Influencing factors contributing to the rapid rise of cesarean section among the married women in Bangladesh

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RECOMMENDATION

This is to certify that the thesis paper entitled “Influencing factors contributing to the rapid rise of cesarean section and its consequence among the married women in Bangladesh” is an original research work of Md. Atikur Rahman, ID 1931527, Department of Public Health, Independent University Bangladesh, conducted under my supervision.

The undersigned certify that this thesis paper is suitable for submission.

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Abbreviation

IUB - Independent University of Bangladesh

CS - Cesarean section

C-section- Cesarean section

WHO - World Health Organization

ANC - Antenatal Care

BMI - Body mass index

OR - Odds Ratio

AOR – Adjusted Odds Ratio

CI - Confidence Interval

SD- Standard Deviation

BDHS - Bangladesh Demographic and Health Survey

USAID- United States Agency for International Development

DHS -Demographic Health Survey

NGO – Non-Government Organization

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ABSTRACT

Background: Cesarean section delivery rate in Bangladesh has been increased rapidly, from 4% in 2004, 23% in 2014, to 33% in 2017-28. Cesarean sections cause severe complications and carry out undesirable consequences in maternal and child health. Therefore, this study examines the factors responsible for the increased cesarean section rates and how the decision for cesarean sections are made in Bangladesh.

Objectives: Discover the prevalence and influencing factors associated with the increased cesarean section rates in Bangladesh and explore how cesarean section decisions are made and why choosing CS.

Methodology: The study is based on data from the 2017-18 BDHS; this is a nationally representative survey that is collected periodically, and 2017-18 is the latest of the BDHS dataset. Data collected from 4,443 mothers who gave birth in health care facilities in the three years preceding the survey were involved in this study to explore the factors associated with the higher cesarean section rate.

Results: The prevalence of CS delivery among Bangladeshi women was 35.7%. The Chi-square test exposed that all the socio-demographic and socio-economic factors were significantly associated with CS delivery. The median age of the mothers was 24.6 years. Multiple logistic regression analysis revealed that women who gave birth at the age of 30 and over were more likely to have a cesarean delivery than younger ($p<0.00$). Overweight and obese women had a more chance to get CS delivery than underweight women ($p<0.02$). Women exposed to media exposure ($p<0.00$) were more likely to have CS delivery than those who had no exposure to media. CS delivery was less marked among the working women and having three or more children($p<0.00$). It is also noted that women from middle & richest families, with the higher number of ANC visits, delivered in the private facility, were more likely to have CS delivery. During the delivery time, decision-making was taken by the doctor (61.9%) and the mother side (38.1%). In most of the cases (63.0%), doctors took the final decision for cesarean section

Conclusions: The practice of C-sections has increased noticeably in Bangladesh over the survey years. This increasing trend and the risk of having CS vary significantly across divisions and socio-economic statuses. The decision to perform a CS must be chosen and monitor carefully and should not be profit-oriented.

Recommendations: Awareness-raising about the negative consequences of CS, monitoring doctors' malpractices, doctor's assurance to reduce the CS rate, government's creativity to policy involvement, and strict monitoring of the private health facilities might help to control the elevated CS rates.

Chapter 1
Introduction

1.1 Introduction

Cesarean section is a widespread and well-known operative procedure in public and private obstetric practice worldwide to secure a healthy outcome for maternal and newborns. Cesarean section rates have been increasing significantly in the past decades around the world, including Bangladesh*(Betrán et al., 2016).* The effect of early skin-to-skin contact (SSC) by one hour after birth is so influential that it surely contributes to exclusive breastfeeding and reduces neonatal and infant mortality rate but is influenced due to Cesarean section delivery. *(Strobel, 2015)* Eight maternal deaths occurred, of which five were delivered by C-section*(Begum et al., 2017).*

Cesarean delivery is a surgical technique used to deliver a baby through openings in the abdomen and uterus via spinal anesthesia (*Mayoclinic*). Cesarean section is considered to be the last choice and a life-saving technique only when enforced for medically indicated reasons only, but as time went on, it became performed with greater safety and more often *(Begum et al., 201*8). A cesarean section might be prearranged previously in time if mothers develop pregnancy complications or had a previous cesarean section and aren't considering vaginal birth after a cesarean (*Mayoclinic*). Sometimes a cesarean section is safer for the mother or her baby than is a vaginal delivery when there is an actual medical reason only (*Mayoclinic*). Though, there is no recommendation showing the advantages of cesarean delivery for women or infants without medical indication are linked with increased maternal and newborn mortality and morbidity (*Solomon*, 2019). It is also evident that the prevalence of cesarean section is unacceptably high, especially among richer women or those who have deliveries in the private sector *(Barros et al., 2019).*

Cesarean section is converting widespread malpractice in private clinic sections rather than the government hospital, and it is because of misconception and medical malpractices. *(Haider et al., 2018).* The increasing number of cesarean sections leads to a higher number of recurrent cesarean sections due to the self-confidence that "once a cesarean section, always a cesarean section"*(Mascarello et al., 2017).* The probability of Cesarean section delivery increased with better socio-economic status, higher education, lower birth order, higher age, more antenatal care practices, and the presence of bad obstetric history.

Since 1985, WHO recommended the ideal rate of cesarean sections to be between 10-15% *(Wagman, 1993)*. In 2014 around 18.6% of the world's births were delivered by cesarean section*(Betrán et al., 2016).* The cesarean section rate in Southern Asia is also rising rapidly. In India, the cesarean section rate had increased from 2.40% in 1992 to 8.37% in 2006, and in Pakistan, the rate is 7.15% (*Rahman et al., 2018)*.

In modern times cesarean section have also been performed for non-life-threatening indications such as fear for delivery pain, maternal requests, medical malpractices. *(Rahman et al., 2018)* . Cesarean performed mothers have been suffering from various physiological and psychological complications during the post-cesarean period *(Neuman et al., 2014).* The physicians are often responsible for encouraging unacceptable demand for Cesarean section deliveries mainly to maximize the provider's income*(Rahman et al., 2018)*. On the other hand, the patient is met with high financial costs, including payments to attain drugs, to improve access and facilities offered for transport, and to accommodate for treatment services*(Aminu et al., 2014).*

Worldwide cesarean section rates have increased from about 7% in 1990 to 21% today and are projected to continue growing over this current decade (Betran *et al.*, 2021). If this tendency continues, by 2030, the highest rates are expected to be in Eastern Asia (63%), Latin America and the Caribbean (54%), Western Asia (50%), Northern Africa (48%), Southern Europe (47%) and Australia and New Zealand (45%), the research suggests. (WHO, 2021). In Bangladesh, the Cesarean section rate increased from 8% in 2007 to 23% in 2014 and 33% in 2017(*Ahsan KZ, Jamil K, Islam S, Al-Sabir A, 2019)*.

Still, limited research has been conducted to identify factors that contribute to the increase of cesarean section rate in Bangladesh *(Rahman et al., 2018)*. Therefore, it is convincing to address this issue critically by the policymakers and monitor and regulate inappropriate and unnecessary cesarean deliveries in Bangladesh. (Aminu *et al.*, 2014).

The outcome of this analysis will contribute to the available knowledge on CS practice in Bangladesh. The study will advantage relevant policymakers and stakeholders in dealing with the increased CS in Bangladesh. It will also create awareness among the would-be mothers not to pick cesarean delivery except it is medically necessary and not to accept doctors' decisions to do a CS without asking life-threatening questions about the indication.

1.2 Objective

The aim of the study is:

To identify the factors associated with high rates of cesarean section delivery in Bangladesh. This study also explores the reasons for cesarean section reported by both the mothers and doctors and the timing of taking the decision of cesarean section among the women who delivered by cesarean section within three years preceding the survey.

Specific objectives: The specific objectives of the study are as follows:

a. Identify the medical, socio-demographic, socio-economic factors of cesarean section performed in the last three years preceding the survey
b. Explore the timing of decision-making and who is the decision-maker behind the cesarean section delivery.

Chapter 2
Data and Methods

2.1 Source of Data

The study used data from Bangladesh Demographic and Health Survey (BDHS), a cross-sectional nationally representative surveillance that conducts every five years in Bangladesh. For the purpose of the analysis, the most recent survey of 2017 was used. The 2017-18 Bangladesh Demographic and Health Survey (BDHS) is the eighth DHS in Bangladesh, which was directed under the authority of the National Institute of Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare financial support provided by USAID.

BDHS follows a multi-stage cluster sampling technique. In the first stage, 675 clusters (250 from rural and 425 from urban areas) were randomly selected. In the second step, 30 households were randomly chosen from each of the clusters, and all ever-married 15–49 years old mothers in the chosen households were interviewed. The survey in 2017-18 resulted in 20,100 finalized interviews of ever-married mothers of age 15–49 years. This data is publicly available from the DHS website (https://dhsprogram.com); hence ethical approval was not required.

2.2 Study Population

Among a total of 20,160 selected households, 19,584 were found to be eligible for the BDHS survey. We have incorporated only the women who had given birth three years preceding the survey for this study. Mothers who gave birth in health care facilities in three years preceding the survey has been used in this study (N = 4,443)

2.3 Variable Selection

Primary Outcome

The primary outcome is Cesarean section delivery, which was measured using the question, "Did you delivered by cesarean section? That is, did they cut your belly open to take the baby out??"

Independents Variable

The key socio-demographic factors like age, division, residence, education, birth order, current working status, mother's body mass index, wealth Index (poorest, poorer, middle, richer, richest), Reading newspaper, Watching TV, Listening to Radio, ANC number, ANC place, the delivery place were included for the analysis.

Following the framework proposed by (Leone, Padmadas and Matthews, 2008), we have grouped the factors associated with cesarean section delivery into different categories, e.g., media exposure-related factors, health care institution-related factors, demographic and pregnancy-related risk factors, and socio-economic factors. Media exposure factors also include, i.e., whether the woman watched TV, reading magazines, listening to the radio yes (at least once a week) or not. The number of antenatal care visits (1,2, 3, 4 or more than 4) at

the institutions, and antenatal care received in Home, Public, private facilities or NGO and Others. Demographic and pregnancy risk factors include mother's age (15–19, 20–24, 25–29, 30–49 years). Among these variables, maternal health status is measured by body-mass index (BMI), where mothers with BMI less than 18.5 were identified as underweight, 18.5 to less than 24.9 as normal, 25 to less than 29.9 as overweight, and 30.0 or higher as obese. Socio-economic factors contain of maternal education, husband's education (no education, primary, secondary and higher), mothers' employment status (yes/no), household socio-economic status based on wealth scores (poorest, poorer, middle income, richer, and richest), and residence (urban and rural). Also, we showed that the place of delivery was conducted in the private facility (yes or no).

2.4 Statistical Data Analysis

A descriptive analysis (Sample, Frequency percentage, mean, Standard deviation) was conducted for all dependent and selected independent variables. We estimated the number and percentage for the binary variables, and for the continuous variable, we calculated mean & standard deviation as a measure of descriptive analysis. Then reason and timing for choosing cesarean section were explored using frequency and percentage distribution.

A Chi-square test was performed to see any significant difference among the categories of each variable with the dependent variable and independent variables. Finally, multivariate analysis was performed within the age group, division, residence, education, media exposure, birth order, current working status, mother's body mass index, wealth Index, ANC number, ANC place, delivery place by the logistic regression model to find the most dominant factors for cesarean section delivery. The analysis is calculated by following a step-by-step procedure and we included the logistic regression model factors that were found to be

statistically significant 95% CI ($p<0.05$). The data that was obtained from BDHS 2017-18 were entered and analyzed using Stata v.14.2

Chapter 3

3.1 Bivariate Analysis

Table 3.1 shows the descriptive statistics, proportion and chi-square test of the cesarean section among different categories. Out of 4,443 mothers who gave birth in the three years preceding the survey, 1587 (35.7%) delivered through cesarean section. The average age of the mother was 24.87 years and (SD=±5.51). In comparison, most of the mothers belonged to 20-24 year (35.1%) and 25-29 year (26.4%) age but cesarean section highest among the 35-49 year (38.2%) and lowest 15-19 year (30.5%) of age, which is statistically significant. The highest number of cesarean section delivery was found in both Dhaka (46.2%) and Khulna (46.2%) division followed by Barisal (30.6%), Chittagong (30.3%), Mymensingh (30.7%), Rajshahi (40.1%), Rangpur (10.7%) and Sylhet (29.8%) divisions, which are statistically significant.

Table 3.1. Characteristic of the mothers under study and who had a cesarean section by various background characteristics (N = 4443)

Variable	Number of respondents N= 4443 N (%)	Delivered by cesarean section N=1587 N (%)	P-Value (Chi-Square Test)
Mean Age	24.87		
SD	5.51		
Respondent's age			
15-19	785 (17.7)	240 (30.5)	
20-24	1561 (35.1)	579 (37.1)	**0.011**
25-29	1172 (26.4)	414 (35.3)	
30-34	663 (14.9)	253 (38.2)	
35+	262 (5.9)	101 (38.5)	
Division			
Barisal	447 (10.1)	137 (30.6)	
Chittagong	723 (16.3)	219 (30.3)	
Dhaka	654 (14.7)	302 (46.2)	
Khulna	483 (10.9)	223 (46.2)	**0.000**

Mymensingh	534 (12.0)	164 (30.7)	
Rajshahi	491 (11.1)	197 (40.1)	
Rangpur	524 (11.8)	170 (10.7)	
Sylhet	587 (13.2)	175 (29.8)	
Place of residence			
Urban	1561 (35.1)	705 (45.1)	**0.000**
Rural	2882 (64.9)	882 (30.6)	
Respondent's education			
No education	220 (5.0)	45 (20.4)	
Primary	1174 (26.4)	237 (20.1)	**0.000**
Secondary	2190 (49.3)	778 (35.5)	
Higher	859 (19.3)	527 (61.3)	
Husband's education			
No education	553 (12.4)	105 (18.9)	
Primary	1,445 (32.5)	355 (24.5)	**0.000**
Secondary	1,530 (34.4)	566 (36.9)	
Higher	915 (20.6)	561 (61.3)	
Wealth index			
Poorest	865 (19.5)	132 (15.2)	
Poorer	881 (19.8)	212 (24)	
Middle	820 (18.5)	275 (33.5)	**0.000**
Richer	932 (21.0)	364 (39)	
Richest	945 (21.3)	604 (63.9)	
Respondent's occupation			
No (Housewife)	2808 (63.2)	1136 (40.4)	**0.000**
Yes	1635 (36.8)	451 (27.5)	
All Media Exposure			
No	1468 (33)	296 (20.1)	**0.000**
Yes	2975 (66.9)	1291 (43.3)	
Birth Order			
One	1748 (39.3)	743 (73.9)	
Two	1475 (33.2)	541 (36.6)	**0.000**
Three	740 (16.7)	220 (29.7)	
Four & more	480 (10.8)	83 (17.2)	
BMI			
Less than 18.5-Under weight	669 (15.1)	165 (24.6)	
18.5 to 24.9-Normal	2,721 (61.2)	860 (31.6)	**0.000**
25 to 29.9-Overweight	846 (19.0)	428 (50.5)	
30 or more- Obese	207 (4.7)	134 (64.7)	
ANC Number			
One	606 (13.6)	79 (13)	
Two	760 (17.1)	184 (24.2)	**0.000**
Three	741 (16.7)	220 (29.6)	
Four & more	2336 (52.6)	1104 (47.2)	
ANC Place			
Home	328 (7.4)	19 (1.2)	
Public	1003 (22.6)	238 (15.0)	**0.000**
Private	2651 (59.7)	1169 (73.7)	
NGO & Others	461 (10.4)	161 (10.1)	
Delivered in private facility			
No	2965 (66.7)	338 (21.3)	
Yes	1478 (33.3)	1249 (78.7)	**0.000**
Total		**1587 (35.7%)**	

We remarked that more urban women (45.1%) experienced cesarean section delivery than rural (30.6%) women. Approximately half of the mothers had secondary education (49.3%) and with (34.4%) husbands and it was stated that the cesarean section delivery rate varied according to the level of education. The prevalence was higher among mothers with higher education (61.3%) and their husbands' higher education (61.3%) which are statistically significant. It was observed that the occurrence of cesarean section delivery was higher among the richest women (63.9%) compared to the poorest (15.2%) and who were currently not (Housewife) working (40.4%) than those who were working (27.5%) which are statistically significant. It was found that (66.9 %) mothers were exposed to media exposure (TV, Radio, Newspaper) and those who did not. Still, the cesarean section was conducted more for the mothers who had more exposure to media (43.3%) which are statistically significant. Women with birth order having one child (39.3%) had a higher prevalence of cesarean section delivery (73.9%) than women with more than two or more children which are statistically significant. Two-thirds of the mothers had normal weight (61.2%), while (64.7%) obese mothers experienced by cesarean section, which is statistically significant. More than half of the mothers (52.6%) received four & more antenatal care visits and experienced cesarean section delivery (47.2%), and (73.7%) of those who visited the private facility for antenatal care visits had cesarean section, which is statistically significant. In contrast, one-third (33.3%) of the mothers had cesarean section, and three-fourths (78.7%) of those delivered in private facilities, which is also statistically significant.

3.2 Reason for Choosing C-Section

Table 3.2 shows the reasons for choosing Cesarean section principal decision-makers, e.g., doctor or Respondent side. In most of the cases (63.0%), doctors took the final decision for cesarean section. Previous cesarean section was the principal reason cited by mothers

(28.2%) followed by other complications (24.1%), Mal-presentation (7.1%), convenience (8.7%), and Avoidance labor pain (7.8%).

Table 3.2- Reason for choosing Cesarean section for delivery by decision-maker (N=1664)

Reasons for caesarian	**Respondent side N (%)**	**Doctor side N (%)**	**Total N (%)**
Convenience	54 (8.7)	14 (1.3)	71 (4.3)
Didn't want labor pains	48 (7.8)	13 (1.2)	61 (3.7)
Mal-presentation	44 (7.1)	149 (14.2)	193 (11.6)
Premature baby	1 (0.1)	4 (0.4)	5 (0.3)
Cord prolapsed	4 (0.7)	5 (0.5)	9 (0.5)
Multiple births	3 (0.5)	7 (0.7)	10 (0.6)
Failure to progress in Labor	72 (11.7)	119 (11.4)	191 (11.5)
Pre-eclampsia	4 (0.7)	12 (1.2)	16 (1.0)
Diabetes	0 (0.0)	6 (0.6)	6 (0.4)
Previous Cesarean section	174 (28.2)	163 (15.6)	337 (20.3)
Less pressure on baby's body	8 (1.3)	34 (3.2)	42 (2.5)
Other complications	148 (24.1)	380 (36.3)	528 (31.7)
Water broke/dried up	12 (1.9)	44 (4.2)	56 (3.4)
Other	40 (6.5)	98 (9.4)	138 (8.3)
Total	**616 (37.0)**	**1048 (63.0)**	**1664**

On the other hand, other complications were the major cause for the doctors (36.3%), followed by Previous Cesarean section (15.6%), Mal-presentation (14.2%), and failure to progress in labor (11.4%).

Timing of decision making on cesarean section

The timing of the decision for the Cesarean section is shown in **Table 3.3**. In most of the cases, one-third (38.3%) decision was taken before one month of the delivery date. At the same time, (19.8%) decision for cesarean section was made on the day of the delivery date.

Table 3.3- Timing of decision making on Cesarean section (N=960)

Time	Respondents Side	Doctor Side	Total (%)
Day of Delivery	45	145	190 (19.8)
Day Before Delivery	26	70	98 (10.2)
2 to 7 Days Before Delivery	63	110	173 (18.0)
8 to 30 Days Before Delivery	39	92	131 (13.6)
30 + Days Before Delivery	191	177	368 (38.3)
Total	366 (38.1%)	594 (61.9%)	960

The decision for the Cesarean section was made one day before delivery in 10.2% of cases, throughout the last week before delivery (2-7 days before delivery) in 18.0% of cases, and between 8-30 days before delivery in 13.6% of cases. It is also noted that the timing of decision-making was taken by the doctor (61.9%) and mother side (38.1%).

Chapter 4

Multiple Logistic Models

Results from the multivariate analysis are provided in Table 4.1. Elder mothers 30-34 years and 35-49 years had higher odds of delivery by cesarean section [OR = 1.87; CI = 1.15-3.03, P<0.011] and [OR = 2.49; CI = 1.32-4.69, P<0.005 individually] than mothers age under 30 years. Mothers who lived in Chittagong division [OR = 0.62; CI = 0.41-0.94, P<0.03] had less chance and Sylhet division [OR = 1.62; CI = 1.06-2.49, P<0.03] had higher chance of getting cesarean section compared to Barisal division. Mothers who belonged to the middle wealth index had more chance of getting cesarean section, [OR = 1.51; CI = 1.06-2.15, P<0.02] than the poorest wealth index. Working mothers had less odds of cesarean section delivery [OR = 0.70; CI = 0.57-0.87, P<0.000] than those who were not working(Housewife). Also, those exposed to media exposure had higher odds of cesarean section delivery [OR = 1.38; CI = 1.09-1.75, P<0.01] than those not exposed to media exposure.

Table 4.1 Examining the association between cesarean delivery and selected socio-economic, socio-demographic and institutional factors using multivariate analysis (N=4443).

Variable	OR	95% CI of AOR	P-Value
Respondent's age *(ref. 15-19 years)*			
20-24	1.33	1.00-1.78	0.05
25-29	1.42	1.00-2.01	0.05
30-34	2.12	1.38-3.24	**0.00**
35+	2.87	1.61-5.09	**0.00**
Division *(ref. Barisal)*			
Chittagong	0.64	0.43-0.97	**0.03**
Dhaka	1.52	1.01-2.29	**0.04**
Khulna	1.53	1.01-2.32	0.05
Mymensingh	1.29	0.85-1.97	0.24
Rajshahi	1.39	0.91-2.11	0.13
Rangpur	1.08	0.70-1.68	0.71
Sylhet	1.75	1.15-2.66	**0.01**
Place of residence *(ref. Urban)*			
Rural	0.91	0.72-1.13	0.38
Wealth index *(ref. Poorest)*			
Poorer	1.40	1.00-1.97	0.05
Middle	1.51	1.06-2.15	**0.02**
Richer	1.39	0.96-2.01	0.08
Richest	2.23	1.47-3.40	**0.00**
Respondent's education level *(ref. No education)*			
Primary	0.85	0.51-1.41	0.52
Secondary	0.84	0.50-1.40	0.50
Higher	1.06	0.60-1.88	0.83
Husband's education level *(ref. No education)*			
Primary	0.93	0.66-1.33	0.71
Secondary	0.90	0.63-1.30	0.58
Higher	1.12	0.73-1.71	0.61
Respondent's occupation *(ref. Housewife)*			
Yes	0.70	0.57-0.86	**0.00**
Media Exposure *(ref. No)*			
Yes	1.38	1.08-1.75	**0.01**
Birth Order *(ref. One)*			
Two	0.83	0.65-1.07	0.16

Three	0.59	0.41-0.84	**0.00**
Four & more	0.34	0.21-0.55	**0.00**
BMI (*(ref. Less than 18.5-Underweight)*			
18.5 to 24.9-Normal	0.98	0.74-1.30	0.87
25 to 29.9-Overweight	1.50	1.07-2.10	**0.02**
30 or more- Obese	2.63	1.56-4.42	**0.00**
ANC Number *(ref. One)*			
Two	1.82	1.22-2.71	**0.00**
Three	1.64	1.10-2.45	**0.01**
Four and More (≥ 4)	2.88	2.03-4.10	**0.00**
ANC Place *(ref. Home)*			
Public	3.76	2.06-6.88	**0.00**
Private	2.50	1.39-4.50	**0.00**
NGO & Others	4.03	2.14-7.61	**0.00**
Delivered in private facility *(ref. No)*			
Yes	40.28	32.48-49.94	**0.00**

According to birth order mothers who gave birth more children had lower odds of cesarean section delivery e.g., three [OR = 0.64; CI = 0.43-0.94, P<0.02] and four & more [OR = 0.37; CI = 0.22-0.63, P<0.000] compared to childbirth order one. Mothers who were overweight e.g., overweight [OR = 1.5; CI = 1.07-2.10, P<0.02], and obese [OR = 2.68; CI = 1.59-4.51, P<0.000], had higher odds of cesarean section delivery compared to thin body. Mothers who received higher number of ANC visits had higher chance of cesarean section delivery, e.g., two [OR = 1.82; CI = 1.22-2.71, P<0.000], three [OR = 1.65; CI = 1.11-2.46, P<0.01] and four & more [OR = 2.89; CI = 2.03-4.11, P<0.000], compared to who just received one antenatal care visit. ANC place is also an important factor because, e.g., public [OR = 3.78; CI = 2.07-6.93, P<0.000], private [OR = 2.52; CI = 1.40-4.54, P<0.000] and NGO & Others [OR = 4.07; CI = 2.15-7.69, P<0.000] had higher odds compared to home antenatal visit. Mothers who had delivery in private health facilities had 40 times higher chances of cesarean section compared to who don't delivered in private facility [OR = 40.26; CI = 32.47-49.93, P<0.000].

Chapter 5

Discussion

This study was intended to explore factors affecting the preference for child-delivery settings and cesarean sections in Bangladesh. According to the BDHS 2017-18, the cesarean rate in Bangladesh is 33%, where was in the survey of BDHS-2014 the rate was 23.94%. The study has noted several factors that have a significant effect on the delivery practice for childbirth. The findings of this study exposed that women's exposure to media applies a significant positive influence on the mode of delivery. Women with higher economic status and non-working mothers used more opportunities to take ANC visits undertook cesarean sections. The possible explanation could be wealthy women have greater confidence and capabilities to take actions regarding their own health (Kamal, 2009; Caldwell, 1981). Overweight and obese women had a more chance to get CS delivery than underweight women. Among other variables included in the analyses, women's division, working status, BMI, birth order, ANC number, place of ANC and delivery place appeared as essential determinants of cesarean delivery. A higher percentage of mothers has chosen more than one antenatal care visit indicating the increased application of ANC facilities. This study's findings concerning birth order portrayed that the odds of cesarean delivery decrease with an increase in childbirth order. A probable clarification is that, after the birth of the first and second child by cesarean, following deliveries are perceived to be of high risk. Analysis suggested that there is a high primary cesarean rate for first birth to women 30 years of age and older. Our study also supports this finding. In fact, it revealed that the age range has decreased to 30. It is because the chances of pregnancy complications are more at higher age. Amazingly, working women were less likely to have a cesarean delivery than non-working women. Perhaps working women experience time constraints that reduce their opportunities for receiving antenatal care (Furuta and Salway, 2006).

According to the doctors, cesarean section is usually justified under certain situations such as dystocia, cephalopelvic disproportion, placenta previa, breech presentation, fetal distress, multiple births, previous cesarean section, pre-eclampsia/eclampsia, active genital herpes of mother, etc. (Shabnam, 2009). However, when there are no pregnancy or delivery-related complications, some doctors perform cesarean section as it is less time-consuming and more profitable. Some doctors also point out the following facts. In a country where there is an extreme shortfall of obstetricians and anesthetists and they are not available round the clock in medical institutions, physician's convenience is an alarming contributing factor for high cesarean section. Above all, a combination of private health facilities and doctors' profit-making tendency and demand from women with higher socio-economic status, particularly in urban areas, have contributed to the recent increasing trend in cesarean delivery in Bangladesh.

Chapter 6
Strengths and Limitations

Strengths and Limitations of the Study:

The study was based on the most current BDHS with a nationally representative large sample size. One of the significant strengths of this study is its well-designed nationwide survey and a high response rate. In addition, this study applied multilevel modeling to accommodate the hierarchical nature of the BDHS data. Despite the above strengths, the study has several limitations. For example, besides the selected socio-demographic factors which have been included in this analysis, a host of other programmatic factors, e.g., accessibility, quality, and costs of delivery services, and cultural factors, e.g., religiosity, prejudices, women's role in the decision-making process, and subordinate status of women are also likely to impact the

delivery practices of women. However, due to the lack of relevant data, the effects of these programmatic and cultural factors on child-delivery practices could not be examined. Additional research can be done using the delivery cost and delivery place between normal and cesarean delivery. Simply, the strength of this paper is that it used very up-to-date data to find out the determining factor of the cesarean section.

Chapter 7
Conclusion

The increase in cesarean section rate and the impact of cesarean delivery on maternal and child health is a serious concern worldwide. A significant growth in the cesarean delivery rate has also been observed in Bangladesh over the last decade. This study reveals that providers induced demand, mainly driven by the private sector, is the leading cause of increased cesarean section rates in Bangladesh. It is also alarming that demand from urban rich and educated women & husbands may play a part. Preference for cesarean section is significantly higher among women living in the urban areas, taking ANC care in private facilities, and those who are wealthy and educated. Physician's influence has been found to play an essential role in the maternal decision on mode of delivery. Although the maternal request for cesarean section and pressure from patients or their families influence the decision-making process, doctors' influence to convince the women might play a key role. All women experiencing cesarean section, either indicated or unnecessary, poses the risk of various complications and may result in maternal morbidity and mortality. Avoiding unnecessary cesarean sections could contribute to making cesarean sections available to those who really need this intervention to manage potential life-threatening complications in both women and newborns. Therefore, it is crucial to prevent unnecessary cesarean sections to keep the cesarean section rates as low as possible. Proper guidance, appropriate and systematic

supervision and direction by senior doctors are essential in conducting usual practices. An additional important thing is that it is highly recommended to perform routine medical audits. The decision to perform a cesarean section delivery must be taken and monitored carefully and should not be profit-oriented. Awareness-rising about the negative consequences of cesarean deliveries, doctor's commitment to reduce the rate of cesarean section, government's initiative to policy intervention, and strict monitoring of the private health facilities may help to control the high cesarean section rates. This study calls for further evidence-based study in understanding the role of private providers in maternity care and careful examination of the consequences of increased cesarean section in the private sector of Bangladesh. An appropriate policy should be ready in consultation with obstetricians/gynecologists and policymakers.

Appendix A
Stata Source Codes

generate weighted sample
gen wgt=v005/1000000
svyset [pw=wgt], psu(v021) singleunit(certainty) strata(v023)
subset making
keep v012 v024 v025 v106 v130 v157 v158 v159 v190 v212 v445 v511 v701 v714 m14 m15 m17 bord m57a m57e m57f m57g m57h m57i m57j m57k m57l m57m m57n m57o m57p m57q m57r m57s m57t m57x
Age group
recode v012 (15/19 = 1 "15-19")(20/24 = 2 "20-24")(25/29 = 3 "25-29")(30/34 =4 "30-34")(35/49 =5 "35+"), gen (v012_v2)
Birth Order
recode bord (1 = 1 "One") (2 = 2 "Two") (3 = 3 "Three") (4/11 =4 "Four & more+"), gen (bord_v2)
BMI Index
recode v445 (1266/1849 = 1 "Less than 18.5-Underweight") (1850/2499 = 2 "18.5 to 24.9-Normal") (2500/2999 = 3 "25 to 29.9-Overweight") (3000/4937 = 4 "30 or more- Obese"), gen (v445_v2)
Number of ANC Visit
recode m14 (0 = 0 "None")(1 = 1 "One") (2 = 2 "Two") (3 = 3 "Three") (4/20 =4 "Four & more+"), gen (m14_v2)
Place of delivery
recode m15 (11 = 1 "Home") (21/28 = 2 "Public")(31/36 = 3 "Private")(41/96 = 4 "NGO & Others"),gen (m15_v2)
recode m15 (11 =.) (21/28 = 1 "Public")(31/36 = 2 "Private")(41/96 = 3 "NGO & Others"),gen (m15_v2)
recode m15_v2 (1/2 = 0 "No")(4 = 0 "No")(3= 1 "Yes"), gen (private_d)
Media Exposure
generate all_media = .
replace all_media = 0 if v157==0 | v158==0 | v159==0
replace all_media = 1 if v157==1 | v158==1 | v159==1
replace all_media = 1 if v157==2 | v158==2 | v159==2
***Antenatal care receive from place ***
generate anc_place = .
replace anc_place= 1 if m57a ==1
replace anc_place= 2 if m57e ==1 | m57f ==1 |m57g ==1 |m57h ==1 |m57i ==1 |m57j ==1 |m57k ==1 |m57l ==1
replace anc_place= 3 if m57m ==1 | m57n ==1 |m57o ==1 |m57p ==1 |m57q ==1 |m57r ==1
replace anc_place= 4 if m57s ==1 | m57t ==1 |m57x ==1
recode anc1 (1 = 1 "Home")(2= 2 "Public")(3= 3 "Private")(4 = 4 "NGO & Others"),gen (anc_place)
chi-square test
tab anc_place m17,chi2
gen wgt=v005/1000000
svyset [pw=wgt], psu(v021) singleunit(certainty) strata(v023)
keep s433a s433d s433fa s433fb s433fc s433fd s433fe s433ff s433fg s433fh s433fi s433fj s433fk s433fl s433fm s433fx
decision maker
recode s433d (1/2=1 "Respondent side")(3=2 "Doctor Side"), gen(s433d_v2)
medical reason
generate m = .
replace m = 11 if s433fa==1,replace m = 12 if s433fb==1,replace m = 13 if s433fc==1,replace m = 14 if s433fd==1,replace m = 15 if s433fe==1,replace m = 16 if s433ff==1,replace m = 17 if s433fg==1,replace m = 18 if s433fh==1,replace m = 19 if s433fi==1,replace m = 20 if s433fj==1,replace m = 21 if s433fk==1,replace m = 22 if s433fl==1,replace m = 23 if s433fm==1,replace m = 24 if s433fx==1
recode anc_place (1 = 1 "Home")(2/9= 2 "Public")(10/15= 3 "Private")(16/18 = 4 "NGO & Others"),gen

(anc_place)

Multivariate Logistic regression
logistic m17 i.v012_v2 i.v024 i.v025 i.v106 i.v190 i.v701 i.v714 i.all_media i.v445_v2 i. bord_v2 i.m14_v2 i.private_d i.anc_place

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