FACTORS ASSOCIATED WITH AN INCREASE IN CAESAREAN SECTION BIRTHS IN KENYA: EVIDENCE FROM 2014 KENYA DEMOGRAPHIC HEALTH SURVEYS

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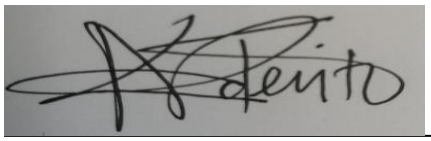
DECLARATION

I hereby declare that this is my original work and it has not been presented in any other university.



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This Research Project has been submitted for examination with the approval of my/our University supervisor(s).

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ABSTRACT

This study set out to examine factors associated with the increase in caesarean sections in Kenya. Using data from the Kenya Demographic and Health Survey (KDHS-2014), However in order to show trends in C-Section, data from KDHS 2003-2014 was used while only data from KDH 2014 was used to show factors that influence C-section deliveries.

The study identified variables linked to the rise using logistic model-based univariate, bivariate and multivariate analysis. According to bivariate results, factors such as mother's age at birth, her marital status, her parity, her level of education, her place of residence, her household's wealth profile, the number of antenatal visits she had and the location of her delivery were associated with C-section deliveries. Multivariate analysis showed that as a mother becomes older, the risk of having a C-section rises. When compared to younger mothers, mothers aged 45 to 49 years had a greater likelihood of having a C-section (OR= 5.494). These results support earlier research that showed that socioeconomic and demographic factors led to avoidance of cesarean deliveries.

As such there is a need for healthcare professionals to re-educate healthcare providers on available guidelines, conduct continuous C-section audit, and provide feedback on unnecessary C-sections. There is also need to educate women on the best delivery options, follow ethical clinical practice, and prevent unnecessary C-sections. Therefore, this study suggests future research to identify the precise causes of the rise in C-sections in Eastern region, socio-economic factors influencing C-section deliveries, and perspectives and cultural norms of women and healthcare professionals.

ABBREVIATIONS

ANC	Antenatal care
C-SECTION	Caesarean section
DHS	Demographic and Health Survey
EA	Enumeration Area
FGM	Female Genital Mutilation
KHIS	Kenya Health Information System
KHSSP	Kenya Health Sector Strategic Plan
GDHS	Ghana Demographic and Health Survey
GoK	Government of Kenya
LMIC	Low- and Middle-Income Country
MoH	Ministry of Health
NHIF	National Hospital Insurance Fund
OR	Odds Ratio
SDG	Sustainable Development Goal
SDT	Second Demographic Transition
TPB	Theory of Planned Behaviour
TTN	Transient tachypnea of the newborn
WHO	World Health Organisation

CONTENTS

CHAPTER ONE: INTRODUCTION

1.1 Background

Caesarean section, sometimes referred to as “C-section," is a life-saving obstetric procedure used to avoid difficulties linked to pregnancy and childbirth, is an operation done by medical specialists to deliver a baby through uterine incisions (Larissa, 2022). C-section rates are rising everywhere, even in Kenya. According to World Health Organisation report of 2018, 18.5 million caesarean sections were anticipated to be performed annually across the world, but almost a third of which would be unnecessary (WHO, 2018). Recent epidemiological studies have revealed that both high-income and low-income countries practice caesarean deliveries at greater, and occasionally much higher rates than stated (Byamugisha & Adroma, 2020; Harrison & Goldenberg, 2016). A study by the US National Library of Medicine found out that the average caesarean rate worldwide climbed from 12.4 percent to 18.6 percent between 1990 and 2014, with regional rates varying from six percent to 27.2 percent. An annual increase of 4.4 percent was also noted (Harrison & Goldenberg, 2016). The procedure has been used to treat foetal distress during labour and maternal problems such as diabetes, hypertension and heart disease (British Medical Journal, 1981). Studies have shown that caesarean births improve the outcome of prenatal disorders, which is why it is becoming increasingly popular. Modern antibiotics, methods of anesthesia, blood banks and intensive care units, according to Jeffrey et al. (2007) reduced the number of women dying after caesarean section by almost a thousand-fold. Greene (2001) also asserts that caesarean sections are associated with less serious complications, including uterine rupture and poor newborn outcomes such as hypoxic-ischemic encephalopathy.

This is a crucial maternal health treatment that saves the life of the mother and the child when complications occur during childbirth. At a consensus development conference on caesarean births held in the United States in September 1980, many causes were identified that might explain the increase in caesarean birth rates (NIH, 2006). At the time, the infant mortality rate was considered a measure of the quality of healthcare. Due to advances in medicine such as with improved anesthetic methods, blood transfusions, a wider range of drugs to treat infections and better medical management of maternal diseases, maternal mortality from caesarean births has become uncommon (British Medical Journal, 1981). As more information and techniques for the foetus and newborn became available, it was recognized that more pregnancies could potentially benefit from caesarean section (Jeffrey et al., 2007).

In a randomised control trial conducted by Bofill et al. in 2000, the results of 15 mothers who underwent vacuum delivery, 14 manual deliveries, and 15 forceps deliveries were compared. The vacuum delivery group's success rate was 13 out of 15, or 87 percent, while the two manual deliveries were performed on the other two mothers. The second delivery was done manually as the foetal head was being moved before the cup was applied in the first failure, which was brought on by a pump fault. In normal delivery, 11 out of 14 cases (or 79%) deliveries were successful; three of these required suction help to make the delivery possible.

In terms of prevalence, Latin America had the greatest rate (40.0%), followed by the Caribbean (35.0%), North America (32.0%), Oceania (31.1%), Europe (25.0%), Asia (19.2%%), and Africa (7.3%). Between 1991 and 2012, the proportion of C-section deliveries in Germany increased from 15.3 to 31.7 percent. The report's conclusions agreed with those of the World Health Organization (WHO, 2018). Increased caesarean deliveries in sub-Saharan Africa (SSA) are already putting stress on the region's limited health care resources, endangering the financial stability of families, and impeding the implementation of universal health coverage (Harrison & Goldenberg, 2016). As more information became available and recognition of the role of patient autonomy gaining prominence, the rise in caesarean section also rose altogether. Obstetricians also grew less comfortable with vaginal deliveries and the decrease became self-perpetuating (Jeffrey et al., 2007). Opinion of the obstetrician ultimately carried the day whether to perform caesarean section or vaginal delivery (WHO, 2018; Norwitz et al., 2001).

Like other procedures, C-sections have negative short- and long-term repercussions on the mother and the baby. The requirement for a blood transfusion, anesthesia-related issues, organ damage, an infection, thromboembolic illness, and respiratory difficulties are some examples of short-term consequences. On the other side, long-term effects of C-sections on mothers include higher chances of hysterectomy, abnormal placentation, uterine rupture, stillbirth, and premature delivery in the following pregnancy (Jane, et al., 2018). Developing economies are 100 times more susceptible to these short- and long-term morbidities than developed nations due to the frequency of prior cesarean deliveries (Keag et al., 2018; WHO, 2018; Sage, 2020). Additionally, C-section-related maternal and neonatal mortality are disproportionately prevalent in LMIC. When a C-section is performed too few times too late or too many times too early, the results are often not favorable (WHO, 2019).

According to research by Sobhy et al. (2019), Africa had the greatest risk of maternal mortality from C-section at 76 percent per 1000 operations. In addition, 25 percent of all mothers who passed away in low- and middle-income nations gave birth through C-section, and eight percent of the newborns died within a week of being born (The Lancet, 2019c; WHO, 2019). Sepsis

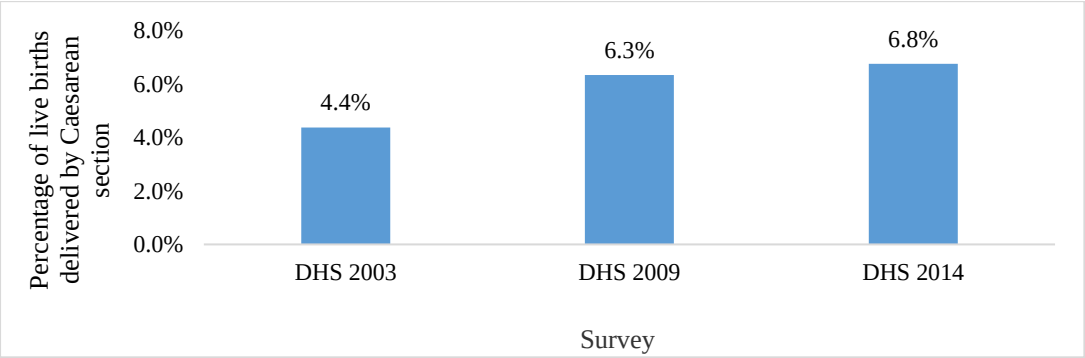
(22%), pre-eclampsia (19%), postpartum hemorrhage (19%), and anesthesia-related causes (14% of all C-section-related fatalities) were all implicated in 33 percent of cases (WHO, 2019). Available data from the World Health Organization, the areas with the greatest rates of cesarean deliveries included Latin America and the Caribbean at 40.5%, North America (32.3%), Oceania (31.1%), Europe (25%), Asia (19.2%), and Africa (7.3%). (WHO, 2018).

In the period 1990 to 2014, the world average cesarean rate went up by 4.4 percent per year (AARI), from 6.7 percent to 19.1 percent (WHO, 2018). The largest increases, according to Betran et al. (2016), were in Asia and Latin America, where caesarian rates grew by 15.1 percentage points from a lower rate of 4.4 percent to 19.5 percent after rising by 19.4 percentage points from an initial low of 22.8 percent to 42.2 percent.; Oceania had an increase of 14.1 percentage points, from 18.5 to 32.6 percent; Europe likewise saw an increase of 13.8 percentage points, from 11.2 to 25 percent; USA, Canada and Mexico saw an increase of 10 percent, from 22.3 percent to 32.3 percent while Africa saw the least increase of 4.5 percentage points, from 2.9 to 7.4 percent. Brazil and the Caribbean had the greatest C-section incidences in Latin America at the national level, with 55.5 and 56.4 percent, respectively; Egypt had 51.8 percent in Africa; Iran had 47.9 percent; Turkey had 47.5 percent in Asia; Italy had 38.1 percent in Europe; the United States American had 32.8 percent in North America and Oceania had 33.4 percent.

During the same period, C-section rates increased in sub-Saharan Africa (SSA), with significant disparities between rich and poor (Goldenberg and Harrison, 2016). Rwanda had a 64 percent C-section rate, according to a 2018 study (Yaya et. al., 2018). While in Ethiopia, it increased from 2.3 percent in 1995 to 24.4 percent in 2010 (Gebremedhin, 2014). Compared to Uganda and Tanzania, Kenya has the highest percentage of caesarean births, with noticeable differences across public and private healthcare institutions (Yaya et. al., 2018). Compared to Uganda, which had 8.0 percent public and 11.8 percent private health facilities, Kenya had C-section births in 11.6 percent of public hospitals and 19.7 percent of private hospitals. Similar disparities exist in Tanzania, where 18.3 percent of the population receives private medical treatment compared to 7.9 percent who utilize public healthcare (Yaya et al., 2018).

A 2018 study found out that Kenya has a higher percentage of caesarean deliveries than Uganda and Tanzania, with noticeable differences between public and private healthcare institutions. C-section births occurred in 11.6 percent of public hospitals and 19.7 percent of private hospitals in Kenya, compared to eight percent in public and 11.8 percent in private health facilities in Uganda. In Kenya, it increased from 4.4 percent to 6.8 percent between 1993 and 2014 as shown in Figure 1.

Figure 1: Delivery by C-section in Kenya

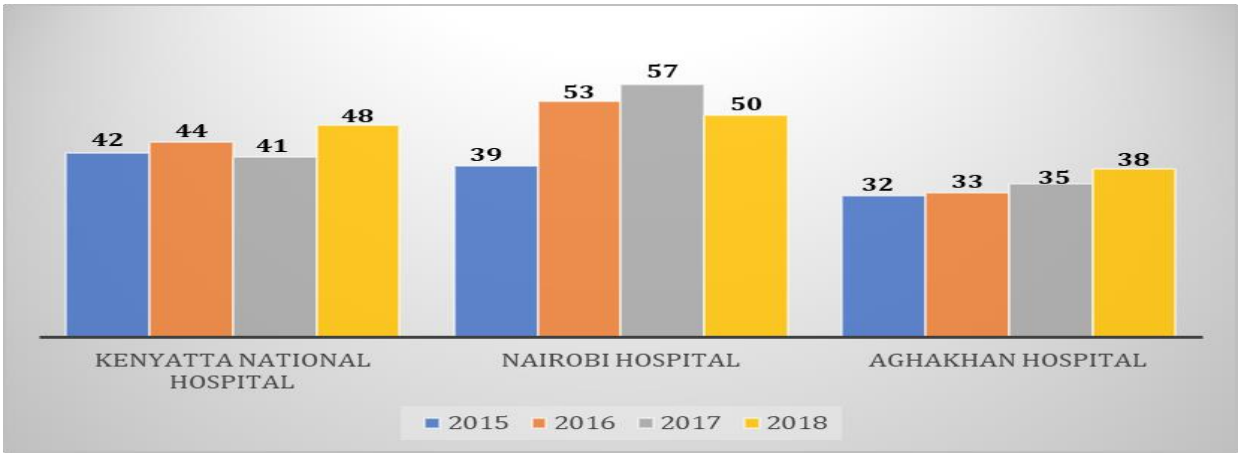


Source: KDHS 2003-2014

Additionally, an ex post facto investigation into the Aga Khan University Hospital in Nairobi, C-section rate between 2001 and 2004 revealed that the overall C-section rate was 26 percent in 2001, while it increased to 38 percent in 2004. Private obstetricians saw patients at a rate of 31 percent in 2001 and 42 percent in 2004, as opposed to 22 percent and 35 percent for general patients over the same period. 67.4 percent of caesarean deliveries were main, 65.4 percent were emergency, and 19.7 percent were repeat caesarean deliveries, according to case-control research done in 2015 among moms who gave birth at Mama Lucy Kibaki Hospital. Caesarean deliveries were linked to a healthy baby's delivery and stable employment (Yaya et al., 2018).

In 2015, caesarean rates at Kenyatta National Hospital, Nairobi Hospital and the Aga Khan University Hospital were 42 percent, 39 percent and 32 percent respectively, while in 2018 they were 48 percent, 50 percent and 38 percent (MoH-KHIS, 2019), an indication that C-sections were higher in major hospitals. The Kenya National Hospital Insurance Fund (NHIF) insured 65,278 mothers with C-section in the 2017/2018 financial year, up from 21,490 in the previous financial year. Caesarean sections accounted for most of the NHIF's maternal costs, which totaled 1.5 billion Kenyan shillings.

Figure 2: Delivery by C-section in selected hospitals (Kenyatta National Hospital, Nairobi Hospital and Agha Khan University Hospital)



Source: MoH-KHIS 2019.

The rising trend in Kenya and elsewhere in the world has continued to cause concern among scientists and the public health and medical communities prompting them to discuss clinical and non-clinical factors responsible for the increase. They note that among other factors, clinically justified grounds for C-sections include challenging labour, foetal distress, breach deliveries, post-term pregnancy, multiple pregnancies, diabetes and hypertension. Additionally, non-clinical characteristics including maternal age and education level, affluence and the location of birth correlate with C-section deliveries contributing to the rise in the global rates of cesarean sections (Ghosh, 2010). Cultural beliefs and psychological factors such as fear of prolonged labour, fear of pain and pelvic damage also play a central role in reinforcing women's preference for delivery by C-section (WHO, 2018; The Lancet, 2018$_b$). This has led the World Health Organization to propose that population-level caesarean rates should not go beyond 15 percent, based on evidence that caesarean rates above 15 percent do not result in additional prevention of maternal and infant morbidities and mortalities (WHO, 2018; Yaya et al., 2018). This scenario underscores the need to identify issues related to the increase in caesarean sections in Kenya, as it raises questions as to why increasing numbers of women are choosing this method of delivery.

Concerns are raised by the growth regarding the short- and long-term hazards, as well as the expenses, of caesarean births, which can cause a negative effect on maternal health, newborns, and future pregnancies (WHO, 2019). Compared to vaginal delivery, a mother is more likely to die during childbirth with a caesarean delivery (Medscape, 2020). According to studies, thromboembolism has been suggested as the main cause of maternal death, followed by postpartum hemorrhage, sepsis, pre-eclampsia and anesthesia-related causes, all associated with caesarean section complications (WHO, 2019; Silver et al., 2004). Obesity, as well as other obstetric risks like dystocia, previous caesarean section, foetal distress, miscarriage,

multiple pregnancies, diabetes and hypertension have been suggested as contributing factors to the world's high caesarean rates (Kirchengast, 2018; ElArdat, 2013; Mishra, 2002).

In addition, demographic and other socioeconomic parameters such as maternal age, wealth, education, occupation, delivery location and type of housing have been found to be closely related to increases in caesarean births (Boatin, 2018.; Manyeh, 2018; Nilsen, 2014). Similarly, cultural norms are shown to influence women's behavior, particularly in the mode of childbirth (Latifnejad, 2014; Lori, 2011). Psychological considerations, such as the fear of long labour and the pain associated with vaginal delivery, also influence a woman's choice to have a caesarean section (Béhague e et al., 2002). In recent years, the use of medical technology to treat childbirth problems has increased, leading to an increase in caesarean sections (Buekens, P., 2001; Johanson, 2002). Medicalization of childbirth have raised concerns about health malpractice, such as doctors performing unnecessary caesareans for personal reasons, prompt treatment to save time and financial incentives (Pai, M., 2000).

A retrospective analytical study conducted at M.P. Shah Hospital with women giving birth at the facility between 1998 and 2000 established that 28 percent of mothers gave birth by C-section, with repeat caesarean section accounting for 40 percent of cases (Jahonga, K.R., 2000). According to a case-control study conducted in 2015 among mothers who gave birth at Mama Lucy Kibaki Hospital, 67.4% of caesarean deliveries were primary, 65.4 percent were emergency and 19.7% were repeat caesarean deliveries. Caesarean births were associated with the birth of a healthy baby and formal employment.

Women who give birth through C-section are more likely to need an emergency hysterectomy than mothers who give birth naturally. The mortality and morbidity rates are increased following peripartum hysterectomy. It is one of the most-risky obstetric complications, and it is quite expensive to treat (Silver et al., 2004). A caesarean section might potentially involve a gravid hysterectomy. It is possible to remove the uterus, ovaries, cervix, fallopian tubes, and other nearby tissues, but doing so can result in dangerous surgical complications or even death (American Pregnancy Association, 2019). Compared to mothers who give birth normally, caesarean mothers feel less comfortable afterward. Additionally, they assert that in the beginning, they worry more and spend less time with their infants (Shu-Yu Kuo et al., 2014). They typically have to wait a very long time before they finally get to see their infants (American Pregnancy Association, 2019).

1.2 Problem statement

Caesarean sections have become increasingly common in Kenya over the years (KHIS 2019), rising from 4.4 percent in 2003 to 6.8 percent in 2014 as reflected by Kenya Demographic Health Survey (KDHSs). In addition, caesarean sections have similar but larger trends in hospital data as exemplified by Kenyatta National Hospital case where rates jumped from 42 percent in 2015 to 48 percent in 2018, Nairobi Hospital grew from 39 percent to 50 percent and Aga Khan University Hospital increased from 32 percent in 2015 to 38 percent in 2018 (KHIS, 2019). Furthermore, there are no signs that the increase in caesarean rates will slow down (WHO, 2018). It's critical to comprehend why the technique is growing more and more prevalent in various scenarios given the rising caesarean birth rates. When medically essential, C-sections can prevent illnesses or fatalities in the mother and the fetus (WHO, 2018). On the contrary, hazards associated with C-sections might last forever and harm subsequent pregnancies as well as the delivery itself (WHO, 2018). The fact that the causes of increased application of C-section are unknown, but they appear to be a complicated, multi-faceted web involving healthcare systems, healthcare professionals, women, societies, fashion, and the media only serve to exacerbate the issue.

Despite these data, there is insufficient information about caesarean sections in the Kenyan population. Few studies suggesting possible causes associated with an increase in caesarean sections have relied on agency/hospital-based datasets that lack an overview of the problem at the community level. Additionally, there is a paucity of literature that comprehensively examines factors associated with an increase in caesarean sections in Kenya between 2003 and 2014. This study uses population-level data to fill in this research gap, focusing on the period 2003-2014 to highlight trends and using 2014 data to explain factors related to the rise in caesarean deliveries.

1.3 Research Questions

The main study questions are as follows:

i. What demographic factors influenced the increase in caesarean deliveries in Kenya between 2003 and 2014?
ii. What socioeconomic factors influenced the rise in C-sections in Kenya from 2003 to 2014?

1.4 Study Objectives

The main objective of the study was to find out the factors associated with the upsurge caesarean section births in Kenya.

The other study objectives were:

i. To find out demographic factors contributing to the increase in C-section in Kenya from 2003 to 2014.
ii. To establish socioeconomic factors that influenced the rise of C-sections in Kenya between 2003 and 2014.

1.5 Justification of the study

C-section has become an increasingly important issue of study because it is a crucial maternal health care service that can save both women's and infants' lives when difficulties arise during pregnancy and childbirth (WHO, 2018). The findings of this study will aid in understanding non-clinical reasons that make women prefer caesarean section, which is important in reducing inappropriate use of surgery and averting many immediate and long-term risks to help women enjoy their reproductive health throughout their childbearing years in Kenya in the period between 2003 and 2014. Further, study outcomes will support the Ministry of Health (MoH) in achieving its policy goal of decreasing exposure to health risk factors, as defined in the Kenya Health Policy of 2012–2030. One of the key components of Sustainable Development Goal (SDG) 3—promote healthy lifestyles and well-being for all people of all ages—emphasizes on improvement of quality of life for women and children. Determining causes of the rise in C-sections will help in addressing non-clinical causes that result in unnecessary surgery.

1.6 Scope and Limitations of the study

The purpose of this research was to determine factors related to the increase in caesarean births in Kenya using data from Kenya Demographic Health Surveys (KDHSs) for the period 2003 to 2014. The main weakness of this research is that KDHSs do not disclose reasons for choosing a caesarean section; such information would have been valuable in separating clinical from non-clinical aspects related to C-section. It only considers women who were interviewed as part of the KDHS interviews, so the perspectives of other women who were not interviewed can be overlooked. Other potential limitations of the study are memory errors, since KDHS surveys rely on retrospective reporting, and biases associated with self-reports of individual experiences and situations. Despite these obstacles, researchers have found demographic health survey data to be reliable (Madeleine, S., 2012).

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section summarizes literature from different parts of the world, as well as from Kenya. It discusses some of the immediate and long-term hazards of C-section births, including their impact on future pregnancies and other factors associated to the rise. It considers the following variables: place of delivery, health insurance coverage, affluence, birth order, residency, maternal age, educational attainment and cultural and psychological issues leading to C-section.

2.2 Prevalence of C-section globally, regionally and in Kenya

When problems arise during childbirth, a C-section is an essential maternal health procedure that preserves both the mother and the child's lives. Many reasons were suggested as potential explanations for the rise in caesarean birth rates during a consensus-building conference on the procedure conducted in the United States in September 1980. At the time, the infant mortality rate was used as a benchmark for healthcare quality. Maternal death from caesarean births is now rare thanks to medical advancements such as better anesthetic techniques, blood transfusions, a greater variety of medications to treat infections, and better medical management of maternal illnesses (British Medical Journal, 1981). Better pregnancies could perhaps benefit from cesarean sections if more knowledge and methods for the fetus and newborn became available (Jeffrey et al., 2007). The outcomes of 15 mothers who underwent vacuum delivery, 14 manual deliveries, and 15 forceps deliveries were compared in a randomised control trial carried out by Bofill et al. in 2000. The success rate of the vacuum birth group was 13 out of 15, or 87 percent, whereas the other two moms underwent manual deliveries. The second delivery was carried out manually because the initial failure, which was caused by a pump issue, occurred as the foetal head was being shifted before the cup was applied.

Diverse literary sources demonstrate that when choosing their chosen technique of birthing, women mainly rely on unofficial information offered from others' experiences. Other pregnant women pick up on the apparent anxiety, worries, misunderstandings, and negative experiences that other women have. According to a study by Latifnejad and colleagues in Iran involving 2,521 pregnant women in 67 public hospitals, women preferred delivery by C-section due to what they had heard from their friends about the pelvic floor muscles not working properly after vaginal delivery, as well as other issues like losing bladder control and having less sexual

pleasure. They further stated that, in contrast to vaginal deliveries, C-sections did not necessitate routine vaginal inspections (Latifnejad et al., 2015).

These contrast with those reported in the Lancet series of 2018, which noted that many women prefer delivery by C-section for a variety of reasons, including the belief that a typical vaginal delivery is not possible following a prior C-section, the fear of pain, the fear of pelvic damage, the fear of involuntary urination, the negative effects on sexuality and romantic relationships, and the fear of pain. Birthing a child via cesarean section has also gained popularity in several countries. It is thought that a more contemporary method of childbirth without labor allows women to have their tubes closed right away after giving birth without experiencing any more pain. Another advantage is that it permits babies to be born on holidays and other special occasions (The Lancet, 2018). The cultural belief in Pakistan that having a C-section is a sign of having higher socioeconomic position is one of the possible causes of the rise in C-sections (Latifnejad et al., 2015).

The rise in caesarean rates appears to be unstoppable and shows no sign of abating (WHO, 2018). With caesarean birth rates on the rise, it is important to understand why the procedure is becoming more and more common in different contexts. When clinically necessary, C-section can avert maternal and perinatal diseases or deaths (WHO, 2018). Caesarean sections, on the other hand, carry both instant and interminable risks that may affect future pregnancies and extend beyond the current delivery (WHO, 2018). Compounding the problem is the fact that the origins of the surge are unknown, but they appear to be a complex, multi-faceted maze that encompasses healthcare systems, healthcare providers, women, societies, fashion and the media. A group of professionals meeting in Fortaleza, Brazil, in 1985 to study appropriate birth technologies reflected on what was seen as an unwarranted rise in caesarean rates around the globe. They found out that a caesarean rate greater than 10-15 percent in each region is unjustified based on the evidence presented (WHO, 2015).

In the sub-Saharan Africa (SSA), the rise is already straining the region's limited health care resources, jeopardizing the stability of families' finances, and delaying the introduction of universal health coverage (Harrison & Goldenberg, 2016). 11 of of 15 (73%) attempts at forceps delivery were successful; however, three cases required manual delivery and one required vacuum delivery. The number of patient-generated requests for caesarean sections increased as more information became available and the importance of patient autonomy was recognized. Additionally, when obstetricians lost confidence in vaginal births, the decline became self-perpetuating (Jeffrey et al., 2007). Whether to deliver the baby vaginally or via caesarean section ultimately depended on the obstetrician's advice (WHO, 2018).

It was expected that 18.5 million caesarean sections would be performed worldwide each year, of which about a third would be unnecessary (WHO, 2018). Recent epidemiological research has shown that caesarean births are performed at higher, and occasionally significantly higher, rates than reported in both high- and low-income countries (Byamugisha & Adroma, 2020; Harrison & Goldenberg, 2016). According to a study published by the US National Library of Medicine, the world caesarean average rate increased to 18.6% up from 12.4% in the period 1990 to 2014, with rates by region ranging from 6% to 27.2%, and an annual increase of 4.4 percent was recorded (Harrison & Goldenberg, 2016). Latin America had the highest prevalence of 40.0 percent, then the Caribbean at 35.0 percent, North America at 32.0 percent, Oceania at 31.1 percent, Europe at 25.0 percent, Asia at 19.2 percent and Africa having the least at 7.3 percent. In Germany, the percentage of delivery by C-section doubled in the period between 1991 and 2012 from 15.3 percent to 31.7 percent. The findings of this report were consistent with that of the World Health Organization (WHO, 2018). Rising caesarean deliveries in sub-Saharan Africa (SSA) is already putting pressure on scarce health care resources, jeopardizing families' financial security and hampering universal health coverage (Harrison & Goldenberg, 2016).

Women with higher educational levels and better socioeconomic status had more surgical deliveries, according to a cross-sectional study based on 1,344 live births in Brazil (Ministry of Health (Brazil), 2007). The findings of greater caesarean rates among primiparous women are concerning, considering that doctors may conduct a caesarean delivery if a previous indication of a caesarean birth exists. The maternal age was another factor identified in the study as a primary indicator of caesarean deliveries. According to the literature, older mothers are more likely to have caesarean births because they have more comorbidities that require surgery.

According to Egypt Demographic and Health Survey (EDHS), C-section rates grew to 52%, a rise of almost 100% since 2005. (ICF International, 2015). C-sections performed in hospitals were reported at 67.3%, double what they were in Jordan and Saudi Arabia. A survey of 4,357 births that occurred in 2016 in 13 public hospitals in Egypt revealed that 50% of caesarean sections were performed because of signs of a prior C-section. The high prevalence of C-sections, according to the obstetricians surveyed, was caused by convenience, a lack of monitoring, a lack of training, an absence, and a lack of knowledge of clinical guidelines at public hospitals (Elnakib, 2019).

In South Africa, C-section rate in public sector rose from 15.1 percent in 2006 to 24.1 percent in 2015. There were marked differences across provinces, with the lowest record being that of rural provinces reflecting unequal access to maternal health care services. The largest increase was in KwaZulu-Natal, Western Cape and Limpopo which recorded 21.1 percent, 19.9 percent and 15.1 percent in 2006 and 28.8 percent, 28.1 percent and 22.3 percent in 2015 respectively. In 2015, C-section rate in private sector was at 73.6 percent, the highest rate globally. According to a research conducted in 2009 by Naidoo and colleagues based on an examination of private practices, the C-section rate in South Africa is 65%. In its annual report, the Council for Medical Schemes estimated a C-section rate of 60 to 70% for the private sector between 2007 and 2017, which rose to above 75% in 2018. The Saving Mothers Report of 2011-2013 showed a C-section rate of 67 %. Potential contributing factors for the increased C-section rates among women working in the private sector include the gender-specific demographics of women, the higher incidence of medical issues, and the higher demand for C-sections among women enrolled in medical plans (Solanki et al., 2020).

Malale et al. (2012) discovered that most cases in a Tanzanian quality assurance assessment of two rural hospitals were poorly managed, resulting in needless caesarean procedures. Noninvasive interventions that could have avoided the need for surgery were underutilized. When a caesarean section was decided, 26% of the time the contractions had not been extended, and 16% of the time the membranes were still intact (Maale et al., 2012). With a completely dilated cervix, 36% of women who actually went into labour had caesarean procedures. Vacuum extraction was ruled out. Evidence-based guidelines were unfamiliar to the hospital workers interviewed. Notably, verbal communication, individual and possibility of contracting HIV transmission influenced management decisions (Maale et al., 2012).

A national survey of caesarean births in Ethiopia discovered a 0.6 percent national population rate, with regional rates ranging from 0.2 percent to 9 percent (Fesseha et al., 2011). Overall, the institutional rate was 18 percent, with for-profit corporations accounting for 46 percent and government accounting for 15 percent. Caesarean sections were performed for maternal reasons 66% of the time and foetal reasons 34% of the time. (2011) (Fesseha and colleagues). Only 12% of caesarean sections were classified as emergency, and only 35% had labour observed by a partogram. The average time between decision-making and delivery, was less than 30 minutes in 36 percent of the women, 31-60 minutes in 23 percent and for more than five hours in 19%. Despite the fact that antibiotics were administered in 94 percent of the cases studied, wound infection was discovered in 12 percent of the cases (Fesseha et al., 2011).

In district hospitals in Rwanda, caesarean sections account for more than 60% of all operations (Petroze et al., 2012). According to a retrospective cohort study of 621 women who gave birth in a rural district hospital in Rwanda in 2017, the majority of the cases were urgent when they were presented, and the most prevalent reason for delivering via C-section in Rwanda was having had a C-section before (Mazimpaka et al., 2020). Between nations and countries around the globe, such as the Middle East and North Africa (MENA) area, there are significant variations in the usage of cesarean sections, which coincides with the overuse of the technique globally. Within-country disparities in low- and middle-income nations are shown by increased use among the wealthiest quintiles, among women with higher levels of education, and in private facilities. Given the MENA region's substantial and expanding reliance on the private healthcare sector, a closer look at inequality will help us better comprehend the region's healthcare systems. The goal of this study is to analyze c-section trends and describe variations in C-section utilization by socioeconomic class and healthcare facility type (private/public sector).

A C-section could be carried out as either an elective, h is planned or an emergency which arises from a complication, depending on the situation. To ensure the best obstetric care, anesthesia, newborn resuscitation, and care settings, an elective cesarean section is performed at a predefined point in the pregnancy. A significant obstetric emergency, on the other hand, necessitates performing an emergency CS when the lives of the mother and the unborn child are at risk. Due to a substantial increase in cesarean birth rates internationally, certain countries have recently seen cesarean delivery rates that are significantly higher than those recommended by the WHO.

The optimal rate of cesarean deliveries is a topic of continuing discussion on a global scale. According to a WHO study, cesarean section rates greater than 10% are not linked to reductions in mother and baby mortality rates. Despite the apparent discrepancy, the global C/S rate is rising. According to several research, Ethiopia has a cesarean section rate that ranges from 11 to 49%. Because it is unacceptably high in low- and middle-income countries, particularly in sub-Saharan African countries, maternal mortality is still an issue on a global scale. Obstetrics-related care is given without charge in public health facilities in Ethiopia in an effort to reduce maternal mortality and morbidity (Yaya et al., 2018). To reduce unnecessary use of this life-saving procedure and expand access to those who most need it, it's critical to identify risk factors for cesarean sections.

According to studies, the mother's educational level, her history of C-section, her doctor's recommendations, the type of health institution (public or private), her poor obstetric history, the fetal weight, her socioeconomic status, and her place of residence are all relevant factors.

The average rate of CS increased internationally between 1990 and 2018 by 19%. The greatest increase was seen in developing countries (22.9%), while the smallest increase was observed in least developed countries (8.6%). Sub-Saharan Africa and Northern America experienced the smallest growth, followed by Eastern Asia, Western Asia, and Northern Africa (44.9%, 34.7%, and 31.5%, respectively) (3.6% and 9.5%, respectively). Compared to 1990 to 2000 and 2010 to 2018, the period from 2000 to 2010 saw the fastest growth. The only region whose CS rates fell between 2010 and 2018 was Northern America (0.5 percentage points). According to trends and predictions, Africa is going through a "two-speed boom," which has caused two different emergencies on the continent. While measures to improve maternal and neonatal care quality and policy discourse for determinant research may be addressed in Northern Africa, foreign financing for building health systems in Sub-Saharan Africa is still required to provide essential therapies. Over the past 10 years, patterns in more industrialized countries, such as Northern and Western Europe and North America, have showed some signs of stabilizing. Given the complexity of the problem, it is necessary to look into the root reasons of this tendency. More investigation is needed to understand how sociocultural, public health policy, and therapeutic improvements may have contributed to the surge.

The choices of women and families, the opinions and beliefs of health professionals, convenience, compensation, the structure of the healthcare system, and financial processes are only a few of the factors that have an impact on the increase on use of CS globally. Some of these characteristics are country-specific, but others are universal and congruent with the ideals and principles that underpin contemporary civilization. Our estimates show that CS has overtaken other delivery methods in a number of nations, making it challenging to eliminate CS abuse in this context in a sustainable manner. Even though technology has made CS quite safe in locations with the proper infrastructure and staff, this is not always the true in LMIC settings, where there are frequently insufficient facilities or resources to carry out safe surgery or address difficulties. If there are no significant global steps to reverse the current trend, by 2030 overall CS incidence of Low- and middle-income countries will be equal to that in more developed nations. Subregions that will account for at least 50% of births are North Africa, Eastern Asia, West Asia, and Latin America.

In acknowledgment of the growing significance of non-medical factors in the decision-making process for mode of delivery, WHO produced guidelines for non-clinical strategies for reducing inappropriate application of CS in 2018. Due to the number of variables involved and the intricate nature of how they interact, implementation and success require time and dedication. The WHO also emphasizes the need to adapt interventions to local variables and take into account the opinions and requirements of everyone participating in the mode of birth decision-making process. Recent financial, regulatory, and legislative interventions have been made with the goal of reducing needless CS. Examples include different payment options for healthcare providers or organizations, financial incentive programs, and legally mandated clinical guidelines. However, there is conflicting evidence, low-quality evidence, and inconsistent effects.

2.3 C-section in Kenya

Female genital mutilation (FGM) is a widespread practice in a number of sub-Saharan African nations, including some areas of Kenya. This method, however, raises the chance of C-section since a lot of scar tissue is created, preventing the vagina from opening. FGM is the partial or total removal of a female's external genitalia motivated more by social pressure and cultural expectations than by medical necessity. The vulvar and vaginal tissues are considerably narrowed after FGM, which could occasionally impede childbirth. Additionally, it limits the ability of obstetricians to perform pelvic exams to assess the safety of alternatives to C-sections like assisted vaginal birth or vaginal delivery under vacuum extraction (Rodriguez, 2017). A World Health Organization study that examined 27 nations in 2018 found that the effects of FGM cost over US$ 1.4 billion yearly and that more pregnant FGM patients needed emergency C-section births (WHO, 2022).

Like in many other countries, the C-section rate in Kenya is growing rapidly. Data derived from the Kenya Health Information System show that the national C-section rate in 2014 was at 14.4 percent. The capital city (Nairobi) recorded 24.9 percent in the same year; specific hospitals, for instance, Kenyatta National Hospital recorded 30 percent, Nairobi Hospital 33 percent and Agha Khan University Hospital 20.4 percent (Juma et al., 2017). In 2015, the C-section rates had further grown to 42 percent in Kenyatta National Hospital, 39 percent in Nairobi Hospital and 32 percent in Aga Khan University Hospital. In 2018 Kenyatta National Hospital recorded a C-section rate of 48 percent, Nairobi Hospital 50 percent and Agha Khan University Hospital 38 percent (KHIS, 2019).

In a retrospective analytical study undertaken at M.P. Shah Hospital encompassing women who delivered in the hospital between 1998 and 2000, 28 percent of mothers delivered by C-section, with repeat cases accounting for 40 percent of the cases (Jahonga K.R., 2000). Similarly, a retrospective analysis of the caesarean rate at Aga Khan University Hospital between 2001 and 2004 found that the overall caesarean rate was 26 percent in 2001 and 38 percent in 2004. Patients attended by private obstetricians had a rate of 31 percent in 2002 and 42% in 2002, compared to 22 percent and 35percent for general patients over the same period. A study in Nairobi using household and hospital data (Ngala, 2003) found that maternal income had a significant and a direct impact on the possibility of undertaking a vaginal delivery. The study also discovered that the greater the financial benefit to a doctor, the more likely he or she can recommend a caesarean delivery. This likelihood was influenced by the facility type, the mother's professional status, and the number of obstetricians or gynaecologists, available (Patroba H, 2010).

According to an unmatched case control study involving 396 mothers, who gave birth at Mama Lucy Kibaki Hospital in 2015, 67.4 percent had their first caesarean. Of which, 51 percent of those who recorded their first C-section had intrapartum complications, arrest of labour and intra-partum bleeding. Besides, 65.4 percent had emergency caesarean with indications for emergency C-section being foetal distress in 21 percent of the cases and prolonged labour in 22.7 percent of the cases. In addition, 19.7 percent had a repeat caesarean, 10 percent had cephalo pelvic disproportion (CPD) and 1.5 percent had placenta praevia. Bivariate analysis linked caesarean deliveries with healthy baby births and formal employment (OR = 1.90 95% CI 1.4, 3.1) in comparison to those who had vaginal birth. Formal employment was independently found to be associated with a caesarean section when compared to non-working women (Juma et al., 2017). The study concluded that employment and babies birth weight were strongly associated with caesarean sections in mothers.

A cross sectional study, carried out between the month of October 2010 and March 2011, on women who had given birth at St. Mary's Hospital, Nairobi Women's Hospital, and Pumwani Maternity Hospital revealed significant correlations between C-section and the mother's age, prior cesarean delivery, family background, and employment status. A 20 percent emergency C-section, and a 10 percent elective C-section cases were noted. Foetal discomfort (29%) and a prior scar (73%) were the two most frequent reasons for elective caesarean sections (Wanjohi,2021). A planned elective C-section is carried out when there are obstetrical or clinical indications for it, or if the mother requests for it- while, an emergency C-section is carried out during labour when it is a perceived risk to the life of the foetus.

A retrospective case-control study of births registered in 2014 at the PCEA Kikuyu Hospital revealed a high prevalence of caesarean at 7.7 percent for elective and 26.8 percent for emergency, with parity, pregnancy, employment status, previous mode of delivery, and gestational age cited as factors influencing C-section as a mode of delivery (Elie et al, 2017). The outcome of the study was similar to findings of another descriptive cross-sectional study of 202 pregnant women who had an experience of caesarean section conducted in 2017 at Kenyatta National Hospital (KNH). According to the study, 67 percent of women chose a repeat caesarean, and their method of delivery was strongly related to the consulting physician's preference (Biraboneye et al., 2017). In the fiscal year 2017/2018, 65,278 mothers insured by Kenya's National Hospital Insurance Fund (NHIF) opted for C-section up from 21,490 in the fiscal year 2016/2017. The majority of the NHIF's maternity costs were accounted for by Caesarean sections, and more than a third of women insured by the fund chose the procedure without medical justification (NHIF, 2019).

2.4 Complications associated with C-section

Short-term complications affecting the mother, long-term complications affecting future pregnancies of the mother, and infant complications are the three types of complications connected with C-sections.

2.4.1 Short-term risks associated with C-section that affect the mother

Maternal death is one of the short-term dangers of caesarean delivery. Compared to vaginal delivery, a mother is more likely to die during childbirth with a caesarean delivery (Medscape, 2020). In a Netherlands retrospective cohort study of 2,684,946 pregnancies in the period 1st of January, 1999 to 31st December, 2013 found out that the risk of losing life after a caesarean section stood at 22 per 100,000 compared to 3.8 per 100,000 in vaginal deliveries.

According to the study, caesarean section contributed to a set of circumstances that resulted in death in 43 of the reported maternal deaths. Caesarean births increased the possibility of loss of life by 13 per 100,000 women, which was three times higher than vaginal births according to a study based in Sweden among 1,003,489 women (Silver et al., 2004). As a result, thromboembolism was one of the most frequent causes of maternal death arising from caesarean section. A C-section causes more blood loss than a vaginal birth. The uterine vessels are injured after the uterus is incised, resulting in excessive blood loss. As the number of cases of previous caesarean deliveries rise, so does the risk of bleeding lead to a blood transfusion (Silver et al., 2004).

Wound infection is among the most common complications of a caesarean section. Wound infections occurred in 16% of caesarean sections performed in a randomised controlled trial at a University Hospital in Birmingham, Alabama, between August 2009 and November 2010.Without antibiotics, the risk of postpartum endomyometritis can range from 35 to 40%. (Duff, 1986). Injuries to surrounding body structures sometimes occur during caesarean section. According to one study, bladder injuries are the most common, accounting for 0.28 percent (0.14 percent for primary caesarean sections and 0.56 percent for repeat procedures) of all caesarean births (Phipps et al., 2005). Mothers who gave birth by caesarean section had a greater possibility of hospitalization than mothers who experience virginal birth, and they are also more likely to be hospitalized again. Because of complications following caesarean sections, the average length of hospital stay is even longer for some mothers (Silver et al., 2004).

Compared to mothers who undergo virginal delivery, women who deliver by C-section have more chances of having an emergency hysterectomy. Peripartum hysterectomy is associated with higher mortality and morbidity. It is considered one of the most dangerous complications in obstetrics and generates enormous health costs (Silver et al., 2004). A gravid hysterectomy can also be performed during a caesarean section. The uterus, ovaries, cervix, fallopian tubes, and other surrounding structures can be removed, leading to serious surgical complications or even death (American Pregnancy Association, 2019). Compared to vaginal deliveries, mothers who have a caesarean section feel less comfortable after the delivery. They also report more anxiety and less early interactions with their newborns (Shu-Yu Kuo et al., 2014). They usually have to wait a long time before they see their babies for the first time (American Pregnancy Association, 2019).

2.4.2 Long-term risks associated with C-section that affect the mother

Adhesions after a caesarean section are common over the long term and significantly increase the likelihood of complications. Among women who previously experienced a caesarean section, adhesions can cause intestinal obstruction (Al-Took et al., 1999) and ectopic pregnancy (Hemminki, 1996). Besides, placenta previa is also prevalent in women who previously had an experience of a caesarean section. Placenta previa, which most commonly occurs in the third trimester, is a disorder in which the placenta is embedded deep into the womb and partially or completely covers the uterine cervix, causing painless bleeding. Signs and symptoms include preterm labor, a breech or transverse position in the baby, and a uterus that is larger than it should be for the gestational age.

As a result of the intensity and depth of placental attachment, caesarean births, on the other hand, have an increased chance of placenta accreta development, which raises the possibility of maternal death (American Pregnancy Association, 2019).

Bleeding during the third trimester can be a sign of placenta accreta, which can lead to premature birth. Accreta is responsible for the increased risk of bleeding and hysterectomy following a caesarean section in patients who have already undergone one (American Pregnancy Association, 2019). A study involving 255,000 women in Switzerland found that uterine rupture was reported at 0.007 percent in those who had never had a caesarean section and at 0.192 percent in those who had had the experience. In mothers who had a trial birth after C-section, uterine rupture increased to 0.397 percent (Phipps et al., 2005).

2.4.3 Risks associated with C-section that affect the new born

Although C-sections are performed for the baby's benefit, they can sometimes result in a baby's death. Data from the US Vital Statistics Service has shown that caesarean deliveries had a 1.5-fold higher risk of newborn mortality than vaginal deliveries over the years. Additionally, hazards linked to elective caesarean sections include bronchial asthma, type 1 diabetes, and allergic rhinitis. In 20 observational studies, a meta-analysis indicated a substantial incidence of type 1 diabetes in newborns delivered through C-section at odds ratio of 1.23, at 95% CI 1.15-1.32, and a p-value of 0.001- Cardwell et al.,2008.

According to Madar and colleagues, C-section deliveries have a higher rate of respiratory morbidity than vaginally delivered babies (Madar et. al., 1999). Failure of the processes that typically drive the resorption of foetal lung secretions during vaginal birth causes transient tachypnea of the newborn (TTN) (Hakansson et al., 2003). According to a study of over 30,000 newborns, TTN is nearly three times more prevalent after caesarean deliveries than after vaginal deliveries. 67.4% of the the mothers who had C-section at Mama Lucy Kibaki in 2015 reported their first C-section, 51% experienced intrapartum difficulties, labor arrest, and intra-partum bleeding. Emergency C-sections accounted for 65.4% of deliveries, with prolonged labor accounting for 22.7% of those and foetal distress for 21% of the cases. Repeat cesareans were performed 19.7% of the time, CPD affected 10% of women, and placenta previa affected 1.5% of women. When compared to women who gave birth vaginally, bivariate analysis showed a stronger association between caesarean deliveries and the birth of healthy babies and formal employment (OR = 1.90 95% CI 1.4, 3.1).

A study in the Boston metro area on 432 children exhibiting a precondition of atopy since birth to around nine years found out that caesarean births had a two-fold greater risk of atopy than vaginal births (OR = 2.1, 95 percent CI = 1,13,9) (Hakansson et al., 2003). Another study of nearly 40,000 children found that childhood caesarean births were 30 percent more likely to be hospitalized for asthma than vaginal births. Accidental injury to the fetus can occur during a caesarean birth (Dessole et al., 2004). They are present in 0.1–3.1% of caesarean births and more frequent in emergency births (5.3%) while unplanned laboring deliveries (1.8%) more compared to elective caesarean sections performed without labor (1.0%) (Haas & Ayres, 2002).

2.5 Factors associated with C-section

One of the justifications given for this rise in C-sections is the rise in C-sections carried out exclusively at the mother's request. On pages 798–806, Begum and colleagues presented the findings of a thorough review on the frequency of caesarean sections carried out without a sufficient medical justification in various parts of the world. This research study also utilized meta-regression, a novel technique for controlling for the quality of basic investigations in data pooling, in an effort to minimize the degree of variation between studies and to investigate probable explanations of the heterogeneity.

There were numerous explanations for the variation in cesarean section rates. Possible contributing variables included women's lack of confidence in the tools or information required to do intrapartum fetal monitoring and promote vaginal deliveries. Another defense is that obstetricians do not make an effort to encourage their patients to make a different decision. Currently, caesarean sections are reported to be performed 54% of the time in Egypt, with primigravida individuals and patients having private deliveries being the patient categories most likely to request one. They also highlighted how the frequency of cesarean deliveries raises the danger of subsequent placenta accreta.

A cross-sectional study based on 1,344 live births in Brazil found that women with higher educational levels and better socioeconomic position had more surgical deliveries (Ministry of Health (Brazil), 2007). Given that doctors may perform a caesarean birth if there is a prior indication of one, the findings of higher caesarean rates among primiparous women are alarming. Another element discovered in the study as a key predictor of caesarean deliveries was the mother age. Because they have more comorbidities that require surgery, older moms are said to have a higher caesarean delivery rate.

Since 2005, the C-section rate in Egypt has increased by over 100 percent, reaching 52 percent. C-sections carried out in hospitals were reported at a rate of 67.3 percent, which is double what it was in Jordan and Saudi Arabia. 50 percent of caesarean operations in Egypt's 13 public hospitals where 4,357 births took place in 2016 were carried out due to symptoms of a previous C-section, according to the survey. According to the obstetricians questioned, the high rate of C-sections was brought on by convenience, a lack of monitoring, a lack of training, an absence, and a lack of knowledge of clinical recommendations at public hospitals (Elnakib, 2019).

2.5.1 Socio-demographic factors

Sociodemographic characteristics that are related to pregnancy include age, education, occupation, median monthly income, and place of residence. Gravidity, balanced, prior maternal history, ANC follow-ups, and obstetric outcomes are further considerations. Compared to mothers between the ages of 35 and 39, moms between the ages of 20 and 24 had decreased odds of developing C/S, according to the current study. An identical study conducted in Tahiran, Iran, found a strong association between C/S and mother age. However, studies by Farhana et al. and Hiwot et al. showed that age had little impact on the rate of C/S.

The rate of cesarean deliveries continues to climb and doesn't seem to be slowing down (WHO, 2018). Given the rising caesarean birth rate, it's critical to comprehend the reasons why the surgery is spreading to more and more situations. When medically essential, a C-section can prevent illnesses or fatalities that could affect the mother or the baby. Contrarily, dangers associated with Caesarean sections might last forever and harm future pregnancies in addition to the present delivery. The fact that the causes of the increase are unknown, but they appear to be a complicated, multifaceted web including women, cultures, fashion, and the media only serves to exacerbate the issue. A group of specialists studying acceptable birth technologies in Fortaleza, Brazil, in 1985 pondered on what they perceived to be an unjustified spike in caesarean rates globally. Based on the available research, they concluded that a caesarean rate of more exceeding 10-15 percent in each region is unnecessary (WHO, 2015).

According to our research, mothers with a college degree or above have a 3.43 times higher risk of having C/S than mothers without any formal education. This result is consistent with research carried out by several academics. Employed moms are significantly more likely to have C/S than stay-at-home mothers, according to our research. This is consistent with research conducted in underdeveloped Asian nations by Melissa et al. This also fits with various investigations.

When compared to women who are not employed, formal employment was independently discovered to be related with a caesarean section (Juma et al., 2017). The study found a substantial correlation between employment and a baby's birth weight and caesarean sections performed on moms. The research also showed that mothers with monthly salaries over 6000 Ethiopian Birr are more likely to undergo a cesarean section than mothers with monthly incomes under 3000. This conclusion is supported by research from various different countries. Mothers who have previously experienced C/S are far more likely to experience it again than mothers who have not. A number of preceding studies and this result are in agreement.

2.5.2 Place of delivery- Public and Private hospitals

According to a study conducted in Bangladesh, evaluating case notes from 530 women having ceasarean section from five public hospitals in Thakurgaon district and from interviews with key whistleblowers in 18 service providers, the most dominant responses for having a caesarean section were previous C-section at 29.4 percent, fetal Distress at 15.7 percent, head-pelvis disproportion at 10.2 percent, prolonged inhibition of labor at 8.3 percent and postpartum appointments at 7.0 percent (Aminu et al., 2014). Most caesarean sections (68%) were emergency, mostly during business hours. Previous caesarean sections and postpartum appointments were the frequent reasons for elective caesarean sections in primiparae. Caesarean sections were performed in 16.0 percent of all cases when other available options of care would have been more appropriate (Aminu et al., 2014). Despite the fact that procedures and evidence-based standards were readily available, clinicians reported that they were rarely used.

Due to demands from patients and families to deliver by caesarean section, doctors from private hospitals received cash payment for each caesarean section conducted in public hospitals. They were also seen campaigning for caesarean deliveries in public hospitals (Aminu et al., 2014). C-section rates in private healthcare centres were unacceptably high, according to respondents in a survey conducted in Delhi, India, and the neighboring cities of Gurgaon and Ghaziabad. The physician's perceived time and convenience were the main drivers of the observed trend (Peel et al., 2018). They also discovered that financial incentives indirectly influenced surgical decision-making. Obstetricians believed that keeping their patient burden high was necessary for business success (Peel et al., 2018). In these situations, they were not only concerned about patient safety, but also about legal ramifications if something went wrong, and they had limited time to monitor each patient individually due to their busy schedules.

The lack of situation-specific direction and support from intermediate staff members and caregivers made these problems worse. The rise in caesarean sections was also influenced by maternal demand (Peel et al., 2018).

Based on a cross-sectional survey of 45,327 newborns in Bangladesh, India and Nepal conducted between 2005 and 2012, it was established that institutional delivery rates varied significantly by context, from a low of 21 percent in rural areas to a high of 90 percent in towns of India. In Bangladesh, 73 percent new-borns in private and other charitable institutions were born via caesarean section, compared to 30 percent new-borns in rural Nepal, 18 percent in urban areas of India, compared to 5 percent in rural areas of India (Neuman et al., 2014). The possibility of delivering through a C-section were higher in both private and non-profit institution settings than in government health care settings in the sampled areas. According to the study, better educated women in private settings in both urban India and rural Bangladesh were highly likely to have caesarean section.

A cross-sectional study of 1,344 live births in Brazil between April 2004 and March 2005 discovered that 75.8 percent of births took place in a public hospital (Graciete et al., 2015). Caesarean births, on the other hand, accounted for 29.9 percent in public health-centres and 86.2 percent in private ones. The characteristics of the women delivering in hospitals varied significantly as well (Graciete et al., 2015). These findings were similar to those of the 2006 Nationwide Demographic Health Survey, which found a disparity in surgical delivery prevalence between private and public institutions at 80.8 percent and 33.6 percent respectively (Ministry of Health Brazil, 2007).

Another cross-sectional study of 920 postpartum mothers in Maring-PR, Brazil, found that C-section was 55.5 percent at the public health system and 93.8 percent at the private sector. In the integrated health service, the odds of having had a prior cesarean section were (OR=8.9; CI=4,616.9), the odds of wanting one were (OR=2.0; CI=1.13.6), the odds of being obese were (OR=1.8; CI=1, 1-2.8), and the odds of being wealthier were (OR = 2.1; CI = 1.3-3.4). Early pregnancy was associated with a desire for a caesarean section (OR=25.3), while previous caesarean sections (OR=11.3) were highly associated with private system operations (Rosana, 2016).

2.5.2 Health insurance and high rates of C-section

According to a study conducted in Santiago, Chile, between 1995 and 1997, health financing had an impact on the health management of physicians who have no moral objections to non-medical caesarean sections (Murray, 2000).

Women who had private obstetricians consistently had higher caesarean rates, ranging from 57 percent to 83 percent than women handled by mid-wives or healthcare personnel in either public or university health facilities that stood from 27 percent to 28 percent. A small minority among women in private doctor's care indicated that C-section was their preferred delivery method (6-32 percent). In New Jersey, a review of hospital discharge data for moms who had not had a previous C-section indicated that nearly one in every seven women underwent a C-section without labouring between 2004 and 2007. C-section rates were inversely proportional to insurance status. Women who had Medicaid or self-paying insurance had a far reduced likelihood of having a C-section, whereas those who had BlueCross or regular commercial insurance had a much higher chance (Huesch, 2011).

However, preliminary results from 12 of the 21 studies suggested a greater link (OR 1.35, 95 percent CI 1.27 to 1.44) despite the fact that the research findings did not differ substantially from one another (Hoxha and colleagues, 2017). According to a 12-year systematic evaluation of articles covering 16 different studies involving over 8.8 million women in the United States, there was no meaningful overlap in the studies and that uninsured women had a 0.70-fold lower likelihood of having a C-section than women with private insurance (95 percent, confidence level 0.63 to 0.78). Likewise, the probability of being uninsured was 0.70 times lower for women who were not covered by commercial or public insurance (95% confidence interval: 0.69 to 0.72) (Hoxha and colleagues, 2019). C-section deliveries among the population covered by medical schemes were found to be much higher than the public sector average and globally, according to a study conducted by the council for medical schemes (CMS) in year 2020 in South Africa and covering the period between 2015 and 2018. In 2018, the rate of C-section was at 76.9 percent among those coved by medical schemes which is one of the highest recorded the world over. The study showed that there was an annual increase of 0.6 percent in C-section, a trend that was expected to continue if no measures were put in place to curb the rise. According to the survey, the cost of a C-section was R37 596.19, which is 75 percent more expensive than the cost of a normal/vaginal delivery, which was R21 545.37.

2.5.3 Wealth and C-section deliveries

The Republic of South Sudan had a caesarean rate of 0.6 percent, whereas the Dominican Republic had a caesarean rate of 58.9 percent, according to a study conducted in 72 LMIC that comprised health demographic surveys and a variety of multi-indicator cluster surveys. The caesarean rates were lowest in the poorest five nations and highest in the richest five. The richest and lowest quintiles differed by 20% in 18 of the 72 nations surveyed (Boatin et al., 2018).

Women with a better socioeconomic position were found to be more likely to undergo a caesarean section in a cross-sectional survey of 150 women in Bangladesh's Jessore district. More caesareans were performed on women with higher income husbands than on women with lower income husbands. Caesarean sections were less common among women who supported their families financially. Regardless of whether they resided in rural or urban regions, women with better socioeconomic status were more likely to have had a caesarean section (Shri, 2019).

Women in the higher wealth quintile have a greater rate of caesarean sections, according to research on 20,468 women of Nigerian origin who had given birth within the 5 years before the Demographic and Health Survey (DHS) of 2013. C-section births were most common (13.6 percent) among women in the wealthiest quintile and least common among women in the bottom quintile (0.4 percent). Lower chances of delivering by C-section was associated with being in the poorest wealth quintile (Boniface et al., 2019). Besides, according to a critical look into the Ghanian Demographic and Health Survey (GDHS) of 2014, caesarean births varied from 5 percent at the bottom quintile to 27.5 percent in the upper quintile. Caesarean births were 2.76 and 4.38 times more common among the richest and wealthiest women respectively compared to poor women. Mothers in the middle quintile were 2.13 times more likely to experience a caesarean compared to poorer mothers (Dankwah, 2019). Similar to this, a 2017 study by Nababan and colleagues that examined statistics from the Indonesian Demographic and Health Surveys from 1991, 1994, 1997, 2003, 2007, and 2012 discovered that there were notable access disparities to maternal healthcare services by wealth quintile. The study found that wealthy women were 2.83 times more likely than poor women to give birth via C-section and 5.45 times (95% CI: 4.75-6.25) more likely to give birth in a medical facility (Nababan et al., 2017).

2.5.4 Order of birth and the practice of C-section

Caesarean births were most common among the first births, as per the outcomes of a nationwide family health survey carried out in India in 2015-16 of 249,949 live births, involving 699,686 women from 601,000 families in 640 districts (Shri et al., 2019). In another study that used Ghana Demographic and Health Survey (GDHS) data of 2014 found out that first-time mothers had a C-section more often than mothers who had given birth to their fifth child. Data from the 2014 Demographic and Health Survey of Bangladesh revealed that a high birth order decreased the likelihood of a C-section delivery. Third birth order (OR = 0.42; CI = 0.29-0.63) and second birth order (OR: 0.58; 0.43-0.78) compared to the first birth (Rahman et al., 2018).

Similar to this finding, a study of 1,142 deliveries from eight hospitals in Bangladesh, four public and four private discovered that babies born first and second had a higher risk of being delivered by C-section than those born third or above (OR = 0.52, CI = 0.16-1.83). (Rahman et al.,2015). In their study among Australia's mothers, Nassar & Sullivan also found that first time mothers aged 30 years and older accounted for many of the primary C-section cases.

2.5.5 Place of residence and the practice of C-section

A study of 61,903 women who had deliveries in three big public hospitals in Mongolia in the period between January, 2012 to December, 2016 found out that C-section rate was much higher in rural health centres (48%) compared to urban health centers (38%) and that this discrepancy has grown over time (Kang et al, 2019). Previously, rural hospitals performed fewer caesareans than metropolitan hospitals, and mothers with aggravating conditions gave birth in urban hospitals. The situation has improved since 2010, when the government invested in rural healthcare, helping them buy new equipment and training clinicians. This increased the demand for caesarean operations in rural health centers and lowered the rate of caesarean sections in urban hospitals. Caesarean section rates in China also increased from 3% in 1988 to 39% in 2008, according to data from the 1993, 1998, 2003, and 2008 surveys of the National Health Service (Feng et al., 2012).

Women in urban areas increased by more than 50 percentage points (from 10% to 64%), while women in rural areas increased by 11-36 percentage points. Similarly, in Ghana, the rate of caesarean births among urban residents (17.1%) was more than twice that of rural residents (7.3%) (GDHS, 2014).

Women in urban areas had a greater rate of C-section births than women in rural areas, according to research by Islam and colleagues (Islam et al., 2022). This result is consistent with a previous study conducted in the Islamic Republic of Iran by Bahadori and colleagues, which found that women from rural areas used C-sections less frequently. This suggests that women living in rural areas have fewer birth options, less knowledge about them, and financial challenges in meeting the financial obligations associated with C-sections (Bahadori et al., 2013). In addition, a 2013 study by Cavallaro and colleagues hinted that women from urban areas gave birth more frequently via C-section than did women from rural areas, arguing that these women had access to and could afford cesarean section services, many of whom they used privately, and they had higher employment rates (Cavallaro et al., 2013).

2.5.6 Education attainment and C-section

A study of 1,915 mothers who had had a caesarean section at Royal Victoria Hospital found that 12.6 percent had only a secondary education, 38.3 percent had a college qualification and 49.1 percent had a university diploma (Audrey G., 2010). A study conducted among 500 pregnant women in Turkey found out that women with a university degree were more likely to prefer a C-section compared to those with primary education (Ardi, 2018). Caesarean delivery was most common with women having a university degree or higher education and least common among mothers with little formal education (NDHS, 2013). No formal education was linked to a lower likelihood of undergoing a C-section (Boniface et al., 2019). Similarly, in another study among mothers discovered that those with secondary and college education were 1.65 and 2.17 times more likely than women with no education to have a caesarean section (GDHS, 2014). Caesarean births among women with only a secondary diploma did not differ statistically from those in women with no education.

Additionally, this survey revealed that women with better educational attainment and higher socioeconomic status delivered babies via surgery more frequently. Primiparity, twinning, and older maternal age were maternal traits linked to a caesarean section outcome inside the public sector. Given that doctors contemplate performing a caesarean delivery based on a previous indication of a caesarean birth, the findings of greater caesarean frequencies among primiparous women are alarming. Women with more education had a 4.12 times greater risk of having a C-section than women with less education, according to data from 36 demographic and health surveys in sub-Saharan Africa that included 234,660 women (OR 4.12; CI 3.75-4.51). In comparison to women with less educated husbands, women with more educated husbands had a 1.71-times higher likelihood of giving birth through C-section (OR 1.71; CI 1.57-1.86). (Islam et al., 2022).

2.5.7 Advanced maternal age and C-section

Age accurately depicts a woman's biological makeup. According to several literary sources, younger mothers are less likely than older mothers to deliver their babies via C-section. The rate of C-sections has been significantly impacted by the growth in mean mother age. The risk of fetal congenital abnormalities, hypertension, diabetes, and other pathologies rises as maternal age increases, more so in women of age thirty-five and above more likely to have a high-risk pregnancy. Age alone is not a reason to deliver via C-section, but the incidence of comorbidities and associated risks in this age range do so (Franz,2010, Zaki, 2013).

For instance, untreated gestational diabetes can lead to births of children who weigh at least 4,000 grams (Bjrstad, 2010, Fuchs, 2013). This, in addition to other maternal concerns like hypertension and obesity, as well as labor-related factors, deteriorate the outcome for maternal health, leading to a preference for C-section as a delivery method to preserve the mother.

People under the age of 20 were found to be 17.7 percent more likely to deliver by C-section than those aged 20 to 29 according to a study using population-based data from Taiwan that looked at advanced maternal age and the risk of giving birth by C-section. Women who were 30 to 34 years old had a 37.4 percent C-section delivery rate, while those beyond 34 years old had a 47.5 percent C-section delivery rate. As a mother's age increased, her chances of having a C-section increased as well (Lin, H.C.,2004). Similar to this, a Danish study found that women over the age of 40 were three times more likely to give birth through C-section than women under the age of 20 (AOR 3.64, 95% CI: 3.41-3.90). Maternal age at birth was a significant factor in determining whether a delivery by C-section with the commencement of labor will occur in Egypt's 13 public hospitals across 4357 births in 2016. When compared to mothers who were 21 years old or younger, mothers over the age of 35 had a 2.1-fold increased likelihood of having a C-section. For women aged 35 years and older, there was a significant relationship between age and pre-labor C-section (OR 3.9; 95% CI 1.3-4.0). (Elnakib, 2019). Researchers have discovered a correlation between pre-pregnancy morbidity and advanced mother age at childbirth, as well as risk variables that may help explain why there may be a higher chance of C-section (Rydahl, E,.2019).

The risk of having a C-section increased with advanced maternal age when compared to younger women, both for those who had never given birth and for those who had multiple births, according to a systematic review of the literature from 1995 to 2008 published by Medline, EMBASE, PsychINFO, and CINAHL (Bayrampour, H.,2010). Women increasingly turn to reproductive treatments as they age since their natural fertility levels fall. The chance of C-section delivery is increased by many pregnancies caused by fertility treatments (Mylonas,2015). For instance, a population-based study in Belgium comparing 15,228 controls with the same maternal and gestational ages to 1866 women giving birth for the first time after in vitro fertilization (IVF) revealed that pre-labor C-sections were performed more frequently on women who conceived through IVF than on women who conceived naturally (Gillet, 2011).

2.5.8 Cultural and psychological issues leading to the rise of C-section

A study published by the American Journal of Obstetrics and Gynecology in United States of America in the year 1976 found that C-section births had risen from 6 percent in 1969 to 9.1 percent in 1974 and 10.3 percent in 1975. In year 2003, the national caesarean section rate had risen to 27.6 percent but varied across states. For instance, in 2002, New Mexico recorded 19.1 percent and Utah 30.9 percent (Moore, 2005).

Obstetricians were penalized for low C-section rates. For instance, in what was observed as hospital demand for increased C-section rate, an obstetrician in a hospital situated at the nation's Southern region who had maintained C-section rate of below 10 percent for more than ten years faced difficult demands from the hospital administration to raise her C-section rate with two standard deviations of the mean of that hospital (Moore, 2005). From a cultural perspective, women who chose to delivery in her care saw childbirth as a normal occurrence and did not welcome unnecessary birth interventions.

In many Sub-Saharan African countries, including certain parts of Kenya, female genital mutilation (FGM) is a widespread practice. However, because so much scar tissue is produced, which stops the vagina from opening, this practice increases the risk of C-section. FGM, often known as female genital cutting, refers to the partial or complete removal of a female's external genitalia due to social pressure and cultural norms rather than medical requirements. FGM significantly narrows the vulvar and vaginal tissues, which might hinder labor in some situations. Additionally, it restricts the capacity of obstetricians to do pelvic exams to determine the safety of C-section options such aided vaginal birth or operative vaginal delivery using vacuum extraction (Rodriguez, 2017). According to World Health Organization research published in 2018 that looked at 27 countries, FGM consequences cost over US$ 1.4 billion annually, and more pregnant FGM patients required emergency C-section births (Kulaksiz, 2022; WHO, 2022).

Different sources of literature show that women rely heavily on informal information shared from experiences of others in making the decision on their preferred method of childbirth. The perceived fear by other women, concerns, misperceptions and unfavorable experiences are passed down to other pregnant women. A study done by Latifnejad and colleagues in Iran among 2,521 pregnant women in 67 public hospitals found that women preferred delivery by C-section based on what they heard from their friends about misfunctioning of pelvic floor muscles, loss of bladder control, impairment in sexual pleasure among other reasons after

vaginal delivery. They further claimed that C-sections did not require routine vaginal examinations, as opposed to vaginal deliveries (Latifnejad et al., 2015).

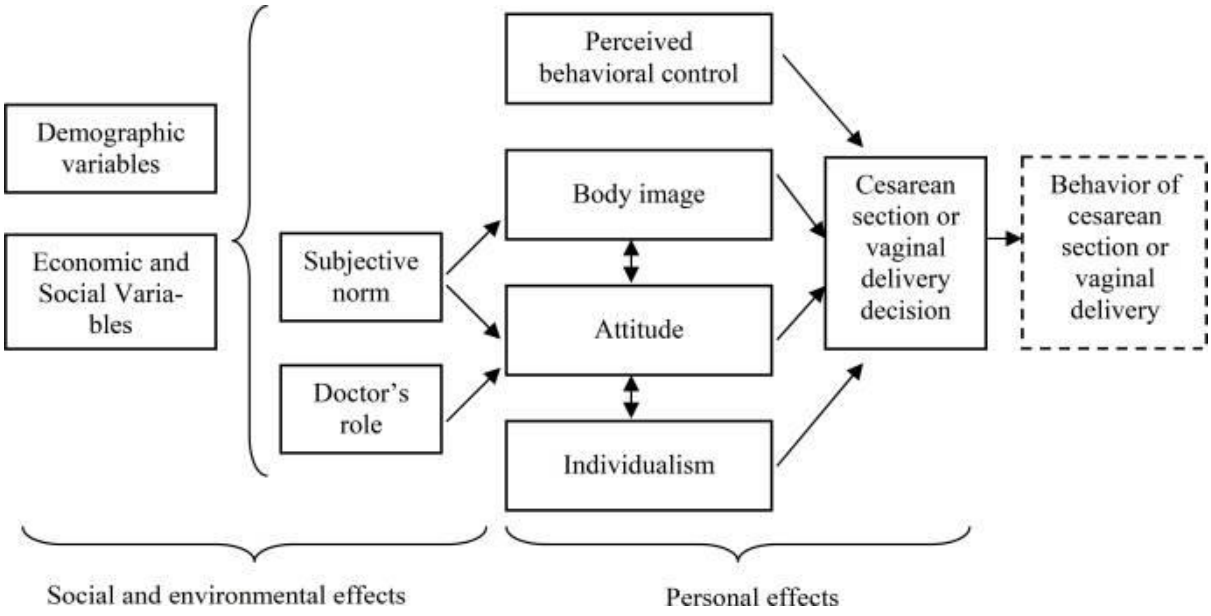
These compares with those published in the Lancet series of 2018, which noted that many women prefer delivery by C-section for a variety of reasons: the fear of pain, the fear of pelvic damage, the fear of involuntary urination, the negative effects on sexuality and romantic relationships, and the conviction that a normal vaginal delivery is not possible following a prior C-section. In some nations, having a baby via caesarean section has also become fashionable. It is thought to be a modern method of giving birth without labor that enables women to undergo tubal ligation right away after giving birth without experiencing any further discomfort. It also has the benefit of allowing babies to be born on certain dates that are celebrated as being special (The Lancet, 2018b). Of the potential causes of the rise in C-section is the cultural perception in Pakistan that having a C-section is a sign of having higher socioeconomic standing (Latifnejad et al., 2015).

Patient-generated demands have also spurred more information availability and recognition of the value of patient autonomy, which have likewise caused an increase in C-section deliveries. A comparative study of 2348 Italian women who had given birth by C-section between 2015 and 2018 found that the use of fertility drugs, prior C-section deliveries, intracytoplasmic sperm injection (ICSI), cryopreservation of gametes or embryos, in vitro fertilization (IVF), cryopreservation of gametes or embryos, cryopreservation of gametes or embryos, prior C-section deliveries, and miscarriages were all positively associated with C-sections carried. However, giving in to a patient's request should be strongly justified by their enlightened choices, which are acknowledged in the framework of an interpretive, respectful, and open debate.

2.6 Conceptual framework

This study used two constructs namely the Theory of Planned Behaviour -TPB (Ajzen, 1991) and the Fishbein's 1975 Theory of Reasoned Action. The focus was on the factors that a woman considers to prefer delivery by caesarean section. Perceived behavioural control (PBC) is critical to a person's conscious strategy, according to the TPB. Due to circumstances such as age, education, place of residence, wealth status and region, many women are forced to give birth by caesarean section. These variables provide the basis for determining their association with the increase in caesarean births. Additionally, according to literature, parity, number of antenatal visits, and delivery site are all factors determining one’s decision to deliver by caesarean section and are constructs building this theory (Zahra, S. et al., 2016).

Figure 5: Conceptual Model leading to C-section



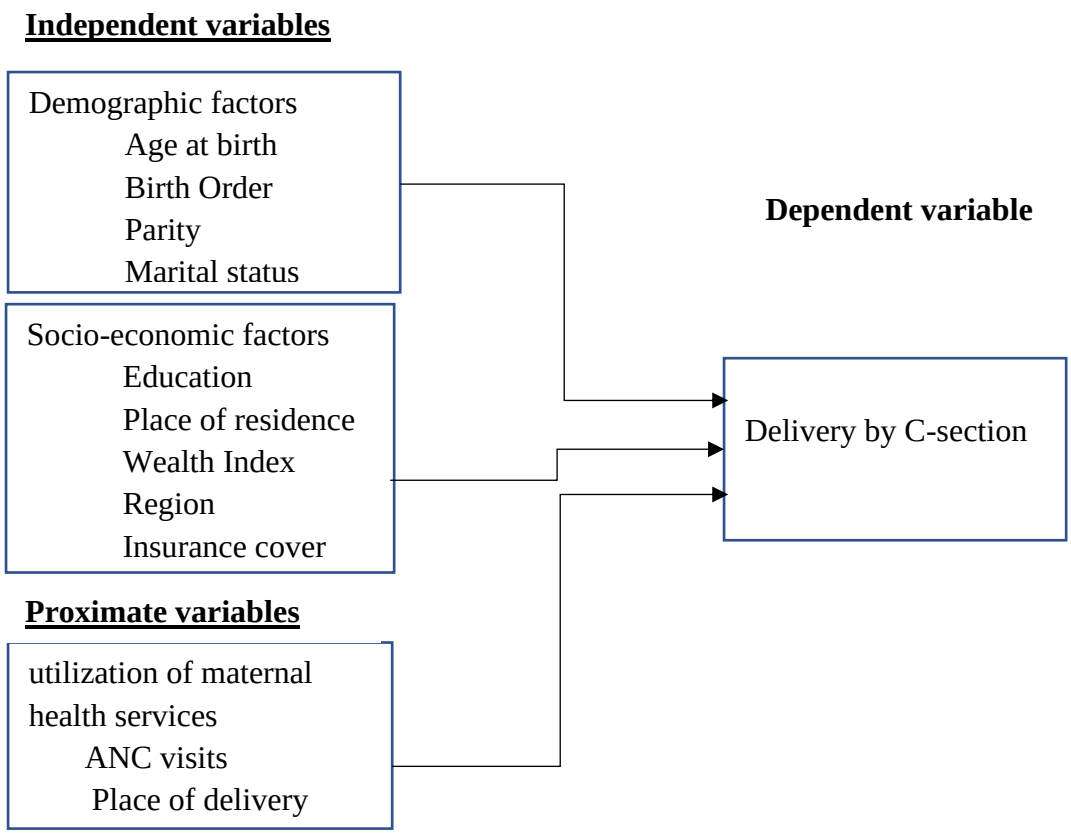
Source: Conceptual model of delivering by C-section by Shams G. et all., (2016)

The model was used to analyze various factors contributing to the practice of CS. The economic and socio-cultural factors under socio-environment level were explored. Whereas personal factors like number of CS experience/number of children, health professional's role, previous birth experience were analyzed. Further at personal level, perceived behaviour control, body image, attitude and individualism were explored in association with CS. The health professional related factors were further explored in context of health professionals' training and education, doctor-patient-relationship, convenience of CS, financial awards and fear of blame when denied providing CS on demand. Health professional's role in relation to organizational level were also studied. One of the important constructs of this model, "subjective norm" analyzed the acceptance of CS among women over Normal Vaginal Delivery (NVD) depended upon views and influence of the society.

2.7 Operational framework

The data from this study are analyzed and interpreted based on the Theory of Planned Behavior (TPB). Demographics, socioeconomic factors together with maternal health-care utilization associated with caesarean births are examined. The aim of the study is to show that a woman's birth age, education level, where she lives and wealth status, quintile level, place of delivery, insurance coverage, parity, clinic visits and place of residence - all influence her decision to prefer birthing by caesarean section.

Figure 6: Factors associated with the intention to deliver by C-section



Source: The Researcher

2.8 Operational Hypotheses

The following operative hypotheses are tested:

- Caesarean births are more common in younger mothers than in older mothers.
- Caesarean delivery is common among mothers having their first births
- A caesarean birth is more likely to be avoided by mothers who have completed secondary school or higher.
- Mothers in urban areas have better access to information and are more likely to avoid caesarean births.
- Mothers in the top wealth quintile have more financial resources and are more likely to deliver by C-section.
- Mothers who use health insurance aid have a higher chance of delivering by caesarean section.
- Mothers who attended more ANC visits are better informed about the risks of C-section delivery and are more likely to give birth vaginally.
- Mothers who visit private health-care providers have a greater likelihood of choosing C-section because they have resources.

The study will primarily focus on women aged 15 to 49, with birth order categorized as 1 only, 2-3, 4-5, 6 and above , Parity categorized as 1, 2-3, 4-5, 6 and above, Marital status as: single, married or cohabiting; widowed/divorced or separated; Level of education attained as: without education, elementary; secondary level and above; Residence as: rural or urban; Wealth index as: poorest, poorer, middle, richer and richest; region based on prior provinces; availability of insurance coverage; prenatal screenings categorized as none, 1-3, 4 and above and delivery location - public or private facility.

CHAPTER 3: METHODOLOGY AND DATA ANALYSIS

3.1 Introduction

This chapter presents data and describes the methodology used to investigate factors related to the rise in caesarean births in Kenya. It begins by describing the data sources, variables, measurements as well as data analysis methods.

3.2 Data Sources

The study analyzed the Kenya Demographic Health Survey (KDHS) data for the period 2003 to 2014 to show trends but used the 2014 dataset to explain why mothers have more caesareans. The Kenya Demographic Health Surveys (KDHS) are national representative sample surveys that form part of the global Demographic Health Survey (DHS) program. DHS surveys segment populations into urban and rural areas, taking into account demographic differences and the validity, cost and quality of the data collected. The surveys include questions on population, health and nutrition.

The Women file was used in this study, and women aged 15 to 49 who had deliveries five years prior to the surveys examined (Table 3.1). The key outcome variable is delivery by C-section. In the 2003-2014 KDHSs, 32,926 women of ages between 15 and 49 (Table 1) were interviewed, with 2,057 of them having given birth by C-section.

Table 3.1: Number of women interviewed and delivered by C-section 5 years preceding the survey (KDHS 2003-2014)

	KDHS 2014	KDHS 2009	KDHS 2003	Total
Total number of women interviewed	20,930	6,077	5,919	32,926
Total women who delivered by CS	1413	385	259	2,057

3.3 Variable description and measurement

The dependent variable of this study is C-section delivery, while the independent variables are the mother's age, birth order, parity, marital status, level of education, place of residence, wealth index, area, insurance coverage, antenatal care visits and delivery location. Table 2 shows the study variables' descriptions and measurements.

Table 2: Study variable and their measurements

	Variable Name	Variable description	Measurement	Type of variable
Dependent variable	Delivery by C-section	This is a binary variable depicting delivery by CS or not	No Yes	Nominal
Independent variables				
Demographic factors	Age of mother at birth	Defines the age of mother at delivery. Date of birth CMC, calculated as yyyy= int ((CMC – 1) / 12) + 1900 and categorized in 5-year age groups.	Category 1 15-19 20-24 25-29 30-34 35-39 40-44 45-49	Nominal

	Birth order	This variable refers to the birth order number in which children were born	1 2-3 4-5 6+	Nominal
	Parity	This refers to total number of children ever born by the mother.	1 2-3 4-5 6+	Nominal
	Marital status	This variable refers to whether a mother is single, married/living together or widowed/divorced/separated	Never married Married or living together Widowed or divorced or separated	
Socio-economic factors	Level of education	This variable measures the highest level of education attained categorized as: No education, Primary, Secondary, and above.	No education Primary level Secondary level College and above	Nominal

	Place of residence	This variable refers to the de facto place of residence categorized as urban or rural.	Urban Rural	Nominal
	Wealth Index	It indicates the wealth status of the household grouped as: Poorest, Poorer, Middle, Richer and Richest.	Poorest Poorer Middle Richer Richest	Nominal
	Region	The variable refers to de- facto region of residence of the mother- Central, Coast, Eastern, Nairobi, North Eastern, Nyanza, Rift Valley, Western provinces	All regions (Central, Coast, Eastern, Nairobi, North Eastern, Nyanza, Rift Valley, Western)	Nominal
	Insurance cover	This variable refers to whether the mother was covered by health insurance or not.	Yes No	Nominal
Proximate variables				

Utilization of maternal health services	Antenatal care (ANC) visits	This variable refers to number of ante-natal visits by the mother during the pregnancy.	None 1-3 4+	Nominal
	Place of delivery	This variable refers to place of delivery of the child categorized as: public or private health facility	Health facility Public Private	Nominal

NB: In all the variables, only mothers of children born alive and delivered withing the 5 years preceding the KDHS survey were considered.

3.4 Data analysis

Data analysis only took into account mothers who had given birth during the five years prior to the period 2003 to 2014 and were between the ages of 15 and 49. Version 25 of the Statistical Package for Social Sciences (SPSS) program was used to analyze this data. At the single-variate, bivariate, and multivariate levels, analysis was carried out.

3.4.1 Univariate and Bivariate analysis

Univariate analysis examined each data variable separately and helped describe and summarize data to reveal trends. Frequency distribution and percentages have been included. Bivariate analysis has been used to examine whether there was a relationship between independent variables and the dependent variable which included crosstabulations with Chi-square tests.

3.4.2 Multivariate analysis

The influence of each independent variable on the dependent variable was investigated using a binary logistic regression analysis. An extended linear model termed binary logistic regression makes the claim that log chances serve as a connection between the exposure factors and the outcome. The maximum likelihood technique was used to fit the model in order to get maximum likelihood estimates. The effect of mother features of health care usage, socioeconomic parameters, and demographic variables on caesarean delivery was investigated using binary logistic regression. Based on a significance level of $p \leq 0.05$, independent variables were included.

CHAPTER 4: FACTORS ASSOCIATED WITH CAESAREAN SECTION IN KENYA

4.1 Introduction

This section presents results in three parts to address study objectives. The first part shows caesarean section trends in Kenya from 2003 to 2014, the second part summarizes the demographics of mothers aged 15 to 49 years who experienced deliveries by caesarean section. The third part shows the relationship among each of the independent variables and the dependent variable and its influence on the dependent variable. Triangulation is used to improve discussion of results. This section ends with a summary of the conclusions reached.

4.2 Birth by Caesarean section trends in Kenya (DHS 2003-2014)

Analysis of DHS data shows an upward trajectory in the practice of C-section in Kenya as shown in figure 8. The highest jump was noted in 2009 where a 1.9% increase was recorded from 4.4% in 2003 to 6.3% in 2009 as presented in figure 8 below.

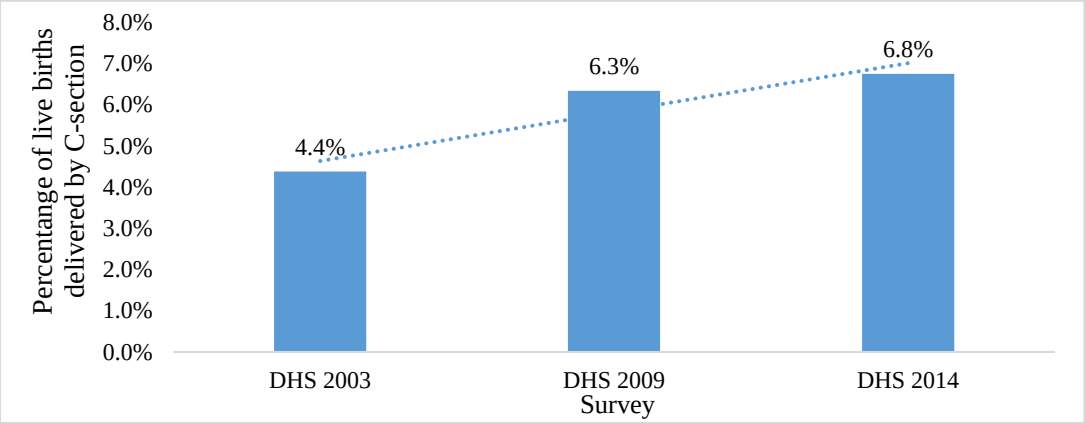


Figure 8: Trends in delivery by caesarean section in Kenya 2003 -2014

When compared to health facilities, analysis of data obtained from Kenya Health Information System showed a higher rise in C-section as shown in figure 9.

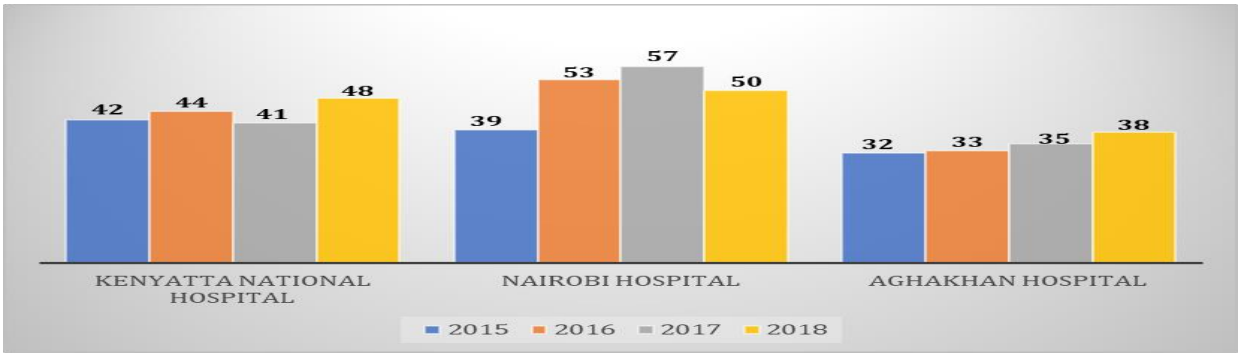


Figure 9: Delivery by C-section in selected hospitals (Kenyatta National Hospital, Nairobi Hospital and Agha Khan University Hospital)

4.3 Demographic and socioeconomic characteristics of women aged 15-49 years with caesarean deliveries within five years to the 2014 KDHS

Majority of women who had births through C-section five years preceding the 2014 KDHS survey were between the age 25 and 29 years (7%), were married (6.5 percent), and had birth orders and total children ever born of 2-3 (7.5 percent and 8.0 percent, respectively).

Majority of them had only an elementary education (5.8%), lived in metropolitan regions (11.2%), and had the highest wealth index (16.4 percent). Besides, a number of them had gone to more than four prenatal checkups and had given birth in a public hospital (Table 4).

4.4 Bivariate analysis

This section provides an analysis of how each of the variables is associated with delivery by C-section using Chi-square test.

Age, marital status, birth order, parity/total children-ever-born, educational level, place of residence, wealth profile, area, number of ante-natal visits, and place of delivery - all had statistical significance ($p < 0.05$) on delivery by C-section as shown in (Table 4).

Table 4: Socio-economic characteristics and demographic factors of women who had given birth by C-section five years prior to 2014 KDHS

Demographic characteristics	Delivery by caesarean section			
Age	No	Yes	Total	Chi square
15-19	792 (94.0%)	49(6.0%)	841(100%)	x2 (415)=543.8 p≤0.000 n=20930
20-24	4473 (94.4%)	265 (5.6%)	4738(100%)	
25-29	5992 (92.9%)	455(7.1%)	6447(100%)	
30-34	4050 (93.3%)	290 (6.7%)	4340(100%)	
35-39	2645 (92.3%)	222 (7.7%)	2867(100%)	
40-44	1218 (92.0%)	106 (8.0%)	1324(100%)	
45-49	347 (93.0%)	26 (7.0%)	373(100%)	
Total	19517 (93.2%)	1413 (6.8%)	20930 (100%)	
Current marital status				
Never Married	1181 (90.8%)	119 (9.2%)	1300(100%)	x2 (5)=25 p≤0.000
Married/living together	16579 (93.3%)	1159 (6.5%)	17738(100%)	

Widowed/divorced/separated	1757 (92.9%)	135 (7.1%)	1892(100%)	n=20930
Total	19517 (93.2%)	1413 (6.8%)	20930(100%)	
Birth order				
1	4277 (89.2%)	517 (10.8%)	4794(100%)	x2 (14)=268
2-3	7276 (92.5%)	588 (7.5%)	7864(100%)	p≤0.000
4-5	4326 (96.0%)	182 (4.0%)	4508(100%)	n=20930
6+	3638 (96.7%)	126 (3.3%)	3764(100%)	
Total	19517(93.2%)	1413(6.8%)	20930(100%)	
Parity/Total children ever born				
1	2834 (87.6%)	400 (12.4%)	3234(100%)	x2 (14)=358
2-3	7659 (92.0%)	670 (8.0%)	8329(100%)	p≤0.000
4-5	4737 (95.9%)	202 (4.1%)	4939(100%)	n=20930
6+	4287 (96.8%)	141 (3.2%)	4428(100%)	
Total	19517 (93.2%)	1413 (6.8%)	20930(100%)	
Socio-economic characteristics				
Highest educational level				
No education	4500 (98.2%)	83 (1.8%)	4583(100%)	x2 (3)=701
Primary	10392 (94.2%)	642 (5.8%)	11034(100%)	p≤0.000
Secondary	3584 (89.7%)	410 (10.3%)	3994(100%)	n=20930
Higher	1041 (78.9%)	278 (21.1%)	1319(100%)	
Total	19517 (93.2%)	1413 (6.8%)	20930(100%)	
Place of residence				
Urban	6058 (88.8%)	766 (11.2%)	6824(100%)	x2 (1)=321
Rural	13459 (95.4%)	647 (4.6%)	14106(100%)	p≤0.000
Total	19517 (93.2%)	1413 (6.8%)	20930(100%)	n=20930
Wealth Index				
Poorest	7017 (97.9%)	150 (2.1%)	7167(100%)	x2 (4)=764
Poorer	4127 (95.1%)	214 (4.9%)	4341(100%)	p≤0.000
Middle	3234 (92.7%)	254 (7.3%)	3488(100%)	n=20930
Richer	2790 (89.3%)	334 (10.7%)	3124(100%)	

Richest	2349 (83.6%)	461 (16.4%)	2810(100%)	
Total	19517 (93.2%)	1413 (6.8%)	20930(100%)	
Region				
Coast	2472 (93.4%)	174 (6.6%)	2646(100%)	x2 (7)=413
North Eastern	1543 (96.9%)	49 (3.1%)	1592(100%)	p≤0.000
Eastern	2719 (90.2%)	296 (9.8%)	3015(100%)	n=20930
Central	1223 (86.2%)	196 (13.8%)	1419(100%)	
Rift Valley	6503 (95.1%)	336 (4.9%)	6839(100%)	
Western	1881 (95.4%)	91 (4.6%)	1972(100%)	
Nyanza	2754 (94.5%)	161 (5.5%)	2915(100%)	
Nairobi	422 (79.3%)	110 (20.7%)	532(100%)	
Total	19517 (93.2%)	1413 (6.8%)	20930(100%)	
Health insurance cover				
No	8327 (94.6%)	473 (5.4%)	8800(100%)	x2 (1)=157
Yes	1080 (85.3%)	186 (14.7%)	1266(100%)	p≤0.000
Total	9407 (93.5%)	659 (6.5%)	10066(100%)	n=10066
Proximate Variables- Use of maternal health services				
Number of ante-natal visits				
None	957 (98.6%)	14 (1.4%)	971(100%)	x2 (18)=318
1-3	5555 (94.6%)	318 (5.4%)	5873(100%)	p≤0.000
4+	7262 (89.8%)	829 (10.2%)	8091(100%)	n=14935
Total	13774(92.2%)	1161(7.8%)	14935(100%)	
Place of delivery				
Public	7976 (88.9%)	993 (11.1%)	8969(100%)	x2 (10)=1939
Private	2016 (82.8%)	420 (17.2%)	2436(100%)	p≤0.000
Total	19403(93.2%)	1413(6.8%)	20816(100%)	n=20816

4.5 Factors associated to C-section

The influence of variables on caesarean delivery was determined in this section using multivariate analysis and the logistic model. Table 5 shows the results obtained by fitting the logistic model. The rates in the table illustrate the proportional risk of caesarean delivery in every percentage increase of the independent variable. The reference category is hundred percent, which corresponds to a unit. If Exp(B) is more by a unit, it shows that the mother has a higher chance of experiencing delivery by caesarean section than those in the reference group. Besides, if Exp(B) is less than one unit, it indicates that the mother is unlikely to deliver by C-section compared to those in the reference category. Women aged between 45-49 years were more likely to experience a caesarean section (OR=5.494), followed by women aged 40-44 years (OR=4.945) and 35-39 years (OR=2.963).

Women with the highest level of education were twice more likely to give birth by caesarean section than women having no education (OR=1.966). A caesarean birth was also more likely to occur in mothers with only primary education (OR=1.424). Mothers who had C-section deliveries had a higher likelihood of having given birth in a private than in public hospitals (OR = 1.396), while women with higher parity did so less often (OR = 0.367) than those with lower parity. Women from the Eastern Province (OR=1.393) were also having a higher chance of giving birth through C-section than others in the different regions, as shown in table 5. There is no major change on mothers delivering by C-section when compared against marital status or wealth index.

Table 5: Associated predictors linked with C-section amongst women aged 15–49 years

	Coefficient(B)	Standard Error	EXP (B)/Odds Ratio	95% CI.for EXP(B)	
				Lower	Upper
Demographic characteristics					
Age of Mother at Childbirth					
15-19 (Reference category)			1		
20-24	.188	.167	1.207	0.870	1.675
25-29	.545	.172	1.724**	1.231	2.415

30-34	.758	.185	2.134***	1.484	3.070
35-39	1.086	.198	2.963***	2.008	4.372
40-44	1.598	.226	4.945***	3.173	7.708
45-49	1.704	.314	5.494***	2.967	10.176
Current marital status					
Never Married (Reference category)			1		
Married/living together	-.010	.119	0.990	0.784	1.252
Widowed/divorced/separated	.024	.155	1.024	0.756	1.387
Parity/Total children ever born					
1(Reference category)			1		
2-3	-.389	.088	0.678***	0.570	0.806
4-5	-.916	.133	0.400***	0.308	0.520
6+	-1.003	.171	0.367***	0.262	0.512
Socio-economic characteristics					
Educational level					
No education (Reference category)			1		
Primary	.353	.177	1.424*	1.006	2.014
Secondary	.349	.186	1.418	0.984	2.043
Higher	.676	.199	1.966***	1.333	2.902
Place of residence					
Urban (Reference category)			1		
Rural	-.147	.079	0.863	0.740	1.006
Wealth Index					

Poorest (Reference category)			1		
Poorer	.153	.134	1.165	0.896	1.515
Middle	.114	.133	1.121	0.863	1.455
Richer	.133	.132	1.142	0.881	1.481
Richest	.145	.144	1.156	0.873	1.532
Region					
Coast (Reference category)			1		
North Eastern	-.247	.240	0.781	0.488	1.250
Eastern	.332	.119	1.393**	1.103	1.760
Central	-.058	.129	0.944	0.732	1.216
Rift Valley	-.300	.116	0.741*	0.590	0.930
Western	-.337	.157	0.714*	0.525	0.971
Nyanza	-.405	.135	0.667**	0.512	0.868
Nairobi	.225	.160	1.252	0.915	1.713
Proximate variables-Use of maternal health services					
Number of ANC visits					
None (Reference category)			1		
1-3	-.094	.347	0.911	0.461	1.797
4+	.138	.345	1.148	0.584	2.258
Place of delivery					
Public (Reference category)			1		
Private	.333	.075	1.396***	1.204	1.618

Key: *p≤ 0.05 **p≤0.01 *** p≤0.001

CHAPTER 5: DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a discussion of the findings, conclusion and recommendations for policy, programmes and further research work.

5.2 Discussion

The main objective of the study was to examine factors associated with the rise of caesarean section births in Kenya. The study used 2003 to 2014 Kenya Demographic Health Surveys which are national representative sample surveys to show trends but used the 2014 dataset to explain why Kenyans have more caesareans. The study considered mothers aged 15 to 49 years old who had a delivery experience within five years preceding the survey and performed analysis at univariate, bivariate and multivariate level. Chi square tests were used in bivariate analysis and logistic model in multivariate analysis to establish the comparative risk of delivery by caesarean section in every percentage increase of the independent variable.

Rates of caesarean section among women in Kenya increased from 4.4% in 2003 to 6.8% in 2014. Repeat caesarean sections, parity, wealth index and delivery location have been associated with an increase in caesarean sections in Kenya, according to various hospital research (Biraboneye et al., 2017; Elie et al., 2017; Jahonga, KR, 2000; Juma et al., 2017; Ngala, 2003; Patroba, 2010; Wanyonyi et al., 2006). C-section rates were between 32 and 57 percent above the recommended 15 percent, according to statistics from Kenyatta National Hospital, Nairobi Hospital and the Aga Khan University Hospital from 2015 to 2018 (KHIS, 2019). The more financial benefits a doctor is likely to receive, the more likely he is to induce demand for caesarean sections (Patroba, 2010, Wanyonyi et al., 2006), thus another factor that could influence caesarean delivery in Kenya.

Women's age, marital status, birth order, parity, education level, place of residency, wealth profile, region, number of prenatal visits, and place of delivery were all associated with C-section deliveries. These factors are all part of the demographic and socioeconomic makeup of women. With mother's advancing age, the risk of a C-section birth rose. Additionally, compared to moms between the ages of 20 and 24, mothers between the ages of 45 and 49 had a fivefold higher likelihood of having a C-section. According to several studies (Lin, H.C.,2004, Bjrstad,2010, Bayrampour, H.,2010, Franz,2010, Gillet, 2011, Zaki, 2013, Fuchs, 2013, Mylonas,2015, Rydahl, E.2019), pregnancies at advanced maternal ages contribute to an increase in C-section deliveries due to pre-pregnancy diseases and related risk factors.

Higher educational attainment was also linked to an increased chance of having a C-section (OR=1.966). According to the study, women with highest level of education had a higher chance than women having low level of education to have a caesarean section (Ardi, 2018, Audrey G. et al., 2010, Boniface et al., 2019). Women giving birth in private health-centres in Kenya had a higher chance of a caesarean section than women giving birth in public health centres. The choice of private hospitals corresponds with mother's educational attainment and higher wealth index. These findings agree with previous research that found that caesarean births were more common in private settings as postulated by several authors (Ngala, 2003, Aminu, 2014, KHIS, 2019, Neuman, 2014, Peel, 2018, Rosana, 2016, Wanjohi, 2021).

According to the available literature, antenatal visits serve as a preventative measure to avoid difficulties that may lead to a caesarean section. However, study results suggested that women who had more than four screening sessions were more likely to have Caesarean Section. A study done in 2017 by Begum and others in Bangladesh observed that ANC did not provide adequate information on the medical indications for C-section and as such, mothers who attended more ANC visits still underwent the surgery for lack of information, further influenced by obstetricians' preference for C-section. This is contrary to the assumption that mothers who attend more ANC visits have access to information on risks involved in delivery by C-section and therefore likely to delivery their children vaginally. This raises the question of ANC 's efficacy in reducing unnecessary delivery by C-section. Furthermore, it indicated that women in the Eastern Province delivered more by caesarean section in comparison to other regions. Female genital mutilation (FGM) is widespread in the Eastern Province, which may explain why caesarean sections are so common, although the relationship between this and other relevant sociocultural factors is complex and warrants more research.

5.3 Limitations

Study results need to be considered in light of these limitations. First, KDHS data do not provide medical or non-medical reasons for having caesarean sections performed, and no attempt was made to trace and interview women who gave birth by caesarean section or healthcare providers, so their perspectives on the procedure were omitted. Secondly, KDHS data do not provide the type of complications the mother might have experienced during pregnancy and therefore the study could not identify complications that resulted to delivery by C-section. It also only considers women who were interviewed as part of the KDHS interviews and so perspectives of other women who were not interviewed can be overlooked. Another

limitation of the study are memory errors, since KDHS surveys rely on retrospective reporting, and biases associated with self-reports of individual experiences and situations.

5.4 Conclusion and recommendations

The data show that both private and public hospitals are increasingly misusing caesarean section operations, and there are a number of contributing variables. A call to action is sent on the optimal delivery methods based on transparency of the risks and rewards of the choices made. Some of the major aspects highlighted include age, education level, and site of delivery. Averting unneeded C-sections may be made possible by outlining the short- and long-term difficulties and costs that go beyond delivery and include effects on the health of mothers, children, and future pregnancies.

To address this, there is need to enhance the quality of ANC's along with the number of ANC visits with emphasis done on available child delivery options and risks and benefits that come with it. Women need to be educated on delivery options available. A comprehensive medical reason for doctors performing C-sections should be provided, and healthcare personnel should be continually encouraged to follow ethical clinical practice and prevent unnecessary C-sections. Continuously re-educate healthcare providers on the available guidelines and conduct C-section audits and provide prompt feedback to health-care providers on unnecessary C-section.

5.5 Further research work

Due to socio-cultural differences across regions in Kenya, more region focused studies should be done to get more insights on why some areas report higher cases of C-section than others. In particular, more research needs to be done to establish reasons for the rise in C-sections in Eastern province, local determinants of delivery by C-section, women's and health-care professionals' perspectives and cultural norms.

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Annex 1

Nov 18, 2019

Lilian Nderitu
ChildFund Kenya
Kenya
Phone: 0722469156
Email: lilian.nyawira@gmail.com
Request Date: 11/16/2019

Dear Lilian Nderitu:

This is to confirm that you are approved to use the following Survey Datasets for your registered research paper titled: "Caesarean births in Kenya":

Kenya

To access the datasets, please login at: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm. The user name is the registered email address, and the password is the one selected during registration.

The IRB-approved procedures for DHS public-use datasets do not in any way allow respondents, households, or sample communities to be identified. There are no names of individuals or household addresses in the data files. The geographic identifiers only go down to the regional level (where regions are typically very large geographical areas encompassing several states/provinces). Each enumeration area (Primary Sampling Unit) has a PSU number in the data file, but the PSU numbers do not have any labels to indicate their names or locations. In surveys that collect GIS coordinates in the field, the coordinates are only for the enumeration area (EA) as a whole, and not for individual households, and the measured coordinates are randomly displaced within a large geographic area so that specific enumeration areas cannot be identified.

The DHS Data may be used only for the purpose of statistical reporting and analysis, and only for your registered research. To use the data for another purpose, a new research project must be registered. All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey. Please reference the complete terms of use at: https://dhsprogram.com/Data/terms-of-use.cfm.

The data must not be passed on to other researchers without the written consent of DHS. However, if you have coresearchers registered in your account for this research paper, you are authorized to share the data with them. All data users are required to submit an electronic copy (pdf) of any reports/publications resulting from using the DHS data files to: references@dhsprogram.com.

Sincerely,

Bridgette Wellington

Bridgette Wellington
Data Archivist
The Demographic and Health Surveys (DHS) Program