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Caesarean by Choice: Unveiling the Underlying Determinants of Elective Caesarean Section Insights from Bangladesh

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Abstract

The increase in Caesarean Sections, particularly elective ones, has become a major concern in the field of maternal healthcare, reflecting larger trends in obstetric practices and constitutes important questions about the factors driving this decision. This study specifically investigates the determinants of Elective Caesarean Sections by focusing exclusively on the caesarean cases among Bangladeshi women. Using a restricted sample of caesarean cases, we employed univariate, bivariate, and logistic regression analyses to discern the key factors associated with elective cesarean sections. Our results indicate that higher maternal education, advanced maternal age at birth, exposure to media, higher wealth index, having a qualified antenatal care provider, higher birth order, multiple births, previous cesarean deliveries, and pre-eclampsia are significant predictors of elective caesarean sections. These findings highlight the multifaceted nature of elective caesarean decisions and suggest that socio-economic, educational, and medical factors play crucial roles. Addressing these determinants can lead to more informed decision-making and potentially optimize cesarean delivery practices in Bangladesh.

Keywords: Elective caesarean section, Obstetric characteristics, Healthcare accessibility, Logistics regression

I. Introduction

The increased number of Elective Caesarean Section (ECS)has caused widespread debate and alarm in the healthcare profession[1–3]. A caesarean section, often recognized as C-section (CS) delivery, is a medical technique that involves surgically removal of a newborn via the uterine and abdominal walls of the mother[4,5] which is commonly conducted when vaginal birth would be risky for both the baby and mother [6–8]. C-section which driven by non-medical reasons are referred as Elective CS deliveries, meaning that the timing of decision to execute CS deliveries was made prior to the mother going into labor [9,10]. Unlike emergency C-sections, which are frequently necessary because of unanticipated labor problems, ECSs provide an opportunity for intervention and prevention[11]. To attain the best possible outcomes for expectant mothers and their infants, the World Health Organization (WHO) has recommended that the optimal CS delivery rate is 10% to 15% [12,13]. While, one third of births take place via CS deliveries in Bangladesh and 19% of these cases, the choice to deliver via C-section was determined before the labor pains started, according to the Bangladesh Demographic Health Survey (BDHS)[14,15]. Existing literature focuses on CS rates across all pregnancies, without particular specification on cesarean sections (elective or non-elective)[10]. In this study, the factors that influence ECSs are examined, with an emphasis on the differences between elective and non-elective instances. This study aims to remove a significant gap in the literature by concentrating entirely on ECS rates among all CS deliveries.

In 2008, the World Health Organization (WHO) estimated that the developing world required an additional 3.2 million CS deliveries, while 6.2 million unnecessary C-sections were conducted in other regions[16]. Analysis of data from 121 nations revealed that the worldwide average CS rate experienced a 12.4% increase, rising from 6.7% to 19.1% between 1990 and 2014. Asia and Northern America had the largest and lowest average yearly rate of increase, with rates of 6.4% and 1.6% respectively[17]. The global rate of CS deliveries has risen from 6.7% in 1990 to 21.1% in 2015. [10,18].

C-section is influenced by various elements, including clinical indications, economic and organizational reasons, physician attitudes towards birth management, and women's social and cultural attitudes[19,20]. Significant predictors of CS included mothers' age, place of residence, socioeconomic level, frequency of prenatal visits, frequency of delivered children, and body mass index (BMI) [21]. The previous study highlighted that urban women had the greatest CS delivery rate (43.01%) in Bangladesh[22]. One key reason for the higher prevalence in metropolitan regions could be the rise in the number of privately operated clinics, hospitals, and NGO-based healthcare facilities that have been developed over the years [23]. However, the media's impact on childbirth cannot be ignored since vaginal deliveries are frequently portrayed in the media as unpleasant procedures, which may have negatively impacted women's views and caused anxiety [24]. Women who prioritize private facilities for childbirth over government ones see a higher rate of cesarean sections[25]. Women who have availability of healthcare facilities with

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skilled birth attendants (TBAs) and an adequate supply of medications and vital items, the chances of having a C-section are much higher[26]. Previous successful experience in C-sections also lead the mothers to go for ECS[27]. Women's role in identifying and negotiating medical risks had a larger correlation with caesarean section rates than wealth or education [28].

Access to emergency obstetric care, including aided vaginal delivery and safe C-sections, is vital for achieving the third Sustainable Development Goals (SDG)[29]. By carrying out this study, it will be possible to determine which cohort of women is most likely to have an ECS, and this identification will contribute to increase awareness on the best way to use C-sections to lower mortality and morbidity[30]. This study intends to investigate how factors like maternal education, economic status, healthcare accessibility and birth characteristics influence the desire for ECS.

II. Materials and Methods

Data and Study Design

The data on CS delivery among reproductive aged women have obtained from Bangladesh Demographic Health Survey (BDHS) conducted in 2017-18 for our study. This data was extracted from the DHS website (www.dhsprogram.com) with permission from the DHS administration. This is a cross-sectional survey that utilized a two-stage stratified sample method and encompassed all eight divisions in Bangladesh. 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 comprehensive list of households was then created in all of the chosen EAs, which served as the sample frame in the second step. This level of sampling was then carried out using a systematic sampling design, which picked 30 households each EA on average. We have extracted a subset of data by specifically selecting mothers who underwent Caesarean Delivery for the considering child. The Bangladesh Demographic and Health Survey (BDHS) 2017–18 yielded 20,127 observations in total at the start of the study. 15,120 observations were eliminated from this original pool due to missing data. There were 5,007 observations left for which the mode of delivery was known. These were then divided into 1,671 cases of C-section delivery and 3,336 cases of normal delivery. The 1,671 C-section delivery cases made up the final study population.

Response Variable

The before labor decision of caesarean section has included as Elective C-section (ECS) among Bangladeshi women aged 15-49 years and considered as the binary response coded as 1=yes when caesarean decision made before labor and 0=no caesarean decision made after labor[9].

Explanatory Variables

Table1 shows the details of selected explanatory variables for this study which are related to ECS in Bangladesh

Table 1. Description of Selected Explanatory Variables

Variable	Category	Label
	Maternal Characteristics	
Mother's Age at Birth	<19	mother's age less 19 years than during the birth
	19-30	mother's age between 19-30 years during the birth
	>30	mother's age greater than 30 during the birth
Place of Residence	Urban	mother living in urban areas.
	Rural	mother living in rural areas.
Media Exposure	Non-Exposed	not exposed to any media at least once a week
	Exposed	exposed to media
Wealth Index	Poor	mother from poorest or poorer economic status
	Middle	mother middle economic status.
	Rich	mother from richer or richest economic status.
Maternal Education Level	No Education	mother with no education
	Primary	mother with primary education
	Secondary	mothers with secondary education
	Higher	mothers with higher education
	Healthcare Accessibility	
Antenatal Care (ANC) Provider	No Visit	pregnancy without any ANC Visit
	Qualified	ANC from qualified providers
	Unqualified	ANC from unqualified providers
	Both	ANC from both qualified and unqualified providers

Autonomy in seeking Medical Help	Yes	having permission or money for getting treatment
	No	having no permission and money for getting treatment
Obstetric Characteristics		
Birth Order	1st Birth	1st child of mother
	2nd Birth	2nd child of mother
	3rd or onwards	3rd or onward child of mother
Multiple Birth	Single	birth of single child
	Multiple	birth of multiple child
Wanted pregnancy	Yes	child is desired at conception
	No	child is not desired at conception
C-section Before last Birth	Yes	CS occurred before last birth
	No	CS did not occur before last birth

Methodology

The exploratory analysis has carried out using descriptive statistics like frequency and percentage for the outcome variable and the selected covariates. Then, Bivariate analysis has conducted to analyze the unadjusted association between the dependent and independent variables. Chi-square test is performed to investigate the statistical significance of such associations. Finally, this work has relied on binary logistic regression model, which is appropriate to analyze a binary target variable.

Let Y_i, i=1, 2, …, n with mean μ_i. Also, let x_i= $\left(x_{i0}, x_{i1}, x_{i2}, \cdots, x_{ij}, \cdots, x_{ip}\right)'$ be a set of covariates associated with Y_i, where $x_{i0} = 1$ and β = $\left(\beta_0, \cdots, \beta_j, \cdots, \beta_p\right)'$ be the regression coefficients that are to be estimated. The probability distribution function of Y_i, $f(y_i)$is a member of the exponential family with canonical form, that is, $f(y_i) = \mu_i^{y_i}(1-\mu_i)^{1-y_i}$ =exp $\left[y_i \log\left(\frac{\mu_i}{1-\mu_i}\right) + \log(1-\mu_i)\right]$,where $\mu_i = E(Y_i) = P(Y_i = 1)$.The GLM for binary response can be written as $\log\left(\frac{\mu_i}{1-\mu_i}\right) = x_i'\beta$; which is called a logit model. The link function permits the mean of response to be related non-linearly with the covariates, that is, $\mu_i = [1 + \exp(-x_i'\beta)]^{-1}$. This model is known as binary logistic regression model. The parameters of this model are estimated using maximum likelihood estimation approach.

III. Results

Univariate Analyses

Table 2 represents the percentage distribution of each category for all covariates with respect to ECSs. From the univariate analysis, among mothers who underwent C-sections, 57.6% opted for the procedure before labor onset. Most ECS deliveries occurred among women aged 19–30 years (70.1%), while 17.4% were under 19 and 12.5% were over 30. A majority (55.2%) resided in rural areas, indicating a higher rural representation.

Regarding media exposure, 81.2% of women had access to at least one form of media, while 18.8% were unexposed. In terms of household wealth, 61% belonged to the rich quintile, 17.1% to the middle, and 21.9% to the poor. Educationally, 48.8% had secondary education, 33.3% higher education, 15% primary, and only 2.9% had no formal education.Among the pregnant mothers, 73.6% received antenatal care (ANC) from qualified providers, 24.1% from both qualified and unqualified sources, 1.1% from unqualified personnel, and 1.2% had no ANC visits. In terms of healthcare autonomy, 53.9% of women could independently seek medical help, while 46.1% could not.With respect to birth order, 46.9% were first-time mothers, 34.2% had a second birth, and 19% had three or more children. Nearly all respondents (98.3%) had singleton births, while only 1.7% had multiple births. Regarding pregnancy intention, 83.1% reported the pregnancy was wanted at the time, while 16.9% were unintended.Notably, 23.9% of women had a previous C-section, and 76.1% did not. Lastly, only 2.1% reported pre-eclampsia, indicating a relatively low prevalence of this condition among ECS cases.

Bivariate Analyses

The results of the bivariate analysis are given in the Table 3. The results indicate that all the considered covariates are statistically significant and suggest a strong association with ECS. The likelihood of ECS increases with maternal age, with the highest rate (68.9%) among women over 30, followed by those aged 19–30 (60.6%), and the lowest among adolescents under 19 (37.1%). Urban residence also shows higher ECS prevalence (61.9%) compared to rural areas (54.1%), suggesting regional disparities in delivery preferences. Media exposure is positively associated with ECS, with 60% of exposed women opting for the procedure versus 47.1% of those unexposed. Wealth status manifests a clear gradient: 63.5% of rich women underwent ECS, followed by 50.2% of middle-class and 46.7% of poor women. Maternal education further influences ECS rates which are 66.9% among highly educated women compared to 44.9% among those with no education. Access to qualified antenatal care (ANC) significantly escalates ECS rates

(60.6%), compared to 38.9% among those with unqualified ANC and 49.4% among those with mixed providers. Even among women with no ANC visits, 55% underwent ECS, indicating the potential influence of healthcare access and guidance.Women's autonomy in seeking medical help is also associated with ECS, with a higher rate among autonomous women (62.2%) compared to those facing barriers (52.2%). Birth order reveals that ECS is more common in second (67.6%) and third or higher-order births (65.6%) than in first-time births (47.6%), possibly due to prior birth experiences.

Table 2. Frequency and percent (%) distribution of variables

Variable	Category	Frequency	Percentage
ECS	Yes	962	57.6
	No	709	42.4
Maternal Characteristics			
Mother's Age at Birth	<19	291	17.4
	19-30	1171	70.1
	>30	209	12.5
Place of Residence	Urban	748	44.8
	Rural	923	55.2
Exposed to Media	Non-Exposed	314	18.8
	Exposed	1357	81.2
Wealth Index	Poor	366	21.9
	Middle	285	17.1
	Rich	1020	61
Maternal Education Level	No Education	49	2.9
	Primary	250	15
	Secondary	816	48.8
	Higher	556	33.3
Health Accessibility			
ANC Provider	No Visit	20	1.2
	Qualified	1230	73.6
	Unqualified	18	1.1
	Both	403	24.1
Autonomy in Seeking Medical Help	Yes	901	53.9
	No	770	46.1
Obstetric Characteristics			
Birth Order	1st Birth	783	46.9
	2nd Birth	571	34.2
	3rd or more	317	19
Multiple Birth	Single	1642	98.3
	Multiple	29	1.7
Wanted pregnancy	Yes	1389	83.1
	No	282	16.9
C-section Before index Birth	Yes	399	23.9
	No	1270	76.1
Pre-eclampsia	Yes	35	2.1
	No	1634	97.9

Table 3. Bivariate analysis with corresponding p-value for the chi-square test

Variable	Category	Decision of Elective CS (%)		p-value
		Yes	No	
Maternal Characteristics				
Mother's Age at Birth	<19	37.10	62.90	<0.001
	19-30	60.60	39.40	
	>30	68.90	31.10	
Place of Residence	Urban	61.90	38.10	0.001
	Rural	54.10	45.90	
Exposed to media	Non-Exposed	47.10	52.90	<0.001
	Exposed	60.00	40.00	
Wealth Index	Poor	46.70	53.30	<0.001
	Middle	50.20	49.80	
	Rich	63.50	36.50	
Maternal Education Level	No Education	44.90	55.10	<0.001
	Primary	50.00	50.00	
	Secondary	54.30	45.70	
	Higher	66.90	33.10	
Healthcare Accessibility				
ANC Providers	No Visit	55.00	45.00	<0.001
	Qualified	60.60	39.40	
	Unqualified	38.90	61.10	
	Both	49.40	50.60	
Autonomy in Seeking Medical Help	Yes	62.20	37.80	<0.001
	No	52.20	47.80	
Obstetric Characteristics				
Birth Order	1st Birth	46.70	53.00	<0.001
	2nd Birth	67.60	32.40	
	3rd or more	65.60	34.40	
Multiple Birth	Single	57.20	42.80	0.044
	Multiple	75.90	24.10	
Wanted pregnancy	Yes	56.40	43.60	0.039
	No	63.10	36.90	
C-section Before Last Birth	Yes	83.50	16.50	<0.001
	No	49.50	50.50	
Pre-eclampsia	Yes	74.30	25.70	0.04
	No	57.30	42.70	

ECS was significantly more common in multiple births (75.9%) than in singleton pregnancies (57.2%). Unwanted pregnancies also showed higher ECS rates (63.1%) compared to wanted pregnancies (56.4%). A history of previous C-section is strongly associated with repeat ECS (83.5%), versus 49.5% for women with no prior C-section. Lastly, pre-eclampsia was associated with the highest ECS rate (74.3%), emphasizing the clinical influence of this condition on delivery decisions.

Regression Analysis

The results obtained from regression analysis is depicted in Table 4,to find the adjusted association between the considered covariates and ECS. The following covariates are recognized as the potential determinants for ECS among Bangladeshi women: mother's age at birth, exposed to media, wealth index, maternal education level, ANC provider, autonomy in getting medical help, birth order

multiple birth, C-section before last birth and pre-eclampsia are the significant determinants of ECS. It is observed that, mothers of age 19-30 (OR: 1.611) and age greater than 30 years (OR: 1.918) have higher likelihood of occurring event compared to age less than 19 years. The result implies that the likelihood of ECSs increases as mothers age. It is found that the odds of ECS among women who were exposed to at least one media 43.19% higher compared to the women who were not exposed to any media. The finding underscores that media exposure is a significant indicator of the increasing rate of ECS among the reproductive aged women. The analysis reveals that, relative to mothers from middle-income households, those rich families exhibited significantly approximately 34.9% greater odds of undergoing ECS. Notably, women with higher education have significantly greater odds (OR: 2.380) of undergoing ECS.Using ANC support from both qualified and unqualified providers as the reference category, the analysis reveals that women who received antenatal care exclusively from qualified personnel have 44.8% greater odds of event occurring ($p < 0.05$). This suggests that access to qualified care may influence the likelihood of ECS utilization.Women with autonomy in seeking medical care have approximately 20% higher odds ($p<0.10$) of undergoing ECS compared to those without such autonomy, suggesting a potential link between women's decision-making power and ECS utilization. Higher-order births have 43.2% greater odds ($p<0.10$) of undergoing ECS,indicates a positive association between increased birth order and the likelihood of ECS, after controlling for other covariates. The odds of women with multiple births approximately 2.6 times that of the women with single birth. Women with a history of previous C-section had over four times higher odds of undergoing ECS compared to those without such history, which underscores a strong and statistically significant association between prior C-section and the likelihood of repeat ECS. Women diagnosed with pre-eclampsia are over threefold more likely to undergo ECS than those without the condition.

All the findings interpreted above considered that the covariates other than the corresponding one are kept at a fixed level.

IV. Discussion

This study utilized data from the Bangladesh Demographic and Health Survey (2017–18) to evaluate the influence of maternal, obstetric, and health service factors on elective caesarean section (ECS) deliveries. Multiple determinants emerged as significant.In order to ensure mothers' safe delivery and postpartum well-being, this study set out to identify the factors that should be taken into consideration while utilizing therapeutic procedures like caesarean sections.

Notably, maternal age emerges as a significant predictor, with women aged over 30 more likely to undergo ECS. This may be attributed to the increased prevalence of pre-pregnancy morbidity and risk perception associated with advanced maternal age, influencing their preference toward cesarean delivery. This finding supports prior research in Bangladesh indicating higher ECS rates among women of late reproductive age[31].

Table 4. Results of binary logistic regression model depicting odds ratio (OR)

Variables	Estimate	S.E.	p-Value	OR
Intercept	-1.905	0.07	<0.001***	0.149
Maternal Characteristics				
Mother's Age at Birth				
<19 (ref)	-	-	-	-
19-30	0.477	0.155	0.002**	1.611
>30	0.651	0.246	0.008**	1.918
Place of Residence				
Rural (ref)	-	-	-	-
Urban	0.028	0.119	0.815	1.028
Media Exposure				
Non-Exposed (ref)	-	-	-	-
Exposed	0.359	0.147	0.015**	1.432
Wealth Index				
Poor	0.097	0.175	0.58	1.102
Middle (ref)	-	-	-	-
Rich	0.299	0.154	0.052*	1.349
Maternal Education Level				
No Education (ref)	-	-	-	-
Primary	0.22	0.335	0.51	1.246
Secondary	0.425	0.32	0.185	1.529
Higher	0.867	0.334	0.01**	2.38

Healthcare Accessibility				
ANC Provider				
No Visit	0.358	0.496	0.47	1.431
Qualified	0.37	0.125	0.003**	1.447
Unqualified	-0.088	0.528	0.868	0.916
Both (ref)	-	-	-	-
Autonomy in Seeking Medical Help				
No (ref)	-	-	-	-
Yes	0.182	0.11	0.096*	1.2
Obstetric Characteristics				
Birth Order				
1st Birth(ref)	-	-	-	-
2nd Birth	0.22	0.152	0.147	1.246
3rd or onwards	0.359	0.195	0.066*	1.431
Multiple Birth				
Single (ref)	-	-	-	-
Multiple	0.968	0.477	0.042*	2.633
Wanted pregnancy				
No (ref)	-	-	-	-
Yes	-0.062	0.153	0.687	0.94
C-section Before Last Birth				
No (ref)	-	-	-	-
Yes	1.416	0.17	<0.001***	4.122
Pre-Eclampsia				
No (ref)	-	-	-	-
Yes	1.19	0.404	0.003**	3.287

However, media often portrays ECS as a safer or more convenient alternative to vaginal delivery, emphasizing avoidance of labor pain and perceived risks.Such portrayals may shape women's preferences and contribute to the rising ECS trend.Socioeconomic status plays a critical role in shaping delivery choices. Women from high-income households has better access to private healthcare and the perception of caesarean delivery as a modern or safer option. Interestingly, women with higher education levels were more likely to opt for ECS, which may reflect greater autonomy, increased health awareness, and a desire for control over the birth process.Access to qualified ANC providers significantly increased prevalence of ECS. Women receiving ANC from trained professionals are more likely to deliver in well-equipped facilities where ECS is accessible. Previous literatures have shown that ANC use promotes modern delivery practices in Bangladesh[32]. Women's autonomy in seeking medical care was another influential factor. Those with decision-making power over their healthcare exhibited a higher likelihood of choosing ECS, suggesting that autonomy enables greater agency in delivery method decisions.Birth order is found to be a relevant factor, with third or higher-order births significantly increasing the probability of ECS. This may be linked to prior adverse delivery experiences, leading women to view ECS as a safer alternative. The result is consistent with earlier findings on ECS trends in Bangladesh[9].Multiple pregnancies were strongly associated with ECS, likely due to the elevated risks of complications such as preterm birth, fetal growth restriction, and delivery difficulties. Given these risks, clinicians often recommend ECS to mitigate potential adverse outcomes.[33]Previous cesarean history was the strongest predictor of ECS. Women with a prior C-section were significantly more likely to undergo repeat ECS, likely due to concerns over the risks associated with vaginal birth after cesarean (VBAC), such as uterine rupture. This trend of repeat ECS is well-documented in global literature[34]. Finally, pre-eclampsia issignificantly associated with ECS. Given its complications—such as placental abruption, intrauterine growth restriction, and preterm delivery—healthcare providers often recommend ECS to safeguard maternal and fetal health. This finding aligns with existing evidence highlighting pre-eclampsia as a clinical driver of cesarean delivery[35].

V. Conclusion

This study uncovers a number of sociodemographic and clinical factors that substantially impact the risk of elective cesarean section (ECS) among women in Bangladesh. Advanced maternal age, media exposure, greater education,

socioeconomic level, quality prenatal care, and women's autonomy in healthcare decisions all had a favorable relationship with ECS. Clinical variables, notably prior cesarean delivery, numerous pregnancies, higher birth order, and pre-eclampsia, identified as major predictors.These findings underscore the multifaceted nature of ECS decisions, shaped not only by medical indications but also by social, economic, and informational influences. Policymakers and healthcare providers should consider these dimensions when designing interventions aimed at promoting evidence-based delivery practices. Enhancing awareness, improving the quality of antenatal care, and addressing inequalities in maternal health services may contribute to a more rational and need-based utilization of cesarean delivery in Bangladesh.

This study has several limitations to be acknowledged. First, it relies on secondary data from the 2017–18 Bangladesh Demographic and Health Survey (BDHS), and its cross-sectional design limits the ability to establish causal relationships. Additionally, certain relevant covariates such as maternal working status, body mass index (BMI), and child birth weight were excluded due to incomplete or outdated records, which may have influenced the analysis of factors associated with elective cesarean section (ECS). Furthermore, while more recent BDHS data are available, they lack critical information on the timing of decision-making for caesarean delivery which is an essential variable for distinguishing elective from emergency C-sections. This highlights the need for future national surveys to incorporate detailed information on ECS decision timing to better understand the determinants and motivations behind this growing trend.

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