Public Health in Practice 8 (2024) 100558

Contents lists available at ScienceDirect

Public Health in Practice

journal homepage: www.sciencedirect.com/journal/public-health-in-practice

Cesarean delivery and its determining factors: A hospital-based study in Jashore District, Bangladesh

Md. Sakhawot Hossain [a,1], Suvasish Das Shuvo [a,*,1], Sharmin Asha [a], Md. Raihan Chodhoury [b], Md. Toufiq Elahi [c]

[a] Department of Nutrition and Food Technology, Jashore University of Science and Technology, Jashore, 7408, Bangladesh
[b] Department of Physical Education and Sports Science, Jashore University of Science and Technology, Jashore, 7408, Bangladesh
[c] Department of Applied Nutrition and Food Technology, Islamic University, Kushtia, 7003, Bangladesh

ARTICLE INFO

Keywords:
Bangladeshi women
Obstetric
Prevalence
Childbirth
Decision-making

ABSTRACT

Background: The rising prevalence of cesarean deliveries (CD) is a major public health problem worldwide, especially in Bangladesh. This study aims to investigate the prevalence and factors associated with cesarean deliveries in the Jashore district of Bangladesh.

Study design: This cross-sectional study, conducted from December 2022 to February 2023 in Jashore district, Bangladesh, involved face-to-face interviews with 662 mothers during hospital visits.

Methods: A pretested, structured, and validated questionnaire was employed to gather information on socio-economic characteristics, obstetric history, maternal healthcare utilization, and factors influencing the choice of delivery method. Multinomial logistic regression models were employed to assess and predict determining factors influencing cesarean delivery.

Results: The study revealed a high cesarean delivery (CD) prevalence of 70.5 %, exceeding the WHO-recommended threshold. Key socioeconomic factors associated with increased CD rates included rural residence, younger maternal age (15–20 years), nuclear family structure, and husbands in business. Additionally, private hospital deliveries, a history of previous CD, maternal self-preference, and doctor's influence were significant predictors of CD. The majority of participants believed CD enhances maternal safety (74.6 %) and alleviates pain (74.8 %).

Conclusion: The high rate of cesarean deliveries in Jashore highlights the need for public health interventions that improve access to quality maternal care and promote evidence-based decision-making. Reducing unnecessary cesarean procedures, particularly in private hospitals, and enhancing patient education can significantly improve maternal and neonatal health outcomes.

What This Study Adds:

- Identifies key factors influencing cesarean rates in the study area.
- Highlights maternal age, socioeconomic status, and prior cesarean as main determinants.
- Shows both medical and non-medical reasons, like patient preference and doctor advice, affect cesarean decisions.
- Fills gaps in rural Bangladesh cesarean trends with hospital-based data.

Policy Implications:

* Corresponding author.
E-mail address: shuvo_nft@just.edu.bd (S.D. Shuvo).
[1] M.S.H. and S.D.S. authors have made equal contributions to this work.

https://doi.org/10.1016/j.puhip.2024.100558
Received 4 July 2024; Received in revised form 27 October 2024; Accepted 11 November 2024
Available online 22 November 2024

- Promote clear guidelines to standardize cesarean delivery decisions, ensuring procedures are medically justified.
- Support educational initiatives for healthcare providers and expectant mothers on the risks and benefits of cesarean versus vaginal delivery.
- Advocate collaboration between healthcare providers, policymakers, and community leaders to address socioeconomic factors driving high cesarean rates.
- Implement regular monitoring and audits of cesarean practices in hospitals to ensure adherence to guidelines and reduce unnecessary procedures.

1. Introduction

Cesarean delivery (CD), commonly referred to as C-section, has become an increasingly prevalent mode of childbirth globally, with significant variation between countries and regions. CD involves surgical incisions in the abdomen and uterus, while vaginal delivery is the natural process of birthing a baby through the birth canal [1,2]. Vaginal delivery is always preferred because of the fewer complications and quicker recovery, while CD might be carried out under conditions when natural delivery is impossible or may lead to health consequences [3]. However, CD has emerged as an alarming and widespread phenomenon in certain regions across the globe. The global prevalence of CD has increased dramatically [4], whereas vaginal deliveries have decreased [5–7]. World Health Organization (WHO) suggested that the rate of cesarean sections should not exceed 10–15 % in any population, yet recent reports indicate a significant increase in the prevalence of cesarean deliveries. If current trends continue, cesarean section rates are expected to reach 63 % in Eastern Asia, 54 % in Latin America and the Caribbean, and 50 % in Western Asia [8]. The WHO emphasized that there was no justifiable reason for any region to have a cesarean delivery rate surpassing the predetermined range [9]. Despite this, the global cesarean delivery rate has seen a dramatic rise over the past decade, now exceeding 21 % [10]. Moreover, a meta-analysis study including several countries showed a rising trend of cesarean deliveries [11,12]. Evidently, there exists a considerable contrast in CD rates between high and low-income countries, indicating disparities in healthcare practices [13]. Across different regions, the prevalence of CD exhibits striking variations at an increased rate, surpassing WHO recommendations. Notably, countries like Pakistan [14], Sri Lanka [15], and India [16] have reported significant and continuous increases in prevalence. In low- and middle-income countries like Bangladesh, the cesarean section rate has escalated dramatically over the past two decades [17]. Over the last ten years in Bangladesh, the prevalence of CD births has significantly increased, rising from 4 % to 23 % [8]. The country's current CD birth prevalence is 50.7 %, with rates significantly higher in urban areas compared to rural regions [18]. Recent observations in Bangladesh have shown that some mothers are now preferring cesarean deliveries (CD) even when medically not complicated [19]. One study found that cesarean delivery rates in Bangladesh are influenced by factors such as maternal education and access to healthcare facilities [20]. Additionally, research suggests that women in urban areas are more inclined to opt for cesarean births, often due to perceptions of greater safety and convenience [21].

Identifying factors that influence CD rates is crucial for reducing unnecessary procedures and improving access for individuals who need this lifesaving intervention. Earlier studies have linked cesarean delivery rates to sociodemographic factors such as maternal age, family size, residence, husband's occupation, employment status, socioeconomic status, and geographical differences within Bangladesh [16,17,22]. Other studies found that clinical factors linked to cesarean delivery include numerous births, higher wealth, overweight mothers, 1–3 prenatal visits, delivering in private facilities, and birth order [16,19]. In addition, factors including a fear of pain, concerns about the mother's and the baby's safety, and dissatisfaction with the doctor's skill may influence the decision to choose a cesarean delivery [23].

Importantly, cesarean births can have significant negative impacts on families and caregivers, including postpartum risks, financial stress, and probable newborn brain damage [24]. Increasing cesarean rates in the US contribute significantly to rising maternal morbidity and mortality, often linked to infections and hemorrhages [25,26]. Asthma, arthritis, and immunological deficits are among the myriad health issues that children born through cesarean delivery are more likely to experience [27]. After cesarean deliveries, subsequent pregnancies may pose risks such as fetal death and placental problems [28]. From a microbial perspective, infants born vaginally are exposed to essential healthy gut flora, fostering defense mechanisms and enabling gut-brain communication via the vagus nerves and neurotransmitters [29,30]. Cesarean-delivered newborns lack exposure to the vaginal microbiome, potentially affecting gut microbiota and increasing vulnerability to conditions such as autism spectrum disorders (ASDs) and altered brain development [31].

In recent years, Bangladesh has witnessed a significant rise in cesarean delivery (CD) rates [18].

Despite global and national concerns, there is a lack of primary data-driven research on the factors influencing cesarean delivery (CD) rates across different regions of Bangladesh. To our knowledge, no such data has been published for Jashore district. As the first digital city in Bangladesh, Jashore provides an opportunity to explore how technology, healthcare access, and sociodemographic diversity may influence delivery choices. Furthermore, its population includes both urban and rural residents, making it an ideal case for studying regional differences in cesarean rates within Bangladesh. Identifying these factors is crucial to addressing unnecessary CD procedures and improving maternal and newborn health, in line with Sustainable Development Goals (SDG) 3 (Good Health and Well-being) and 5 (Gender Equality). This study aims to assess the prevalence and factors associated with cesarean deliveries in Jashore district. The study will contribute to a better understanding at both the local and global levels of SDG 3 and 5. It will fill the research gap in this region through data-driven insights specific to Jashore and will provide guidance for targeted interventions regarding rising cesarean rates. The findings will enable policymakers to develop evidence-based strategies that ensure better maternal and newborn health outcomes.

2. Methods

2.1. Study setting and participants

Between December 2022 to February 2023, a hospital-based cross-sectional study was conducted in Jashore district, located in southwestern Bangladesh, approximately 136 km from the capital, Dhaka. Jashore district, according to the 2022 Bangladesh census, has a population of 3,076,144, with 23.39 % residing in urban areas. The gender distribution includes 1,524,060 males and 1,551,084 females. The district is served by 878 health facilities, with data collected exclusively from *sador* hospital. This facility was selected due to its status as the largest government healthcare center in Jashore, which provides high-quality services to patients across all economic backgrounds. Centrally located in the heart of Jashore town, *sadar* hospital attracts individuals from the entire district. Additionally, the hospital features a dedicated childcare section, making it a vital resource for mothers and their children. The hospital setting was chosen to facilitate the collection of a substantial amount of data from a diverse population, as individuals tend to provide accurate information when receiving medical care. Its comprehensive care options and accessibility to a diverse population make *sadar* hospital an ideal setting for this study [32].

2.2. Sample size and data collection

This study included lactating mothers who were recently given birth and receiving care at *sadar* hospital, regardless of whether they delivered at a private or public hospital. The sample size of 662 was determined using the formula: n = (Z *σ/E)^2, where 'n' represents the sample size, 'Z' is the standard score corresponding to the desired level of confidence, 'σ' denotes the population standard deviation, and 'E' represents the desired margin of error. For this study, we assumed a 95 % confidence level (Z = 1.96), a population standard deviation of 0.5 (as a starting point), and a desired margin of error of 5 % (E = 0.05). Plugging these values into the formula yielded an expected sample size of approximately 385 participants, which was rounded up to 662 to ensure robust statistical power.

A simple random sampling technique was used to collect the data through face-to-face interviews using a structured questionnaire adapted from previous literature [13,17,19], translated into local languages, and back-translated for consistency. To ensure randomness in participant selection, we generated a list of lactating mothers who visited the hospital during the study period. Participants were then selected from this list using a random number generator. A pre-test of the questionnaire was conducted with 25 lactating mothers to gather feedback and improve questionnaire clarity. This small group helped identify and refine any ambiguous questions, ensuring that the final version effectively communicated the intended questions and was relevant to the community. As a result, the questionnaire was well-adapted for effective data collection. Five research assistants with experience in conducting health surveys were recruited for the data collection process. Participants were informed about the study's goal, confidentiality, the opportunity to refuse participation, and their obligations. Before collecting data, all participants provided written informed consent. Participants, women aged 15 to 35 receiving care at *sadar* hospital in the Jashore district, were interviewed within one month of childbirth. We excluded mothers below 15 years or above 35 years and those who had delivered more than one month prior, as well as those unable to provide informed consent or had not received care at *sadar* hospital. Other exclusions included mothers with any complication related to pregnancy or delivery of the current pregnancy. This was important because such complications can affect their emotional and physical well-being and thus may not be able to respond appropriately. By focusing on a more uniform group, we aimed to accurately capture the experiences of healthy mothers in the Jashore district.

2.3. Outcome variable

The outcome variable for the study was cesarean deliveries among women aged 15 to >35 years. To gather this information, the participants were asked a specific question: "Was the baby delivered by cesarean or normal delivery?" The responses were then coded, with 0 representing "normal delivery" and 1 denoting "cesarean delivery". This coding system enabled the researchers to analyze and understand the prevalence of the two delivery methods within the specified age group of women.

2.4. Explanatory variables

In this hospital-based cross-sectional study, we meticulously examined a wide range of maternal factors to establish their association with cesarean delivery rates following previous literature [32,33]. The explanatory variables considered were as follows: women's age (20 years and above); type of family (joint or nuclear); age at pregnancy; age at marriage; residence (rural or urban); husband's occupation (day labor, farmer, employee, business, and unemployment); monthly family income in Bangladeshi Taka (BDT) where 1 USD~117.21 BDT, (<85.30 USD and above); maternal education and husband's education (never attended school, primary, secondary, and higher); maternal occupation (unemployed or employed); number of previous births (primi, two, and three or above); antenatal care visit (1–2 and above); distance to the health facility accurately divided into three groups (<30 min, 30–59 min and above); any complication during the last pregnancy (no or yes); maternal employment status during pregnancy (not working or working); pregnancy interval (primi, 6–24 and above); place of delivery (home, public hospital, and private hospital); gestational age (accurately recorded as <37 weeks or ≥37 weeks).

2.5. Data analysis

In our research, we used weighted methodologies for statistical analysis. The distribution of the study population was examined using descriptive statistics. Categorical variables, expressed as percentages (%), were analyzed using a weighted chi-square test. Multivariate logistic regression models explored the odds and related 95 % confidence intervals for associations between predictors and the outcome variable. These analytical techniques facilitated a comprehensive understanding of the variables influencing the frequency of cesarean deliveries among the study participants. To conduct the statistical analysis for this study, Stata (version 14) was employed as the designated software. A significance level of $p < 0.05$ was used to assess the statistical significance of the findings.

3. Result

3.1. Sociodemographic characteristics of the respondents

Sociodemographic factors: The majority of participants (61 %) resided in rural areas. Early first pregnancies (≤20 years) were common, with 94.1 % of respondents falling into this category. Additionally, 70.4 % of participants married before the age of 18, and 55.3 % of husbands worked as day laborers. Maternal education was mostly at the primary level (70.8 %), and 84.6 % of respondents were unemployed during pregnancy (Table 1).

Maternal Factors: Cesarean delivery (CD) was more common among younger mothers, with 94.2 % of participants under 20 years preferring CD. Among age groups, the highest CD prevalence (44.1 %) was observed in those ≤20 years, while the lowest prevalence (4.5 %) occurred in mothers aged over 30. Among participants married before age 18 years, 72.4 % underwent CD, compared to just 1.71 % of those married at ages over 24 years. Respondents who gave birth to their first child had a CD prevalence of 40.9 % (Table 1).

Delivery and Infant Factors: Cesarean delivery was the predominant mode of delivery (70.5 %), particularly in private hospitals (64.5 %), compared to public hospitals (35.5 %). Participants with no previous cesarean history had a higher CD prevalence (82.7 %) than those with prior cesareans (17.3 %). Most infants were born weighing ≥2500 g (79.1 %), and 59.3 % of cesareans were performed on mothers who delivered before 37 weeks of gestational age (Table 1).

Fig. 1 provided data outlines the percentage distribution of various factors influencing individuals' decisions related to childbirth. Among these concerns, 34.59 % expressed self-preference, while doctors convinced nearly 25 %.

Fig. 2 illustrates respondents' perceptions regarding beliefs about medical procedures. It shows that 55.1 % of participants believe certain practices maintain a woman's beauty. A significant majority (77.4 %) consider cesarean delivery beneficial for a baby's safety, and 74.7 % believe a specific procedure prevents pain. Similarly, opinions vary on the safety of cesarean delivery for mothers, with 74.6 % expressing support.

3.2. Factors associated with cesarean delivery

Table 2 provides insight into the factors associated with cesarean delivery (CD) prevalence among participants in the study.

Table 1
Sociodemographic characteristics of the respondents.

Variables	Total n (%)	Cesarean Delivery No n (%)	Cesarean Delivery Yes n (%)	*P-value*
Residence				
Rural	404 (61.1)	122 (62.6)	282 (60.4)	0.600
Urban	258 (38.9)	73 (37.4)	185 (39.6)	
Age at 1st pregnancy (years)				0.973
≤20	623 (94.1)	183 (93.8)	440 (94.2)	
21-25	32 (4.8)	10 (5.1)	22 (4.7)	
26-30	7 (1.1)	02 (1.1)	05 (1.1)	
Age category (years)				
≤20	290 (43.8)	84 (43.1)	206 (44.1)	0.012
21-25	244 (36.9)	75 (38.5)	169 (36.2)	
26-30	95 (14.4)	24 (12.2)	71 (15.2)	
>30	33 (4.9)	18 (6.1)	15 (4.5)	
Age of marriage category (years)				
<18	466 (70.4)	128 (65.6)	338 (72.4)	0.223
18-23	184 (27.8)	63 (32.3)	121 (25.9)	
≥24	12 (1.8)	4 (2.1)	8 (1.7)	
Occupation of husband				
Day labor	366 (55.3)	111 (56.9)	255 (54.6)	0.794
Farmer	88 (13.3)	24 (12.3)	64 (13.7)	
Employee	144 (21.7)	44 (22.6)	100 (21.4)	
Business	64 (9.7)	16 (8.2)	48 (10.3)	
Husband's education				
Never attended	60 (9.1)	13 (6.7)	47 (10.1)	0.516
Primary	241 (36.4)	75 (38.5)	166 (35.5)	
Secondary	182 (27.5)	52 (26.6)	130 (27.8)	
Higher	189 (27)	55 (28.2)	124 (26.6)	
Family monthly income				
≥170.61 USD[a]	141 (21.3)	47 (24.1)	94 (20.1)	0.538
128.00–170.61 USD[a]	108 (16.3)	33 (16.9)	75 (16.1)	
85.30–128.00 USD[a]	228 (34.5)	60 (30.8)	168 (35.9)	
<85.30 USD[a]	185 (27.9)	55 (28.2)	130 (27.9)	
Maternal occupation				
Unemployed	560 (84.6)	167 (85.6)	393 (84.2)	0.629
Employed	102 (15.4)	28 (14.4)	74 (15.8)	
Maternal education				
Never attended	36 (5.4)	8 (4.1)	28 (6)	<0.05
Primary	469 (70.8)	128 (65.6)	341 (73.1)	
Secondary	113 (17.1)	41 (21.1)	72 (15.4)	
Higher	44 (6.7)	18 (9.2)	26 (5.5)	
Maternal employment status during pregnancy				
No	423 (63.9)	118 (60.5)	305 (65.3)	0.241
Yes	239 (36.1)	77 (39.5)	162 (34.7)	
Distance of heath facility (minutes)				
<30	351 (53)	99 (50.8)	252 (53.9)	0.303
30-59	259 (39.1)	84 (43.1)	175 (37.5)	
≥60	52 (7.9)	12 (6.1)	40 (8.6)	
Antenatal care visit				
1-2	108 (16.3)	41 (21)	67 (14.4)	0.104
2-3	100 (15.1)	27 (13.9)	73 (15.6)	
≥4	454 (68.6)	127 (65.1)	327 (70)	
Type of family				0.223
Joint	350 (52.9)	131 (67.2)	219 (46.9)	
Nuclear	312 (47.1)	64 (32.8)	248 (53.1)	
Number of previous births				
Primi	261 (39.4)	70 (35.9)	191 (40.9)	0.235
One	129 (19.5)	47 (24.1)	82 (17.6)	
Two	214 (32.3)	63 (32.3)	151 (32.3)	
Three or more	58 (8.8)	15 (7.7)	43 (9.2)	
Pregnancy interval (in months)				
Primi	273 (41.2)	75 (38.5)	198 (42.4)	0.104
6-24	216 (32.6)	71 (36.4)	145 (31)	
25-36	51 (7.7)	11 (5.6)	40 (8.6)	
37-48	45 (6.8)	9 (4.6)	36 (7.7)	
≥49	77 (11.7)	29 (14.9)	48 (10.3)	
Mode of delivery				
Cesarean delivery	467 (70.5)	195 (29.5)	467 (70.5)	<0.001
Normal delivery	195 (29.5)	467 (70.5)	195 (29.5)	
Place of delivery				
Public hospital	235 (35.5)	102 (52.3)	133 (28.5)	<0.001
Private hospital	427 (64.5)	93 (47.7)	334 (71.5)	
Previous cesarean				
No	561 (84.8)	175 (89.7)	386 (82.7)	0.021
Yes	101 (15.2)	20 (10.3)	81 (17.3)	
Gender of baby				
Girl	322 (48.6)	94 (48.2)	228 (48.8)	0.885
Boy	340 (51.4)	101 (51.8)	239 (51.2)	
Child weight at birth (g)				
≥2500	523 (79.1)	156 (80)	367 (78.6)	0.031
<2500	139 (20.9)	39 (20)	100 (21.4)	
Gestational age (weeks)				
<37 weeks	362 (54.7)	85 (43.6)	277 (59.3)	<0.001
≥37 weeks	300 (45.3)	110 (56.4)	190 (40.7)	

[a] 1 USD~ 117.21 BDT.

3.2.1. Socio-demographic factors

In this context, rural residents demonstrated a statistically significant association with Cesarean Delivery (CD), being 1.79 times more likely to undergo CD compared to their urban counterparts (OR: 1.79; 95 % CI 1.36–3.14). Moreover, among age-related factors, participants aged 15–20 years during their first pregnancy showed a significant

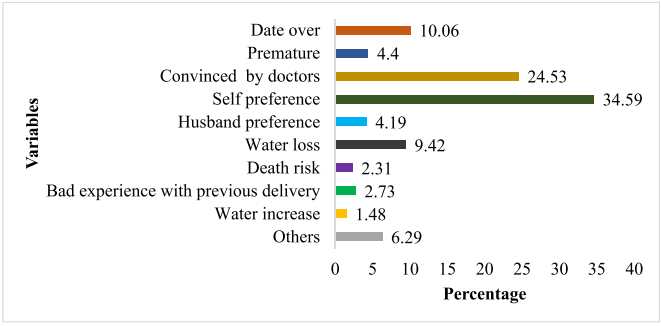

Fig. 1. Reasons for choosing cesarean delivery as reported by mothers (N = 467).

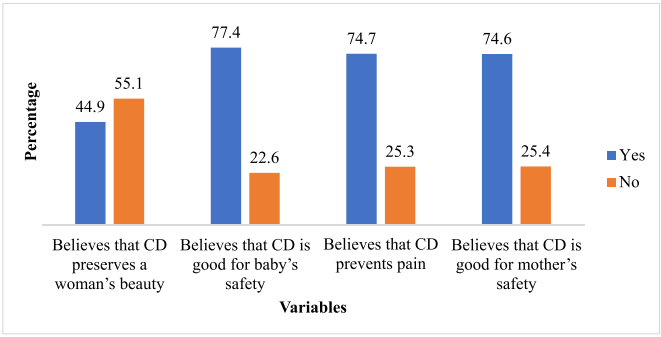

Fig. 2. Knowledge perception of the respondents.

association with CD, indicating a 3.95-fold increased likelihood compared to those aged 26–30 years (OR: 3.95; 95 % CI 1.68–6.79). Additionally, early marriage (<18 years) also emerged as a significant factor, with participants in this category having 3.33 times higher odds of CD compared to those married at ≥24 years. Furthermore, individuals from nuclear families exhibited a 1.94 times higher likelihood of CD compared to the reference group. Interestingly, husbands employed as employees were associated with 2.89 times higher odds of CD, while those in business occupations showed 5.15 times higher odds compared to husbands in day labor. Finally, delivery in private hospitals was significantly associated with higher CD rates compared to public hospitals. Lastly, participants with a history of previous CD also had significantly increased odds of choosing CD compared to those without such history.

3.2.2. *Maternal obstetric factors*

Infants weighing ≥2500 g at birth were significantly more likely to be delivered via cesarean section (CD) compared to those weighing <2500 g. Similarly, infants born before 37 weeks of gestational age had significantly higher odds of CD compared to those born at or after 37 weeks. Furthermore, women experiencing water loss during pregnancy had an odds ratio (OR) of 6.79 for undergoing CD compared to those without this complication. Additionally, difficulty in conception also increased the likelihood of CD. Notably, doctor-reported convenience was associated with 4.61 times higher odds of CD. In addition, having a premature baby increased the likelihood of CD by more than 2 times. Finally, women perceiving a risk of death during normal delivery had 3.19 times higher odds of choosing CD. Participants who viewed CD as safer for the baby were 1.41 times more likely to choose this method, while those considering it safer for the mother had 1.21 times higher odds of selecting CD.

Fig. 3 collectively illustrates various predictive marginal effects on the likelihood of cesarean delivery at a 5 % significance level. Maternal age (Fig. 3(a)) directly influenced this probability, with older women, particularly those over 30, showing higher rates compared to younger

Table:2
Factors associated with cesarean delivery.

Variables		OR (95 % CI[c])	P-Value[b]
Residence	Urban	Reference	0.032
	Rural	1.79 (1.36–3.14)	
Age at 1st pregnancy (years)	26–30	Reference	
	21–25	0.73 (0.30–1.75)	0.486
	15–20	3.95 (1.68–6.79)	0.014
AGE category (years)	>30	Reference	
	26–30	1.33 (0.58–1.65)	0.45
	21–25	2.28 (1.59–2.80)	0.004
	15–20	3.36 (1.94–4.76)	0.009
Age at marriage (years)	≥24	Reference	
	18–23	0.64 (0.42–0.98)	0.044
	<18	3.33 (1.67–4.86)	0.027
Husband's occupation	Day labor	Reference	
	Farmer	0.85 (0.42–1.71)	0.662
	Employee	2.89 (1.16–4.20)	0.036
	Business	5.15 (2.70–7.60)	0.019
Husband education	Never attended school	Reference	
	Primary	0.77 (0.34–1.72)	0.536
	Secondary	0.72 (0.29–1.77)	0.478
	Higher	0.20 (0.03–1.17)	0.761
Family income	≥170.61 USD[a]	Reference	
	128.00 USD-170.61 USD[a]	1.71 (0.33–4.10)	0.795
	85.30 USD-128.00 USD[a]	2.03 (0.54–7.50)	0.292
	<85.30 USD[a]	1.74 (0.48–6.23)	0.390
Mother occupation	Unemployed	Reference	0.035
	Employed	1.87 (1.22–3.60)	
Maternal Education	Never attended school	Reference	
	Primary	0.76 (0.29–1.96)	0.580
	Secondary	0.41 (0.136–1.26)	0.122
	Higher	0.16 (0.03–0.87)	0.035
Number of previous births	Primi	Reference	
	One	0.43 (0.12–1.48)	0.182
	Two	0.85 (0.21–3.45)	0.823
	Three or above	0.40 (0.07–2.23)	0.301
Place of delivery	Public hospital	Reference	<0.001
	Private hospital	3.59 (2.11–4.77)	
Distance of heath facility (min)	<30	Reference	
	30–59	0.75 (0.51–1.11)	0.158
	≥60	1.45 (1.03–3.07)	0.034
Antenatal care visit (ANC)	1–2	Reference	
	3–4	1.80 (0.94–3.43)	0.07
	≥4	1.01 (0.59–1.67)	0.99

(*continued on next page*)

Table:2 (*continued*)

Variables		OR (95 % CI[c])	P-Value[b]
Type of family	Joint	Reference	0.003
	Nuclear	1.94 (1.48–3.78)	
Previous cesarean delivery	No	Reference	0.02
	Yes	1.73 (1.19–3.33)	
Gender	Girl	Reference	0.463
	Boy	0.86 (0.58–1.27)	
Child weight at birth (g)	<2500	Reference	0.004
	≥2500	1.88 (1.39–3.42)	
Gestational age	<37 weeks	Reference	0.005
	≥37 week	2.54 (1.43–3.87)	
Water loss during pregnancy	No	Reference	<0.001
	Yes	6.79 (3.11–8.83)	
Self-evaluated difficulty in getting pregnant	No	Reference	0.001
	Yes	5.71 (2.65–7.96)	
Convinced by doctor	No	Reference	<0.001
	Yes	4.61 (2.78–6.59)	
Premature baby	No	Reference	0.032
	Yes	2.53 (1.13–6.39)	
Death Risk in normal delivery	No	Reference	0.026
	Yes	3.19 (1.25–8.23)	
Believes that CD preserves a woman's beauty	No	Reference	
	Yes	0.72 (0.48–1.08)	0.118
Believes that CD is good for baby's safety	No	Reference	
	Yes	1.41 (1.15–2.23)	0.013
Believes that CD prevents pain	No	Reference	
	Yes	0.67 (0.45–1.09)	0.109
Believes that CD is good for mother's safety	No	Reference	
	Yes	1.21 (1.05–3.19)	0.04

[a] 1 USD~ 117.21 BDT.
[b] statistically significant at <0.05.
[c] CI = confidence interval.

age groups. Previous cesarean history (Fig. 3(b)) significantly increased the likelihood of another cesarean. Cesarean rates also varied by hospital type, with private hospitals (Fig. 3(c)) demonstrating higher rates than public hospitals. Pregnancy complications such as amniotic fluid loss (Fig. 3(d)) affected cesarean likelihood. Maternal perceptions of cesarean safety (Fig. 3(e)) and doctor recommendations (Fig. 3(f)) notably elevated the probability of cesarean delivery.

4. Discussion

In this study, we examined cesarean delivery rates and their influencing factors using primary data from Jashore district, Bangladesh. We found a cesarean delivery prevalence of 70.5 %, markedly surpassing Bangladesh's national rate of 50.7 % in 2023. Both rates are substantially above the World Health Organization's recommended threshold of 15 % for cesarean deliveries in any country [8,18]. The current finding is alarming, as Bangladesh's cesarean delivery rate was just 2.4 % in 2000 [33]. Globally, CD rates are highly variable and depend on different factors such as socio-economic status, culture, and education. This discussion will explore the implications of these findings, comparing them with the existing literature to derive a deep understanding of cesarean delivery practices in different settings.

4.1. Sociodemographic factors

The prevalence of CD was significantly higher among rural women residents, in contrast to findings from the Bangladesh Demographic and Health Survey 2014 [4]. The trends of cesarean sections are increasing in the metropolitan areas. Many studies have reported higher-order rates of CD in such settings over the last decades, especially in low- and middle-income countries of Asia, Africa, and Latin America [8,10,14]. However, our findings deviate from this trend; this can be explained by the high percentage of rural participants in Jashore, further complicated by the socioeconomic status and level of education of the rural women, which could partly explain the higher rates of cesarean section rates recorded. Moreover, rural women have also developed a kind of perception that CS is safer or more convenient, either because health providers advise them on this issue or because they do not want to experience labor pain [34]. Socioeconomic factors, including a lack of comprehensive antenatal care, may further increase complication rates in pregnancy and consequently lead to higher risks. These factors, coupled with the educational background of rural women, most likely explain the higher rates of cesarean deliveries observed [35]. There was a significant association between cesarean delivery and maternal age, indicating that young women aged 15–20 years had a higher tendency for CD compared to older age groups, consistent with prior research [36]. However, Ahmmed et al. (2021) found a contrasting trend where older women were more likely to undergo CD [19]. The observed trend among younger women may be attributed to several factors. Many young parents fear the pain associated with labor and thus consider cesarean delivery as a safer and more viable option. Secondly, if pregnant women do not receive optimum support from their partners, then anxiety and stress can increase their concerns. Additionally, cultural, and social demands and religious beliefs may also influence their decision towards cesarean section [37]. Bangladesh has experienced significant success in increasing per capita income over the past few decades. Our study revealed a higher rate of CD among women whose husbands were in business. A previous study also noted a correlation between the husband's occupation and a rising rate of cesarean deliveries [19]. Mothers from higher-income families tend to enjoy more comfort and luxuries and may be more anxious about labor pain with vaginal delivery, which could be a factor in their choosing cesarean delivery [38]. Husbands in high-demand professions may contribute to higher cesarean rates for several reasons. Their busy work schedules can limit their availability to support their wives during pregnancy, leading to increased anxiety. Additionally, the financial stability associated with higher-income occupations might create an environment where cesarean delivery is perceived as a more convenient or safer option [39]. Over the past two decades, Bangladesh's private healthcare sector has experienced remarkable growth, incentivizing physicians in private hospitals to promote cesarean deliveries, potentially influencing their recommendations for mothers to choose this mode of delivery [40]. Similar trends were observed in India, where the sharp rise in institutional deliveries was driven by an increased prevalence of childbirth in private healthcare facilities [41]. Many people prefer private hospitals, believing they offer superior care and advanced technology, while patients avoid public hospitals for delivery due to mistrust in the quality of treatment, lack of specialized staff, and inadequate facilities. This study also revealed that women who attended antenatal care (3-4 times) during pregnancy were more likely to undergo CD, consistent with previous research findings [39]. Abbas et al. (2018) observed that women who had a higher number of antenatal care (ANC) visits were more likely to undergo cesarean delivery [42]. Better monitoring during ANC visits improves health assessments for both mother and baby [43]. However, profit motives may influence doctors to opt for cesarean deliveries, despite safety concerns in high-risk pregnancies. Interestingly, our findings indicate that joint families exhibited a lower likelihood of undergoing CD compared to those from nuclear families, which aligns with findings from the previous study [44]. Lower cesarean section rates

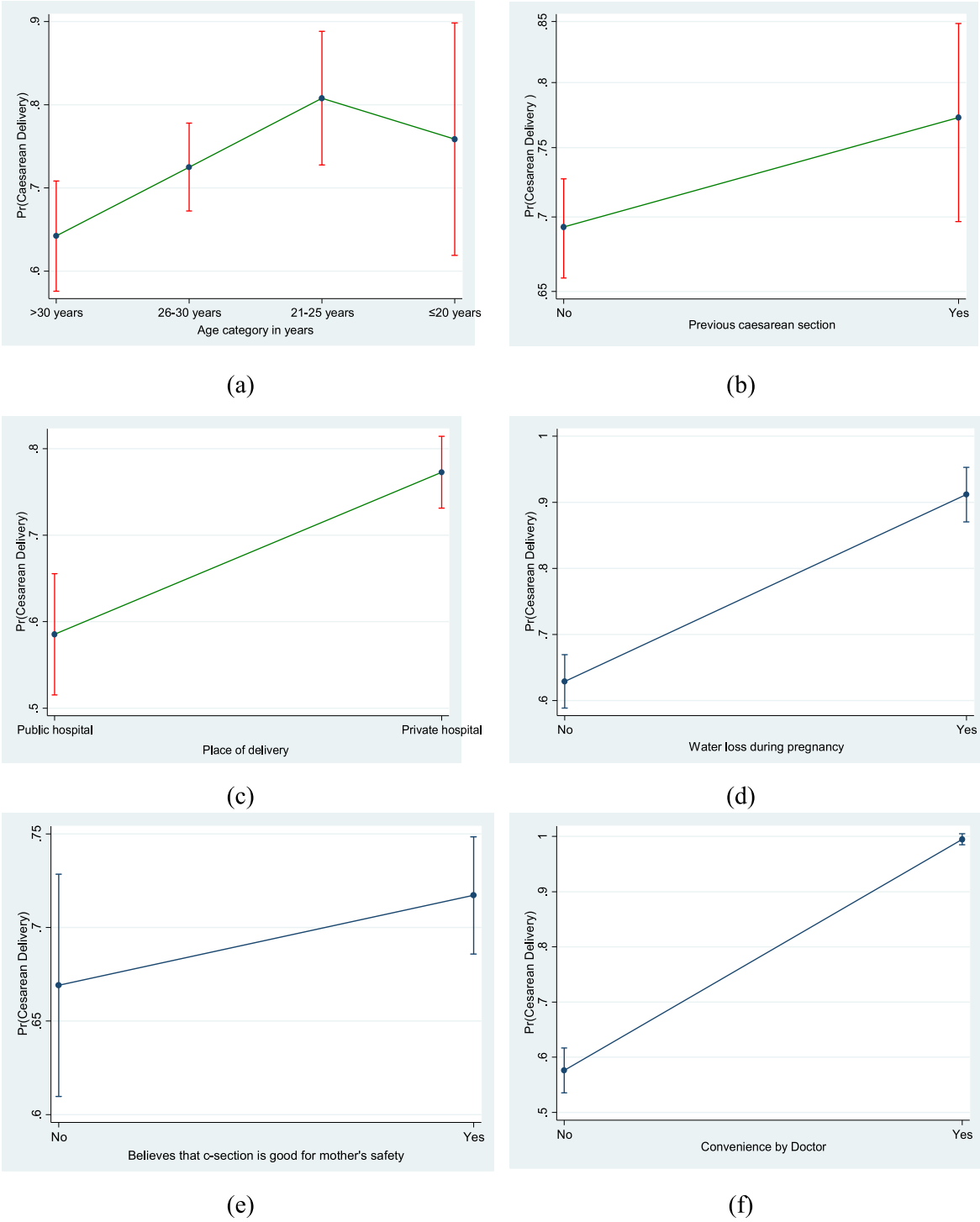

Fig. 3. Predictive marginal effect of cesarean delivery with different predictors.

among mothers from joint families may be due to several factors: a strong support system that reduces anxiety, knowledgeable family members who provide reassurance and promote confidence in natural delivery and shared resources that enhance access to prenatal care. Additionally, social norms in joint families often prioritize traditional birth methods, discouraging unnecessary cesarean deliveries [45]. The study found no significant association between maternal or husband's education and cesarean rates, despite evidence that more educated women tend to prefer health facility births over home births [46,47]. Several factors can explain the lack of significant associations. Education levels will not essentially translate to preferences for cesarean deliveries since those with higher education, considering vaginal births safer, may still go for these methods. Cultural beliefs and social norms are more likely to be a stronger predictor of delivery methods than education [48, 49].

4.2. *Maternal obstetric factors*

Our findings also indicate that individuals with a history of previous CD were more likely to undergo another cesarean delivery, consistent with the earlier study conducted by Abebe et al., in 2015 [50]. A study conducted in Japan also observed that women having a previous

cesarean delivery were more likely to prefer a repeat cesarean [51]. Several factors may account for this phenomenon. A cesarean delivery leaves scar tissue on the uterus and raises complications that may arise in subsequent vaginal deliveries, such as uterine rupture [52]. For this reason, women with previous cesarean sections may feel it's safer to continue with cesarean deliveries. Additionally, healthcare providers might recommend repeating the procedure based on her delivery history, further influencing her choice.

The present study identified a notable correlation between gestational age and cesarean delivery, with deliveries at or beyond 37 weeks showed higher rates of CD. This finding aligns with prior research [37], which showed that women delivering post-term are more likely to have a cesarean delivery compared to those delivering pre-term. As pregnancies extend beyond 37 weeks, risks like fetal distress, macrosomia (a condition of having a large baby), and maternal health issues start to rise [53]. Hence, the health professionals may advise cesarean delivery. At the same time, women with post-term pregnancies may experience increased anxiety about potential labor complications, leading them to prefer cesarean delivery. Additionally, physicians may take a more conservative approach, further raising the likelihood of cesarean deliveries. Additionally, pregnant individuals who experienced water loss during pregnancy were more likely to undergo CD. According to a previous study, low amniotic fluid levels during pregnancy are linked to a higher likelihood of cesarean delivery and may prompt the need for delivery to occur earlier [54]. Those with low amniotic fluid levels often face complications that could require a cesarean delivery. Specifically, low fluid can cause issues like fetal distress or umbilical cord problems, which can harm both the mother and baby [55]. Because of these risks, healthcare providers often suggest a cesarean to ensure safer delivery and protect the health of both.

When examining the reasons for cesarean delivery (CD), we found that many pregnant women opt for cesareans based on personal preference. This agrees with findings from earlier studies showing that personal choice plays a major role in decision-making about cesarean delivery [51], often influenced by concerns about labor complications and perceived safety, alongside psychological factors like anxiety about childbirth experiences.

Most of the participants in our study responded that the reasons for cesarean delivery were on their doctor's recommendation, with almost one-quarter responding as the main reason. In contrast, Ahmmed et al. (2021) found, from their secondary data, that only 4.5 % of individuals were convinced by doctors, which is significantly lower compared to our results [19]. Doctors may recommend cesarean delivery based on concerns about complications, patient preferences, and logistical factors, prioritizing the health and safety of both mother and baby. They may also consider the financial advantages of cesarean deliveries, which often result in higher payment rates compared to vaginal deliveries, and perceive them as enhancing maternal safety and reducing pain [56,57]. Previous studies have consistently shown that there exists a common belief among individuals that cesarean delivery is less painful, safer, and healthier compared to vaginal delivery [58]. The belief may stem from an inadequate understanding of childbirth options, including the risks and benefits of vaginal birth, which can contribute to the perception that CD was safer and less painful.

4.3. Policy implication

Many of the additional factors contributing to CD deliveries in Bangladesh are unknown. However, the implementation of specific effective interventions based on the factors that this study identifies can significantly reduce the rates of CS deliveries. The findings of this study highlight many aspects contributing to the high CD rate in Jashore district, should be guided by specific policy responses. For instance, the higher rates of CD found among private hospitals show that regulation and monitoring of such facilities should be strengthened to ensure that they adhere to the national guidelines on performing CDs. Additionally, the findings of increasing cesarean delivery rates among younger mothers and women with no history of previous cesarean section deliveries emphasize the need for an enhancement in antenatal care services through educating healthcare providers about evidence-based practices for vaginal delivery. The public should be aware of the benefits of vaginal birth and risks from unnecessary surgical procedures; this should be explicitly provided to the subjects, especially in rural areas where the rates of CD are comparatively high.

Strengthening legislation and mechanisms for control will be necessary, as will empowerment of information and support, to reduce unnecessary CDs. This is a necessary action toward the fulfillment of SDGs 3 and 5, or reducing maternal mortality and ensuring access to quality and efficacious health services. These policy initiatives flow from the outputs of this study, which addressed major factors driving high cesarean rates in Jashore and will enlighten future intervention strategies to improve maternal health outcomes locally and globally.

4.4. Strength and limitations

This research has several strengths, particularly its sound methodology: considerable sample size and thorough statistical analysis. The precision is enhanced by using primary data collected through face-to-face interviews and makes for an in-depth study of the participants' perspectives. Focusing on a specified geographic region and maternal influences, this study provides valuable information about cesarean delivery trends in the Jashore district. However, the study is subject to several inherent limitations. Recall bias may affect the accuracy of self-reported data, as participants might not accurately remember past events or experiences. In addition, selection bias could occur if certain population groups are poorly represented in the sample, which might affect the results of the study. The cross-sectional design limits the ability to infer causation, a point that should be considered an important limitation in interpreting the relationship between variables. Apart from this, the results may not be widely applicable to other parts of Bangladesh because of the special focus that was laid on Jashore district. These thus constitute limitations in ways of showing that one should exercise caution while interpreting findings and directions for future research to fill these knowledge gaps.

5. Conclusion

Our study observed a high rate of cesarean deliveries in Jashore district, driven by factors such as rural residence, maternal age, husband's occupation, antenatal care attendance, gestational age, place of delivery, and history of previous cesarean delivery. Decision-making processes were influenced by healthcare providers, personal preferences, and doctor recommendations, with many perceiving cesarean delivery as enhancing maternal safety and pain relief. Achieving sustainable development goal 3 requires targeted efforts to enhance maternal healthcare access, promote evidence-based decision-making, and address socioeconomic barriers nationally and internationally. A holistic approach to policy-making could significantly improve health outcomes for both mothers and newborns.

Consent to participate

To keep confidentiality in data collection, the data collector, supervisor, and investigator used a code number instead of the student's name. All participants provided written consent of their willingness to participate in the study.

Availability of data and materials

Data is available upon request from the corresponding author.

Ethical statement

Ethical clearance was obtained from the Ethical Review Committee of the Faculty of Biological Science and Technology at Jashore University of Science and Technology before data collection commenced. The study strictly adhered to ethical guidelines, with reference number ERC/FBST/JUST/2022-132. Prior to conducting the interviews, the researchers informed participants about the aim of the study and obtained written informed consent from all participants. The data were processed anonymously and no name data were collected as part of the survey completion.

Consent for publication

Not applicable.

Financial support

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Competing interests

The authors do not have any conflicts of interest to declare.

Acknowledgments

The authors would like to express their sincere appreciation to the health facilities administration at Jashore Sadar Hospital for their incredible assistance, as well as to all of the study participants for generously dedicating their time to this research.

References

[1] C.O. Aimakhu, A.O. Ilesanmi, Operative vaginal delivery, in: Contemporary Obstetrics and Gynecology for Developing Countries, second ed., 2021, https://doi.org/10.1007/978-3-030-75385-6_16.
[2] L. Carbone, G. Saccone, A. Conforti, G.M. Maruotti, V. Berghella, Cesarean delivery: an evidence-based review of the technique, Minerva Obstetrics and Gynecology 73 (2021), https://doi.org/10.23736/S2724-606X.20.04681-X.
[3] D.M. Christe, D. Tamilselvi, S. Surya, S. Shobha, C. Ponnuraja, Vaginal deliveries in a tertiary centre: a current profile, Int J Reprod Contracept Obstet Gynecol 9 (2019) 134, https://doi.org/10.18203/2320-1770.ijrcog20196009.
[4] M.M. Rahman, M.R. Haider, M. Moinuddin, A.E. Rahman, S. Ahmed, M. Mahmud Khan, Determinants of caesarean section in Bangladesh: cross-sectional analysis of Bangladesh demographic and health survey 2014 data, PLoS One 13 (2018), https://doi.org/10.1371/journal.pone.0202879.
[5] H.T. Li, R.W. Ye, L.J. Pei, A.G. Ren, X.Y. Zheng, J.M. Liu, Cesarean delivery on maternal request and childhood intelligence: a cohort study, Chin Med J (Engl) 124 (2011), https://doi.org/10.3760/cma.j.issn.0366-6999.2011.23.025.
[6] A.M. Saleh, J.W. Dudenhausen, B. Ahmed, Increased rates of cesarean sections and large families: a potentially dangerous combination, J. Perinat. Med. 45 (2017), https://doi.org/10.1515/jpm-2016-0242.
[7] S. Haberman, S. Saraf, J. Zhang, H.J. Landy, D.W. Branch, R. Burkman, K. D. Gregory, M.M. Ramirez, J.L. Bailit, V.H. Gonzalez-Quintero, J.U. Hibbard, M. K. Hoffman, M. Kominiarek, L. Lu, P. Van Veldhuisen, V. Von Gruenigen, Nonclinical parameters affecting primary cesarean rates in the United States, Am. J. Perinatol. 31 (2014), https://doi.org/10.1055/s-0033-1345263.
[8] A.P. Betran, M.R. Torloni, J.J. Zhang, A.M. Gülmezoglu, WHO statement on caesarean section rates, BJOG 123 (2016), https://doi.org/10.1111/1471-0528.13526.
[9] H. Margareth, WHO recommendations: non-clinical interventions to reduce unnecessary caesarean sections. https://iris.who.int/bitstream/handle/10665/275377/9789241550338-eng.pdf, 2018.
[10] N. Opiyo, C. Kingdon, O.T. Oladapo, J.P. Souza, J.P. Vogel, M. Bonet, M. Bucagu, A. Portela, F. McConville, S. Downe, A.M. Gülmezoglu, A.P. Betrán, Non-clinical interventions to reduce unnecessary caesarean sections: who recommendations, Bull. World Health Organ. 98 (2020), https://doi.org/10.2471/BLT.19.236729.
[11] M. Tefera, N. Assefa, B. Mengistie, A. Abrham, K. Teji, T. Worku, Elective cesarean section on term pregnancies has a high risk for neonatal respiratory morbidity in developed countries: a systematic review and meta-analysis, Front Pediatr 8 (2020), https://doi.org/10.3389/fped.2020.00286.
[12] G. Gedefaw, A. Demis, B. Alemnew, A. Wondmieneh, A. Getie, F. Waltengus, Prevalence, indications, and outcomes of caesarean section deliveries in Ethiopia: a systematic review and meta-analysis, Patient Saf. Surg. 14 (2020), https://doi.org/10.1186/s13037-020-00236-8.
[13] M.R. Festin, M. Laopaiboon, P. Pattanittum, M.R. Ewens, D.J. Henderson-Smart, C. A. Crowther, S.J. McDonald, M. Laopaiboon, M. Murano, N. Narash, M. Hakimi, L. Amanah, D. Lukitasari, D. Astuti, J.J. Ho, S.S. Cham, E.T. Aw, P. Lumbiganon, A. Khianman, A. Pharprapa, J. Nachaipet, B. Saenrien, S. Srisutthikamol, S. Panikom, C. Khunudom, S. Thipawat, S. Choonhapran, S. Nuanbuddee, P. Jarudphan, A. Hempira, R. Poombankor, P. Tharnprisan, P. Sarapon, O. Ponpun, C. Ubaldo-Anzures, L.N. Canete, J. Magsipoc, J.L. Festin, E. Torralba, Caesarean section in four South East Asian countries: reasons for, rates, associated care practices and health outcomes, BMC Pregnancy Childbirth 9 (2009), https://doi.org/10.1186/1471-2393-9-17.
[14] A. Amjad, A. Imran, N. Shahram, R. Zakar, A. Usman, M.Z. Zakar, F. Fischer, Trends of caesarean section deliveries in Pakistan: secondary data analysis from Demographic and Health Surveys, 1990–2018, BMC Pregnancy Childbirth 20 (2020), https://doi.org/10.1186/s12884-020-03457-y.
[15] Sri lankaa ministry of HEALTHH [Internet]. Available from:www.health.gov.lk.
[16] V Neethi Mohan, P Shirisha, G Vaidyanathan, VR Muraleedharan, Variations in the prevalence of caesarean section deliveries in India between 2016 and 2021 – an analysis of Tamil Nadu and Chhattisgarh, BMC Pregnancy Childbirth 23 (2023). https://doi.org/10.1186/s12884-023-05928-4.
[17] V. Verma, R.K. Vishwakarma, D.C. Nath, H.T.A. Khan, R. Prakash, O. Abid, Prevalence and determinants of caesarean section in South and South-East Asian women, PLoS One 15 (2020), https://doi.org/10.1371/journal.pone.0229906.
[18] Bangladesh sample vital statistics, Available from, https://bbs.gov.bd/site/page/ef4d6756-2685-485a-b707-aa2d96bd4c6c/Vital-Statistics, 2022.
[19] F. Ahmmed, M.M.R. Manik, M. Jamal Hossain, Caesarian section (CS) delivery in Bangladesh: a nationally representative cross-sectional study, PLoS One 16 (2021), https://doi.org/10.1371/journal.pone.0254777.
[20] P. Kumar, H. Sharma, Prevalence and determinants of socioeconomic inequality in caesarean section deliveries in Bangladesh: an analysis of cross-sectional data from Bangladesh Demographic Health Survey, 2017-18, BMC Pregnancy Childbirth 23 (2023), https://doi.org/10.1186/s12884-023-05782-4.
[21] S. Kundu, A. Bin Sharif, S.S.A. Chowdhury, S. Afroz, R. Dey, A. Hossain, Socioeconomic and geographical inequalities in delivery by cesarean section among women in Bangladesh, 2004–2017, BMC Pregnancy Childbirth 24 (2024), https://doi.org/10.1186/s12884-024-06327-z.
[22] A. Giletew Wondie, Magnitude, factors associated with cesarean delivery and its appropriateness, in: Current Topics in Caesarean Section, 2021, https://doi.org/10.5772/intechopen.98286.
[23] K. Huang, F. Tao, B. Faragher, J. Raven, R. Tolhurst, S. Tang, N. van den Broek, A mixed-method study of factors associated with differences in caesarean section rates at community level: the case of rural China, Midwifery 29 (2013), https://doi.org/10.1016/j.midw.2012.11.003.
[24] T. Zhang, A. Sidorchuk, L. Sevilla-Cermeño, A. Vilaplana-Pérez, Z. Chang, H. Larsson, D. Mataix-Cols, L. Fernández De La Cruz, Association of cesarean delivery with risk of neurodevelopmental and psychiatric disorders in the offspring: a systematic review and meta-analysis, JAMA Netw. Open 2 (2019), https://doi.org/10.1001/jamanetworkopen.2019.10236.
[25] K. Murtaza, M. Chaudhry, S. Nazeer, S. Malik, Prevalence-pattern and risk factors of cesarean section in a multiethnic cohort, Pakistan J. Med. Sci. 37 (2021), https://doi.org/10.12669/pjms.37.3.3186.
[26] C. Burke, R. Allen, Complications of cesarean birth: clinical recommendations for prevention and management, MCN Am. J. Matern./Child Nurs. 45 (2020), https://doi.org/10.1097/NMC.0000000000000598.
[27] M.S. Sheikh, G. Nelson, S.L. Wood, A. Metcalfe, Surgical errors and complications following cesarean delivery in the United States, Am. J. Obstet. Gynecol. MFM (2020) 2, https://doi.org/10.1016/j.ajogmf.2019.100071.
[28] V. Moramarco, S. Korale Liyanage, K. Ninan, A. Mukerji, S.D. McDonald, Classical cesarean: what are the maternal and infant risks compared with low transverse cesarean in preterm birth, and subsequent uterine rupture? A systematic review and meta-analysis, J. Obstet. Gynaecol. Can. 42 (2020), https://doi.org/10.1016/j.jogc.2019.02.015.
[29] I. Yang, E.J. Corwin, P.A. Brennan, S. Jordan, J.R. Murphy, A. Dunlop, The infant microbiome: implications for infant health and neurocognitive development, Nurs. Res. 65 (2016), https://doi.org/10.1097/NNR.0000000000000133.
[30] G. Lach, H. Schellekens, T.G. Dinan, J.F. Cryan, Anxiety, depression, and the microbiome: a role for gut peptides, Neurotherapeutics 15 (2018), https://doi.org/10.1007/s13311-017-0585-0.
[31] G.B. Rogers, D.J. Keating, R.L. Young, M.L. Wong, J. Licinio, S. Wesselingh, From gut dysbiosis to altered brain function and mental illness: mechanisms and pathways, Mol. Psychiatr. 21 (2016), https://doi.org/10.1038/mp.2016.50.
[32] Statistical yearbook of Bangladesh. https://en.wikipedia.org/wiki/Jessore_District, 2022.
[33] F.L. Cavallaro, J.A. Cresswell, G.V.A. França, C.G. Victora, A.J.D. Barros, C. Ronsmans, Tendance de l'accouchement par césarienne par pays et quintile de richesse: Études transversales en Asie du Sud et en Afrique sub-saharienne, Bull. World Health Organ. 91 (2013) 914–922, https://doi.org/10.2471/BLT.13.117598.
[34] F. Abdulla, M.M. Hossain, M.M. Rahman, M.S. Rahman, A. Rahman, Risk factors of caesarean deliveries in urban–rural areas of Bangladesh, Frontiers in Reproductive Health 5 (2023), https://doi.org/10.3389/frph.2023.1101400.
[35] M.O. Faruk, S. Sultana, M. Al-Neyma, S. Hossain, Socioeconomic, demographic, and nutritional factors associated with cesarean deliveries among childbearing women in Bangladesh, Journal of Medicine, Surgery, and Public Health 1 (2023) 100001, https://doi.org/10.1016/j.glmedi.2023.100001.

[36] Levels and determinants of caesarean deliveries in Egypt: pathways to rationalization, Internet J. World Health Soc. Polit. 7 (2012), https://doi.org/10.5580/2c74.
[37] D. Gyaase, Y.A. Enuameh, B.N. Adjei, S. Gyaase, E.K. Nakua, M.M. Kabanunye, M. M. Alhassan, M.S. Yakubu, R.J. Tetteh, S. Newton, K.P. Asante, Prevalence and determinants of caesarean section deliveries in the Kintampo Districts of Ghana, BMC Pregnancy Childbirth 23 (2023), https://doi.org/10.1186/s12884-023-05622-5.
[38] R. Kumar, S. Lakhtakia, Rising cesarean deliveries in India: medical compulsions or convenience of the affluent? Health Care Women Int. 42 (2021) 611–635, https://doi.org/10.1080/07399332.2020.1798963.
[39] F. Karim, N.B. Ali, A.N.S. Khan, A. Hassan, M.M. Hasan, D.M.E. Hoque, S.M. Billah, S. El Arifeen, M.A.K. Chowdhury, Prevalence and factors associated with caesarean section in four hard-to-reach areas of Bangladesh: findings from a cross-sectional survey, PLoS One 15 (2020), https://doi.org/10.1371/journal.pone.0234249.
[40] A.R. Sarker, I. Zabeen, Z. Hossain, N. Ali, J.A.M. Khan, Increasing rates of cesarean birth in Bangladesh: a household-level pooled analysis, Birth 51 (2024) 326–342, https://doi.org/10.1111/birt.12789.
[41] A. De Costa, K.S. Vora, K. Ryan, P.S. Raman, M. Santacatterina, D. Mavalankar, The state-led large scale public private partnership "chiranjeevi program" to increase access to institutional delivery among poor women in Gujarat, India: how has it done? What can we learn? PLoS One 9 (2014) https://doi.org/10.1371/journal.pone.0095704.
[42] F. Abbas, R.A. Ud Din, M. Sadiq, Prevalence and determinants of caesarean delivery in Punjab, Pakistan, East. Mediterr. Health J. 24 (2018), https://doi.org/10.26719/2018.24.11.1058.
[43] H. Painter, E. Parry, L. McCann, A. Dehn Lunn, J. Ford, Social needs screening in primary care: a tool in the fight for health equity? Public Health in Practice 7 (2024) https://doi.org/10.1016/j.puhip.2024.100466.
[44] B. S.B., S. Dixit, G. Shivram, D. Pandey, S. Saroshe, A study to compare various aspects of members of joint and nuclear family, J Evol Med Dent Sci 03 (2014) 641–648, https://doi.org/10.14260/jemds/2014/1879.
[45] M.O. Faruk, S. Sultana, M. Al-Neyma, S. Hossain, Socioeconomic, demographic, and nutritional factors associated with cesarean deliveries among childbearing women in Bangladesh, Journal of Medicine, Surgery, and Public Health 1 (2023), https://doi.org/10.1016/j.glmedi.2023.100001.
[46] S. Yaya, G. Bishwajit, M. Ekholuenetale, V. Shah, B. Kadio, O. Udenigwe, Factors associated with maternal utilization of health facilities for delivery in Ethiopia, Int Health 10 (2018), https://doi.org/10.1093/inthealth/ihx073.
[47] M. Neuman, G. Alcock, K. Azad, A. Kuddus, D. Osrin, N. Shah More, N. Nair, P. Tripathy, C. Sikorski, N. Saville, A. Sen, T. Colbourn, T.A.J. Houweling, N. Seward, D.S. Manandhar, B.P. Shrestha, A. Costello, A. Prost, Prevalence and determinants of caesarean section in private and public health facilities in underserved South Asian communities: cross-sectional analysis of data from Bangladesh, India and Nepal, BMJ Open 4 (2014), https://doi.org/10.1136/bmjopen-2014-005982.
[48] J. Ansong, E. Asampong, P.B. Adongo, Socio-cultural beliefs and practices during pregnancy, child birth, and postnatal period: a qualitative study in Southern Ghana, Cogent Public Health 9 (2022), https://doi.org/10.1080/27707571.2022.2046908.
[49] A. Gkiouleka, L. Munford, S. Khavandi, R. Watkinson, J. Ford, How can healthcare organisations improve the social determinants of health for their local communities? Findings from realist-informed case studies among secondary healthcare organisations in England, BMJ Open 14 (2024), https://doi.org/10.1136/bmjopen-2024-085398.
[50] F.E. Abebe, A.W. Gebeyehu, A.N. Kidane, G.A. Eyassu, Factors leading to cesarean section delivery at Felegehiwot referral hospital, Northwest Ethiopia: a retrospective record review, Reprod. Health 13 (2016), https://doi.org/10.1186/s12978-015-0114-8.
[51] K. Uno, M. Mayama, M. Yoshihara, T. Takeda, S. Tano, T. Suzuki, Y. Kishigami, H. Oguchi, Reasons for previous Cesarean deliveries impact a woman's independent decision of delivery mode and the success of trial of labor after Cesarean, BMC Pregnancy Childbirth 20 (2020), https://doi.org/10.1186/s12884-020-2833-2.
[52] J. Li, I. Ijaz, L. Zhao, Umbilical artery thrombosis causing fetal distress: a case report, Cureus (2024), https://doi.org/10.7759/cureus.64624.
[53] M.C. Vieira, S. Sankaran, D. Pasupathy, Fetal macrosomia, Obstet. Gynaecol. Reprod. Med. 30 (2020) 146–151, https://doi.org/10.1016/j.ogrm.2020.02.011.
[54] L. Figueroa, E.M. McClure, J. Swanson, R. Nathan, A.L. Garces, J.L. Moore, N. F. Krebs, K.M. Hambidge, M. Bauserman, A. Lokangaka, A. Tshefu, W. Mirza, S. Saleem, F. Naqvi, W.A. Carlo, E. Chomba, E.A. Liechty, F. Esamai, D. Swanson, C. L. Bose, R.L. Goldenberg, Oligohydramnios: a prospective study of fetal, neonatal and maternal outcomes in low-middle income countries, Reprod. Health 17 (2020), https://doi.org/10.1186/s12978-020-0854-y.
[55] H. Bakhsh, H. Alenizy, S. Alenazi, S. Alnasser, N. Alanazi, M. Alsowinea, L. Alharbi, B. Alfaifi, Amniotic fluid disorders and the effects on prenatal outcome: a retrospective cohort study, BMC Pregnancy Childbirth 21 (2021), https://doi.org/10.1186/s12884-021-03549-3.
[56] S. Panda, C. Begley, D. Daly, Clinicians' views of factors influencing decision-making for caesarean section: A systematic review and metasynthesis of qualitative, quantitative and mixed methods studies, PloS one 13 (7) (2018) e0200941.
[57] S. Doraiswamy, S.M. Billah, F. Karim, M.S. Siraj, A. Buckingham, C. Kingdon, Physician–patient communication in decision-making about Caesarean sections in eight district hospitals in Bangladesh: a mixed-method study, Reproductive health 18 (2021) 1–14.
[58] M. Zakerihamidi, R.L. Roudsari, E.M. Khoei, Vaginal delivery vs. cesarean section: a focused ethnographic study of women's perceptions in the north of Iran, Int J Community Based Nurs Midwifery 3 (2015).

Abbreviations

ANC: Antenatal Care
ASDs: Autism spectrum disorders
BDT: Bangladeshi Taka (currency)
CD: Cesarean Delivery
CI: Confidence Interval
OR: Odds Ratio
WHO: World Health Organization