparison to planned pregnancy. Special antenatal care should be given to mothers who have low-economic status.

Keywords: Low birth weight, family socioeconomic condition, maternal health, Bangladesh

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Introduction

Low birth weight is one of the primary causes of child mortality and several diseases of future life in developing countries, especially in Southern Asia. Low birth weight (LBW) is a leading concern for public health in many developing countries, including Bangladesh.[1] According to the World Health Organization (WHO), low birth

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weight babies are those who are born weighing less than 2500g.[2] Global estimates show that in 2012, approximately 15 million premature babies and more than 20 million LBW infants were born. An estimated 15% to 20% of all births worldwide are LBW, and the highest prevalence is observed in South Asian countries, where it is around 28%.[2]

Previous research findings from developed and developing regions suggest that potential risk factors for LBW include a history of premature delivery,[3] maternal younger age (34 years) at childbirth, insufficient prenatal care,[3, 4] underweight mother, shorter birth interval,[5] hard work and low nutritious food consumption during pregnancy, antepartum haemorrhage and anaemia,[6] hypertension disorder and diabetes during pregnancy.[7] Various sociodemographic factors affecting mothers such as living in rural territories, illiteracy, poor economic status and victims of any kind of intimate partner violence (IPV) either physical, sexual or mental[8] are also significantly associated with risk factors for LBW. A study, based on BDHS 2017–18, revealed that singleton infants with LBW were more concentrated among mothers living in the poorest socioeconomic quintile in Bangladesh[9]. Socioeconomic factors such as wealth index, education, family income, occupation, and family size are prominent determinants of LBW.[10,11] Pregnant women who live in the poor households may have less access to health care services, and greater food and nutritional insecurity compared to women living in wealthy households, placing them at higher risk for LBW infants.[12,13] Therefore, it is important to further investigate the role of socioeconomic inequality and its associated determinants in Bangladesh. This study is concerned to improve the health and care of newborn babies in Bangladesh by exploring adverse maternal circumstances and assessing whether these are contributing towards low birth weight (LBW) in neonates.[14]

Methods

The study utilized data from the Bangladesh Demographic and Health Survey (BDHS) collected nationally in Bangladesh in 2017-18. Bangladesh Demographic and Health Survey (BDHS) 2017-18 is a vital source of records on Socio-economic status, demographic information, marriage and sexual activity, fertility information, child health and nutrition, contraceptive use, fertility preference and regulation, Women empowerment and health seeking related information. Among the 4 stages of data collection, in the first stage, 600 enumeration areas with 207 enumeration areas in urban areas and 393 in rural areas were selected and made of household list in all the selected EAs. In the second stage, 30 households per cluster were selected with an equal probability of systematic sampling procedure from the newly generated household list. A total of 20,376 ever-married women aged 15-49 were selected and with a 98.4% response rate a total of 20,127 interviews were successfully conducted. Further explanation about sampling design and other related issues of the 2017-18 BDHS are accessible elsewhere.[15] Data scrutinizing, cleaning and inconsistency checking was done through the execution of range and influential/outlier value identification. Different descriptive and analytical statistical analysis mechanisms were executed. Specific analytical and descriptive data have been presented for all independent variables. Logistic regression models were performed to calculate the association between dependent and independent variables. The operated results were presented in terms of odds ratio (OR) with 95% CI for both adjusted (aOR) and unadjusted (uOR) models. Statistical package STATA (version 14) was used to conduct analysis, and results measured as significant for p value <0.05.

Results

Table 1 shows mothers' health related characteristics. Most of the women gave their 1st childbirth before 20 years of age. This prevalence was higher among the rural women (64.29%) compared to the women from urban area (53.3%). Around 86% of the women were given or brought iron tablet during their pregnancy and this prevalence is more in urban area than the rural area. Also, around 51% of the pregnant women were given vitamin A during their pregnancy; the prevalence is almost same in both urban and rural area. The majority of the mothers in this study had normal BMI. 56.03% of the mothers were with normal BMI and the prevalence was higher for the rural women (60.85%) compared to their urban counterparts (49.76%). In both rural and urban areas, most of the decision has been taken by both husband and wife jointly. In 66.15% cases, decision for health care service has been taken by both husband and wife and in 8.03% cases decision taken by the mother alone. There was also a very small difference between urban and rural areas. Table 2 shows that children from comparatively lower economic conditions suffered more from lower birthweight. In the rural area, 21.53% of the

poorest children took birth as a low birthweight baby, whereas 10.78% of the richest children faced the same. However, in the urban area prevalence of low birthweight is higher among the children from middle class families. The prevalence of low birthweight is 21.7% among the children from middle class families, while it was 12.71% among rich families. Also, prevalence of low birthweight was higher among the children from male headed family in the urban (male 14.49% vs female 14.14%) and rural (male 16.11% vs female 10.29%) areas. However, this difference was statistically significant for the rural areas only. Table 3 shows that the economic condition of the family had a strong association with low birthweight of the children. Odds of having low birthweight in children was about 41% less among the poorer class (aOR= 0.59, 95% CI=0.37, 0.95) and 48% less among the richest (aOR= 0.52, 95% CI=0.31, 0.89) compared to the children from poorest economic status. All those associations in adjusted and unadjusted model were significant ($p<0.05$) for poorer and richest family. Odds of low birthweight was less among the children of those mother who are in professional or technical profession compared to the children of those mother who are not involve in any profession or on agricultural activities. Odds of having low birthweight is 42% higher (aOR=1.42, 95% CI=0.75, 2.67) among the children of agricultural worker and 33% higher (aOR=1.33, 95% CI=0.64, 2.75) among the children of worker compared to the odds of having low birthweight among professional or technical worker mother. But none of these associations is statistically significant in both adjusted and unadjusted model, also odds of having low birthweight is associated with father's occupation. But this association is not statistically significant in both adjusted and unadjusted model. Odds of having low birthweight is 37% higher (aOR=1.37, 95% CI= 0.75, 2.46) among the unplanned children. This association was statistically significant for both unadjusted and adjusted model ($p<0.05$). Odds of having low birthweight for children is also higher among the children when mother received IFA and vitamin supplementation during their childbirth. However, none of those associations were statistically significant in both adjusted and unadjusted model. In addition, odds of having low birthweight are higher among the children of that mother who has low BMI. However, the association was also not statistically significant.

Table 1: Sociodemographic characteristics of the participants

Variables	Urban N (%)	Rural N (%)	Total N (%)
Birthweight			
Normal Birthweight	817 (85.55)	1058 (84.71)	1875 (85.07)
Low Birthweight	138 (14.45)	191 (15.29)	329 (14.93)
Mothers' health related characteristics			
Age of first childbirth			
Less than 20 Years	509 (53.3)	803 (64.29)	1312 (59.53)
20-29 years	425 (44.5)	436 (34.91)	861 (39.07)
30 and above	21 (2.2)	10 (0.8)	31 (1.41)
Read Newspaper			
No	718 (75.18)	1092 (87.43)	1810 (82.12)
Yes	237 (24.82)	157 (12.57)	394 (17.88)
Wanted Last Child			
Yes	765 (80.1)	1042 (83.43)	1807 (81.99)
No	190 (19.9)	207 (16.57)	397 (18.01)
During pregnancy, given or bought iron tablets/ syrup			
No	111 (11.62)	202 (16.17)	313 (14.2)
Yes	844 (88.38)	1047 (83.83)	1891 (85.8)
Mother received vitamin A			
No	437 (45.76)	646 (51.72)	1083 (49.14)
Yes	518 (54.24)	603 (48.28)	1121 (50.86)
Mothers BMI			
Low BMI (<18.5)	100 (10.47)	174 (13.93)	274 (12.43)
Normal BMI (18.5 to <25)	475 (49.74)	760 (60.85)	1235 (56.03)
High BMI (25 and above)	380 (39.79)	315 (25.22)	695 (31.53)
Decision Making for health care			
Mother alone	78 (8.17)	99 (7.93)	177 (8.03)
Combined with partner	662 (69.32)	796 (63.73)	1458 (66.15)
Decision taken by other	215 (22.51)	354 (28.34)	569 (25.82)

Table 2: Prevalence of low birthweight based on mothers' health characteristics and economic condition of the family

Variables	Urban			Rural		
	Birth weight		p value	Birth weight		p value
	Normal	Low		Normal	Low	
Economic Condition						
Poorest	28 (87.5)	4 (12.5)	0.012	164 (78.47)	45 (21.53)	0.021
Poorer	51 (96.23)	2 (3.77)		221 (85)	39 (15)	
Middle	83 (78.3)	23 (21.7)		242 (83.16)	49 (16.84)	
Richer	195 (82.28)	42 (17.72)		249 (87.37)	36 (12.63)	
Richest	460 (87.29)	67 (12.71)		182 (89.22)	22 (10.78)	
Mother's health related characteristics						
Age of first childbirth						
<20 Years	429 (84.28)	80 (15.72)	0.442	683 (85.06)	120 (14.94)	0.843
20-29 years	369 (86.82)	56 (13.18)		367 (84.17)	69 (15.83)	
30 and above	19 (90.48)	2 (9.52)		8 (80)	2 (20)	
Planned pregnancy						
Yes	655 (85.62)	110 (14.38)	0.9	895 (85.89)	147 (14.11)	0.009
No	162 (85.26)	28 (14.74)		163 (78.74)	44 (21.26)	
Mother received iron tablets/syrup						
No	92 (82.88)	19 (17.12)	0.395	165 (81.68)	37 (18.32)	0.192
Yes	725 (85.9)	119 (14.1)		893 (85.29)	154 (14.71)	
Mother received vitamin A						
No	367 (83.98)	70 (16.02)	0.206	541 (83.75)	105 (16.25)	0.382
Yes	450 (86.87)	68 (13.13)		517 (85.74)	86 (14.26)	
Mother's BMI						
Low BMI (<18.5)	84 (84)	16 (16)	0.639	147 (84.48)	27 (15.52)	0.977
Normal BMI (18.5 to <25)	403 (84.84)	72 (15.16)		643 (84.61)	117 (15.39)	
High BMI (25 and above)	330 (86.84)	50 (13.16)		268 (85.08)	47 (14.92)	
Decision making in mother's healthcare						
Mother alone	63 (80.77)	15 (19.23)	0.419	82 (82.83)	17 (17.17)	0.542
Combined with partner	571 (86.25)	91 (13.75)		681 (85.55)	115 (14.45)	
Decision taken by other	183 (85.12)	32 (14.88)		295 (83.33)	59 (16.67)	

Table 3: Logistic regression of low birthweight

Variables	uOR (95% CI)	p value	aOR (95% CI)	p value
Economic condition (ref: Poorest)				
Poorer	0.59 (0.38, 0.93)	0.023	0.59 (0.37, 0.95)	0.029
Middle	0.87 (0.58, 1.3)	0.493	0.85 (0.54, 1.32)	0.468
Richer	0.69 (0.46, 1.02)	0.064	0.64 (0.4, 1.02)	0.061
Richest	0.54 (0.37, 0.8)	0.002	0.52 (0.31, 0.89)	0.016
Mothers' health characteristics				
Age of first childbirth (ref: <20 years)				
20-29 years	0.94 (0.74, 1.2)	0.643	1.14 (0.87, 1.5)	0.338
30 and above	0.82 (0.29, 2.38)	0.72	1.26 (0.41, 3.87)	0.685
Planned pregnancy				
No	1.34 (1, 1.78)	0.048	1.37 (1.02, 1.85)	0.039
Mother received iron tablets/syrup (ref: No)				
Yes	0.77 (0.56, 1.06)	0.113	0.88 (0.63, 1.22)	0.434
Mother received vitamin A (ref: Yes)				
No	1.21 (0.96, 1.53)	0.111	1.18 (0.92, 1.50)	0.188
Mothers BMI (ref: Normal BMI)				
Low BMI (<18.5)	1.03 (0.72, 1.48)	0.871	0.94 (0.64, 1.36)	0.755
High BMI (>25)	0.90 (0.69, 1.17)	0.424	0.97 (0.73, 1.28)	0.848
Decision Making for health care (ref: Mother alone)				
Combined with partner	0.75 (0.49, 1.12)	0.161	0.72 (0.47, 1.1)	0.13
Decision taken by other	0.86 (0.55, 1.34)	0.514	0.82 (0.51, 1.29)	0.386

Discussion

In our study, we found an association of economic status with low birthweight. It is 21.7% among the children from middle class families, while it is 12.71% among rich families. Studies on socioeconomic status showed that the higher the socioeconomic status the lower the risk of LBW.[10,11,12,13] Khan et al. observed socioeconomic inequalities in low birth weight.[16] Prevalence of low birthweight is 21.26% vs 14.11% among the unwanted and wanted children in the rural area and this difference is statistically significant. The economic condition of the family has a strong association with low birthweight of the children. Odds of having low birthweight in children is less among the poorer is 41% less (aOR= 0.59, 95% CI= 0.37, 0.95) and among the richest is 48% less (aOR= 0.52, 95% CI= 0.31, 0.89) compared to the children from poorest economic status. All the association in adjusted and unadjusted model is significant ($p<0.05$) for poorer and richest family. Odds of having low birthweight is 37% higher (aOR=1.37, 95% CI= 0.75, 2.46) among the unplanned children.

Some previous studies also found a positive association of low birthweight with child's nutritional status.[17] Our study results aligned with BDHS report shows that most prevalent low birthweight district also has the higher prevalence of poor nutritional outcome of children. Also, previous studied have identified child birthweight as a major determinants of child undernutrition in Bangladesh.[18] Study shows that child born with low birthweight has 47% higher risk of being underweight in later age. These results indicate that baby who born as an underweight child have a tendency of being underweight in their early childhood.[19-21] Previous studies in Bangladesh and Ghana indicated that mothers aged below 20 years had significantly greater chances of delivering

LBW babies than the age group above 20 years.[22,23] Also Vahdaninia et al. found strong association between maternal age and birth weight.[24] However, in BDHS data was not available for mother age of the respective childbirth. In our study, we also found reverse findings with mother's age of first childbirth and children LBW status. Mothers who give their first childbirth after their 20 years of age are more likely to have LBW child.

Family income and economic status is another determinant of LBW. Previous study has mentioned that women from poorer economic condition gives birth of more LBW child compared to the women from middle or rich economic condition.[22] Our study result also identified that risk of LBW is lower among the child from richer and richest family compare to the children from poorer and poorest family. The findings show a strong association between birth weight and socioeconomic status which is consistent with This shows that poverty is an important determinant of birth weight as shown in other contexts.[25] Low birth weight could be due to poor maternal nutritional intake among mothers with lower socioeconomic status as found in other studies.[26,27]

A study found a significant association between ANC and low birth weight, with mothers who had access to ANC during pregnancy having significantly lower risk of bearing a LBW child.[28] Previous study indicates that women, who received proper antenatal care service, consumed IFA and vitamin properly during their pregnancy, risk of low birthweight is less among the children of those mothers.[29-31] In our study, we also found that women who received IFA and vitamin A supplementation during their pregnancy, odds of low birthweight are less among their children. Number of childbirths, age of childbirth plays an important role in low birthweight among the children. ANC services generally provide regular monitoring of height-weight gain, diagnosing maternal or fetal problems and thus allowing early intervention and nutritional supplementation which may reduce adverse pregnancy outcomes including LBW.[28] Nutritional supplement programs by non-government organizations may arrest or reverse otherwise likely low birth weight outcomes.

However, in our study we also found that women who received IFA and vitamin A supplementation during their pregnancy, odds of low birthweight are less among their children. However, this association is not statistically significant. Previous study also mentioned that LBW was lower among the women who received ANC assistance from doctor/nurse/midwife/auxiliary midwife.[28] The mediating variable may again be poverty. The quality of care received may be determined by the ability to pay or location in a region with more advanced health infrastructure. Optimum utilization of ANC services should be further investigated to understand barriers as well as opportunities to improve services at the community level.

In our study, we found that children who were born unplanned – odds of low birthweight are higher among those children. Besides, a mother's nutritional status is a potential factor behind low birthweight of the children. Another study has indicated that women with low nutritional status gives birth of malnourished child.[32] Our study findings are also found the same result. Odds of having low birthweight are higher among the children when mothers have low BMI. Low birth weight was associated with maternal factors like maternal age of <20 years at birth (adjusted OR vs. 20-29 years: 1.40, 95% CI 1.09-1.78), and maternal undernutrition (adjusted OR 1.33, 95% CI 1.05-1.69) among boys while only the association with maternal undernutrition was significant among girls. The association for no antenatal care was related to low socioeconomic status of the mother.

The limitation of our study includes the main exposure variable which is low birthweight (LBW). Since the BDHS 2017 collected information retrospectively, and actual birth weight measurements were unavailable, LBW was defined based on mother's perception of the size of child at birth. Underreporting is therefore expected since most mothers would be able to recall whether the baby was underweight, unless the baby was very small in size (i.e., <2500gm). Thus, the prevalence of LBW was found to be 14.93% in our study, which is much lower than 23% obtained by recent National Low Birth Weight Survey which measured LBW from actual birth weights.

Conclusion

To conclude, the prevalence of LBW is still high among the children in Bangladesh. The risk of being LBW is higher among the children whose parents are less educated. Nevertheless, the burden of LBW is still high among the children from poorer economic quartile and children who were out of unplanned pregnancies. The existence of LBW may lead to adverse clinical consequences in later stage of life as well as to an unfavorable growth of the future generation. Our results emphasize the necessity of effective public health approaches to address the issue of maternal antenatal care in Bangladesh.

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References

1. Islam Pollob SMA, Abedin MM, Islam MT, Islam MM, Maniruzzaman M. Predicting risks of low birth weight in Bangladesh with machine learning. PLoS One. 2022;17(5):e0267190.
2. World Health Organization (WHO). Global nutrition targets 2025: low birth weight policy brief. Geneva: WHO. 2014.
3. Sharma SR, Giri S, Timalsina U, Bhandari SS, Basyal B, Wagle K, Shrestha L. Low birth weight at term and its determinants in a tertiary hospital of Nepal: a case-control study. PLoS One. 2015;10(4):e0123962.
4. Mahumud RA, Sultana M, Sarker AR. Distribution and determinants of low birth weight in developing countries. J Prev Med Public Health. 2017;50:18-28.
5. Silveira MF, Victora CG, Horta BL, da Silva BGC, Matijasevich A, Barros FC, et al. Low birthweight and preterm birth: trends and inequalities in four population-based birth cohorts in Pelotas, Brazil, 1982-2015. Int J Epidemiol. 2019;48(Suppl 1):i46-i53.
6. Feresu SA, Harlow SD, Woelk GB. Risk Factors for Low Birthweight in Zimbabwean Women: A Secondary Data Analysis. PLoS One. 2015;10(6):e0129705.
7. Rao J, Fan D, Wu S, Lin D, Zhang H, Ye S, et al. Trend and risk factors of low birth weight and macrosomia in south China, 2005-2017: a retrospective observational study. Sci Rep. 2018;8(1):3393.
8. Ferdos J, Rahman MM. Maternal experience of intimate partner violence and low birth weight of children: A hospital-based study in Bangladesh. PLoS One. 2017;12(10):e0187138.
9. Alam MJ, Islam MM, Maniruzzaman M, Ahmed NAMF, Tawabunnahar M, Rahman MJ, et al. Socioeconomic inequality in the prevalence of low birth weight and its associated determinants in Bangladesh. PLoS One. 2022;17(10):e0276718.
10. Asaduzzman M, Saydur MR. Maternal socioeconomic factors affecting birth weight of newborn babies born in Combined Military Hospital Dhaka. Anwer Khan Modern Med Coll J. 2019;10(2):138-42.
11. Mahmoodi Z, Karimlou M, Sajjadi H, Dejman M, Vameghi M, Dolatian M. Working conditions, socioeconomic factors and low birth weight: path analysis. Iran Red Crescent Med J. 2013;15(9):836-42.
12. Choudhury N, Ahmed SM. Maternal care practices among the ultra poor households in rural Bangladesh:

a qualitative exploratory study. BMC Pregnancy Childbirth. 2011;11:15.

13. Ali N, Sultana M, Sheikh N, Akram R, Mahumud RA, Asaduzzaman M, et al. Predictors of Optimal Antenatal Care Service Utilization Among Adolescents and Adult Women in Bangladesh. Health Serv Res Manag Epidemiol. 2018;5:2333392818781729.
14. Khan MMA, Mustagir MG, Islam MR, Kaikobad MS, Khan HT. Exploring the association between adverse maternal circumstances and low birth weight in neonates: a nationwide population-based study in Bangladesh. BMJ Open. 2020;10(10):e036162.
15. National Institute of Population Research and Training (NIPORT). Bangladesh Demographic and Health Survey 2017-18. In. Dhaka, Bangladesh, and Rockville, Maryland: NIPORT & ICF; 2020.
16. Khan MW, Arbab M, Murad M, Khan MB, Abdullah S. Study of factors affecting and causing low birth weight. J Sci Res. 2014;6(2):387-94.
17. Rahman A, Chowdhury S. Determinants of chronic malnutrition among preschool children in Bangladesh. J Biosoc Sci. 2007;39(2):161-73.
18. Rahman MS, Howlader T, Masud MS, Rahman ML. Association of low-birth weight with malnutrition in children under five years in Bangladesh: Do mother's education, socio-economic status, and birth interval matter? PLoS One. 2016;11(6):e0157814.
19. Islam MM, Alam M, Tariquzaman M, Kabir MA, Pervin R, Begum M, et al. Predictors of the number of under-five malnourished children in Bangladesh: application of the generalized poisson regression model. BMC Public Health. 2013;13:11.
20. Amsalu S, Tigabu Z. Risk factors for ever acute malnutrition inchildren under the age of five: a case-control study. Ethiopian J Health Dev. 2008;22(1):21-5.
21. Jesmin A, Yamamoto SS, Malik AA, Haque MA. Prevalence and determinants of chronic malnutrition among preschool children: a cross-sectional study in Dhaka City, Bangladesh. J Health Popul Nutr. 2011;29(5):494-9.
22. Manyeh AK, Kukula V, Odonkor G, Ekey RA, Adjei A, Narh-Bana S, et al. Socioeconomic and demographic determinants of birth weight in southern rural Ghana: evidence from Dodowa Health and Demographic Surveillance System. BMC Pregnancy Childbirth. 2016;16(1):160.
23. Ahmed F, Das A, Mostafa M. Association of maternal biological factors with birth weight in Bangladesh. JOPSOM. 1994;13:52-7.
24. Vahdaninia M, Tavafian SS, Montazeri A. Correlates of low birth weight in term pregnancies: a retrospective study from Iran. BMC Pregnancy Childbirth. 2008;8:12.
25. Conley D, Bennett NG. Birth weight and income: interactions across generations. J Health Soc Behav. 2001;42(4):450-65.
26. Shrivastava SR, Shrivastava PS. A longitudinal study of maternal and socioeconomic factors influencing neonatal birth weight in pregnant women attending an urban health center. Saudi J Health Sci. 2013;2(2):87-92.
27. Fosu MO, Abdul-Rahaman I, Yekeen R, Maternal risk factors for low birth weight in a district hospital in Ashanti Region of Ghana. Res Obstet Gynecol. 2013;2(4):48-54.
28. Khan JR, Islam MM, Awan N, Muurlink O. Analysis of low birth weight and its co-variants in Bangladesh based on a sub-sample from nationally representative survey. BMC Pediatr. 2018;18(1):100.
29. Murphy CC, Schei B, Myhr TL, Du Mont J. Abuse: a risk factor for low birth weight? A systematic review and meta-analysis. CMAJ. 2001;164(11):1567-72.
30. Cogswell ME, Parvanta I, Ickes L, Yip R, Brittenham GM. Iron supplementation during pregnancy, anemia, and birth weight: a randomized controlled trial. Am J Clin Nutr. 2003;78(4):773-81.
31. Kyei NN, Chansa C, Gabrysch S. Quality of antenatal care in Zambia: a national assessment. BMC Pregnancy Childbirth. 2012;12:151.
32. Joshi C, Torvaldsen S, Hodgson R, Hayen A. Factors associated with the use and quality of antenatal care in Nepal: a population-based study using the demographic and health survey data. BMC Pregnancy Childbirth. 2014;14:94.