COMPARATIVE ANALYSIS OF CAESAREAN SECTION AND NON-CAESAREAN DELIVERY WITH ITS ASSOCIATED FACTORS IN URBAN AND RURAL AREAS OF CHATTOGRAM, BANGLADESH

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Roll No. : 0117/17

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A thesis submitted in the partial fulfillment of the requirements for the degree of Master of Science in Applied Human Nutrition and Dietetics

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This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all respects, and that all revisions required by the thesis examination committee have been made

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June 2019

Dedicated

to

My Beloved Family

Acknowledgements

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List of Abbreviation

Abbreviation	Elaboration
%	Percentage
CS	Caesarean Section
VD	Vaginal Delivery
BD	Bangladesh
Lb	Pound
MMR	Maternal Mortality Rate
MDG	Millennium Development Goals
UI	Urinary Incontinence
OS	Ogilvie's Syndrome
CPD	Cephalopelvic Disproportion
EOC	Emergency Obstetric Care
UNICEF	United Nations International Children's Emergency Fund
MCH	Medical College Hospital
WHO	World Health Organization
DH	District Hospital
NGO	Non-profit Organization
MCWC	Maternal and Child Welfare Center
BDHS	Bangladesh Demographic and Health Survey
BMMS	Bangladesh Maternal Mortality and Health Care Survey
NIPORT	National Institute Of Population Research and Training
HPNSDP	Health, Population and Nutrition Sector Development program
SOGC	Society of Obstetricians and Gynecologists of Canada
ACOG	American College of Obstetricians and Gynecologists
RCPNS	Reproductive Care Program of Nova Scotia
BBS	Bangladesh Bureau of Statistics
IBM	International Business Machine Corporation
BMI	Body Mass Index
FIGO	International Federation of Gynecology and Obstetrics
CPD	Center For Policy Dialogue
TRIP	Turning Research into Practice

Abstract

Caesarean section rates have been increasing worldwide, giving cause for concern because of increased maternal and perinatal morbidity and mortality associated with high Caesarean section rates. Cesarean delivery rate in Bangladesh has been increased remarkably in present time, from 4% in 2004 to 31% in 2016. Caesarean sections (CS) cause severe complications and bring about bad consequences in maternal and child health. However, the factors responsible for the increased CS rates in Bangladesh and how CS causes severe complications and bring about bad consequences in maternal and child health are not well understood. This study aims to describe factors associated with high Caesarean section rates in Bangladesh as well as to describe the postpartum and child complications associated with vaginal or caesarean delivery. This study utilized a quantitative cross sectional descriptive design. A preform questionnaire was used to collect data from rural and urban women between January and May 2019. Demographic, obstetric, non obstetric factors, postpartum and child health complications were described. Pearson's Chi-square, Fisher's exact and likelihood tests were used as tests of association between independent variables and Caesarean section. The results show that a combination of doctor's profit making tendency and demand from family with higher socio-economic status, particularly in urban areas (41.5%) than rural areas only 14.3% contributed to the recent increased caesarean rate in Bangladesh. However, socio-demographic factors, maternal and fetal obstetric factors were also associated with higher rate of caesarean section in Bangladesh. The information on post-surgical complications, medicine and anesthesia were not sufficient to women and most of information provided by doctor's assistant. There was a significant association of back pain and distended abdomen with Caesarean section *(P< 0.05)*. There was no significant association of urinary incontinence and pelvic organ prolapse with CS. Children delivered by cesarean section had an increased likelihood of cold fever and pneumonia and the association was stronger among children of vaginal delivery. No increased risk of neonatal death was seen among children delivered by cesarean section. Health system of Bangladesh is poorly regulated and there is lack of evidence-based guidelines for decision making about caesarean delivery. The decision to perform a CS must be chosen and monitor carefully and should not be profit oriented.

Keywords: Caesarean section, vaginal delivery, postpartum complications.

Chapter 1: Introduction

1.1.Background:

The Delivery has always been one of the most highlighted events of women's life everywhere in the world. Until the middle of the 20th century it was an important turning-point in a woman's and her newborn's life, since perinatal loss (maternal or fetal) was commonplace. Since then enormous changes have occurred in the assessment of childbirth-related issues, primarily in high-income countries. By the end of the second Millennium healthy mother and newborn have almost become self-evident outcomes of pregnancy and delivery, as a consequence of general socio-economic well-being and the skyrocketing development of medicine. As adequate outcome has been taken for granted, the emphasis of expectations has shifted from 'result' to 'quality'. The issue of delivery circumstances has become one of the most important factors, by which this important event is being assessed. In the era of relatively safe cesarean sections (CS), two previously inconceivable questions emerged, i.e. which way women should and want to deliver their babies - vaginal or abdominal? (Diana, 2014). Caesarean section (CS) is the termination of pregnancy and delivery of the live or dead foetus through an incision on the abdominal and uterine wall. Surgical interventions during pregnancy are performed to improve the parturition outcome. But the procedure by itself carries inherent risks.(Diana and Tipandjan, 2016).

Caesarean sections (CS) have been performed in Bangladesh from late 1990s. since then, there has been a trend of increasing frequency, acceptancy, and popularity of Caesarean sections. Caesarean section used to be regarded as a last resort and a life saving measure, but as time went on, it became performed with greater safety and more frequently (Dongen, 2009). Caesarean sections in modern times have been performed also for non life threatening indications such as maternal request.

The main advantage of Caesarean section is the avoidance of adverse complications associated with vaginal delivery especially difficult deliveries and deliveries that pose a threat to the life of the unborn baby. Advances in medical knowledge over time and improvements in anesthetic techniques and infection control have made Caesarean section to be a relatively safe operation to perform.

Caesarean section (CS) is an operative procedure whereby the fetus/fetuses after the end of 28th week are delivered through an incision on the anterior abdominal and uterine walls. It is done when vaginal delivery is not possible and the life of mother or babies are in jeopardy. It is well known that, hemorrhage, obstructed and prolonged labor contribute to major causes of maternal mortality and morbidity in Bangladesh. Maternal mortality ratio (MMR) is a good indicator of the health status of the women of a country. In 1990, MMR in BD was 574/ 100000 live births. In MDG-5, the goal was to reduce maternal mortality to 143/100000 live births by 2015 i.e. 75% reduction in maternal mortality and 50% child birth by skill birth attendant (UNDP, 2015). Efforts to reduce maternal mortality became a matter of high priority to the nation from late 1990s and the Government of Bangladesh and UNICEF initiated the emergency obstetrics care (EOC) program to achieve the goal. EOC training programs were conducted to develop skilled personnel in anesthesia and obstetrics to tackle the emergency situations. Facilities were also extended to different health facilities phase by phase. Currently EOC program is running in all public Medical College Hospitals (MCH), District Hospitals (DH), Upazila Health Complexes and MCWC. A good number of private clinics, hospitals and NGO providers are also participating in this program. As a result, over the last few years Bangladesh has made significant progress in improvement of maternal health. Though we could not achieve the goal set by WHO but we are in the track. There has been 40% reduction in maternal mortality between the years 2001 to 2010. All types of deliveries in health facilities have increased from 4% to 15% from 1993 to 2007 (BDHS, 2007).

Preliminary results of BDHS (2017) have reported that the rate of Caesarean Section was 31% in 2016 whereas it was only 4% in 2004, 9% in 2007, 17% in 2011 and 23% in 2014. WHO recommended acceptable limit is 10% to 15%. So it is 8% higher from 2014 and 16% higher than WHOs' maximum prescribed limit. In private facilities, CS accounted for 83 percent of deliveries, compared with 35 percent in public facilities and 39 percent in facilities run by NGOs (BMMS, 2016). It is widely believed that clinic managers and some doctors motivate would-be mothers to undergo surgeries for making money, an allegation that obstetricians always deny. C-section is a lifesaving procedure which means that a higher level of surgical deliveries will reduce delivery-related maternal deaths. With 31 percent C-section rate, the maternal deaths were 196 per 100, 000 births in Bangladesh. But it is only four per 100,000 in Sweden

where the C-section rate is 18 percent, and seven in the Netherlands where the C-section rate is 14 percent (Save the Children, 2019).

The Government of Bangladesh is committed to reducing the maternal mortality ratio (MMR) to 143 deaths per 100,000 live births by 2015 and increasing skilled attendance at birth to 50 percent by 2015. The decline in MMR between 2001 and 2010 indicates remarkable progress ((UNDP, 2015). The 4th Health, Population and Nutrition Sector Program 2017–2022 has set the target of reaching an MMR of 105 per 100,000 live births in 2022 (MOHFW, 2017).

A study by WHO in 2007 found that when the Caesarean section rate of a country goes above 15%, the maternal mortality rises, i.e. unnecessary CS kills women, increases the risk of maternal morbidity, neonatal death and neonatal admission to an intensive care unit. Caesarean delivery rates among the women in the richest quintile were much higher than the rates seen in the poorest quintile. This difference was particularly noticeable in Bangladesh, India and Pakistan, where the poorest quintile probably receives fewer caesarean sections than are indicated, while the richest quintile receives too many - increasing maternal and neonatal morbidity. Besides the solvency, increasing number of health facilities of public, private and NGOs in different levels of the country, trained EOC providers, small family norms, lack of patience and confidence for vaginal delivery of some women, improper assessment of patient for CS are the factors for unnecessary Caesarean section. In periphery, there are so many clinics running without sufficient skilled manpower and with substandard operative theatre facilities.

Bangladesh is facing a massive boom in the number of medically unnecessary CS between 2016 and 2018 the number of operations increased by 51 per cent, new figures released by Save the Children reveal. The country saw an estimated 860,000 of these unnecessary operations last year, while up to 300,000 women who need a C-section are unable to afford or access it. The findings highlight the extent of Bangladesh's burgeoning C-section problems, where the country's wealthy are turning to caesareans in record numbers, even though unnecessary C-sections place mother and baby at a needless risk. In 2018 Bangladeshi parents paid $483 million in out-of-pocket expenses for C-sections that were medically unnecessary. That's an average cost of $612 per case. About 77 per cent of all C-section operations—or an estimated

860,000 procedures in 2018 were medically unnecessary, up from 570,000 in 2016. At the same time, up to 300,000 women who desperately need a C-section every year are unable to get one (Save the Children, 2019).

1.2.Rationale:

The researcher, who has an interest in women's health, observed during her MS in Applied Human Nutrition and Dietetics, that Caesarean sections were performed rather frequently. He became concerned about the frequency of Caesarean sections and the reasons for the Caesarean sections. The second area of concern became the subject of this research.

High Caesarean section rates while indicating adequate access to essential and life saving obstetric care, have not been shown to be associated with improved maternal and fetal outcomes; in fact in studies, such as a survey in 2005 on maternal and perinatal health in Latin America, Villar and other researchers found that high Caesarean section rates were associated with harm(Villar, 2006). In Bangladesh, data from the of confidential enquiry into maternal deaths indicate that there is a steady increase in institutional maternal mortality ratio, and that a woman has an increased risk of dying if she is delivered by Caesarean section compared with vaginal delivery (BMMHS, 2016).

The increased risks of maternal and perinatal morbidity and mortality associated with high Caesarean section rates underlie the growing concern by health professionals; Obstetricians in the UK have instituted studies to address the issue (Parajothy, 2001). A woman who delivers by Caesarean section gets a uterine scar. This scar has important implications for future pregnancies; she is predisposed to uterine rupture, placenta previa and placenta accreta. Induction of labor in a woman with previous CS carries a higher risk of uterine rupture than in a woman with no previous CS (Cunningham, 2010). Consequently, avoidance of unnecessary primary Caesarean sections should be one of the goals of every facility that offers obstetric services. Identification of factors associated with high Caesarean sections in urban and rural area of Bangladesh is a step toward this goal.

There are very few studies that explain the factors responsible for high Caesarean section rates in Bangladesh. The researcher hopes to provide research findings that will bridge this information gap. It is hoped that the information provided through this

study will inform national health policy and also impact on clinical practice in hospital for improved fetal and maternal outcomes.

The researcher hopes that the recommendations made from the findings of this study to the management of hospital will result in lower caesarean section rates in the hospital. Besides improving maternal and perinatal outcomes, such recommendations will help to curb expenditure associated with Caesarean deliveries. This information could also be useful to policy makers and facility managers of health related sectors in saving cost and improving obstetric practice.

The researcher hopes to contribute to the realization of the 3rd sustainable development goal in Bangladesh. The 3rd sustainable development goal seeks to improve good health and well-being (CPD, 2019)

1.3. Aim and Objectives

Aim:

To describe the frequency rate and factors that were associated with the high caesarean section rates in Bangladesh.

Objectives:
1. To describe the socio-economic and demographic factors associated with caesarean section in Bangladesh.
2. To describe the obstetric factors associated with caesarean sections in Bangladesh.
3. To describe the complications associated with cesarean section among women and child health of Bangladesh.
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Chapter 2: Review of Literature

The researcher searched Pubmed, Cochrane Library, SUM Search 2, TRIP Database, Essential Evidence Plus, and Google Scholar for studies on high Caesarean section rates using search terms "high caesarean section rates, associated factors" and "high caesarean section rates". Relevant studies were selected and reviewed. To further broaden the search, some of the studies referenced in the selected studies were also retrieved and reviewed. Information obtained from several studies is presented below.

2.1.Caesarean rates in Bangladesh

Cesarean section has been on the rise worldwide and Bangladesh is no exception. . In Bangladesh, the CS rate, which includes both institutional and community based deliveries, has increased from about 3% in 2000 to about 24% in 2014 (Rahman et al.2014) and 31% in 2016(BDHS, 2007). Bangladesh could make remarkable progress in safe motherhood where maternal mortality rate has reduced from 322 deaths per 100,000 live birth in 2001 to 194 deaths per 100,000 live birth in 2010.Bangladesh demographic and health survey shows that of 37% of facility delivery , 60% took place in for-profit private sector hospital (NIPORT, 2015).

The prevalence of cesarean section increase fastest among urban, highly educated women. For example, while the relative risk of cesarean delivery more than tripled among urban women during the 20 years span, they increase by a factor of 15 among women living in rural areas. Both increased demand and increased supply have been proposed as drivers. On the demand side, women may request a cesarean section because they fear the consequences of vaginal delivery. In Bangladesh, a large proportion of deliveries take place at home. So in large proportion of cases, though cesarean section is required, women do not get it due to lack of essential facilities. The rural areas in most parts in Bangladesh do not have facilities for conducting even a normal delivery. The women having a delivery complication in the rural sector usually turns up into the places where they are forced to go for normal delivery because of absence of adequate cesarean section facilities.

 Although In the past few decades, a number of maternal health strategies were adopted and implemented by the government of Bangladesh. In 1994, basic and comprehensive emergency obstetric care services were introduced in peripheral public

sector health care facilities by the Ministry of health and family welfare. These policies and services have improved maternal health by lowering maternal and infant death as well as morbidities (Anwar et al.1991-2011). At the same time, improved access to comprehensive have led to rapid increase in CS deliveries as unintended consequence (Rahman et al.2014). Many of the private health facilities do not have a full range of basic emergency obstetric care (EmOC) services, lack many necessary equipment and do not follow good medical practices (HPNSDP, 2012) A number of studies done on the use of maternal health care services but there is a insufficient information on clinical indications for caesarean section in Bangladesh that is essential for proper understanding of why cesarean delivery rate is increasing and what strategies are needed to control the increased rate of C-section.

2.2.Caesarean Section Rates in Developing Countries

In poor, developing countries, access to health service is limited and Caesarean section rates are low. In a retrospective analysis of data from 42 countries in sub-Saharan Africa, Asia, Latin America and the Caribbean carried out in 2006, found Caesarean section rates to be extremely low among the very poor. The poorest 20% of the population in 20 countries had Caesarean section rates below one percent implying very limited access to lifesaving Caesarean sections(Ronsmans et al., 2006). Other researchers18,19 had similar findings and suggested that Caesarean section rate of at least 3.6%- 6.5% is needed to address basic obstetric complications in West Africa (Buekens et al., 2003; Dumont et al., 2001).

Cesarean section is a surgical procedure to reduce complications associated with child birth. CS has witnessed a rising trend during the last three decades globally and the current rates greatly vary across different countries in the world. In high income countries CS rates seem to have risen from around 4% to 5% in 1970 to 20% to 22% in 2001 (Khunpradit et al.2005). According to the world health organization 2010 report the CS rate was highest in Brazil (45.9%) and was probably the lowest in countries like India and Pakistan about 7 to 8%.(Gibbons et al.2010).

Similarly, in poorer African countries such as Somalia where access to health services remains a challenge, Caesarean section rates are low and women resist Caesarean sections (Borkan et al., 2010). There are cultural and sometimes economic reasons for their refusal to consent to Caesarean sections. In Ethiopia, where C-section rates are low and many deliveries are not attended by skilled health care personnel, the

Government has attempted to improve access to care by training Non Physician Clinicians to perform Caesarean sections (Fesseha et al., 2011)

2.3. Caesarean Section Rates in Developed Countries

In United States, between 1996 and 2008 reported that the Caesarean section rate rose to 32.3% in 2008, from 20.7% in 1996, marking a 12th consecutive year of increase (Menacker and Hamilton, 2010).Caesarean section rate variability between different regions in United States ranged from 25% to 38% (EPCSRP, 2010). In New South Wales, Australia, in a population based study reported that Caesarean section rate increased from 19.1% in 1998 to 29.5% in 2008 (Stavrou et al., 2011). In Canada, the Caesarean section rate quadrupled from 6% in 1970 to 26% in 2006 (RCPNS, 2008).

2.4. Contributory Factors to High Caesarean Section Rates

In developed countries, studies have been done to show reasons for the high and increasing Caesarean section rates (Barber, 2011) as well as efforts to reduce the Caesarean section rates. (EPCSRP, 2010). Some of the identified factors are, demographic such as maternal age and parity, others are obstetric such as failure to progress in labour and yet other factors are non obstetric such as maternal request for Caesarean delivery (Lauer, 2010).

2.5. Demographic Factors Associated with High C-Section Rates

The most important characteristic is maternal age. Older (more than 35 years) nulliparous and multiparous women tend to deliver more by Caesarean section (Villar et al., 2006)In studying contributing factors to Caesarean delivery rates some investigators have had to control for maternal age in a bid to eliminate confounders in their results (Dorman et al., 2008).

Other independent demographic variables found to be positively associated with Caesarean section rates are increase in parity and increase in body mass index (Dereure et al., 2000). In Bertha Gxowa hospital, patients' heights are not usually recorded in the files; the researcher will not be able to determine an association between increased body mass index and Caesarean section.

Other investigators tried to link Caesarean section rates with race; authors of a South African survey reported that Caesarean section rate was higher in women classified as

white or coloured than those classified as black (Matshidze et al., 2007). The authors, Matshidze and others however concluded that neither demographic risk factors for assisted delivery nor access to private health care explained the different Caesarean rates among different population groups. They attributed their findings to physicians' bias in decision making (Matshidze et al., 2007).

In a national audit report of Caesarean sections in the UK, found higher Caesarean section rates in black and Caribbean women than in white women. It was also observed that certain complications of pregnancy such as hypertensive disorders and diabetes are more prevalent in blacks and that HIV infection is more prevalent in blacks. These factors were believed to be responsible for the higher Caesarean section rates observed in black women (Parajothy and Thomas, 2001).

2.6. Clinical Factors

The commonest five clinical indications for Caesarean section found in many studies were; non-reassuring fetal status or fetal distress, failure to progress in labour or arrest of dilatation, previous Caesarean delivery, mal or Breech presentation and hypertensive disorders in pregnancy (pre-eclampsia and eclampsia) (Barber et al., 2011).

In developed countries, the increase in Caesarean section rates was more related to previous Caesarean delivery than other clinical factors (Lauer et al., 2010) whereas in developing countries, it was more related to fetal distress and dystocia (Buekens et al., 2003; Dumont et.al., 2001) Consequently, there is a trend of performing more elective Caesarean deliveries in developed countries than in developing countries where majority of Caesarean sections are performed as emergency procedures (Naidoo and Moodley, 2009).

In a study that used physician documented indications for Caesarean section to describe factors contributing to increases in Caesarean delivery rate in United States, Barber and others found that primary Caesarean sections contributed to 50% of the increase in Caesarean section rate, the rest being repeat Caesarean sections. Considering the primary Caesarean sections, more subjective indications like non-reassuring fetal status contributed more to the rates than the more objective indications like malpresentation, cord prolapse and abruptio placenta (Barber et al.,

2011).The researchers concluded that modifiable factors were involved and that it is possible to reduce Caesarean section rates.

Other clinical factors like multiple pregnancy, macrosomia, ante partum haemorrhage, and failed induction contributed less significantly to the rise in Caesarean section rates (Barber et al., 2011). Caesarean section outcomes are often studied while describing clinical factors associated with Caesarean section rates. In Sub-Saharan Africa as well as in Latin America, such studies have shown correlation between high Caesarean section rates and maternal and peri-natal outcomes, high Caesarean section rates have been found to be associated with increased maternal and peri-natal morbidity and mortality (Villar, 2006).

Prior to the 1990s many primary care physicians and obstetricians adopted the position "once a Caesarean, always a Caesarean". However in response to growing concerns about rising Caesarean section rates, as research progressed, professional bodies like the Royal College of Obstetricians and Gynaecologists of England, the American College of Obstetricians and Gynaecologists and the Society of Obstetricians and Gynaecologists of Canada developed guidelines for the safe vaginal delivery of women with previous Caesarean section (SOGC, 2005).

A classification system that is internationally applicable and simple to use in describing obstetric characteristics of women undergoing Caesarean section is the Robson classification system. It allows for analysis of determinants and implications of Caesarean sections and has mutually exclusive and totally inclusive categories of pregnant women (Costa et al., 2011). The researcher hopes to identify those categories of women according to Robson classification with high Caesarean section rates in Bertha Gxowa hospital for whom interventions to reduce Caesarean section rates would be most beneficial.

2.7.Non- Clinical Factors

Just as there has been growing concern about rising Caesarean section rates, there has been an increase in the number of women in the United States who choose to have an elective Caesarean delivery; the Caesarean section on demand. In a statement released in 2013, the ACOG recommends that in the absence of medical indications, vaginal delivery should be recommended. However, if Caesarean section is performed on

maternal request, it should not be performed before 39 weeks of gestation and it should not be motivated by absence of effective pain management (ACOG, 2013).

The popular press criticized a popular model and footballer's wife in the UK for having her three children by Caesarean saying she was 'too posh to push' (Macrae, 2011). In South African studies, Caesarean on demand is not a major contributor to Caesarean section rates in public hospitals; it probably plays a greater role in the private hospitals where Caesarean section rates of up to 60% have been reported. Pregnant medical professionals have been reported to have a high Caesarean delivery rate in South Africa (Lawrie et al., 2001).

Fear of litigation also affects the attitude of many doctors who have a low threshold for Caesarean section. Obstetricians who have suffered litigations or higher liability insurance premiums have been found to have higher Caesarean section rates than others who do not have similar history. Clinicians in developed countries have admitted that the medico-legal environment influences their decision making. In the researcher's opinion, fear of litigation may not be a strong contributing factor to high Caesarean rates in South African district hospital setting as clinicians employed in the public sector are indemnified by the Government (Murthy et al., 2007)

One of the arguments in support of a low Caesarean threshold is that Caesarean sections are becoming safer for the mother and baby with fewer incidences of obstetric fistula and of pelvic floor problems like urinary incontinence (Singer, 2004). It has been suggested that financial incentive also influenced some doctors to perform unnecessary Caesarean sections in the private sector as more money is made in performing a Caesarean delivery than a vaginal delivery (Grant, 2005).

In managed care processes where Health Maintenance Organizations co-ordinate health care services and remunerate contracted physicians for services rendered, opportunities exist to regulate Caesarean section rates. This could be in form of incentives and penalties; funders of medical schemes could insist on specific evidence-based practice protocols, paying only for medically indicated Caesarean deliveries. They could also reward physicians for conducting successful VBACs or pass the financial burden of Caesarean deliveries with no medical indications to the members of medical schemes (Mawson, 2002; Rothberg and McLeod, 2005).

In the United States, managed care resulted in some reductions in Caesarean section rates in some managed care plans compared with state-wide average rates (Roohan et

al., 2001). In South Africa, reduction in caesarean section rates may be one of the auditable standards that will be used to evaluate the success of the National Health Insurance Scheme which has been piloted in some areas (Matsotso and Fryatt, 2013).

2.8.Study Designs of Previous Researchers

Many of the previous studies that addressed factors associated with high Caesarean section rates utilized quantitative cross sectional descriptive approaches. The quantitative descriptive design is suitable in addressing the research question hence the researcher chose it as the research design.

One study that used a case-control design looked at factors associated with Caesarean section among nulliparous women with type 1 diabetes (Lepercq et al, 2010). This French study has an evidence rating of II and its strength lies in the fact that data was collected over years from a cohort of women with type 1 diabetes who were managed according to standardized institutional management protocols.

From the collected data, maternal demographic, medical, and obstetric factors were evaluated for association with cesarean delivery without labor compared with trial of labor. The target population in rural and urban area is not as homogenous as that of the French study, and standard guidelines are not always applied hence the researcher opted not to use a case control design; selection bias would be a problem.

There are other notable studies which utilized cross sectional descriptive methods with qualitative components. In one such study, carried out by the Reproductive Care Program of Nova Scotia, across four sites, selected health records were used to obtain data for quantitative analysis. In the same study, focus group interviews were used to obtain qualitative results (RCPNS, 2008)

With these methods, the teams of researchers were able to identify practice, environmental, resource and population factors that contribute to Caesarean section rates. The study yielded a rich blend of information from both the quantitative and qualitative analyses. In this study however, the single researcher design and limitation of time for a prospective study prevent the researcher from adopting a similar approach. The method adopted by the researcher is presented in the next chapter.

Chapter-3: Materials and Methods

3.1. Study Design

This was a quantitative cross sectional descriptive study using a retrospective review of mothers history. The quantitative design was chosen so that collected data could be analysed for statistical significance of associations between predictor and outcome variables.

3.2. Site of Study

This study was conducted in Chattogram city and Hatiya upazila under Chattogram division of Bangladesh. Chattogram Division is geographically the largest of the eight administrative divisions of Bangladesh. It covers the south-easternmost areas of the country. Chattogram plays a vital role in the Bangladeshi economy. The Port of Chattogram is the principal maritime gateway to the country. The city has a population of more than 2.5 million while the metropolitan area had a population of 4,009,423 in 2011 making it the second-largest city in the country. Hatiya is an upazila under Noakhali District of Chattogram division and it is located at the mouth of the Meghna river on the Bay of Bengal. It has a total population of

Figure 3.1: Location Map of Study Area

about 450,000 including 51% male and 49% female (BBS, 2011). These offer comprehensive obstetric services including Caesarean sections.

3.3. Sampling

3.3.1. Sample Size: This sample size was calculated using a web based automated calculator, Raosoft software with a 5% margin of error and a confidence level of 95% (Raosoft, 2011). From the records of the Bangladesh Demographic and Health Surveys, 2011, In randomly selected area of Hatiya upazila there were 31,811 women whom age ranged 15-44 years, where the General fertility rate was 127 per thousand women. From the above study population, the calculated sample size was 351. On the other hand in some randomly selected area of Chattogram city, there were 79,055 women whom age range was 15-44 years and the calculated sample size was 371 but due to lack of time and budget the researcher took 241 samples from urban area and 196 samples from rural area in this study (BDHS, 2011).

3.3.2. Sampling Method: Systematic random sampling method was used to select women. All women who delivered by Caesarean section or vaginal delivery from 1st January 2013 to 31st December 2018 were selected for this study. All locations and sample were randomly selected without any bias.

3.4. Inclusion Criteria

A woman who was interested to participate in this study and whom age range was 15-44 years and gave child birth by Caesarean section or vaginal delivery between 1st January 2013 and 31st December 2018. The total sample size for this study was 437.

3.5. Exclusion Criteria

Women who were not interested to participate in this study and who age range was out of 15-44 years and not at least once child birth within time frame.

3.6. Data Collection Tools

The researcher collected data from mothers using a pre-structured questionnaire data collection sheet. This tool was developed by the researcher based on the findings of previous researchers who did similar studies, with the research objectives in mind. There are four parts of the data collection sheet.

Part A of the data collection sheet described the consent form of mothers where the personal information they provided will be used only for this study purpose (see Appendix I).

Part B of the data collection sheet described demographic information such as age, Height, weight, religion, educational status, and employment status. It also included husband's occupation and educational status (see appendix I).

Part C of the data collection sheet described the delivery history in terms of total delivery, total caesarean delivery, and other characteristics. It was designed to describe the context under which it was performed. It also described the immediate fetal and maternal outcomes. This part also described fetal factors, maternal factors, and factors (see appendix I).

Part D of the data collection sheet described the post complications of mother and child for being cesarean or vaginal delivery such as back pain , urinary incontinence, pelvic organ prolapsed, abdominal distention and miscarriage of mother and neo-natal death, pneumonia, cold allergy and school performance in case of child (see appendix I).

3.7. Data Capture and Analysis Strategy

3.7.1. Data Capture: Data from questionnaire were captured in a Microsoft Excel spreadsheet for data cleaning and coding.

3.7.2. Data Cleaning: For missing values, the researcher retrieved information from the mothers' form for confirmation; if they had missing information on key variables, they were excluded. For extreme values that were captured, information was also retrieved from questionnaire for confirmation; if the information was extreme, it was excluded. For inconsistent values, information was retrieved from questionnaire for confirmation.

3.7.3. Data Coding: Numerical data were grouped for analysis purposes. Qualitative or categorical data were replaced with numbers that could not be used to identify them.

3.7.4.Data Analysis: The researcher held discussions with statisticians from The University of Chittagong regarding data analysis approach. Data in Microsoft Excel spreadsheet were imported to IBM Statistical Package for the Social Sciences- SPSS (version 17.0) for data analysis. Frequencies of different variables were tabulated. Bivariate analyses of demographic variables, obstetric and non obstetric variables were done using Chi square and Fisher's exact tests. These variables were tested for association with C-section. Finally, logistic regression model was used to describe some risk factors identified in bivariate analyses as well as other risk factors of interest. The information obtained in the different analyses was presented on tables.

Chapter 4: Results

This section describes the findings of the study. The Caesarean section rates in urban and rural area are presented first, followed by a description of the demographic characteristics of the mothers and other variables. Associations between different variables and C-section were described using Chi square test and Fisher's exact tests. A logistic regression model was used to estimate the impact of some independent variables on C-section.

4.1. Caesarean Section Rates in Rural and Urban Area of Chattogram division

The total Caesarean section rates had higher in urban area 41.50% compared with 14.30% in the rural area. However, rural area had a higher vaginal delivery rate of 54.40%% compared with 45.60% in the urban area. Both of Primary and repeated caesarean rates were higher in urban area than rural presented in **Fig. 4.1.**
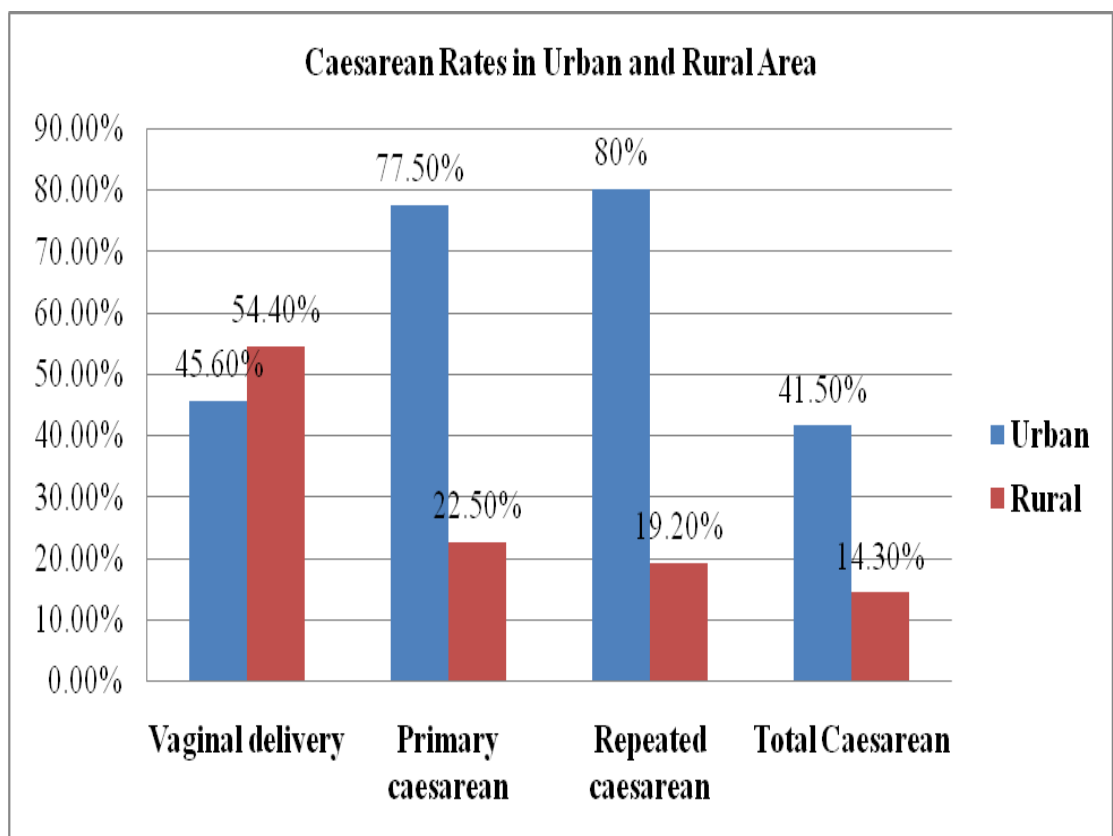
Figure 4.1: Comparison of Cesarean Delivery Rates in Urban and Rural Area

4.2. Demographic Characteristics:

4.2.1. Age: The participants in this study had ages ranging from 16 years to 40 years, with a mean of 24.67 years and a standard deviation of 4.93. Of these, 80 mothers were aged below 20 years, being teenage deliveries and 20 mothers were aged 35 years and above, being advanced maternal age deliveries. **Table 4.1** shows the age groupings and their frequencies.

4.2.2. Body Mass Index (BMI): There were three categories of BMI ranging ≤ 18.4, with underweight being 72 (36.7%) in rural and 8(3.3%) in urban area shown below in **Table 4.1**. Around half of rural mothers were ranging from 18.5 to 24.99 with normal being 99(50.5%) and 145(60.2%) in urban area and constituting the largest category.

Table 4.1: Frequency distribution of demographic variables in studied women

Characteristic		Rural N=196	Percentage (%)	Urban N=241	Percentage (%)
Age	≤19	73	37.2	7	2.9
	20-34	115	58.7	222	92.1
	≥35	8	4.1	12	5.0
BMI	≤18.4	72	36.7	8	3.3
	18.5-24.9	99	50.5	145	60.2
	≥25	25	12.8	88	36.5
Mother's occupation	Housewife	174	88.8	163	67.6
	Jobholder	22	11.2	78	32.4
Mother's education	Primary	56	28.6	5	2.1
	High school	105	53.6	14	5.8
	College	26	13.3	119	49.4
	Graduation	9	4.6	103	42.2
Husband's occupation	Day labor	105	53.6	6	2.5
	Jobholder	51	26.0	123	51.0
	Businessman	40	20.4	112	46.5
Husband's education	Primary	78	39.8	13	5.4
	High school	57	20.1	31	12.9
	College	46	23.5	19	7.9
	Graduation	15	7.7	178	73.9

4.2.3. Mother's occupation: As shown in **Table 4.1**, 88.8% of the mothers (174) were housewife, 11.2% (22) were jobholder in rural area where 67.6% (163) were housewife and 78 (32.4%) were jobholder in urban area.

4.2.4. Mother's education: The education was represented as Primary, High school, College and Graduation. By far the greatest majority, 241 (91.6%) of mothers were completed their college and graduation in urban area where about half 105 (53.6%) of mothers were completed their high school.

4.2.5. Husband's employment status: As shown in **Table 4.1**, 105 (53.6%) of the husband were day labor, reflecting the low socio economic status of majority of the study population in rural area, on the other hand 123 (51.0%) were jobholder and 112 (46.5%) were businessman in urban area. Details of the type of occupation or average monthly income were not recorded in the Questionnaires.

4.2.6. Husband's education: Most of 78 (39.8%) rural's husband were completed their primary education and only 15 (7.7%) completed their graduation level where about three quarter of 178 (73.9%) urban's husbands completed their graduation level.

4.3. Bivariate Analyses of Variables

This section describes associations between demographic, obstetric variables information Variables, influential variables, postpartum complications and child health outcomes with caesarean and vaginal delivery. Obstetric variables were the medical reasons for the Caesar-sections. A significance level of 0.05% was used in this study.

4.3.1. Bivariate Analyses of demographic Variables

For demographic variables, age, BMI, mother's occupation, mother's education, hhusband's occupation, hhusband's education showed statistically significant association with vaginal and Caesarean section.

4.3.1.1. Association of Age with vaginal and caesarean delivery

As tabulated in **Table 4.2**, the results show a statistically significant association of age with vaginal delivery and Caesar-section (Chi square test with 2 degrees of freedom = 28.127, p = 0.00).

4.3.1.2. Association of BMI with vaginal and caesarean delivery

The results show that BMI had statistically significant association with vaginal and C-Section (Pearson's Chi^2 with 2 degrees of freedom = 15.729, p = 0.00). **Table 4.2** illustrates this association.

Table 4.2: Association of demographic characteristics with vaginal and caesarean

Characteristic		Vaginal delivery N (%)	Caesarean delivery N (%)	Total N (%)	Pearson's χ2 (df)	P-value
Age	≤19	76(24.6)	4(3.1)	80(18.3)		
	20-34	219(70.9)	118(92.2)	337(77.1)	28.127(2)	0.00
	≥35	14(4.5)	6(4.7)	20(4.6)		
BMI	≤18.4	71(23)	9(7)	80(18.3)		
	18.5-24.9	165(53.4)	79(61.7)	244(55.8)	15.729(2)	0.00
	≥25	73(23.6)	40(31.3)	113(25.9)		
Mothers' occupation	Housewife	252(81.6)	85(66.4)	337(77.1)	11.767(1)	0.001
	Jobholder	57(18.4)	43(33.6)	100(22.9)		
Mothers' education	Primary	59(19.1)	2(1.6)	61(14)		
	High school	103(33.3)	16(12.5)	119(27.2)	57.006(3)	0.00
	College	83(26.9)	62(48.4)	145(33.2)		
	Graduation	64(20.7)	48(37.5)	112(25.6)		
Husband's occupation	Day labor	106(34.3)	5(3.9)	111(25.4)		
	Jobholder	111(35.9)	63(49.2)	174(39.8)	44.555(2)	0.00
	Businessman	92(29.8)	60(46.9)	152(34.8)		
Husband's education	Primary	88(28.5)	3(2.3)	91(20.8)		
	High school	81(26.2)	7(5.5)	88(20.1)	104.263(3)	0.00
	College	50(16.2)	15(11.7)	65(14.9)		
	Graduation	90(29.1)	103(80.5)	193(44.2)		

* Chi-square test (Undetermined values were due to unreliability of the test results and P < 0.050 was considered statistically significant)

*χ2 = Chai square * df = Degrees of freedom

4.3.1.3. Association of mother's occupation with vaginal and caesarean delivery

The results show that mother's occupation had statistically significant association with Caesarean section (Chi-Square test with one degree of freedom, p = 0.001).

4.3.1.4. Association of mother's education with vaginal and caesarean delivery

The results show that there was statistically significant association of mother's education with vaginal and C-section, Chi- square test with 3 degrees of freedom =57.006, p value= 0.00 (**Table 4.2**).

4.3.1.5. Association of husband's occupation with vaginal and caesarean delivery

The results show that there was statistically significant association of husband's occupation with vaginal and C-section, Chi- square test with 2 degrees of freedom =44.555, p value= 0.00.

4.3.1.6. Association of husband's education with vaginal and caesarean delivery

The results show that there was statistically significant association of husband's education with vaginal and C-section, Chi- square test with 3 degrees of freedom =104.263, p value= 0.00.

4.3.2. Bivariate Analyses of Fetal Obstetric Variables

The results show that all the fetal obstetric variables such as breech presentation, large baby and twins/ triplets had statistically significant association with vaginal and Caesarean section (Chi-Square test with one degree of freedom, p = 0.001) illustrated in **Table: 4.3**.

Table 4.3: Association of Fetal obstetric variable with vaginal and caesarean delivery in studied women

Variable		Vaginal delivery N (%)	Caesarean delivery N (%)	Total N (%)	Pearson's χ^2 (df)	P-value
Breech Presentation	No	297(96.1)	90(23.3)	387(88.6)	59.476(1)	0.00
	Yes	12(3.9)	38(29.7)	50(11.4)		
Large Baby	No	305(98.7)	113(88.3)	418(95.7)	23.642(1)	0.00
	Yes	4(1.3)	15(11.7)	19(4.3)		
Twins/Triplets	No	308(99.7)	121(94.5)	429(98.2)	13.332(1)	0.00
	Yes	1(0.3)	7(5.5)	8(1.8)		

* Chi-square test (Undetermined values were due to unreliability of the test results and P < 0.050 was considered statistically significant)

4.3.3. Bivariate Analyses of Maternal Obstetric Variables with vaginal and caesarean delivery in studied women

The results show that all the maternal obstetric variables such as previous caesarean, long maternal leave, fear of pain, no pain progress and due to doctor suggestion had statistically significant association with vaginal and Caesarean section (Chi-Square test with one degree of freedom, p = <0.05) illustrated in **Table: 4.4**. There was 68% mother's caesarean where only 3.2% was vaginal delivery due to doctor suggestions. On the other hand 100% of vaginal delivery mothers had progressive delivery pain where 25% of caesarean mothers had no progressive pain that's why they done caesarean section. Again only 25% mothers had repeated caesarean where about three quarter (75%) mothers had primary caesarean.

Table 4.4: Association of Maternal obstetric variable with vaginal and caesarean delivery in studied women

Variable		Vaginal delivery N (%)	Caesarean delivery N (%)	Total N (%)	Pearson's χ2 (df)	P-value
Previous caesarean	No	308(99.7)	96(75)	404(92.4)	78.944(1)	0.00
	Yes	1(0.3)	32(25)	33(7.6)		
Long maternal leave	No	294(95.1)	107(83.6)	401(91.8)	15.977(1)	0.00
	Yes	15(4.9)	21(16.4)	36(8.2)		
Fear of pain	No	298(96.4)	113(88.3)	411(94.1)	10.767(1)	0.001
	Yes	11(3.6)	15(11.7)	26(5.9)		
No pain progress	No	309(100)	96(75)	405(92.7)	83.354(1)	0.00
	Yes	0	32(25)	32(7.3)		
Due to Doctor Suggestion	No	299(96.8)	41(12.1)	340(77.8)	219.606(1)	0.00
	Yes	10(3.2)	87(68)	97(22.2)		

* Chi-square test (Undetermined values were due to unreliability of the test results and $P < 0.050$ was considered statistically significant)

4.3.4. Decision making process for vaginal or caesarean delivery

Of all deliveries 66% vaginal delivery mothers were influenced by their relatives where 40.60% of caesarean was influenced by relatives. Again 34.4% caesarean done by the influence of doctor where only 6.5% vaginal delivery mothers were influenced by doctor (**Fig. 4.2**)
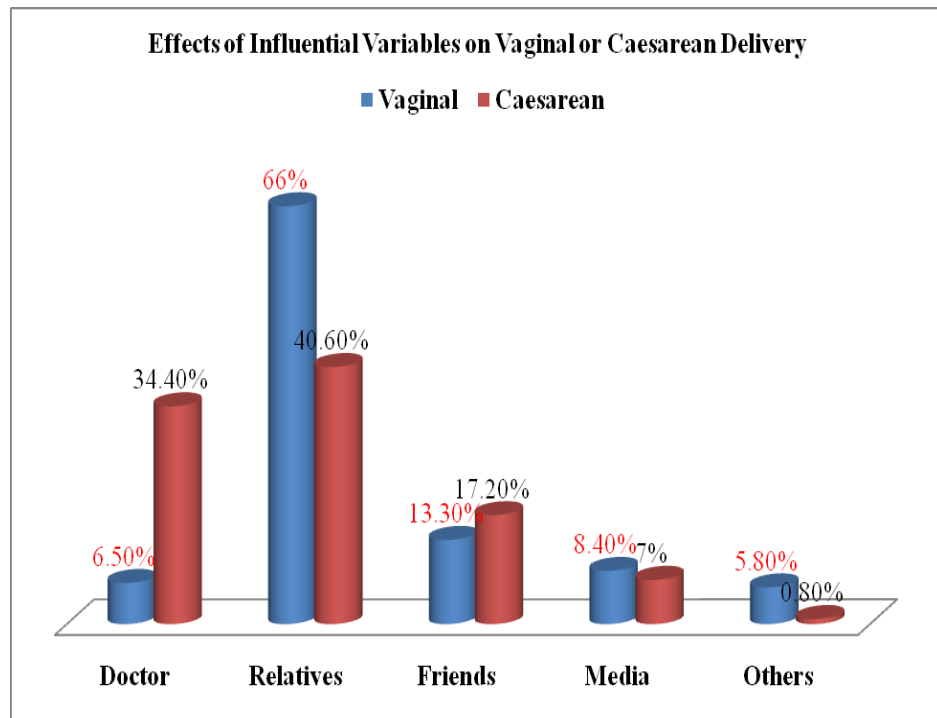
Figure 4.2: Effects of influential variables on vaginal and caesarean delivery

4.3.5. Bivariate Analyses of Information Variables provided to mother prior to delivery

The results show that all the information variables such as risk of surgery, types of anesthesia, types of pain medicine and expected recovery had statistically significant association with vaginal and Caesarean section (Chi-Square test with one degree of freedom, $p = <0.05$) illustrated in **Table: 4.5**. The results show that most of mothers did not get information about the risk of surgery and vaginal delivery. Only 8% mothers got information directly from doctors where 92% from doctors assistant and others.

Table 4.5: Association of Information Variables provided prior to delivery in studied women

Variable		Vaginal delivery N (%)	Caesarean delivery N (%)	Total N (%)	Pearson's χ2 (df)	P-value
Risk of Surgery	No	301(97.4)	90(70.3)	391(89.5)	70.568(1)	0.00
	Yes	8(2.6)	38(29.7)	46(10.5)		
Types of anesthesia	No	305(98.7)	103(80.5)	408(93.4)	48.583(1)	0.01
	Yes	4(1.3)	25(19.5)	29(6.6)		
Types of pain medicine	No	303(98.1)	97(75.8)	400(91.5)	57.956(1)	0.00
	Yes	6(1.9)	31(24.2)	37(8.5)		
Expected recovery	No	299(96.8)	93(72.7)	392(89.7)	56.945(1)	0.00
	Yes	10(3.2)	35(27.3)	45(10.3)		
	Not applicable	175(56.6)	9(7)	184(42.1)		
Information provided by whom	Doctor	17(5.5)	18(14.1)	35(8)	92.312(4)	0.00
	Nurse	34(11)	33(25.8)	67(15.3)		
	Physician	28(9.1)	25(19.5)	53(12.1)		
	Others	55(17.8)	43(33.6)	98(22.4)		

* Chi-square test Undetermined values were due to unreliability of the test results and P < 0.050 was considered statistically significant)

4.3.6. Bivariate Analyses of Postpartum Complications with Vaginal and Caesarean delivery

4.3.6.1. Association of back pain with vaginal and caesarean delivery

As tabulated in **Table 4.5**, the results show a statistically significant association of back pain with vaginal delivery (VD) and Caesar-section (CS) (Chi square test with 1 degrees of freedom = 4.819, p = 0.028).

4.3.6.2. Association of urinary incontinence with vaginal and caesarean delivery

The results show that urinary incontinence had no statistically significant association with vaginal and caesarean delivery (Chi-Square test with one degrees of freedom= 2.177, p = 0.140).

4.3.6.3. Association of pelvic organ prolapsed with vaginal and caesarean delivery

The results show that pelvic organ prolapsed had no statistically significant association with vaginal and caesarean delivery (Chi-Square test with one degrees of freedom= 0.606, p = 0.436).

4.3.6.4. Association of pelvic abdomen distention with vaginal and caesarean delivery

The results show that abdomen distention had statistically significant association with vaginal and Caesarean section (Chi-Square test with one degree of freedom= 40.621, p = 0.00) illustrated in **Table: 4.5**.

Table 4.6: Association of Postpartum Complications to delivery in studied women

Variable		Vaginal delivery N (%)	Caesarean delivery N (%)	Total N (%)	Pearson's χ2 (df)	P-value
Back pain	No	243(78.6)	88(68.8)	331(75.7)	4.819(1)	0.028
	Yes	66(21.4)	40(31.3)	106(24.3)		
Urinary incontinence	No	238(77)	90(70.3)	328(75.1)	2.177(1)	0.140
	Yes	71(23)	38(29.7)	109(24.9)		
Pelvic organ prolapsed	No	248(80.3)	106(83.5)	354(81.2)	0.606(1)	0.436
	Yes	61(19.7)	21(16.5)	82(18.8)		
Abdomen distention	No	280(90.6)	84(65.6)	364(83.3)	40.621(1)	0.00
	Yes	29(9.4)	44(34.4)	73(16.7)		
Miscarriage	No	296(95.8)	127(99.2)	423(96.8)	3.425(1)	0.076
	Yes	13(4.2)	1(0.8)	14(3.2)		

* Chi-square test or Fisher's exact test (Undetermined values were due to unreliability of the test results and P < 0.050 was considered statistically significant)

4.3.6.5. Association of pelvic miscarriage with vaginal and caesarean delivery

The results show that miscarriage had no statistically significant association with vaginal and Caesarean section (Fisher's exact test, p = 0.076).

4.3.7. Bivariate Analyses of Child Health Outcomes with Vaginal and Caesarean delivery

4.3.7.1. Association of neonatal death with vaginal and caesarean delivery

The results show that neonatal death had no statistically significant association with vaginal and Caesarean section (Fisher's exact test, p = 0.078) illustrated in **Table 4.6**

Table 4.7: Effect of Vaginal and Caesarean delivery on Child Health Outcomes

Variable		Vaginal delivery N (%)	Caesarean delivery N (%)	Total N (%)	Pearson's χ2 (df)	P-value
Neonatal death	No	295(95.5)	127(99.2)	422(96.6)	3.839(1)	0.078
	Yes	14(4.5)	1(0.8)	15(3.4)		
Cold and fever	No	279(90.3)	55(43)	334(76.4)	106.135(2)	0.00
	Yes	30(9.7)	72(56.3)	102(23.3)		
Pneumonia	No	294(95.1)	99(77.3)	393(89.9)	31.676(1)	0.00
	Yes	15(4.9)	29(22.7)	44(10.1)		

* Chi-square test or Fisher's exact test or likelihood test (Undetermined values were due to unreliability of the test results and *P < 0.050* was considered statistically significant)

4.3.7.2. Association of cold fever with vaginal and caesarean delivery

The results show that cold fever had statistically significant association with vaginal and Caesarean section (Likelihood Ratio test with 2 degree of freedom= 106.135, p = 0.00).

4.3.7.3. Association of pneumonia with vaginal and caesarean delivery

The results show that pneumonia had statistically significant association with vaginal and Caesarean section (Chi-Square test with one degree of freedom= 31.676, p = 0.00)

Chapter 5: Discussion

The results showed that total 70.7% women delivered vaginal where 29.3% were caesarean delivery. But in urban area caesarean rates were higher 41.5% than rural area 14.3% and the vaginal delivery were 4 times higher in rural area than urban area.

Evidence shows that there has been considerable increase in the rates of birth by CS, especially in urban areas of the low and middle income countries (Leone et al., 2008). Betran et al. (2007) conducted a study in 26 South Asian and sub-Saharan African countries and found that CS rates were highest among the urban rich, and lowest among the rural population. Similarly, in Bangladesh the CS rate in urban women were more than double compare to rural women 38% in urban areas and 18% in rural areas (BDHS, 2014). This is also in agreement with the findings of Kamal (2013), who indicated that urban women in Bangladesh, compared to their rural counterpart are more likely to deliver through CS due to easy access of health facilities and higher socio-economic status of the urban population. Anwar et al. (2008) also found that use of CS was significantly higher among mothers from rich urban areas of Bangladesh. The availability of modern health technology and increased access to, and use of antenatal care services in rich urban areas partly explain the higher rate of CSs in urban areas. Hospitals in urban areas are better equipped and have more qualified staff than those in more remote rural regions that make CS more accessible (Feng et.al., 2012).

5.1. Demographic characteristics

In this study, the researcher adopted a similar approach to that of Menacker and Hamilton (2010) in classifying deliveries under 20 years as teen deliveries and over 35 years as advanced maternal age. Of the women, one-third was adolescents in rural area and in urban area most of women (92.1%) were aged 20-34 years where the rural value was 58.7%. The results show that maternal age was higher with Caesar-sections. The women aged 20-34 years were more likely to undergo caesarean delivery than others. This finding was similar to result of Kamal (2013) where most of caesarean women were aged group >19-34. Women in younger and advanced maternal age are more likely to suffer from obstetric and maternal complications than

women in middle maternal age, and this may subsequently contribute to the increasing rate of CS use.

BMI was shown to be significantly associated with C-section (p value 0.00). We also found that rates of caesarean delivery were higher in the overweight group. This finding is similar to results from other studies (Rahman et al., 2018). The higher CS rates in the obese groups and the unwillingness of practitioners to perform vaginal deliveries in this population because of the increased risk of complications. In one study it was found an increased risk of shoulder displacement of the newborns in the overweight group (Gonik et al., 2003).

It is evident from previous studies conducted in different parts of the world that rate of CS is associated with women's education (Shabnam, 2016, Nazir, 2015). A study conducted in India by Shabnam (2016) revealed that women who had 10 years plus schooling were significantly more likely to experience CS than those who never attended school. The result shows of this study lower the education level higher the vaginal delivery, in contrast higher the education level women prefer to caesarean delivery. Similarly in Bangladesh, among women with secondary or higher education half of births were delivered by CS (BDHS, 2014). This is also supported by the study of Kamal (2013). They also found that use of CS was significantly higher among mothers with higher education. The likelihood of CS increased with the increase of women's level of education. Jisun and Kabir (2014) found that about 85% women having no education prefer vaginal delivery and about 55% women having secondary level education prefer caesarean delivery. Huda et al. (2012) found that CS without any pregnancy related complication was more common among women having 10 years plus schooling. Educated women are aware of the costs and benefit of the use of antenatal and maternity services. Education is likely to enhance women's confidence and make them capable in making decisions about their own health (Kamal, 2013).

In this study it was found that husband's education level and occupation significantly influence the rate of caesarean section. Higher the husband's education level higher the caesarean rate that is why most educated people are concerned about their child health as well as mother's health. It is also found that higher economic condition of husband's significantly associated with the rate of caesarean section in women. The result shows only 3.9% women from day labor family had CS, whereas 49.2% and

46.9% were from jobholder and business family respectively had CS. It is evident from many studies across countries that women who are from better socio-economic status would have higher rates for CS births (Nazir, 2015, Ghosh, 2010, Betrán et al., 2007, Feng et al., 2012). Anwar et al. (2008) conducted a study on inequity in maternal health-care services in Bangladesh and found that only 3.3% of the women from poor households had CS, whereas 28.4% of women from the rich households had CS. This is also supported by the study of Kamal (2013), who found that the likelihood of CS increased with the increase of women's wealth status. According to BDHS (2014), among women with higher wealth status, half of births were delivered by CS. Leone et al. (2008) also found that women with higher socio-economic background and having better access to antenatal services were most likely to undergo CS.

5.2. Obstetric Factors Associated with Caesarean-section

The results of this study show that the three most common fetal obstetric indications for C-section were fetal distress or Breech presentation, large baby or cephalopelvic disproportion (CPD) and twin or triplets and four maternal obstetric factors such as previous C-section, Long maternal leave, fear of pain and poor progress of pain. Similar findings were obtained in many studies as noted in a systematic review (EPCSRP, 2010)

Fetal distress was diagnosed in 38 cesarean women (29.7% of patients) in this study. Almost universally, it is the commonest indication for emergency C-section. Even though there are guidelines on the diagnosis of fetal distress, in practice however what constitutes fetal distress may differ from one clinician to another based on inter and intra-observer differences in interpretation of fetal heart rate patterns.(Beaulieu, 1982). Ideally suspicion of fetal distress should be confirmed with fetal scalp blood sampling for pH and lactate determination. Most doctors would prefer to err on the side of caution and deliver by C-section a normal baby suspected of having fetal distress than to lose a baby while trying to be conservative or more objective. The similar results were found in the study conducted by Inyang-Out (2014) where he found 35.7% of patients were had caesarean due to fetal distress.

In this study, Cephalopelvic disproportion (CPD) was recorded as the indication for C-section in 15 women (11.7% of patients). This is also supported by the study of Inyang-Out (2014)), who found that the likelihood of CS increased with the increase of CPD and he found his study 30.6% caesarean had CPD. It was a subjective assessment made by the attending medical officer based on physical examination findings during labor. Studies in other countries used different terminology such that head to head comparisons could not be made. Such terminologies as arrest of dilatation, arrest of descent and dystocia could have been recorded in the patient records in our study as poor progress or CPD. On the other hand if an assessment of CPD is made, it implies that the woman cannot deliver vaginally with safety. The findings of our study suggest a bit of subjectivity in clinical assessment, a modifiable factor which if addressed could lead to lower C-section rates. This study found only 5.5% women did their caesarean section due to twin or triplets baby.

The results of this study showed that previously caesarean contributed to 32 of the C-sections (25%). Giving birth previously by CS increase the likelihood of another CS (Nazir, 2015). Currently, the national guidelines for Bangladesh on delivery after previous CS follow WHO and FIGO guidelines. These guidelines do not support a repeat CS unless there is a clear medical indication for the procedure (Aminu et al., 2014). Healthcare providers are taught that "only 25-30% of women with a previous CS need a CS in the subsequent pregnancy" (Aminu et al., 2014). However, in some studies, for instance Nazneen et al. (2011) found that patients with a previous CS are more likely to undergo a repeat CS in the subsequent pregnancies due to mainly safety consideration. They found repeat CS for 34.3% cases in Bangladeshi hospitals. Similarly Aminu et al. (2014) found repeat CS accounted for 35.1% of cases, which is higher than the 25-30% range, could be a matter of concern. Nazneen et al. (2011) also found that the same patient attends the hospital for her successive deliveries, because they found CS less painful and convenient previously. Previous CS is thus relevant and an important factor especially in the context of Bangladesh. This is evident from the fact described by Aminu et al. (2014), ''For cases with previous CS, providers know a repeat CS is not mandatory but actual practice is different. "Everywhere in Bangladesh, we (healthcare providers) recommend CS for every woman with previous CS''. Because of pressure from patients and competing private interests doctors suggests the procedure (Aminu et al., 2014). Therefore, repeated CS

is an important contributor of the already high CS rates in Bangladesh and is likely to increase more in future. Awareness regarding the potential dangers associated with caesarean delivery must be raised among providers as well as among pregnant women and their families (Aminu et al., 2014).

In this study long-term maternal leave was found in 16.4% of the women who had C-sections. Similarly 11.7% and 25% of women were had caesarean section because of fear of pain and poor progress of pain respectively. Now a days labor fails to progress is common problem in women, it means cervix is not dilating and baby is not descending. There are many causes a failure to progress, including cephalopelvic disproportion, inefficient contractions, and posterior presentation. If mother cervix is not dilating, or baby is not descending, as quickly as expected during the first stage, than doctor takes decision to undergo caesarean section.

5.3. Decision making process for vaginal or caesarean delivery

In this study, about 34.4% influenced by the doctor, 40.6% identified the family members, 17.2% influenced by friends, 7% influenced by media and 0.8% identified by others made the decision. In this study, the result reveals that family members or relatives are greatly influenced the women to make their decision. Secondly, in case of caesarean deliveries, advice from doctors has been found to play an important role in the maternal decision on mode of delivery. Doctors of for-profit private clinics were found to persuade women and influence them to opt for caesarean delivery. However, from service providers point of view, pressure from patients and their families have main influence on the decision-making process of caesarean delivery. On the contrary, it is evident from the study of Sarker et al. (2012) that about 58% of the cases the doctors, 37% cases the doctors and family members, and only 4% cases the women themselves made the decision of CS. Moreover, others may also argue that doctor's influence might be the strongest, since doctor's are the ultimate decision maker and the power imbalance during labor favors decision making by the doctors. Despite women's own preferences, obstetricians can indeed persuade women's to change their choices. Similar indication was also made by Hou et al. (2014) in their study on Chinese and Brazilian women. The study found that at the start of the women's pregnancy, they had a preference for normal delivery but they changed their decision to CS after repeated interaction with their doctors. However, Jisun and Kabir

(2014) conducted a similar study based on primary data from different public and private hospitals in Bangladesh. They found that about 60% women reported that she and her family jointly took decision about her caesarean delivery. In most hospitals in Bangladesh, the rural hospitals in particular, don't have the adequate number of staffs to conduct the CS for 24 hours a day. Such hospitals rely on visiting staff who have busy schedule. In such a situation, they have to conduct elective CSs in most cases and during working hours, because after office hours they don't have the required manpower. This is evident from the findings of Sikder et al. (2015). In addition, in the context of Bangladesh, the difficulty in arranging for an emergency CS within short period possibly be an important cause of choosing an elective CS. In Bangladesh, proper vaginal delivery related requirements, such as electronic fetal monitoring system, painless vaginal delivery expert are lacking in many private and public health facilities. For this reason doctors sometime have to give CS preference over vaginal delivery. So it is clear from the above discussion that supplier induced demand and profit motive are playing a leading role in the decision of CS and driving the CS rates up in Bangladesh.

5.4. Information being provided to mother prior to delivery

Once the surgery was over, most participants remembered having been provided with information on all aspects of their surgery. Women least remembered being provided with information about what to expect in the recovery time as well as the type of pain medication used during recovery. In most cases (25.8%), nurse provided and about 19.5%, a physician provided the information to mothers. Doctors directly provided the information to 18 mothers (14.1%). The current study results reveal that 29.7% women got information about on the risk of surgery where only 19.5% knew about types of anesthesia which used during her surgery. In addition, 24.2% women informed by the types of medicine which were used for their recovery, furthermore, 27.5% women were informed by what to expect about their recovery. However, Puia (2013) conducted a similar study based on The Cesarean Decision Survey. He found that about 42.9%, a private physician provided the information. Most (97.0%) of the women felt they understood the information that was provided and (94.0%) felt they had the opportunity to ask questions. Overall (95.9%), study participants felt the information provided was helpful.

5.5. Maternal postpartum complications according to delivery mode

The maternal postpartum complication variables such as Urinary incontinence (UI), Pelvic organ prolapse and miscarriage did not show any significant association with CS and VD, whereas back pain and abdomen distended were significantly associated with CS and VD and higher in CS women. On the contrary, it is evident from the study of Hung et al. (2016) that the found significant higher risk of UI with than VD women. Another study conducted by Keag et al, (2018) also found that Compared to vaginal delivery, cesarean delivery was associated with decreased risk of urinary incontinence and pelvic organ prolapse. Moreover, they also reported that Pregnancy after cesarean delivery was associated with increased risk of miscarriage and stillbirth. In this study about 31.3% CS women complained back pain , apart from this 34.4% CS women were accused that their abdomen were distended after surgery. These are due to spinal anesthesia and lower movement of abdomen after surgery. The similar results have been reported by Kimberley et al., (2016) where they found Cesarean section and spinal anesthetic as etiological factors for Ogilvie's syndrome (OS) and paralytic ileus.

5.6. Child Health Outcomes with Vaginal and Caesarean delivery

This study showed that neonatal death was not significantly associated with CS and VD, on the other hand, 56.5% and 22.7% child supposed to cold fever and pneumonia respectively with CS delivery. On the contrary, Moore et al., (2012) reported that there was no association between elective caesarean delivery and number of pneumonia admissions aged <12 months and 12-23 months but they also noted that caesarean child were supposed to higher rate of bronchiolitis. Similarly Keag et al., (2018) also reported that Cesarean delivery was associated with increased risk of childhood asthma.

Chapter 6: Conclusions

The increase in CS rate and the impact of caesarean delivery on maternal and child health, is a serious concern worldwide. A significant rise in the rate of cesarean delivery has also been observed in Bangladesh over the last decade. This study reveals that Caesarean section rates are high in urban area in contrast to rural area. Obstetric factors contributed more to the high C-section rates than others factors. Above all, a combination of profit making tendency of private health facilities and doctors, and demand from women with higher socioeconomic status, particularly in urban areas have contributed to the recent increased trend in caesarean delivery in Bangladesh.

Doctor's influence has been found to play an important role in the maternal decision on mode of delivery. Although, maternal request for CS and pressure from patients or their families have some influence on the decision-making process, doctor's influence to persuade the women might play the major role. All women undergoing CSs, either indicated or unnecessary, poses the risk of variety of complications and may results in maternal morbidity and mortality. Performing a CS when it is not really needed poses economic pressure on family and on the limited resources of a poor resource setting like in Bangladesh.

Avoiding unnecessary CS could contribute to making CS accessible to those who really need this intervention to manage potential life threatening complications in both women and the newborns. Therefore, it is important to prevent unnecessary CSs and to keep the CS rates as low as possible. The decision to perform a CS delivery must be taken and monitored carefully and should not be profit oriented. Awareness raising about the negative consequences of caesarean deliveries, doctor's commitment to reduce the rate of CS, government's initiative to policy intervention and strict monitoring of the private health facilities may help to control the high CS rates.

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Appendix-I: Cesarean Section and Vaginal Delivery Survey

PART-A: Participant Consent Form

My name is Ishrat Jahan, and I am a student at Chattogram Veterinary and Animal Sciences University. I am conducting a qualitative research study on "Comparative Analysis of Caesarean Section and Non-caesarean Delivery with It's Associated Factors in Urban and Rural Areas of Chattogram, Bangladesh." The purposes of this study are to determine the caesarean rate in urban and rural area of Bangladesh and the driving factors of caesarean section. Your participation in the study will involve an interview with an estimated length of half an hour.

This study poses little to no risk to its participants. I will do my best to ensure that confidentiality is maintained by not citing your actual name within the actual study. You may choose to leave the study at any time, and may also request that any data collected from you not be used in the study.

By signing below you agree that you have read and understood the above information, and would be interested in participating in this study.

Date:………………………

_____
Signature

PART-B: Demographic Information

1.1 Age in Years: …………………

1.2 Level of education in year: ☐ Primary School ☐ High School ☐ College ☐ Graduation ☐ Other

1.3 Height: …………………………………….. 1.4 weight:

…………………………………….............

1.5 Occupation: ☐ Housewife ☐ Jobholder

1.6 Husband's Occupation: ☐ Day Labor ☐ Job Holder ☐ Businessman

1.7 Husband's Education: : ☐ Primary School ☐ High School ☐ College ☐ Graduation ☐ Other

PART-C: Delivery History and Factors Associated with Delivery

1. Delivery History:
1.1 Total number of deliveries: …………………
1.2 Number of cesarean births (including the current delivery): ……………

Fetal Obstetric Factors

Could you please check the reason for the cesarean birth: Check all that apply
1. Breech presentation: ☐ Yes ☐ No

2. Large baby :   ☐ Yes ☐   No
3. Twin Baby :   ☐ Yes   ☐ No

Maternal Obstetric Factor

Could you please check the reason for the cesarean birth: Check all that apply
1. Previous cesarean birth :   Yes ☐ No
2. Longer maternity leave : ☐ Yes ☐ No
3. Fear of labor pain : ☐ Yes☐   No
4. Labor did not progress : ☐ Yes ☐ No
5. Doctor Recommendation ☐   Yes☐   No

Information Variable

What information do you remember being provided to you prior to your cesarean?
Cheek all that apply

1. Risks of surgery to you : ☐ Yes ☐ No
2. Types of anesthesia used during delivery : ☐ Yes ☐ No
3. Types of pain medicine : ☐ Yes ☐ No
4. Expect recovery: ☐ Yes ☐ No
5. Who provide you with the information? ☐ Doctor ☐ Nurse ☐ Physician ☐ Others
6. Did you understand the information provided? ☐   Yes ☐ No
7.   Did you feel that your had the opportunity to ask question? ☐ Yes ☐ No
8. Did you feel the information provided was helpful? ☐ Yes ☐ No
9. If No, What other information would you like to have received?
…………………………………………………………………………………………
…………....................

10. Were you satisfied with your decision to have a caesarean birth? ☐ Yes ☐
No

Influential Variable

When considering whether or not to have cesarean birth, what sources of information
dies you use to help make your decision? Cheek all that apply.
1. Doctor : ☐ Yes ☐ No
2. Relation : ☐ Yes ☐ No
3. Friend :   ☐ Yes ☐ No
4. Other :   ☐ Yes ☐ No

Part –D: Post-Partum Complications and Child Health Outcomes

Mother Post-Partum Complications

1. Back pain ☐ Yes ☐ No	2. Pelvic Organ prolapsed ☐ Yes ☐ No	3. Miscarriage ☐ Yes ☐ No

4. Urinary Incontinence	5. Abdominal distention	
☐ Yes ☐ No	☐ Yes No	

Child Health outcomes

1. Neo-Natal Death	2. Pneumonia
☐ Yes ☐ No	☐ Yes ☐ No
3. Cold Allergy	4. School performance
☐ Yes ☐ No	☐ Yes ☐ No

6.7 Any additional comments you would like to make?

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……………………………………………………………………………………………………

……...

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Appendix-II: Photography

Measurement of weight and height

Data collection

Brief Biography

Mrs. Ishrat Jahan passed the Secondary School Certificate (SSC) Examination in 2009 and then Higher Secondary Certificate (HSC) Examination in 2011. Ishrat jahan obtained her B.Sc. (Hons.) in Food Science & Technology in 2016 from Chittagong Veterinary and Animal Sciences University (CVASU), Bangladesh. Now, she is a candidate for the degree of MS in Applied Human Nutrition and Dietetics under the Department of Applied Food Science and Nutrition, Faculty of Food Science & Technology, Chattogram Veterinary and Animal Sciences University, CVASU, Bangladesh. She has immense interest to improve child and women's nutritional status across the world.