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Determinants of Caesarean Section in Bangladesh: A Multilevel Analysis of BDHS 2017-2018 Data

M. Ershadul Haque*, Sabina Sharmin and Sayema Sharmin

Department of Statistics, University of Dhaka, Dhaka-1000, Bangladesh

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Abstract

In recent years Caesarean Section (C-S)is considered as an important mode of child delivery in lowering mother and infant mortality. However, the unnecessary use of C-S has detrimental impacts on both mothers' and newborns' health. The purpose of this study is to evaluate the prevalence of caesarean delivery and to find out the related factors influencing the rapid rise in C-Sin Bangladesh by considering an appropriate statistical model in line with the data structure. The study is based on the data from the 2017-2018 BDHS which is a nationally representative survey. BDHS is conducted periodically and 2017-2018 is the latest of all the BDHS conducted so far. Information used in the present study was collected from 5230 mothers who provided complete information about all the variables considered in the study. Among the Bangladeshi women, the rate of Caesarean sections (C-S) was reported to be 32.94% which is high in any international standard. Multilevel analysis suggests that the highest education level, current working status, wealth index, media exposure, number of decisions in which women participated, age at birth, BMI, birth order of the index child, number of ANC visits during the period of pregnancy, and childbirth weight have significant influence on whether mothers deliver babies through the C-S. In order to prevent needless caesarean deliveries and safeguard mothers from the consequences, Bangladesh urgently needs caesarean delivery policy guidelines. The study will help the policymaker in taking such initiatives.

Keywords: Caesarean section, Maternal health, Women empowerment, BDHS, Multilevel modeling

I. Introduction

The surgical operation of delivering child, known as Caesarean section (C-S) is typically used when a vaginal delivery is not possible or could endanger the mother, baby, or both[1,2]. Studies have demonstrated how medical technology has influenced childbirth over the past few decades. In this context, Bruekens (2001) contends that excessive medicalization of maternity care has spread globally[3]. According to Johanson et al. (2002), birth has been overly "medicalized", and the increased frequency of unnecessary obstetrical intervention raises questions about the mother's health[4].

The use of C-Ss is rising worldwide, although usage varies greatly within and between nations[5,6]. Over the past two decades, the rate of C-S has nearly doubled in many countries, exceeding the WHO-recommended range of 10-15%[5,7]. According to the most recent trends analysis, between 2000 and 2015, the average worldwide C-S rate grew from 12.1% to 21.1%[8]. The highest C-S rates (44.3%) were found in Latin America and in the Caribbean, followed by North America (32.0%), the Middle East and North Africa (29.6%), East Asia and the Pacific (28.8%), Eastern Europe and Central Asia (27.3%), Western Europe (26.9%), South Asia (18.1%), Eastern and Southern Africa (6.2%), and West and Central Africa (4.1%)[8]. According to the Bangladesh Demographic and Health Survey (BDHS), the percentage of C-S deliveries in Bangladesh has increased from about 3% in 1999–2000 to about 33% in 2017–18[9]. However, no obvious health or other advantages for women and their unborn children have been found to accompany the steady rise in C-S[10]. The research points to the fact that most C-Ss are medically unnecessary and these unnecessary surgeries deprives many mothers and their babies from the benefit of vaginal birth[11,12] such as: a shorter time for women to recover physically and psychologically after giving birth, a higher possibility of successful breastfeeding, a baby's improved immunity, and support for the baby's longer-term growth, health, and development[13,14].

To prevent needless caesarean deliveries and to safeguard the mothers andtheir babies from its adverse consequences, Bangladesh urgently needs caesarean delivery policy guidelines with clinical indications to monitor C-S deliveries in this country[15,16].

The potential reasons for the increased predilection for C-S deliveries are a topic of discussion among social scientists and medical sociologists. Despite the fact that many researchers have identified significant links between numerous socio-economic and demographic factors and the rise of C-Sdeliveries across the world[1,3,15,16,17,18], the social factors that influence the preference for C-S in Bangladesh are yet to fully understood. While some researches are solely concerned with medical explanations[17,19], other studies show that the trend is driven by women's choices[17,18]. It is evident that non-medical factors, in addition to medical ones, frequently influence the decision to perform a caesarean section over normal delivery.

*Author for correspondence. e-mail: ershad_sbi@du.ac.bd

The available evidence on the effects of potential determinants to reduce unnecessary C-Ss is inconclusive and insufficient and more thorough research is required[20]. Moreover, using the BDHS data, the recent studies regarding the determinants of C-S deliveries in Bangladesh did not consider the actual structure of the data, so the clustering effect was ignored. Therefore, it is critical to fill the research gapin analyzing the preference for C-Ss by incorporating proper statistical analysis that is consistent with the data structure to help launch rapid public health initiatives. The current study will thus attempt to determine the socioeconomic factors of C-S deliveries among Bangladeshi women by taking the effects of clustering in the BDHS data into account.

II. Materials and Methods

Data and Study Design

The study analyzed the latest country-wise representative BDHS 2017-18 data. The survey employed a two-stage stratified cluster sampling design where each of the eight administrative divisions was considered as the sampling stratum. The primary sampling units were the enumeration areas (EAs) and households were the secondary sampling units. In the first stage of sampling, a total of 675 EAs were selected using the probability proportional to size (PPS) method, where 250 and 425 EAs were selected from urban and rural regions, respectively. A complete listing of households was then prepared in all the chosen EAs and used as the sampling frame in the second stage. This stage of sampling was then conducted through a systematic sampling design which selected 30 households per EAs on average. Finally, the survey selected 20,250 households in total and 20,100 women of reproductive age group (15-49 years) were interviewed. The information regarding C-Ss that a woman receives during delivery was collected from 5299 women who have children under the age of 5 years. Finally, a sample of 5230 women was included in the analysis, as they provided complete information about all the variables considered in the study. Detailed information about the survey data is available at https://dhsprogram.com/data/available-datasets.cfm.

Variables Included in the Study

To find out the potential determinants of caesarean section in Bangladesh, we considered 5230 ever-married women of reproductive age 15 to 49 years in this study. The Caesarean section among Bangladeshi women was considered as the binary response variable coded as 1 = yes; and 0 = no as the outcome variable.

The study has included a proxy for women's empowerment, namely; "number of decisions in which women participate". Several socio-economic and demographic characteristics of the respondents including division, place of residence, highest educational level, current working status, number of decisions in which women participate, birth order, media exposure, wealth index, mother's age at birth, number of antenatal care (ANC) visits, mother's body mass index (BMI), and child birth weight were considered as the explanatory variables in this study. The media exposure variable is computed by the frequency of listening to the radio, reading newspapers and watching television.

Statistical Analyses

The outcome variable and all the explanatory variables considered in this study are categorical. Therefore, we have computed the percent distribution for the explanatory variables as a measure in the univariate analysis. As both the outcome and the explanatory variables are categorical, to draw inferences about the association between C-S delivery and the explanatory variables, we have performed a chi-squared test of independence as a measure in the bivariate analysis. Finally using BDHS 2017-2018 data, a logistic regression model with random effects has been fitted considering the hierarchical structure of BDHS data in the analysis for determining the potential factors of C-S delivery in Bangladesh.

The Model

We suppose that Y_{ij} denotes the binary response for the jth individual ($i = 1, \ldots, n_i$) in the ith cluster $i = 1, \ldots, K$. The value $Y_{ij} = 1$ indicates that the jth individual in the ith cluster utilized C-S delivery and $Y_{ij} = 0$ otherwise. Given the random effects u_i, the probability of outcome event for the jth individual in the ith cluster $P(Y_{ij} = 1|u_i) = \pi_{ij}$, can be modelled using a logit link function as

$$\text{logit}(\pi_{ij}) = \log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 x_{ij1} + \cdots + \beta_k x_{ijk} + u_i$$

where the random effect term u_i has a normal distribution with mean 0 and variance σ^2.

III. Results

The information on C-S delivery along with other characteristics was collected from a total of 5230 women in this study. Table 1 demonstrated the percent distribution of C-Sdelivery in Bangladesh along with the socio-demographic characteristics of the respondents. According to this study,the maximum number of respondents (65.81%)are found to live in rural areas. Among the divisions, the highest number of respondents (16.79%)were observed to have come from the Chattogram division. A little less than half of the respondents (47.88%) had

completed the secondary education level, which is the highest percentage among the various levels of education. The minimum percentage of respondents (6.46%) were found to have no education. Most of the women (63.10%) were not working at the time of the survey. Almost equal percentages of women have been found in all the three categories of wealth. Of the respondents, about 53.50% were exposed to any of the three media for at least once a week. More than half of the respondents (54.59%) were able to take all the three major decisions regarding themselves. 15.24%, on the other hand, had no role in the decision making process. Majority of the respondents (56.62%) had given birth to their index child at the age of 20–29 years, 14.89% at the age of 30–39 years, and a little more than one-fourth (28.49%) had given birth while they were below 20 years of age. Most of the women (60.44%) were identified as "normal-weighted" at the time survey, whereas 24% were reported to be "Overweight/Obese", and 15.56% as "tooth in". It was found that for the majority of the women, (38.64%) the index children were their first births. For 32.14% of the respondents, the index children were their second births, and for 17%, the index children were their third births. Of all the women, a small proportion (16.54%)received the WHO-recommended 8+ antenatal care services, 34.59% received 4-7 ANC services and about half (48.87%) of them received less than 4 ANC services during the index pregnancy. A higher percentage of women (62.22%) gave birth to babies with low birth weights, whereas only 24.07% gave birth to babies with normal weight. The rest of women gave birth to overweight children. The finding of the study is clearly depicting an increasing demand of C-S delivery (32.94%) among women in Bangladesh.

From Table 2 it was observed that all the explanatory variables that have been considered in this study are significantly associated with C-S delivery at 1% level of significance. Women who live in urban areas had the highest (43.01%) C-S delivery. The rate of C-S delivery was highest in Dhaka and Khulna divisions (about 45%). Sylhet division, on the other hand, showed the lowest rate of C-S delivery among eight divisions (25%). Women's education plays an important role in C-S delivery. It was found that the higher the level of education, the higher is the percentage of C-S. For example, the highest percentage of women (61.50%) reported to have C-S were highly educated. The percentage of C-S, on the contrary, was lowest among women with no education (14.79). Women who were not working at the time of survey showed a higher proportion of C-S deliveries than those who were working. Household wealth plays a vital role in C-S deliveries among women in Bangladesh. Rich women had the highest (54.4%), and poor women had the lowest (15.3%) percentages of C-S. Women exposed to media at least once a week had a higher percentage of C-S deliveries (44.0%).Respondents who played a vitalrole in decision making, had a higher percentage of C-Sbirths (34.4%). Maternal age was found to have a positive association with C-S deliveries. The percentage of C-S deliveries increases as the women's age at childbirth increases. The BMI of women was also found to be a contributory factor in C-S delivery. Overweight/Obese women had the highest (50.8%), and underweight women, on the other hand, had the lowest (22.0%) percentages. Birth order was found to be negatively associated with C-S deliveries. The percentage of C-S deliveries decreases as the birth order increases. In Bangladesh, women receiving more antenatal care visits were found to be more likely to have their babies delivered byC-S. As expected, the childbirth weight was positively associated with C-S deliveries. Women with overweight children were found to have the highest rate of C-S deliveries.

To identify the potential determinants of C-S deliveries, logistic regression analysis with random effects has been carried out. The estimated odds ratios and the p-values obtained from the fitted model were given in Table 3. The following covariates were identified as potential factors of C-S deliveries among Bangladeshi women: highest education level, current working status, wealth index, media exposure, number of decisions in which women participated, age at birth, BMI, birth order of index child, number of ANC visits during the period of pregnancy, and childbirth weight. It was observed that there is a regional variation (variation in divisions) in C-S deliveries. Khulna (OR: 1.44, p-value < 0.10) and Rajshahi (OR=1.45, p-value < 0.05) divisions hada higher likelihood of the event compared to Barisal (reference category). Chottogram division, on the contrary, showed the lowest likelihood of C-S. Rich women (OR: 1.90, p-value < 0.001) were significantly more likely to have C-S deliveries compared to their poor counterparts. The higher-educated women in Bangladesh had a higher likelihood (OR=1.57, p-value < 0.05) of C-S than women with no education. However, working women were associated with a lower likelihood (OR=0.67, p-value < 0.001) of C-S deliveries. The women exposed to media at least once a week had a higher likelihood (OR=1.26, p-value < 0.05) of C-S deliveries than those who were not exposed to any of the media. Women who are empowered, that is, who make all the major decisions in their household, were more likely (OR=1.26, p-value < 0.05) to have had experienced C-S compared to their other counterparts. As expected, the mother's age at birth was highly associated with C-S deliveries in Bangladesh. Women who gave birth at 30+ years had the highest likelihood (OR=2.35, p-value $<$

0.001) of C-S. Women who gave birth at 20-29 years, also had a higher likelihood (OR=1.34, p-value $<$ 0.01) of the event compared to women in the younger age group (20years).

Overweight or obese women were more likely (OR=1.80, p-value $<$ 0.001) to deliver babies byC-S than those who were underweight. Higher-ordered births had a lower likelihood of the event than first-ordered birth. In particular, the odd ratio of C-S deliveries for second, third, and fourth or higher-order births was 0.77 (p-value $<$ 0.05), 00.59 (p-value $<$ 0.001), and 0.34 (p-value $<$ 0.001), respectively, compared to the first-order. Surprisingly, the women who were taking more ANC visits during the pregnancy period had a higher likelihood of delivering babies byC-S. The odds ratio of C-S deliveries for women who had 4-7, and 8+ ANC visits were 1.72 (p-value $<$ 0.001), and 1.85 (p-value $<$ 0.001), respectively, compared to the women who took <4 visits. Women who gave birth to overweight babies had the highest likelihood (OR=8.75, p-value $<$ 0.001) of C-S. Women who gave birth to babies with normal-weight alsohad a higher likelihood (OR=6.45, p-value $<$ 0.001) of C-S than women who gave birth to low-birth-weight babies.

A significant non-zero cluster variance (95% CI: 0.15-0.45) has been found in the data, showing a positive intra-cluster correlation among the observations.

To assess the goodness of fit of the random effect logistic regression model under the current setup with selected covariates, the logistic regression model without considering the cluster level variation (by excluding the random effect) has also been fitted. It was found that the AIC values of the logistic regression model without random effects and the logistic regression model with random effects were 4779.8 and 4758, respectively. It implies that the logistic regression model considering the cluster-level variation provides a better fit.

IV. Discussion and Conclusion

Based on the most recent nationally representative survey conducted by the Bangladesh DHS program (BDHS 2017-2018), the study sought to identify the significant socio-economic and demographic factors of C-S delivery.The BDHS survey employed a two-stage cluster sampling design in each stratum so that the data are inherently hierarchical. It is crucial that any statistical methodology be coherent with the data structure. From reviewing the available literature on C-S deliveries in Bangladesh, it is obvious that no recent studies has been found to consider the hierarchical effects of the BDHS data. The study was therefore conducted to investigate the determinants of C-S deliveries after adjusting for the hierarchical structure (the women are nested with clusters) of the data by incorporating random effects term for clusters in the model.

According to the BDHS, the prevalence of C-S deliveries has increased 10-fold between 1999-2000 and 2017-2018. Moreover, this percentage increased from 23% to 33% between 2014 and 2017-18. The primary cause of the rapid increase in C-S deliveries is facility delivery, which is promoted by policymakers to decrease maternal deaths[16,21,22]. Although facility births have steadily increased over the years, the sharp increase in the C-Ss rate in facilities illustrates the misuse of limited healthcare resources and expenses and poses serious risks on both mothers and new-borns[16,23]. Studies show that two out of every three women in Bangladesh and their unborn children are at risk from the negative consequences of C-Ss[15,23,24]. According to BDHS 2014, approximately 55% of C-S deliveries were decided before the delivery date. This figure has risen to approximately 58% in 2017-2018 (BDHS 2017-18) indicating an increase in the number of intentional caesarean births in Bangladesh over time.

Previous studies have identified a number of medical and non-medical variables that contribute to the rising use of C-S deliveries. Maternal age, obesity, frequent deliveries, diabetes, high blood pressure, pre-eclampsia, delivery-related difficulties, and a lack of ANC are among the medical variables that are linked to greater percentages of C-S deliveries[15,25]. Instead, non-medical reasons such as place of residence, education, improved economic status, the large number of private hospitals and unethical acts of the doctors in these hospitals, preference of patients and changes in cultural and social factors and demand for C-Ss are contributors driving the rise in caesarean births[1,15,16,17,18,25,26].

Using BDHS 2014 data, Rahman, M. M. et al[16] identified that the factors like a mother being older, being obese, residing in urban areas, having first birth, maternal perception of large new born size, husband being a professional, having higher number of antenatal care (ANC) visits, and seeking ANC from private providers were statistically associated with higher rates of C-S delivery. A multilevel analysis conducted by Ahmed, M. S. et al[15] suggests the age of the women, household wealth status, utilization of antenatal care (ANC), and division were significantly associated with Caesarean deliveries in Bangladesh.

Rahman, M. M. et al[16] found women with higher maternal age at birth contain greater odds of Caesarean delivery[16]. A somewhat different result has been observed by Ahmed, M. S. et al[15] is that women belonging to only age group 30-34 have greater odds of C-S[15]. The findings of this study

regarding maternal age at birth are very much in line with the findings from the study of Rahman, M. M., et al.[16].

In this study, we observed that the higher-educated women had a higher likelihood (OR=1.57, p-value $<$ 0.05) of C-S delivery than women with no education; women with middle- (OR: 1.24, p-value $<$ 0.10) and rich-wealth index (OR: 1.90, p-value $<$ 0.001) were more likely to have C-S deliveries than women with poor-wealth index; the odd ratio of C-S deliveries for women who took 4-7, and 8+ ANC visits was 1.72 (p-value $<$ 0.001), and 1.85 (p-value $<$ 0.001), respectively, compared to the women who took <4 visits.Similar results have been observed by Rahman, M. M., et al. (2018)[16] and Ahmed, M. S. et al[15].

Although Rahman, M. M., et al. (2018)[16] have found the working status of women to be statistically insignificant, the current study identified working women as being associated with a lower likelihood (OR=0.67, p-value $<$ 0.001) of C-S deliveries.This may be due to the fact that the proportion of working women has been found to be highest (43.2%) in the no-education group, followed by the primary (42.0%), secondary (35.5%), and higher education (30.5%) groups. Rahman, M. M., et al.[16], and Ahmed, M. S., et al.[15] have considered watching television as a covariate of the model and found it is to be insignificant. However, we have observed that the women exposed to media at least once a week had a higher likelihood (OR=1.26, p-value $<$ 0.05) of C-S deliveries than the unexposed women.

Similar to this study, Rahman, M. M., et al.[16] found the odds ratio of C-S deliveries for second and third or higher-order births to be 0.58 (p-value $<$ 0.01) and 0.48 (p-value $<$0.01), respectively, compared to the first-order; Obese women were more likely (OR=1.63, p-value $<$ 0.01) to deliver babies in a C-S facility than undernourished women; women who gave birth to larger than average-sized babies had the highest likelihood (OR=1.51, p-value $<$ 0.05) of C-S than women who gave birth to smaller than average-sized babies. Although Rahman, M. M., et al.[16] identified place of residence as a significant predictor of C-S, the current study and Ahmed, M. S., et al.[15] did not find any evidence of a significant influence of this factor.

In addition to the available studies conducted using BDHS data regarding the determinants of C-S delivery in Bangladesh, the present study has included a proxy of women's empowerment, which is the "number of decisions in which women participate". Women who are empowered, or who make all the major decisions in their household, were more likely (OR=1.26, p-value $<$ 0.05) to have C-Ss than other women.

The study demonstrated that the prevalence of Caesarean delivery in Bangladesh has been increasing rapidly over the past two decades, and has reached a peak in recent years. The highest education level, current working status, wealth index, media exposure, number of decisions in which women participated, age at birth, BMI, birth order of the index child, number of ANC visits during the period of pregnancy, and childbirth weight were identified as the significant socio-economic and demographic factors of the C-S deliveries in Bangladesh.It is argued in the present study that most of the C-S deliveries are unnecessary and therefore, putting both mother's and children's health at risk. In order to prevent these needless caesarean deliveries and safeguard mothers and children from the adverse consequences, Bangladesh urgently needs caesarean delivery policy guidelines. The study will help the policymaker to take necessary initiatives in this regards.

Table 1. (a) Frequency and percent distribution of various characteristics of caesarean among the reproductive women in Bangladesh

Variables	n	%
Type of place of residence		
Urban	1788	34.19
Rural	3442	65.81
Division		
Barisal	553	10.57
Chittagong	878	16.79
Dhaka	767	14.67
Khulna	534	10.21
Mymensingh	624	11.93
Rajshahi	547	10.46
Rangpur	574	10.98
Sylhet	753	14.40
Highest educational level		
No education	338	6.46
Primary	1453	27.78
Secondary	2504	47.88
Higher	935	17.88
Respondent currently working		
No	3300	63.10
Yes	1930	36.90
Wealth index		
Poor	1744	33.35
Middle	1768	33.80
Rich	1718	32.85
Media exposure		
None	2432	46.50
Accesses any at least once a week	2798	53.50
Number of decisions in which women participate		
None	797	15.24
1-2	1578	30.17
All 3	2855	54.59
Mother's age at birth		
<20	1490	28.49
20-29	2961	56.62
30+	779	14.89
Mother's BMI		
Too thin	814	15.56
Normal	3161	60.44
Overweight/Obese	1255	24.00
Birth order		
One	2021	38.64
Two	1681	32.14
Three	889	17.00
4+	639	12.22

Table 1. (b) Frequency and percent distribution of various characteristics of caesarean among the reproductive women in Bangladesh

Variables	n	%
Number of ANC visits		
<4	2556	48.87
4-7	1809	34.59
8+	865	16.54
Childbirth weight		
Low birth weight	3254	62.22
Normal	1259	24.07
Large (3.5+ kg)	717	13.71
Delivery by caesarean section		
No	3507	67.06
Yes	1723	32.94

Table 2. (a) Frequency and percent (%) distribution of variables by caesarean of respondents and results from bivariate analysis along with the corresponding p-value for the chi-square (χ^2) test

	Delivery by caesarian section n (%)			
	no	**yes**	**Total**	**P-value**
Type of place of residence				
Urban	1019 (56.99)	769 (43.01)	1788 (100)	<0.001
Rural	2488 (72.28)	954 (27.72)	3442 (100)	
Division				
Barisal	404 (73.06)	149 (26.94)	553 (100)	<0.001
Chittagong	636 (72.44)	242 (27.56)	878 (100)	
Dhaka	426 (55.54)	341 (44.46)	767 (100)	
Khulna	297 (55.62)	237 (44.38)	534 (100)	
Mymensingh	450 (72.12)	174 (27.88)	624 (100)	
Rajshahi	338 (61.79)	209 (38.21)	547 (100)	
Rangpur	394 (68.64)	180 (31.36)	574 (100)	
Sylhet	562 (74.63)	191 (25.37)	753 (100)	
Highest educational level				
No education	288 (85.21)	50 (14.79)	338 (100)	<0.001
Primary	1197 (82.38)	256 (17.62)	1453 (100)	
Secondary	1662 (66.37)	842 (33.63)	2504 (100)	
Higher	360 (38.50)	575 (61.50)	935 (100)	
Respondent currently working				
No	2066 (62.61)	1234 (37.39)	3300 (100)	<0.001
Yes	1441 (74.66)	489 (25.34)	1930 (100)	
Wealth index				
Poor	1477 (84.69)	267 (15.31)	1744 (100)	<0.001
Middle	1247 (70.53)	521 (29.47)	1768 (100)	
Rich	783 (45.58)	935 (54.42)	1718 (100)	
Media exposure				
None	1940 (79.77)	492 (20.23)	2432 (100)	<0.001
Accesses any at least once a week	1567 (56.00)	1231 (44.00)	2798 (100)	
Number of decisions in which women participate				
None	571 (71.64)	226 (28.36)	797 (100)	0.005
1-2	1064 (67.43)	514 (32.57)	1578 (100)	
All 3	1872 (65.57)	983 (34.43)	2855 (100)	

Table 2. (b) Frequency and percent (%) distribution of variables by caesarean of respondents and results from bivariate analysis along with the corresponding p-value for the chi-square (χ^2) test

	Delivery by caesarian section n (%)			
	no	**yes**	**Total**	**P-value**
Mother's age at birth				
<20	1050 (70.47)	440 (29.53)	1490 (100)	0.004
20-29	1947 (65.75)	1014 (34.25)	2961 (100)	
30+	510 (65.47)	269 (34.53)	779 (100)	
Mother's BMI				
Too thin	635 (78.01)	179 (21.99)	814 (100)	<0.001
Normal	2254 (71.31)	907 (28.69)	3161 (100)	
Overweight/Obese	618 (49.24)	637 (50.76)	1255 (100)	
Birth order				
One	1205 (59.62)	816 (40.38)	2021 (100)	<0.001
Two	1101 (65.50)	580 (34.50)	1681 (100)	
Three	652 (73.34)	237 (26.66)	889 (100)	
4+	549 (85.92)	90 (14.08)	639 (100)	
Number of ANC visits				
<4	2041 (79.85)	515 (20.15)	2556 (100)	<0.001
4-7	999 (55.22)	810 (44.78)	1809 (100)	
8+	467 (53.99)	398 (46.01)	865 (100)	
Childbirth weight				
Low birth weight	2791 (85.77)	463 (14.23)	3254 (100)	<0.001
Normal	481 (38.20)	778 (61.80)	1259 (100)	
Large (3.5+ kg)	235 (32.78)	482 (67.22)	717 (100)	

Table 3. (a) Socio-demographic and behavioural determinants of caesarean among the reproductive women in Bangladesh along with odds ratio (OR), *p*-value and their confidence intervals (CI) obtained from fitting a mixed logistic regression model

Variable	**OR**	**P-value**	**95% CI of OR**	
			Lower	**Upper**
Type of place of residence				
Urban (ref.)	-	-	-	-
Rural	1.101	0.334	0.906	1.339
Division				
Barisal (ref.)	-	-	-	-
Chittagong	0.825	0.280	0.581	1.170
Dhaka	1.279	0.169	0.901	1.815
Khulna	1.438	0.051	0.998	2.072
Mymensingh	0.941	0.745	0.651	1.360
Rajshahi	1.450	0.047	1.004	2.092
Rangpur	0.827	0.323	0.568	1.205
Sylhet	1.143	0.478	0.790	1.653
Highest educational level				
No education (ref.)	-	-	-	-
Primary	0.809	0.293	0.545	1.201
Secondary	1.048	0.811	0.712	1.544
Higher	1.571	0.036	1.029	2.396
Respondent currently working				
No (ref.)	-	-	-	-
Yes	0.667	<0.001	0.562	0.791
Wealth index				
Poor (ref.)	-	-	-	-
Middle	1.235	0.052	0.998	1.529
Rich	1.897	<0.001	1.470	2.448

Table 3. (b) Socio-demographic and behavioural determinants of caesarean among the reproductive women in Bangladesh along with odds ratio (OR), *p*-value and their confidence intervals (CI) obtained from fitting a mixed logistic regression model

Variable	OR	P-value	95% CI of OR	
			Lower	Upper
Media exposure				
None (ref.)	-	-	-	-
Accesses any at least once a week	1.260	0.010	1.058	1.501
Mother's age at birth				
<20 (ref.)	-	-	-	-
20-29	1.336	0.006	1.085	1.644
30+	2.352	<0.001	1.702	3.252
Mother's BMI				
Too thin (ref.)	-	-	-	-
Normal	1.129	0.298	0.898	1.420
Overweight/Obese	1.800	<0.001	1.385	2.340
Birth order				
One (ref.)	-	-	-	-
Two	0.766	0.010	0.625	0.939
Three	0.588	<0.001	0.449	0.771
4+	0.341	<0.001	0.236	0.491
Number of ANC visits				
<4 (ref.)	-	-	-	-
4-7	1.715	<0.001	1.444	2.038
8+	1.851	<0.001	1.495	2.293
Childbirth weight				
Low birth weight (ref.)	-	-	-	-
Normal	6.447	<0.001	5.399	7.699
Large (3.5+ kg)	8.746	<0.001	7.035	10.873
Variance	0.264	-	0.153	0.453
Constant	0.056	<0.001	0.032	0.098

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