UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

INDICATIONS FOR CAESAREAN SECTION DELIVERY IN THE NORTHERN REGION, GHANA.

BY

YUSSIF GUNU BUHARI (BEd HEALTH SCIENCE)

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A THESIS REPORT SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH AND FAMILY MEDICINE, SCHOOL OF MEDICINE, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR MASTER OF PUBLIC HEALTH WITH SPECIALIZATION IN EPIDEMIOLOGY AND BIOSTATISTICS.

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DECLARATION

Student declaration

I, YUSSIF, GUNU BUHARI, hereby declare that this research ‘‘indications for caesarean section delivery in the northern region, Ghana’’ is my independent work. It is being carried in fulfilment of the university requirement for the matter of public health degree at the school of medicine, university for development studies, Tamale. I further affirm that this thesis has not been submitted for another degree qualification in this or any other university.

Signature…….. Date……

NAME OF STUDENT: BUHARI YUSSIF GUNU

Supervisor’s Declaration

I declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by the University for Development Studies.

NAME OF SUPERVISOR: PROFESSOR EDMUND MUONIR DER

Signature…… Date……

ABSTRACT

Background: Caesarean section (CS) is an important maternal and reproductive health intervention routinely performed in complicated pregnancies for the purpose of saving the lives of mothers and babies where vaginal delivery is deemed to be life threatening. Sometimes it is carried by the request of a mother as a preferred choice of delivery for various reasons. Little efforts are made to investigate the drivers and impact of increased CS rates in Ghana's healthcare facilities partially in the northern region. This multi-facility observational study sought to close the knowledge gap when it comes to CS delivery in the northern region by targeting three different facilities in the region. **General objective:** The study investigated the rates, indications and outcome of CS delivery in some selected health facilities offering obstetric services in the Northern Region, Ghana. **Methods:** Descriptive cross-sectional study design to explore the rates, indications and outcomes of caesarean section operations in three health facilities in northern region, Ghana. **Results:** The overall caesarean section delivery rates in the health facilities (study sites) were 23.5% (TTH), 7.6% (TCH) and 7.7% (SMH) respectively. There were 34.1% elective CS compared to 65.9% emergency CS deliveries. The mean age of the participants was 29 ± 0.55 years, with median age of 30 years, and a modal age group of 25 – 34 years (64.40%). The major indications for caesarean section delivery in this study in descending order of magnitude include; history of previous CS (35.3%), poor progress of labour (12.9%), foetal distress (12.4%) and multiple gestation (9.4%). **Conclusion:** Caesarean section delivery rates at the district health facility level in the northern region were within the 10.0 – 15.0% range recommended by the WHO, however, that from the tertiary hospital (TTH) was well above this range. The commonest obstetric indications for CS are previous CS, poor progress, foetal distress etc and the demographic indications were parity and advance maternal age. Single cephalic mothers with or without previous cs with less degree of distress should be targeted for trial of vaginal delivery.

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DEDICATION

This research work is dedicated to my foster father, the late Dr. Mahammoud Sumait, my mother, Laddy Musah, my sister, Hajia Moshie and my late father, Alhaji Mohammed Gunu for their spiritual and emotional investment in me throughout this year; and to the Almighty God for His profound favours throughout this exercise.

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World Health Organisation **(**WHO)

DEFINITION OF TERMS

A Caesarean section: Caesarean section also known as C-section or Caesar, is a surgical procedure in which incisions are made through a mother's abdomen (laparotomy) and uterus (hysterotomy) to deliver one or more babies.

Breech presentation: It is defined as a foetus in a longitudinal lie with the buttocks or feet closest to the cervix.

Caesarean section rate: It is the proportion of Caesarean sections performed in a health facility or a geographical region in relation to the total number of live births. It is usually expressed as a percentage.

Cross sectional study design: It is also referred to as prevalence study which is a type of study design is called a cross-sectional study because both exposure and disease outcome are determined

simultaneously for each subject; it is as if we were viewing a snapshot of the population at a certain point in time.

Confounder: Refers to an extraneous variable whose presence affects the variables being studied so that the results do not reflect the actual relationship between the variables under study.

Context: Refers to the circumstances that form the setting for an event, statement, or idea, and in terms of which it can be fully understood. When applied to Caesarean section, it is an effort to gain insight into the Caesarean section rate. For example, the uniqueness of health facility where it was performed, whether a Caesarean section was done as an emergency or elective operation. For patient's context, it also indicates whether it was a primary caesarean section or a repeat caesarean section for the patient, as well as the maternal and foetal outcomes of the Caesarean section.

Demographic factors: Quantifiable characteristics of a study population. In this study, patients' characteristics such as age, race, parity, marital status, level of education, and employment status were studied.

Dependent variable: This refers to the outcome variable. In this study it is Caesarean section.

Dystocia: Literally means difficult labour. It is characterized by abnormally slow progress of labour.

Eclampsia: In a woman with preeclampsia, a convulsion that cannot be attributed to another cause is termed eclampsia. The seizures are generalized and may appear before, during, or after labour.

Epidemiology: Epidemiology is the study of how disease is distributed in populations and the factors that influence or determine this distribution.

Fistula: Is an abnormal passageway in the body, making a communication between two epithelial surfaces. An example of obstetric fistula is vesico-vaginal fistula where the bladder communicates with the vagina resulting in constant leaking of urine.

Foetal indications: Refers to caesarean section delivery decision based on problem associated with the foetus.

Gestational Hypertension: This diagnosis is made in women whose blood pressures reach 140/90 mm Hg or greater for the first time after midpregnancy, but in whom proteinuria is not identified.

Hypothesis: Assertion of an association believed, but not known, to be true.

Independent variables: Predictor or causal variables. Examples in this study are maternal age, race, education and employment status, foetal indications and maternal indications for C-section. Intraoperative period: This is the time from the arrival of the patient in theatre or the start of an operation to the time the patient is transferred out of

the theatre to the post anaesthetic care area. It describes events occurring during an operation.

Maternal indications: Refer to maternal determinants of caesarean section delivery.

Multiple gestation: also known as twin gestation in general terms consist of two or more foetuses. Twins make up the vast majority (nearly 99 per cent) of multiple gestations.

However, there are pregnancies with three or more foetuses referred to as 'higher multiples.

Preeclampsia: is a disorder of widespread vascular endothelial malfunction and vasospasm that occurs after 20 weeks' gestation and can present as late as 4-6 weeks post-partum. It is clinically defined by hypertension and proteinuria, with or without pathologic edoema.

Foetal distress: A broad term used to describe foetal compromise based on abnormal foetal heart rate patterns or detection of meconium or foetal acidaemia.

Likelihood ratio: A ratio of likelihood positive to likelihood negative; a measure of how much more likely it is that a positive test is true than a negative test is false; provides a measure of reliability that is independent of disease prevalence.

Likelihood ratio test: A statistical test used to compare the fit of two models of which one is the null model and the other the alternative model. It describes how much more likely data are under one model than the other. Its logarithm, the Log Likelihood ratio is used to calculate the p value.

Logistic regression analysis: This is a statistical analysis used to predict the outcome of a categorical dependent variable (C-section in this study) based on several risk factors or predictor variables using a logistic function.

Malpresentation: This refers to a situation where the foetal presenting part is anything but vertex (occiput). It includes breech, shoulder, face and brow presentations.

Maternal mortality ratio: The number of maternal deaths that result from the reproductive process per 100 000 live births.

Meconium: The earliest stool of a baby. When it is passed in the uterus, it stains the liquor and may indicate a foetus in distress. It is thick, green to black in colour and mucilaginous.

Meta-analysis: Quantitative synthesis of the results of multiple smaller studies into a single analysis.

Multipara: refers to a woman who has completed two or more pregnancies to viability.

Myometrium: This is the smooth muscle of the uterus.

Non-Obstetric factors: These are non-pregnancy related situations that influence the delivery method or the performance of Caesarean section.

Obstetric factors: These are pregnancy related conditions which may arise before or during pregnancy, which affect the pregnancy and the delivery process and predispose a patient to having a Caesarean delivery or an adverse outcome. Obstetric factors could be maternal, foetal or combined foetal and maternal.

Odds ratio: A measure of association between exposure and outcome. It describes the odds that an outcome (C-section) will occur given a particular exposure, compared to the odds that the outcome will occur in the absence of that exposure.

Parity: This refers to the number of pregnancies carried to foetal viability.

Nullipara: Refers to a woman who has never completed a pregnancy to foetal viability.

Primipara: Refers to a woman who has been delivered only once of a foetus or foetuses who reached viability.

Perinatal Period: The period around the time of birth. It includes all births weighing 500g or more and ends at 7 days after birth.

Placenta Accreta: Placental implantation in which there is abnormally firm adherence to the uterine wall. It results from partial or total absence of decidua basalis and imperfect development of the fibrinoid layer so that placental villi are attached to the myometrium.

Placenta Praevia: This refers to a placenta that is implanted in the immediate vicinity of the cervical canal.

Sampling bias: This refers to the inclusion in a study of subjects not fully representative of the underlying population. Systematic Review is a review of literature on a focussed research question. It utilizes high quality evidence to analyse and synthesize findings of many studies to answer the research question.

CHAPTER ONE

INTRODUCTION

1.1 Background

Caesarean section (CS) is one of the most important maternal and reproductive health interventions routinely performed in complicated pregnancies and on request. There is currently an increased demand for this service across the globe (Vogel et al., 2015). Caesarean section services have become readily available in most parts of the world, yet debates on the appropriateness or necessities for the operation continue to grow (Belizán, et al., 2018). The World Health Organization's recommended CS rate ranges from 10% to 15% at the population level (Betrán et al., 2016).

Caesarean delivery also referred to as Caesarean section is the surgical delivery of a baby by an incision through the mother's abdomen (belly) and the uterus (womb). Where it is not safe to have vaginal birth, CS is deemed to be a life-saving surgical procedure that saves the lives of mothers and/or babies. A caesarean section may be scheduled (planned caesarean section) or results from complications of labour (emergency or unplanned caesarean section).

Emergency or unplanned caesarean section would most likely result from a number of maternal conditions including but not limited to: abnormal foetal heart rate, abnormal progression of labour, big baby, complications of the placenta (placenta praevia), maternal hypertension, HIV infection, maternal diabetes mellitus and previous caesarean delivery. A study in Ghana by James et al., (2017), found the leading causes/reasons for caesarean sections to be: previous caesarean section (23.10%), big baby (17.21%) and failure to progress (13.18%). In the emergency caesarean group, failure to progress (25.37%) and foetal distress (20.60%) were the most frequent

indications whilst previous caesarean section (37.74%) and big baby (27.10%) were leading indications in the elective caesarean section.

Elective CS is a delivery completed upon the solicitation of the mother regardless of any obstetric sign. Fatemeh et al., (2017), indicated that variables affecting ladies' choice to pick caesarean segment included progressed maternal age, high educational background, living in the city, dread of vaginal birth torment, worries about baby wellbeing, dread of urogenital injury during vaginal birth, and earlier muddled normal labour.

A systematic review of 79 investigations on elective CS versus vaginal delivers have indicated that ladies who had CS as a method of delivery have diminished urinary incontinence at 3 months and diminished perineal torment in examination with those having a vaginal delivery. The investigation similarly uncovered that, CS was related with a higher danger of maternal mortality, hysterectomy, ureteral plot and vesical injury, stomach torment, neonatal respiratory dismalness, foetal demise, placenta praevia, and rupture of the uterus in future pregnancies (Belizán J. M., 2007).

The American College of Obstetricians and Gynaecologists' Committee on Obstetric Practice (ACOG, 2019) held that '"the danger of respiratory sickness, including transient tachypnoea of the new conceived, respiratory pain disorder, sustained pulmonary hypertension, was higher for elective caesarean delivery in contrast with vaginal delivery when delivery is sooner than 39-40 weeks of growth. In another writing, elective caesarean segment was related with expanded pace of inconveniences identified with prematurity (counting respiratory side effects, other neonatal transformation issues such hyperthermia and hyperglycaemia, and admission to

neonatal intensive care) for babies conveyed by caesarean delivery before 39 weeks of growth (National Institutes of Health, 2006).

WHO (2014) asserts that Caesarean section can cause noteworthy and, now and then, perpetual complexity, for example, disability or death especially in settings that come up short on the capacity and, additionally, ability to appropriately direct a safe medical procedure and treat careful intricacies (surgical complications).

Regardless of the hugeness of the wellbeing hazard related to Caesarean delivery for the mother and youngster, there is an upsurge in both crisis (emergency) CS and caesarean delivery dependent on maternal solicitation, and this subsequently is of significant general wellbeing around the world imposing a major public health burden.

Menacker et al., (2006), reasoned that just about 3 of every 10 births were conveyed by CS in 2004 (29.1%), the most elevated rate ever revealed in the United States. The general rate had expanded by over 40% since 1996, reflecting two simultaneous patterns: an expansion in the essential rate (14.6% to 20.6%), and a 28.3% to 9.2% demonstrating steep decrease in the pace of vaginal birth after caesarean delivery (Menacker et al., 2006).

In the case of Ghana where comprehensive data on CS rates are woefully inadequate, the few records available showed lower rates when compared with other developed countries. However, the lower rates may well be as a result of limited access or low patronage of skilled obstetric services (Kunu, et al., 2017).

Evidence suggests that there has been a persistent increase in the rate (from 14.6% in 2015 to 16.0% in 2016) of caesarean delivery in Ghana. This increase above the World Health Organization recommended threshold for CS is a reflection of increases at district and regional rates with the exception of the Upper East Region which is one of

the poorest regions in Ghana with limited access to quality health care services (GHS, 2016).

Despite this worrying trend, very few researchers have investigated the drivers and impact of increased caesarean delivery rates in Ghana's healthcare facilities. Even so, the few studies conducted in the area of CS in Ghana were conspicuously or unable to cover the northern region and basically focused on Teaching Hospitals. This study intends to provide a hospital-based investigation to find the caesarean section delivery rates, indications and outcome in some selected hospitals with obstetric services in the Northern Region.

1.2 Problem Statement

Reducing the prevalence rates of caesarean sections to the level (10% -15%) recommended by W.H.O has become a global goal. In the view of the WHO (2015), while a ''medically supported CS can viably forestall maternal and perinatal mortality and morbidity''. Pointless, usage of the method appears to have prompted an expanded pace of CS from 14.6% in 2015 to 16.0% in 2016 in Ghana.

Be that as it may, there is no proof indicating the advantages of aesarean birthing for ladies or babies who don't need the system'. Recognizing the centrality of caesarean section at reducing maternal and child morbidity and mortality, the WHO has set maximum levels of caesarean delivery at 10% - 15% to ensure a balance between the availability of caesarean delivery services for those in need and reduce the unnecessary utilization of the caesarean delivery at the population level. Stakeholders (governments and health workers) have expressed stress over the expanding pattern in the quantities of CS and the likely undesirable consequence for maternal and child wellbeing (WHO, 2015).

Meanwhile, it has been set up in another report that pointless caesarean segment performance fills in as an obstruction (barrier) to general inclusion of fundamental wellbeing (health) administrations to populations introducing the issue of health equality (Gibbons et al., 2010). It is imperative therefore to identify the context in which caesarean deliveries are conducted at various hospitals in order to put interventions towards reducing unnecessary caesarean section and at the same time increasing access to caesarean delivery for those who need CS services the most. Hence, preventing maternal deaths resulting from the lack of access to CS and as well as reducing maternal and neonatal risks that come with caesarean section.

Data from the Ghana health service indicate that the proportion of deliveries by caesarean section recorded for 2016 exceeded the WHO recommended rate of between 10% and 15% of all births. This represents an increase of 1.4% between 2015 and 2016 (GHS, 2016).

While the overall increases in the national average are evident, the driving factors of high utilization of CS are not clear. Moreover, very few studies have investigated the drivers and impact of increased caesarean delivery rates in Ghana's healthcare facilities. The couple of studies that investigated the variables liable for caesarean segment rates in Ghana are regularly engaged in the southern area and regularly at referral health facilities. Little effort is being made to close this knowledge gap when it comes to caesarean section deliveries in the northern region. This study therefore seeks to provide a multi-facility observational study on the rates of caesarean section deliveries, the indications for caesarean section and outcomes; and the conditions under which the deliveries were conducted. It is instructive to note that the extent of caesarean section delivery at the population level is a proportion of the degree of access and utilization of the caesarean section intervention (WHO, 2015). Therefore, the

outcome of this study can also serve as a reference guide for management (policy-makers) in assessing the progress in maternal and infant health at the selected facilities.

1.3 Research Questions

1.3.1 General Research Question

What are the rates, indications and outcome of caesarean section delivery in the northern region?

1.3.2 Specific Research Question

1. What are the caesarean section rates among pregnant women in selected hospitals in the northern region
2. What are the obstetric and non-obstetric indications for caesarean section rates in northern region?
3. What health related outcomes do women who undergo C section experience in the northern region?

1.4 Objectives of the Study

1.4.1 General objective

The general objective of the study is to establish the rates, indications and outcome of caesarean section deliveries and in northern region.

1.4.2 Specific Objectives

1. To establish the caesarean section rates in selected health facilities with obstetric services in the Northern Region.
2. To identify the obstetric and non-obstetric indications for Caesarean sections in the Northern Region.

3. To explore the health-related outcomes and experiences of women who have undergone caesarean section delivery in the northern region.

1.5 Justification

This inclination of the study was to investigate the indications for caesarean section deliveries in Tamale Teaching hospital, Tamale Central Hospital and the Savelugu Municipal Hospital all within the northern region of Ghana. To increase our understanding about these indications whether obstetric or non-obstetric, to describe the outcome of and context under which women of childbearing age undergo caesarean sections and to determine whether there exist any shared demographics and the impact of these factors. These hospitals are central in the delivery of tertiary and basic health care and obstetric services in parts of the northern region. By identifying the indications of CS within these three hospitals, a good understanding of the factors related to caesarean section deliveries in the northern region would be gained. Findings from this study are deemed essential in the future planning of maternal and reproductive health services, development of management protocols to be used in the hospital and allocation of human and material resources to maternity and reproductive health units. The anticipation is that findings of the study will help improve care for mothers who are due for caesarean section, whether elective or emergency caesarean section and go a long way to impact on the better health outcome of mothers, and babies whiles also meeting the WHO strategy of ending preventable maternal deaths with the aim of reducing preventable causes of death before, during or after childbirth (WHO, 2015).

CHAPTER TWO

LITERATURE REVIEW

This section of the study provides an overview of the existing knowledge about the topic and presented according to themes that reflect the set objectives of the study. `Basically data were obtained from secondary sources such as published books and articles. Some of the electronic search engines for published articles were PubMed, JSTOR, Wikipedia, Google Scholar etc. The key search items were ‘‘Indications/determinants/causes of caesarean section, emergency VRS elective CS, C-section VRS vaginal birth etc’’.

2.1 Caesarean section rates in the developed countries

Increasing caesarean section delivery rates is a matter of public knowledge worldwide, prompting many researchers to investigate the indications for caesarean section deliveries (Soto-Vega et al., 2015). The phenomenon is even more profound in many developed nations (OECD, 2017). In 2015, the Organization for Economic Co-operation and Development (OECD) detailed that rates of caesarean section delivery rose after some time in virtually all OECD nations, in spite of the fact that in a couple of nations this pattern had turned around. It ascribed reasons, for example, the ascent in first births among more seasoned ladies and in quite a while coming about because of assisted reproduction, negligence obligation concerns, delivery convenience for the two doctors and patients, and the expanding want of certain mothers to have a caesarean section delivery.

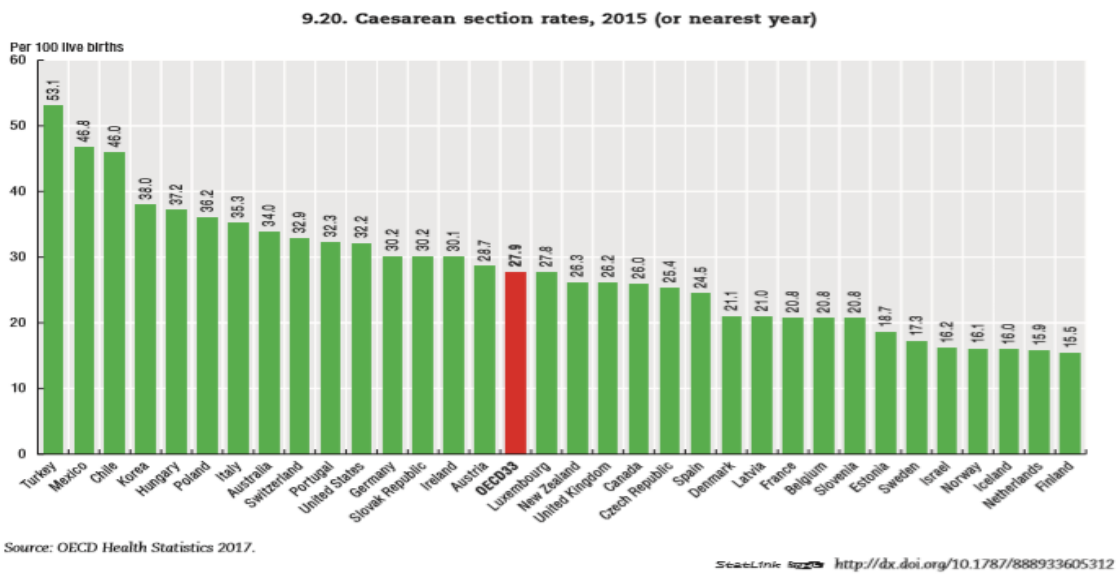

Figure 0.1: Caesarean section rate

Somewhere in the range of 2000 and 2015 paces of caesarean delivery essentially change from the normal of 20% to 28% in most OECD nations. Rates have been especially fast in Poland, the Slovak Republic and the Czech Republic which have recently had moderately low rates, just as a portion of the nations with the most noteworthy rates today (OECD, 2017).

Much equivalent to the OECD, the (CNN, 2018) covered 28th October 2018 that '' C-segment deliveries almost multiplied worldwide since 2000, study discoveries'' citing from a distribution in the Lancet diary, expressed that the number of births coming about because of CS is on the ascent, moving from around 16 million (12.1%, everything being equal) in 2000 to as high as 29.7 million (21.1%, all things considered) in 2015.

The investigation's first creator, Dra Ties Boerma, an educator at the University of Manitoba and head of the multi-institutional exploration activity Countdown to 2030 for Women's, Children's, and Adolescents' Health is accounted for to have said that

"We realized that universally, C-segment rates were expanding for a long while now, yet that now more than one out of five infants are delivered by CS is striking".

The work showed that caesarean section deliveries were most common in certain areas of the world. The practice was most frequent in about 10 times with Latin America and the Caribbean areas where it was utilized in 44.3% of all births than in West and Central African districts where utilization is only 4.1% of births in 2015. In the same report, 32% of births were by CS as of 2015 in the United States, which was an increase from 23% in 2000. It indicated an increase from 19.7% to 26.2% of births from 2000 to 2015 in the United Kingdom.

In 2018, the caesarean delivery rate was 31.9% in the United States, which is a slight decrease from the preceding year (2017), showing a recorded caesarean delivery rate of 32.0% (Joyce A. Martin, 2019). These findings is supported by national centre for health statistics, it shows caesarean delivery rates of 2018: 31.9%, 2017: 32.0%, 2016: 31.9%, 2015: 32.0%, 2014: 32.2% respectively (CDC, 2019). In mainland China, the overall caesarean section rates were 54.90% with a mix of both clinical and non-clinical indications (Liu, et al., 2014).

The Canadian Institute for Health Information (CIHI, 2018) indicated that the most frequent inpatient surgical procedure in Canadian hospitals last year was CS, accounting for more than 103,000 times, placing Canada in the middle of the OECD nations at 28%. In another report by CTVNEWS, (2018), a cross-province study in Canada revealed that the lowest CS rates were recorded to be 18.5% in the Northwest Territories while the highest rate was almost double in British Columbia at 35.3%.Caesarean Section rate in Developing countries

In contrast, with the developed nations, the practice of caesarean section in developing countries is a complex situation, with extremes of rates partly due to limited access to caesarean section services (Buekens P, 2003). Buekens et al., (2003), played out a demographic and health review investigation in 8 sub-Saharan African nations to be specific – Burkina Faso, Cameroon, Ghana, Kenya, Madagascar, Niger, Tanzania, and Zambia; and discovered paces of caesarean segments to be lower than 5% in all nations with Burkina Faso, Madagascar, Niger, and Zambia recording rates lower than 2%.

Quick forward, a planned investigation of caesarean section delivery in three sub-Saharan African nations, in particular, the Democratic Republic of Congo (DRC), Burundi, and Sierra Leone shows CS rates to be incredibly low, averaging 6.2% (Kathryn Chu, 2012).

In a secondary data analysis of Women from thirty-four (34), sub-Saharan African (SSA) countries between 2008–2016, Sanni, (2018) researched the predominance and determinants related to caesarean segment in SSA nations and detailed inconsistencies in the paces of caesarean segments across different nations.

In Sierra Leone, Hampus et al., (2019), reported a caesarean section rate of 2.9% of all live births with a difference of 0.8% increase from the rate in 2012, which was 2.1%. In a 5-year demographic and health survey preceding 2013, Boniface et al., (2019), found an overall caesarean delivery rate of2.1% in Nigeria. Adewuyi et al., (2019), also reported similar caesarean section rate of 2.1% in Nigeria.

While there is enough evidence to the claim of low caesarean section rates in certain developing countries, the opposite is the experience of other developing countries such as Brazil. For instance, the (BBC, 2015) reported that ‘’ Brazil has the most noteworthy pace of Caesarean section on the planet’’ quoting a rate of 80.0% for private hospitals,

and public hospitals stood at 45%. Doucleff (2018), reported that caesarean section rates can be extremely high at the clinics in poor countries and indicated that less than 60% of deliveries occur at clinics in Bangladesh and that about 65% of them were by Caesarean sections. A 53.0% regional prevalence of caesarean sections was reported by Laiane et al., (2018), in a meta-analysis in Brazil.

2.2 Caesarean section at the facility level:

Reference emergency clinics get patients from both metropolitan and rustic networks. Furthermore, the reference status is regularly suspected as the explanation behind higher paces of caesarean section delivery at reference emergency clinics. Wanjari (2014), revealed that 37.8% of caesarean section delivery rate with the main marker being past caesarean segment followed by foetal trouble (9.36%), CPD (7.69%), and postdate pregnancy among others.

An examination on the commonness of caesarean segment at a teaching medical hospital by Hafeez et al., (2014), likewise underpins the way that past caesarean sections are generally answerable for the high rates of caesarean section at reference hospitals followed by poor progress, foetal pain, and breech presentation respectively. During the period 2010 to 2011, 70.0% of caesarean sections performed at the korle-Bu teaching hospital were crisis (emergency) and 30.0% elective. With prior CS been the significant sign of the absolute caesarean deliveries, trailed by foetal pain, malpresentation (breech) and just a couple (0.2%) was accordingly maternal solicitation (Afrifa, et al., 2017). The 70% emergency caesarean segment perhaps is legitimate on the suspicion that it is a reference medical hospital and besides, may have gotten muddled pregnancies from a nearby medical clinic. At a tertiary medical clinic in Nigeria, Daniel and Singh (2016), found an all-out CS rate of 11.3%.

In this flow study, the analyst will appraise the level of caesarean delivery owing to references and depict the attributes or signs for caesarean cases. Also, the high caesarean segment rate at 17.69% was seen by Ugwa, Ashimi, and Abubakar (2015), at a tertiary health care centre in Nigeria. At a semi-rural hospital in Namibia, van Dillen (2007), reported that most caesarean sections were carried as a result of dystocia and previous caesarean sections.

2.3 Disparity in Caesarean section delivery rates

In a methodical audit of 26 investigations on caesarean segment delivery extents in Sub-saharan Africa, Dikete et al., (2019), set up that there is dissimilarity in caesarean section delivery rates and this went from 14% to 24%. A study conducted in 12 district hospitals in Benin reported differences in rates averaging 37.6% (Mongbo et al., 2016). It has been proven to vary across populations and the availability of safe obstetric services (Mongbo et al., 2016). Mongbo et al., (2016), observed that access to caesarean section services in Benin is still a challenge accompanied by delays and frequent diagnostic errors which in its self would lead to lower rates. Significant differences in area and women's characteristics have been observed by Long et al., (2015). They reported lower rates of caesarean section delivery in Mozambique.

2.4 Caesarean section outcome

Acceptable caesarean section delivery rate is the one that comes with maximum benefit to the mother and foetus (Dikete et al., 2019). There is no linear connection between caesarean section rate and mortality or morbidity related with foetus and the mother (Ye et al., 2014). Whilst prior research has demonstrated that lower caesarean section delivery rates was best for maternal health (Ye et al., 2014; Volpe, 2011 & Betrán et al., 2007) and the measurement of neonatal mortality was basically relient on data from advance countries making it difficult to generalze in the context of less wealthy

countries. The absence of association between rates of caesarean section deliveries and improvement in neonatal outcome supports the case of the need to reduce caesarean section intervention in normal pregnancies (Ugwa et al., 2015). According to Nakimuli et al., (2015), for all maternal morbidities, haemorrhage is the commonest among women undergoing caesarean section accompanied with longer stay in hospital, and the most common neonatal problem are respiratory conditions. It has been previously established in a systematic review study that caesarean section is associated with elevated risk of respiratory problems among neonates (Kirkeby et al., 2007). This study has been corroborated by Zanardo et al., (2004), who reported greater risk of respiratory disorders among children born through elective caesarean section delivery. In a different findings, lower caesarean section deliveries less than 15% were significantly related to higher maternal mortality and caesarean section rate above 15% were found not to be associated with increased adverse infant and maternal outcome (Volpe, 2011). It has likewise been expressed that ladies who go through crisis caesarean area have high danger of maternal mortality (Fawole, et al., 2012). There is a continues evidence of an increased perinatal risk with caesarean section, especially for deliveries which are not medically indicated for both mother and the foetus, relative to spontaneous vaginal delivery (Volpe, 2011).

2.5 Indications for caesarean section

According to Cunningham (2014), there are numerous reasons for the performance of a caesarean section delivery however, there are four major caesarean sections indications attributable to about 70.0% of segments. These are; previous caesarean section, dystocia, mal-presentation, and suspected acute foetal compromise. Other reported indications which are deemed less common include; multi-foetal pregnancy, placenta praevia, abruptio placenta, foetal and maternal diseases (Cunningham, 2014). No

rundown of signs can genuinely be complete, the prime rule is that a caesarean section ought to be booked, at whatever point the foreseen threat to the foetus or the mother from vaginal delivery supplants that of caesarean delivery. Complete indications requiring caesarean section delivery are very few, very often, indications are circumstantial and there are instances where caesarean delivery may be the ultimate for one woman and not for the other.

In an investigation of international comparison of the signs for caesarean section during the 1980s, Notzon et al., (1994), nalysed levels and patterns of caesarean section delivery by sign in four unique nations to expand information on the fundamental variables liable for the differences in the national obstetric delivery and learn pathways to bring down caesarean rates.

The investigation estimated change in the utilization of caesarean section delivery by signs in Norway, Scotland, Sweden, and the United States during the time periods, 1985 and 1990. They found that public caesarean area rates declined enormously between the time-frames 1980 to 1985 and 1985 to 1990 in each of the four nations under examination; there was real decrease in the caesarean segment rate in Sweden.

Past caesarean section and foetal pain were discovered to be huge supporters of higher caesarean frequency in three of these nations from 1980 to 1985, in any case, their commitment to caesarean growth diminished pointedly in 1985 to 1990.

The general rate varied from 24% in the United States to 11% in Sweden, and all the four nations introduced comparative rates of CS for breech, foetal distress and other signs. The discoveries reasoned that past caesarean segment and dystocia represented the enormously higher caesarean section rate in the U.S.

Similarly, Begum et al., (2017), conveyed a population review putting together investigations with respect to caesarean segment in Banagaladish and introduced past caesarean section delivery, foetal distress, problem of amniotic liquid, post-dated pregnancy, malpresentation, hypertensive issue, prolonged and obstructed labour; and others.

In Williams obstetrics, it is expressed that over 85% of caesarean activities are performed for four significant reasons, in particular; earlier CS, dystocia, fetal peril, or irregular fetal presentation. The following table presents some list of other indications for performing caesarean section delivery (Cunningham et al., 2014).

TABLE 30-1. Some Indications for Cesarean Delivery

Maternal
Prior cesarean delivery
Abnormal placentation
Maternal request
Prior classical hysterotomy
Unknown uterine scar type
Uterine incision dehiscence
Prior full-thickness myomectomy
Genital tract obstructive mass
Invasive cervical cancer
Prior trachelectomy
Permanent cerclage
Prior pelvic reconstructive surgery
Pelvic deformity
HSV or HIV infection
Cardiac or pulmonary disease
Cerebral aneurysm or arteriovenous malformation
Pathology requiring concurrent intraabdominal surgery
Perimortem cesarean delivery
Maternal-Fetal
Cephalopelvic disproportion
Failed operative vaginal delivery
Placenta previa or placental abruption
Fetal
Nonreassuring fetal status
Malpresentation
Macrosomia
Congenital anomaly
Abnormal umbilical cord Doppler study
Thrombocytopenia
Prior neonatal birth trauma

HIV = human immunodeficiency virus; HSV = herpes simplex virus.

Figure 0.2: Some indications of caesarean delivery

A multi country study on caesarean section in the Democratic Republic of Congo, Brundi and Sierra Leone identified the most frequent indication as:; obstructed labour (39%), poor presentation (18%), previous caesarean section (14%), foetal distress (10%), uterine rupture (9%) and antepartum haemorrhage (8%) (Chu, 2012). In western Nigeria, Daniel and Singh (2016), found the regular signs among pregnant ladies going for crisis to be delayed or obstructed labour (25.7%) and preeclampsia/eclampsia

(10.7%), while the least signs were malpresentation and breach at term (1.5%) respectively. In the elective caesarean group, previous caesarean section delivery was identified as the commonest indication (39.8%), followed by breach presentation (17.6%), and with placenta praevia as the least (2.8%).

Assessing the signs for caesarean segment at the Chris Baragwana Academic Hospital in South Africa, Adam et al., (2018), did a cross-sectional examination to assess the rightness of the choices for caesarean segment. This involved two researchers with requisite obstetric postgraduate training. The study found that the common indications for caesarean section delivery to be foetal distress (49.7%) and dystocia 928.5%) respectively. The reviewers were in agreement with regard to the following indications: Multiple pregnancy, retained second twin, abnormal presentation, placenta praevia, severe intrauterine growth restriction, antepartum haemorrhage (APH) of an unknown origin, eclampsia and two previous caesarean section deliveries. They had absolute agreement of 73.85% and 90.24% when the indications were foetal distress, dystocia, second-stage caesarean section or previous caesarean section.

The findings above are consistent with a study conducted at the Korle Bu teaching hospital in Accra, Ghana. The aim of the Accra study was to identify the indications for caesarean sections and also to establish the characteristics of women undergoing caesarean section at the metropolis. Out of the 548 Caesarean sections covered; 70% were emergency caesarean sections and 30% were elective. And previous caesarean section (37.6%), foetal distress (9.1%) and foetal malpresentation were identified as the major indications for caesarean sections (Afrifa, 2017). Similarly, previous caesarean section, failure in progress, foetal distress, malpresentation, preeclampsia and eclampsia; antepartum haemorrhage, failed induction, bad obstetric history, previous

myomectomy, and maternal request were identified as the major indicators for caesarean section by (Zweigenthal, Daniels & Reagan 2017).

2.6 Demographic Factors Associated with Caesarean Section.

In investigating the variables related with caesarean section, the most significant segment pointer is maternal age. More seasoned ladies inside the ages of 30-34 record for higher level of the caesarean delivery at population level. Notwithstanding, ladies at 34 years old years or more will be more than threefold liable to go through caesarean segment contrasted with those under 20 years (Manyeh, Amu, Akpali, Williams & Gyapong, 2018). Quite differently, Kaur et al., (2013), conducted a case control study in the at Pujan Institute of Medical Sciences and found that majority of mothers who had caesarean section delivery falls in the age range of 21-30 years representing as high as 78.46% of the caesarean group.

Other important demographic factors are level of education, parity, occupation, marriage status, socio-economic status etc. Preceding birth interval, richer household and rural residence has also been positively related to caesarean section rates (Azene,Aragaw, & Birlie, 2019). Similar results emerged in the study of the characteristics of women contributing to the increase caesarean rate in India. It however, added that rural dwellers are more likely to have caesarean section than women from urban areas whiles rates of caesarean section increases with increasing level of education with as low as 5.85% being attributed to illiterate class (Jain, Shivkumar, & jain 2019). Kaur et al., (2013), additionally recognized that ladies with low financial status were more averse to have caesarean section while ladies with high financial status have high possibility of having birth through caesarean segment. There is altogether higher pace of elective caesarean segment among ladies with high financial status contrasted with ladies with low financial status (Afrifa et al., 2017).

Mia et al., (2019), uncovered high caesarean section rate of 26% with huge relationship with mother's biosocial attributes. Among others, the examination uncovered that caesarean delivery were higher among moms who had male child, trailed by moms with advanced education, lower gestational age, and living in families with great financial status contrasted with moms who conveyed a female child, lower training, higher gestational age and living with families with low financial standing.

What is not clear in the literature is whether when given the opportunity the women in the low economic status would decide to have caesarean delivery as against the vaginal delivery. As a result further studies will be required to answer this important demographic phenomenon. Interestingly, there is universal access to maternity care in Ghana's public health facilities so the current study will adequately demonstrate whether women with low socioeconomic status has natural affinity for spontaneous delivery or it is because of financial constrains that leaves them no choice. In Tanzania, Nilsen, (2014) showed the demographic factors with higher odds of caesarean section as follows: referral from different facility for delivery, age of mother above 25 and no or low level of education of the spouse, place of residence and ethnicity. After adjusting for age, Klemetti R, et al., (2010), found that women with higher education and higher household income has higher odds of caesarean section delivery in Eastern China.

The important predictors of caesarean sections among Bangladesh mothers include: education of women and their husband, residence type, employment status, wealth index, age at first birth, baby's weight and number of children (Hasan, Alam, & Hossain, 2019). Similar findings have been arrived at in Mozambique by Long, Kempas, Madede, Klemetti & Hemminki (2015). Rates of caesarean section delivery rises with increasing maternal age (Janoudi, et al., 2015). The research findings will

provide knowledge about main demographic characteristics of the caesarean delivery population in the selected health facilities.

2.7 Obstetric factors

2.7.1 Vaginal birth after caesarean section vs elective or emergency caesarean section.

According to The Royal College of Obstetrics and Gynaecologist (RCOG), vaginal birth after Caesareans section (VBACS) refers to the normal or vaginal delivery of a child by women who earlier delivered by caesarean section. Elective Repeat Caesarean section (ERCS) on the other hand refers to the choice of delivery by caesarean section following a prior caesarean section usually after a gestation period of 39 weeks (Gupta, Smith & Chondankar 2015).

Past caesarean section has consistently been identified as one of the most important indicators for caesarean section. This probably has its roots from the long-held view that said ‘’Once a Caesarean always a caesarean’’. Aaron (2018), explained that from 1916, when these words were spoken to the Association of Obstetricians and Gynecologists (AOG) in New York through the following 50 to 60 years, it profoundly reflected in the management of previous caesarean section delivery in the United States. Repeat caesarean section (CS) is the main contributor of high caesarean segment rate and is liable for one in each three caesarean segments completed (Sanjivani, 2014).

Trial of vaginal birth after caesarean section or Trial of Labour after Caesarean section (TOLAC) has a known risk of 0.5 to 1% of uterine rupture, with the right conditions TOLAC is an attractive option for patients and result in a successful outcome in a high proportion of cases. Also, women without prior vaginal birth, maternal height less than

160cm, diabetes or suspected foetal macrosomia are of an increased risk of TOLAC (Place, Kruit, Tekay, Heinonen, & Rahkonen, 2019).

Equally, the alternative repeat caesarean section is not risk free. Quite apart from the intrinsic risk that caesarean section delivery has over normal delivery, patients also have a high risk of uterine rupture prior to the onset of labour. By contrast, Seffah, & Adu-Bonsaffoh, (2014) explained that both VBAC and ERCS deliveries are associated with more complications than when the woman has not undergone any caesarean delivery before. Women trying normal delivery may succeed with vaginal delivery or end up in an emergency.

It is subsequently contended that Trial of vaginal delivery after caesarean section has a larger number of odds of entanglements than elective recurrent caesarean segment (ERCS). Caesarean segment deliver is likely for ladies with past caesarean segment contrasted and ladies without earlier caesarean delivery and furthermore connected with critical antagonistic or adverse birth result (Hong-Tao et al., 2018).

Vaginal birth after caesarean section (VBACS) is generally reasonable for larger part of ladies with a singleton pregnancy with cephalic introduction at 37 weeks development who have a solitary earlier lower fragment caesarean segment delivery, without or with a background marked by past vaginal birth (Gupta, Smith and Chondankar, 2015). It is in any case, not suggested for ladies with history of past uterine burst or old caesarean scar and among ladies who have other outright contraindications to vaginal deliver that apply regardless of the presence or nonappearance of a scar, thus the requirement for ERCS.

The Royal Australian and New Zealand College of Obstetrics and Gynaecologist introduced the accompanying as impacting determinants influencing the achievement of Vaginal Birth after Caesarean segment (Ranzcog, 2019):

Table 0.1: Factors affecting the success of vaginal birth after caesarean section

Favouring Success	Reducing Success
• Previous safe vaginal delivery. • Previous fruitful VBAC. • Spontaneous beginning of labour. • Not complicated pregnancy and without other danger factors	• Dystocia induced revious caesarean delivery • Labour Induction • Presence of foetal, placental or maternal conditions • Mother's BMI greater than 30kg/m2 • Macrosomia of 4kg or more • Older (advance) maternal age • Size of the mother (stature) • Previous caesarean section more than one. • Dangers associated with an increased risk of uterine rupture

Bangal et al., (2013), reported vaginal birth after previous caesarean section success of 85% with 15% emergency repeat caesarean section. It was observed in this study that women with previous vaginal delivery better chance (90%) of a successful vaginal birth than their counterparts who did not have a previous vaginal delivery (Bangal, Giri, Shinde & Gavhane, 2013). Frass and Al Harazi (2011), also concluded on a VBAC of 87.1% with indications for repeat caesarean section (12%) mainly attributed to intrapartum foetal distress.

In Sub-Saharan Africa, Boulvain et al., (1997), conducted a meta-analysis on trial of labour after previous caesarean section and found that it has a success rate of 67%. Successful or failed normal delivery in women are significantly associated with the following: maternal age, parity, number of ANC visits, gestational age at delivery, birth

weight, Apgar score at 1min and Apgar score at 5min (Seffah & Adu-Bonsaffoh., 2015). Elnahas (2018), presented VBAC success rate at 67.3% whiles ERCS were 32.7%. Achieving VBAC in this investigation were affected by; BMI within 25 to 30, previous successful vaginal delivery, and birth weight. Women with primary caesarean section at firth birth had lower success and indication for emergency caesarean section was mainly due to poor progress.

2.7.2 Malpresentation

Of all term deliveries malpresentation occurs up to about 4% and more common in earlier gestation (Baker & Kenny 2011). It is simply the presentation of the baby other than the typical cephalic presentation. Breech presented has been cited as the commonest malpresentation and presented when foetal longitudinal lie is oriented parallel to the long axis of the uterus and the buttocks are close to the cervix (Fischer, 2020).

Breech presentation has been categorized into three types: with most frequent breech been the frank breech, complete breech which is less common and the least common breech called the footling (Baker & Kenny 2011). Maternal predisposing factors for breach include; fibroid, congenital uterine abnormalities, and uterine surgery whereas, foeto-placental predisposing factors comprises multiple gestation, placenta praevia, prematurity, foetal neuromuscular condition, oligohydromnios, and polyhydromnios. Noli et al., (2019), also found previous caesarean section to be significantly associated with subsequent breech.

Breech presentation has been cited in many studies as one of the key indicators for caesarean sections. Singh, Hashimi & Swain (2018) reported breech presentation as one of the indications for caesarean section deliveries in a district level household survey.

Gardberg, Leonova & Laakkonen (2011), also concluded that malpresentation is an underlying factor for dystocia which often result in obstetric intervention and for that matter an increase caesarean section rate. However, Hehir, McHugh & Carrol (2015), share a contrary finding by demonstrating that a second twin breach can be delivered vaginally without an increased risk in maternal or neonatal morbidity or mortality.

In South Africa, Moodley, Khedun, & Devjee (2010), found 2.4% of breech indicated caesarean sections. Similarly the proportion of term breach singleton deliveries by caesarean section rose in 2007 increasing from 81% in 1998 to 96% in 2007 (Laws, 2009) and (Nassar N, 2001).

2.7.3 Dystocia

Dystocia is an obstetric complication of a normal vaginal delivery during which the shoulder of the foetus is not delivered after the head has emerged from the mother's introitus (Allen, 2016).

Dystocia is ensued when the head of the foetus recoils against the perineum, spontaneous restitution does not occur and failure of delivery with expulsive effort and usual manoeuvre (ALARM International , 2006). It is detected when the rate of cervical dilatation in the active phase of labour is relaxed below the mean, median or slowest 10^{th} centile depending on the unit (Penn, & Ghaem-Maghami, 2001).

Women with previously indicated dystocia has the tendency of a recurrent dystocia and subsequent delivery by caesarean section (Sandström, Cnattingius, Wiskstrom, & Stephansson, 2012). Despite the above stated, Place et al., (2019), indicated that women with prior dystocia has a feasible option of trial of labour after caesarean section (TOLAC). Djurić, et al., (2012), described dystocia as a major contributor to caesarean section deliveries and also showed that dystocia induced caesarean section

deliveries resulted in longer delivery time compared to others deliveries that were not occasioned by dystocia. In order of frequency, Poole (2005), identified dystocia to be the highest contributor to caesarean section delivery. Dystocia is not a complete indicator for delivery by caesarean section. It is however present in about 40% to 50% of caesarean section deliveries (Tita, 2012). As a result, there is a need for proper attention to be focused on the probable impact of dystocia in order to reduce the rates of caesarean section deliveries.

2.8 Foetal factors

2.8.1 Macrosomia (big baby)

When a baby is born with excessive weight at the time of delivery, it is referred to as foetal macrosomia. It is a condition that can physicians cannot confidently diagnose before the child is delivered. It is ascertained by taking a measure of the after delivery of the neonate making the confirmation of the condition retrospective (Baur, 2017). Macrosomia has also been defined in many ways including the weight of a baby at birth greater than 4000 to 4500g or above 90% of gestational age (ACOG, 2016). The problem that usually creates anxiety among obstetricians and midwives are having to endure and manage maternal concerns about the size of the foetus.

Maternal worry about foetal size is a typical issue that regularly induces nervousness among obstetricians and birthing specialists (Baker, 2011). As per Baker, notwithstanding the accessible proof proposing that there is increment in birth weights in developed countries, the sum (30 g more than 12 years) is probably going to have no natural significance. Lamentably, both clinical and ultrasonography assessments of foetal size are inclined to mistake (particularly in large term new born children), and superfluous inductions of labour and Caesarean delivery are proceeded as an outcome (Baker, 2011).

Dr. Terrie Inder, a neonatologist at Brigham and Women's Hospital in Boston has been accounted for by Thielking (2015), to have said that "With no proof at all to recommend constant foetal checking improves results, it has gotten a norm of care," And when there's a blip in the perusing or if a child's pulse goes up or down that can trigger a C-segment, regardless of whether it's not satisfactory the infant is really in trouble. In a similar report, Kozhimannil said certain strategies at the ward level aren't constantly supported by science. That mothers often deliver via caesarean sections for carrying babies deemed too big to be delivered vaginally, meanwhile there is simple test to ascertain the size of a baby so that's often a guessing game.

According to the American college of obstetrics and gynaecologist (ACOG, 2016), birth weight increases with increasing chance of labour abnormalities, birth trauma, dystocia and permanent damage to the neonate. Kim et al., (2014), reported that foetal macrosomia is associated with overweight, gestational weight gains and gestational diabetes mellitus. However, gestational weight gain has the potential to reduce the risk of foetal macrosomia. Mohammadbeigi, et al., (2013), also identified pregnancy induced diabetes, previous foetal macrosomic at birth as predictors of macrosomia. In a prospective comparative cohort study of singleton deliveries in Canada and France, Fuchs, et al., (2017), indicated that maternal obesity has an impact on macrosomia often resulting in caesarean section delivery.

The primary risk associated with foetal macrosomia is elevated risk of caesarean section delivery (ACOG, 2016). Modanlou (1980), established that, for women attempting vaginal birth, birth weight higher than 4500g has a doubling risk of caesarean section delivery. In examining physician documented indications for caesarean sections deliveries, Barber et al, (2011), found that suspected foetal macrosomia contributed 10% of the total caesarean section delivery rates.

2.8.2 Intrauterine growth restriction (IUGR)

Intrauterine growth retardation is a pathological condition that is present in 3 to 10% of all pregnancies and is attributed to 20-255 of all foetal intrauterine deaths and accompanied with long term neurologic problems. It increases the risk of distress at term and greater risk of perinatal mortality (FM, et al., 2000).

The following has been identified as the causes or risk factors for IUGR ; chronic hypertension, pregnancy induced hypertension, cyanotic heart disease, class higher diabetes, hemoglobinopathies, autoimmune disease, protein-calorie malnutrition, smoking, substance abuse, uterine malformations, thrombophilia, prolonged high-altitude exposure. Other placental or umbilical cord causes of IUGR include: twin-to-twin transfusion syndrome, placental abnormalities, chronic abruption, placenta praevia, abnormal cord insertion, cord anomalies, multiple gestations (Ross, 2020).

Inherent in the aforementioned causes IUGR are also other indication for caesarean section such as placenta praevia, cord abnormalities and multiple gestation making IUGR an obvious factor for caesarean section. Perrotin, Simon, Potin, & Laffon , (2013) argues that even though elective caesarean section is most common with IUGR, there is no evidence supporting systematic use of caesarean section delivery, especially when the woman is in labour.

2.8.3 Multiple gestation

According to Cunningham (2014), twin foetuses occur as a result of fertilization of two separate ova and less often arise from a single fertilized ovum that divides. Epidemiologically, incidence of twin gestations varies from country to country due to regional variations in dizygotic twin rates. Monozygotic twinning rates are fairly common across nations (Heard, 2020). As high as 49 per 1000 twin birth rate has been

reported in Nigeria by Nylander, (2020), whiles japan the rate of twin delivery is 1.3 per 1000 births (Soma et al). Nylander, (2020) also found that twining rates varies with increasing maternal age and constant with parity. In Australia, there was an increasing rate of multiple birth in 2007 (Laws, 2009).

Beside preterm labour, there are several complications that are likely to occur with twin gestation. Among others, twin gestation is associated with increased incidence of uterine contractile dysfunction, umbilical cord prolapse, abnormal foetal presentation, placenta praevia, placental abruption, emergency operative delivery and postpartum haemorrhage (Cunningham, 2014). As discuss earlier, some of these complications are independently presented as indication for caesarean section even among singleton pregnancies (Cunningham, et al., 2014). In 2007, two third of all twin births were by caesarean section in Australia (Laws, 2009).

2.9 Feto- placental factors

2.9.1 Placenta praevia

Placenta previa is an obstetric entanglement which is introduced as an effortless vaginal seeping (bleeding) in the third trimester of the pregnancy which is secondary to bizarre placentation close with covering of the inside cervical OS. Placenta praevia is inherently characterised with risk of haemorrhage, and may result in serious morbidity or mortality whether maternal or foetal or both (Almnabri, Al Ansari & Abdulmane, 2017). It is a form of bleeding, provoked or spontaneous, presumably because of the placenta covering or encroaching on the cervical OS (Baker, 2011).

Figure 1. Normal Placenta vs Placenta Previa.

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Figure 0.3: Normal Placenta vs Placenta Praevia

Source: William's Obstetric.

Oyelese & Smulian (2006), mentioned four Placenta praevia categories as follows:

1. Complete placenta Praevia, which implies that the placenta will cover the internal OS completely.
2. Partial placenta praevia, where the internal os is partially covered by the placenta.
3. The third type is marginal placenta praevia which refers to stretching of the internal os but does not cover it.
4. And low laying placenta, where there is an extension for the lower uterine segment without necessarily reaching the internal os.

2.9.1.1Types of placenta praevia

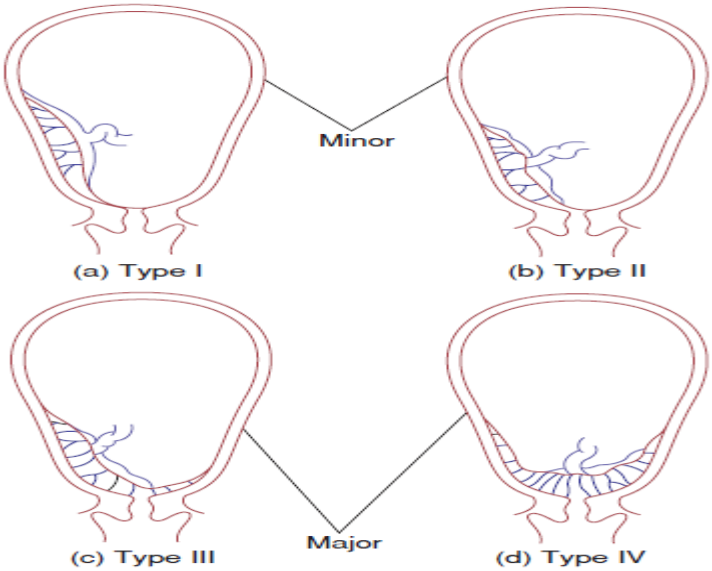

Figure 8.10 Classification of placental praevia

Figure 0.4: Types of placenta praevia

The Aetiology of placenta praevia is not exactly known. However, there are certain risk factors that has been suggested to be related to the condition. These are; advance maternal age(above 35years), infertility treatment, Multiparity, multiple gestation, short inter pregnancy interval, previous uterine surgery, previous caesarean delivery (including the first subsequent pregnancy following a caesarean section delivery), previous abortion, previous placenta previa, Non-white ethnicity, low socioeconomic status, smoking, and cocaine use (Oyelese, et al., 2006; Nykiforuk, 1938). In a case control study in Southern Nigeria, Eniola et al, came out with similar risk factors as previous caesarean section, previous abortion, grand multiparity, age above 35 and history of retained placenta (Eniola, Bako, & Selo-Ojeme, 2002).

2.9.1.2 Epidemiology

The prevalence of placenta praevia is 5 per 1000 pregnancies with regional variations. Asia appear to have higher prevalence and regions with lowest prevalence include;

Europe, North America and Africa (Cresswell, Ronsmans, Calvert & Filippi, 2013). The frequency of placenta previa is estimated at 0.5% in the United States (Bakker, 2018). A population base cohort study indicated the incidence of placenta previa at 2.8 per 1000 live births in the US between 1989 to 1997 (Annanth, Smulian & Vintzileos, 2003). Incidence of placenta praevia in patients with caesarean section deliveries is higher than in patients with vaginal spontaneous deliveries (Swetha, 2016; Parvin, et al., 2017). Prior pre-labour caesarean section is associated with subsequent praevia relative to prior vaginal delivery (Downes, et al., 2016).

It has also been shown in a systematic review that increasing numbers of caesarean delivery has a replica effect on the rate of placenta praevia, with a rate 1% after 1 caesarean delivery, 2.8% after Caesarean delivery and as high as 3.7% after 5 caesarean deliveries (Marshall, R, & Guise, 2011). The chance of occurrence of placenta praevia is in a dose-response relationship with number of previous caesarean section deliveries, and parity with risk of praevia increasing from 4.5 to 44.9 in women with one previous caesarean section and women with four previous caesarean sections respectively (Oyelese & Smulian, 2006). In a study of the association between caesarean section and placenta praevia, Mohamed & Ali, 2016 reported that there is significant association of placenta praevia among women with prior caesarean section (with a $P<0.000$).

2.9.2 Abruptio placenta

It can be defined as the immature disjoint of the placenta and the uterus. Patience with abruptio placenta, characteristically present with bleeding, uterine contractions, and foetal distress (Deering, 2018). It is significantly associated with third-trimester bleeding with a resulting foetal and maternal morbidity and mortality (Deering, 2018).

Maternal hypertension, advance age, trauma, membrane rupture, preeclampsia, major multiparity etc are among some of the risk factors for placenta abruption (Gaufberg, 2015; Boisramé et al., 2014). Deering (2018), also added that pregnant women who aged bellow

20 years have high risk of placental abruption. Abruption placenta has been linked as a risk factor bleeding during or after caesarean section delivery (Buchmann, 2017).

Premature delivery of the foetus is necessitated in cases of severe abruption or where significant foetal or maternal distress occurs even in situations of profound prematurity (Deering, 2018; Ugwu, 2015). Caesarean section intervention is often required if patient is not near term or if significant foetal compromise is presented.

T Boisramé, et al., (2014) reported a caesarean section delivery rate of 90.3% among patients with placental abruption. Tikkanen, et al., (2006) also found preterm birth of 57% and caesarean delivery rate of 91% among women with abruption placenta. Gul, (2016) reported an increased risk for caesarean section delivery in patients whose pregnancies have been complicated by abruptio placenta.

2.10 Factors that may contribute to an increase in the rates of Caesarean section

Several reasons have been suggested for the observed increase in caesarean birth. Beside advance maternal age, breech, especially with first birth, breech presentation, suspected birth weight, private hospital status and maternal BMI (Dodd, et al., 2011). Organizational factors, women's choices towards childbirth and preferences for health care are other contributory factors influencing caesarean section rate (Thomas, 2001). Baker, (2011) has also identified the following as factors that can that impact on the rise in caesarean section delivery rates as inaccurate dating of the pregnancy, Foetal monitoring, Macrosomia, Maternal request etc

2.10.1 Inaccurate dating of the pregnancy

Practitioners often use data obtained from a carefully taken history combined with that form dating from an ultrasound scan, most importantly when the date of the last menstrual period is unattainable. The use of the ultrasound increases precision in pregnancy dating and thereby reduces the anxiety experienced by women when their pregnancy passes the expected date of birth and hence reducing maternal requests for early induction of labour.

An opportunity for accurate dating of pregnancy may be missed in facilities where ultrasound is not used to scan for date of pregnancy before 20 weeks of gestation. This may be especially beneficial to facilities that have a policy of offering labour by induction to women who are of or above 41 years of gestation.

2.10.2 Foetal monitoring

Following its inception in the 1970s, without proper trials, the electronic foetal monitoring (EFM) was universally implemented. This lead to a rise in the rates of caesarean sections without a corresponding improvement in perinatal outcome (Baker, 2011).

McCusker, Harris, & Hosmer, (1988) used multiple regression model to analyse the association between electro foetal monitoring and caesarean section and indicated that was an interaction between some independent variables such as placenta praevia and transverse lie or inadequate pelvis; and EFM. They reported that caesarean sections were very high in pregnancies which were complicated by transverse lie, inadequate pelvis or placenta previa.

Thy however, added that, the odds ratio associated with these complications was significantly reduced with the use of electronic foetal monitoring. It concluded that

EFM was positively associated with increased caesarean section rate only in pregnancies without the aforementioned complications. It has also been argued that increasing intervention in pregnancy and childbirth such as monitoring intrapartum foetal heart rate and induction of labour may impact significantly on the increasing caesarean section rates. Alfirevic, Devane, & Gyte (2006) studied the use of cardiotocograph in labour and subsequent birth outcome and found that there was no reduction in perinatal death or cerebral palsy, meanwhile the was an increased risk of women giving birth by caesarean section and instrumental birth.

2.11 Elective caesarean section and emergency caesarean section

Normally, caesarean operations has been a preserve for use in conditions guided by standard clinical signs. In any case, mother's inclination for elective cs where there is no convincing clinical sign is turning out to be very regular. There is divergent outcomes in studies exploring the effect of maternal request and caesarean section rate (Baker, 2011).

Elective caesarean section has been one of the main factors responsible for the global rise in caesarean section delivery rate across regions, countries and even at the facility level. Fifteen percent (15.0%) of all deliveries in Germany were by caesarean section in 1991; and by 2012 a corresponding figure 31.7% was recorded with as low as 10% of all cases occurring for medical reasons (Mylonas, & Friese, 2015).

Elective caesarean is relatively profound in the developed nations and mostly for non-medical reasons. Between 2000 and 2009 the elective caesarean section rate for singleton women stood at145,492 corresponding to 33% of all elective caesarean deli veries in England with 18% of women delivering at a gestation age of 34 weeks (Gurol-urganci et al., 2011). In china for instance, Lei, & Walker (2003), a prospective cohort

study found elective caesarean section rate of 7.5% and indicated that about 18% were as a result of non-medical reasons with pregnant women's social demands, personal and insurance status accounting for greater proportions of elective caesarean deliveries in a remote population. In mainland china, caesarean delivery was largely influenced by maternal request (Liu et al., 2014). Some women have preference for caesarean section delivery for the fear of vaginal birth, luck of social support and impaired mental health (Størksen, Garthus-niegel, Adams & Vangen, 2015).

Some choose caesarean section because their friends advise them too, others do because they think it is a safe option for them and their baby (Konlan, Baku, Japiong, Konlan, & Amoah, 2019). In Kampala, Uganda, Nakimuli, et al., (2015), conducted a prospective cohort study on women admitted for elective caesarean section delivery and showed that it contributed to 15.0% of 22.0% of all caesarean sections, obviously playing a big role in the rise of caesarean section delivery rate.

To go through labour and have normal vaginal delivery can be a stretching process that is physically demanding for the mother in most cases (Aggrey, 2020). A reason some women would possibly choose caesarean section despite the relative risk that comes with caesarean delivery. The increase in primary caesarean section is suspected to be a result of an increase in maternal demand for elective caesarean section herein described as the elective caesarean delivery (Natcher, 2006). As earlier discussed, providers and expectant mothers may find convenience in conducting a repeat caesarean section with previous caesarean section as the sole indication.

2.12 Indications for elective CS

Prior caesarean section is a major indication for elective caesarean section (Nakimuli, et L 2015). Stjernholm, et al., (2010) reported a shift in elective caesarean section

indication between 1992 and 2005. The major indication for elective caesarean section in 1992 2were pathological foetal lie or a uterine factor. By 2005 fear of labour also described as psychological indication or maternal request with a co-medical indication became the most frequent indication for elective caesarean delivery rates. In another study, Agbozo, et al., identified in descending order, previous caesarean section delivery, malpresentation, cephalopelvic disproportion, chronic hypertension, macrosomia, post-date and placenta previa as the indications for elective caesarean sections (Agbozo, Abubakari, & Jahn, 2019).

There is substantial benefit in delaying elective caesarean section up to 39 weeks gestation period (Gurol-urganci, 2011). Despite the 39 weeks recommended gestation period before an elective caesarean section is considered, about 35.8% of repeat caesarean sections had been performed electively and below the recommended gestation period specified (Landon, Caritis, Hospital, Wapner, & Miodovnik, 2009). It further reported that adverse birth outcomes such as respiratory outcomes, mechanical ventilation, new-born sepsis, hypoglycaemia, admission to the neonatal ICU and prolonged hospitalization. Zanardo, et al., (2004) affirms that infants delivered via elective caesarean section are at risk of developing respiratory disorders compared to infants born through vaginal delivery. They also have an increased risk of emotional problems (Huang, Yan, Wu, Zhu, & Tao, 2019). Contrary to Landon, et al., (2009) conclusions above, Pirjani, et al., (2018), found no significant difference in the incidence of sepsis between delivery at 38-39 weeks gestation and after 39. It is there acceptable base on the two findings that sepsis is likely to occur in babies born through caesarean section intervention irrespective of the gestational age (below or above the 39 weeks gestation period). However, they do have agreement on neonatal intensive care unit (NICU) admission. Babies born via vaginal delivery are at low risk of reparatory

distress syndrome, most importantly because they go through a process during vaginal birth that prepares their lugs filled it with fluid in the womb and enables them to breathe oxygen after delivery. In a sharp contrast, caesarean section delivered babies have an elevated risk of respiratory problems with extra fluid in the lungs at birth because they do not have chance to go through same process as the former (Aggrey, 2020).

Despite the apparent risk associated with elective caesarean section delivery as stated above, Elective caesarean section usually after 39 weeks gestation is a recommended obstetric intervention when vaginal delivery is deemed not safe (NHS, 2020). Elective caesarean section may be appropriate to avoid mother to child transmission of infectious diseases. Yang et al., (2008), reported the effectiveness of elective caesarean section in curtailing mother-child transmission of Hepatatis B. It is also important noting that elective caesarean birth could be hugely beneficial in other circumstance such as breech. When breech is detected in advance through foetal monitoring, its complications could be minimised. For example, in South Africa, Moodley et al, (2002) reported that unplanned spontaneous vaginal delivery was significantly attributable to perinatal mortality while there was no neonatal mortality associated with planned or elective caesarean section delivery. In developing countries elective caesarean section is associated with better perinatal outcome compared to induced vaginal delivery or emergency caesarean section from failed induction of labour before term (Moodley C. D., 2002).

The quantity of ladies who deliver through caesarean section in Ghana is growing consistently over the period of 15 years with one of every five live birth being delivered through caesarean birth. In a retrospective study of caesarean section in a primary health care facility in Ghana, Zweigenthal, et al., (2017) reported caesarean section rate

of 26.9%. However, the 12% elective caesarean section rate is unacceptable. The increasing acceptance and preference for elective caesarean section should be evaluated by women should be evaluated with their physicians while considering the intraoperative and postoperative risk of caesarean along with its attendant complications and the potential effect on subsequent pregnancies. It has been established from the literature that women with previous caesarean section can achieve a successful trial of labour after caesarean section, especially with women who had previous caesarean section from a low transverse uterine incision, with adequate pelvis and carrying an average size foetus.

2.13 Emergency CS

It's a long-held view that Ghanaian women prefer vaginal birth than caesarean section birth. Danso et al., (2009), examined this view in two teaching hospitals; Korle-Bu and Konfo Anorkye teaching hospital and found that about 55% of Ghanaian women preferred vaginal delivery that caesarean section. Nonetheless, they generally have good opinion about caesarean section delivery despite their stated preference for vaginal delivery (Danso, et al., 2009).

Adageba et al., (2008) also observed that more than 90% Ghanaian women attending antenatal clinic would prefer vaginal delivery over elective caesarean section (Adageba, Danso, Adusu-Donkor, & Ankobea-Kokroe, 2008).

Emergency caesarean sections are often emerged from failure at initial attempt at vaginal delivery and subsequent referral for caesarean section delivery. This phenomenon by itself come with added risk to caesarean section delivery. Compared to elective caesarean section delivery, emergency caesarean section is more associated with adverse maternal outcome (Suja et al., 2014). With a significantly higher rate of

adverse foetal outcome associated with emergency caesarean section deliveries (Zweigenthal, Daniels & Reagon, 2017). The indication for emergency caesarean section according to Agbozo et al., (2019), are foetal distress, prolonged or obstructed labour, severe preeclampsia and failed induction.

2.14 Robson classification

There is a long standing challenge of defining the optimal caesarean section rate at any level due to the lack of internationally acceptable classification system to produce standardized information to enable the comparison of caesarean section data across populations and providing mechanism to investigate the increasing trend (WHO, 2015). Dra Michael Robson proposed a system of classification known as the Robson classification (also referred to as the 10-group classification) which has become widely used in many countries (Robson, 2001). The Robson classification system stratifies women in accordance with their obstetric characteristics, which allows for a comparison to be made on caesarean section rates with fewer confounding factors (WHO, 2015). Information used in the characterization is obtained from obstetric history, gestation and course of parturition. The variables involved are routinely collected health records in patient folder such as previous caesarean section, parity, gestational age, labour onset, number of foetuses (single or multiple gestation), and foetal presentation (Triep, 2019). In 2014, the convened a panel whose outcome proposes that the Robson classification system be used as the global standard to assess, monitor, and compare caesarean section rates within health care facilities over time and between facilities (WHO, 2017). It emphasized that this system of classification is simple, robust, reproducible, clinically relevant and prospective. And allows for comparison and analysis of caesarean section rates among and across these groups of

women. It has gained wide acceptance in many countries including but not limited the United Kingdom, Ireland, Scandinavia, Canada and among others (Vogel, et al., 2015).

1. Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation in spontaneous labour
2. Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation who either had labour induced or were delivered by caesarean section before labour
3. Multiparous women, without a previous uterine scar, with a single cephalic pregnancy at greater than or equal 37 weeks in spontaneous labour
4. Multiparous women, without a previous uterine scar, with a single cephalic pregnancy at greater than or equal to 37 weeks gestation who either had labour induced or were delivered by caesarean section
5. All multiparous women, with at least one previous uterine scar and a single cephalic pregnancy at greater than or equal to 37 weeks gestation
6. All nulliparous women with a single breech pregnancy
7. All multiparous women with a single breech pregnancy including, women with previous uterine scars
8. All women with multiple pregnancies, including women with previous uterine scars
9. All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars
10. All women with a single cephalic pregnancy at less than or equal to 36 weeks gestation, including women with previous scars

Figure 0.5:Robson 10 Classification of caesarean section. Robson et al

Source: (Triep, 2019)

WHO, (2015) found an increased rates caesarean section delivery across Robson groups in all Human Development Index (HDI). Using the Robson classification system, Senanayake, et al., (2019) revealed that, Robson group 3 and group 1 were the most represented in the study (representing 27% and 23.1% respectively). However, groups 5 (29%), 1 (14%), 2 (13.3%) and 10 (11.5%) were the major contributors to caesarean section rates. This finding is almost similar to Kazmi, et al., (2012) who reported higher caesarean section rate among 5, whilst group 2 maintains the second highest contributor to caesarean section deliveries.

In order of contribution to the overall caesarean section rates, Begum, et al., (2019) also affirms that group 5 contributed higher with 24%, followed by group 10 and 4 which contributed 23% and 12% respectively. While Senanayake et al., (2019) and Begum et al., (2019) have both found group 10 to be in the first three groups that contribute to the overal increase in caesarean section rates, Kazmi et al., (2012) rather found group 2 to be the third most influencing factor.

2.15 Co Morbidities

Certain pathological conditions have been suspected to have influence over the continues rise in caesarean sections. Whiles some of these conditions such as abruptio placenta, preeclampsia, placenta praevia have been adequately discussed in the current review, it is imperative to acknowledge other significant pregnancy related conditions such as hypertension, severe anaemia, diabetes, renal diseases and other infections such Hepatitis B and HIV which may independently be a cause for caesarean section delivery (Sun et al., 2014).

Pregnancy induced hypertension and preeclampsia are essential hypertensive disorders during pregnancy and child birth which impact on maternal morbidity and mortality and thereby necessitating caesarean delivery to avert any complications (Koopmans et al., 2007). Among other indications, McIlwaine et al., cited hypertensive disorders as one of the contributing factors to caesarean section delivery rats (McIlwaine Cole & Macnaughton, 1985).

2.16 Methodology

Various study methodologies have been used in the study of caesarean section delivery rates Acrros the world. In Benin for instance Mongbo et al., (2016) used a cross sectional study design among 12 administrative districts in the country to decribe the

quality of caesarean section deliveries. In Mozanbique, Long et al., (2015) invsetigated changes caesarean section delivery rates by area using demographic and health survey spaning between 1995 and 2011. A stronger methodoloy, prospective cohort study capble of establishing causality was used by Nakimuli et al., (2015) at Mugalo hospital in Uganda. Zanardo, et al., (2004) used a retrospective study to investigate respiratory mobidity and and type of delivery at term.

CHAPTER THREE

METHODOLOGY

3.1 Study Design

The research was led utilizing a quantitative descriptive cross-sectional design to investigate the signs and results of caesarean section delivery among ladies who deliver at the sampled health care facilities in the northern region of Ghana. This was a survey method where data were collected from mothers using structured questionnaires and review of medical officers' archived reasons for every caesarean section and birth outcome were obtained from the patient folder. Obstetric data was likewise guided by the Robson Ten Group Classification System which is suggested by the World Health Organization for the appraisal and review of CS rates inside and among facilities and at the population level. This study design was necessary because both exposure (indication/determinants) and disease outcome (herein referred to as caesarean section) can effectively be obtained at a point in time and thereby provide a perfect preview of the CS situation of the population and at a certain point in time. Quantitative information assortment took into consideration information to be broken down for measurable analysis of relationship among variables of interest.

3.2 Study Location

The study was conducted in three major hospitals, located in the northern region of Ghana. The selection of these three health facilities was arrived because of the lack of resources and time to cover the many health facilities in the northern region. It is instructive to note, however, that these three health facilities represent all levels of the health care market (from tertiary to primary and urban to rural) and play a significant part in the health care delivery in the northern region. The specific health facilities are

the Tamale Teaching Hospital (TTH), Tamale Central Hospital (TCH) and the Savelugu Municipal Hospital (SMH).

3.2.1 Profile of Tamale

Tamale is geographically located at the latitude 9˚ 23'N and longitude 0˚ 50'W. It is the administrative headquarters of the Northern Region of Ghana. The city shares boundaries with the Sagnarigu municipality in the north; central Gonja District at the south; Tolon District from the west and to the east by Mion District (Fuseini, Yaro & Yiran. 2017). The number of inhabitants in the Tamale enclave is 371,351, with 185,995 males and 185,356 females (GSS, 2010 PHC). It is located within latitude 9◦ 16'N and 9◦ 34'N and longitudes 0◦34'W and 0◦57'W.

3.2.2 Profile of the Tamale Teaching Hospital (TTH)

The TTH was earlier commissioned as a regional hospital on 2nd February, 1974. The mandate of the facility is set by Act 525 of the Ghana Health Service and Teaching Hospitals Act of 1996. The order of the office is set by Act 525 of the Ghana Health Service and Teaching Hospitals Act of 1996. The specifications enable the hospital to work in three basic regions of medical care. In particular, the arrangement of cutting-edge clinical health services, supporting the training of students and postgraduates in clinical sciences and lastly, carrying out scientific investigations into medical problems to improve medical services (Ministry of Health, 2020).

TTH can be located in the eastern part of the Tamale Metropolis along with the Tamale- Salaga Street with a total land area of approximately 0.12 km2. Its catchment population is approximately 2.1 million. Whereas there is continuing rehabilitation, the hospital has a total bed capacity of 600 at present (ADK Consortium, 2029).

It is a reference medical facility for the five northern regions of Ghana. It works together with the University for Development Studies' School of medication and Allied

Health Sciences in Tamale to offer undergraduate and graduate programs in core programmes such as Medicine, Biomedical Laboratory Science, Pharmacy, Nursing and Nutrition. Beside the Korle Bu Teaching Hospital and the Komfo Anokye Teaching Hospital, it is the third teaching hospital in Ghana. It makes essential health care services available to the people of Tamale and serves as a reference hospital for the five (5) Northern regions of Ghana, namely, the Northern, North-East, Savanna, Upper East, Upper West regions and some parts of the Brong Ahafo Region.

3.2.3 Profile of Savelugu Municipal Hospital

Secondary data from the information department of the hospital has it that the Savelugu Municipal Hospital until 2003 operated as a Health Centre/Poly Clinic with minimal facilities. It currently serves as the referral hospital for all clinical cases in the Savelugu/Nanton Municipality and other adjoining districts including Tolon/Kumbungu, Gusheigu and Karaga with a bed capacity of 93 as at June, 2017.

The hospital provides both outpatient and inpatient services including, Maternal and Child Health, Family Planning, Laboratory, Surgical, Pharmaceutical, ART Services, Ultrasound Scanning, 24-hour Ambulances Service, Neonatal Intensive Care, Health Education, Comprehensive Abortion Care and Eye Care Services. The mission of the facility is to provide preventive, curative and emergency health care delivery and services in a manner acceptable by national standards and providing medical and allied health and clinical training to support the development of health professionals. And envisaged to become a Centre of medical choice with state-of-the-art infrastructure and equipment poised to provide both comprehensive, primary and secondary level health services and medical and allied health training.

3.3 Study Population

The target population comprises women of reproductive age with deliveries at the selected hospitals. Namely, the Tamale Teaching Hospital, Tamale Central Hospital and Savelugu Municipal Hospital which all offer obstetric services. That is, the study population will include only women who delivered by caesarean section, be it emergency or elective at the aforementioned health facilities within the study period.

3.4 Sample Size Determination

Epi info Version 7 was used to calculate the sample size for this study. Population survey or descriptive study for a simple random sampling option was preferred for the sample size calculation since that design was basically a descriptive study. The Epi info software is an efficient research tool used for the calculation of effect sample size for all types of study designs. It is also effective at data collection and analysis. However, in the present study, Epi info was only used to calculate the sample size. The study was conducted from 1st to 30th March, 2020. To ensure that a representative sample is obtained for the study, we took the northern region live births for 2019, calculated the average to make the population size for each month. Caesarean section delivery rates are set at 10% to 15% maximum. So the expected frequency for this calculation was set at 15%. The confidence level was set at 95% with a 5% acceptable margin of error.

The figures are presented below;

Total live births for 2019 = 60072

Monthly average for the region = 60072 ÷ 12 = 5006

Population size = 5006

Total sample (N) = 189.

A sample size of one hundred eighty-nine was therefore planned for the research.

Sampling Technique

Hospitals were classified and selected based on tertiary, urban and rural primary health care facilities with obstetric services. The Tamale teaching hospital (TTH) was selected using purposive sampling and a simple convenient sampling method was used to select Tamale Central and the Savelugu Municipal Hospitals (SMH) respectively. Convenient sampling was preferred for the facilities because randomization may include facilities that are too far and expensive to effectively conduct the research within the time allowed.

3.5 Data Collection

All women who delivered via caesarean section from 1st to 30th March, 2020 at the selected hospitals were identified from the labour ward and the operating theatre and included in the study. The number (170) of participants obtained by 30th March, 2020 was eventually used for the purpose of analysis.

Data on demographic factors were obtained from participants with the help of a standard questionnaire while information on obstetric indications for CS is retrieved from medical officers documented records involved the retrieval of patient folders at participating hospitals. This data gathering process was done via a patient folder analysis sheet. The selection of CS cases was based on incidence. Thus, the selection of participants was dependent on the number of new deliveries that the data collection officer meets at the facility. Data collection was focused on identifying all signs and risk factors as well as socio-demographic variables, obstetric history, antenatal care, delivery type, adverse birth outcome, birth weight, birth injuries and complication. Hospital staff such as midwives and nurses who had direct care for patients were always involved to help in the timely selection of the participants for the field officer for onward collection of data. Two days training was conducted to prepare all the study

team (field enumerators) and a one-day pilot study was undertaken at the Tamale Polytechnic clinic to test the validity of the test instrument.

Women who deliver via caesarean section were put into 10 groups in tandem with Robson's classification, using maternal characteristics and obstetrical history. For each group, the number of caesarean sections were documented and how these group of women contribute to the overall caesarean rate.

3.6 Data Analysis

There are several research tools, software and theories used in the analysis and interpretation of research data. In this study data were transported from Kobocollect into Microsoft Excel processing and cleansing for efficient use. Processed data file was uploaded from excel into Statistical Package for Social Sciences (SPSS IBM 20) software for final analysis. Descriptive statistics were performed and are presented in tables and graphs depending on the suitability of the variables. Reviewing both parametric and non-parametric models for statistical analysis and inferences, the researcher used proven statistical methods to test for association between dependent and independent variables. Specifically, suitable statistical test such as Chi-square, and Fishers exact test which are proven non parametric models were used to test for independence between categorical independent and dependent variables. Chi square preferred for categorical variables and where the conditions are not met Fishers exact test was used as it is less sensitive to extreme low values. Whilst parametric test for independence, independent sample t-test was applied for continuous variables to compare the mean differences between these variables (continuous variables) and categorical dependent variables (type of caesarean section operation). These analyses were important to establish variable which are significant and those which are insignificantly associated with the outcome variable (type of operation). As these

statistical analyses are good at establishing association between the independent and the dependent variable, it lacks the potency to establish the degree or level of association between the predictor and the predicted variables. As a result, significant independent variables from the chi-square, the fisher's exact and the independent sample t-test were selected for a further analysis in a logistic regression. Logistic regression is capable of establishing the association between the independent variable and a categorical dependent variable. Beyond these associations, the logistic regression is also capable of explaining the relationship between the independent variables and the outcome variable. Binary logistic regression analysis was purposively chosen for this analysis as our outcome variable, type of caesarean section operation was both categorical and dichotomous. Odds ratios were calculated and confidence level was set at 95% with 5% margin of error and a P-value less than or equal to 0.05.

Michael Grossman's model for demand for health was modified and used to model the demographic data collection. The key constructs in the Grossman's model are age, education, health status, income and price of medical care. For the purpose of this model study, price of medical cost was not relevant as delivery in Ghana is free for all as a result cost differential may not be necessary. Income was also replaced with the employment status of the mother and husband. Our demographic model constructs are age, education, parity, employment status of the mother and husband, place of residence, and travel time.

3.7 Ethical Clearance

Before the commencement of this study a letter of introduction was obtain from the department of community health and family medicine, School of Allied health – University for Development Studies. Permission was granted by the research department of the Tamale Teaching Hospital, same was granted by the Northern

Regional health Directorate and the respective health facilities to carry out the study. The data from participants were treated as private records and access was allowed for the sole purpose of the research. It was handled with utmost confidentiality and protected from the reach of persons who do not have a role in the study.

3.7.1 Inclusion Criteria:

Participants were selected when they had undergone caesarean section delivery. Women who delivered at the selected hospitals by Caesarean section from 1st to 30th March, 2020 were included if they deliver at the selected hospitals.

3.7.2 Exclusion Criteria*:*

Participants with deficient maternity case records or missing data on key factors were barred. Patients who were discharged were not considered for the study. Data on maternal or perinatal adverse outcomes experienced after patients' release or readmission from hospital following the caesarean section were not likewise considered for participation in the study.

3.7.3 Pilot Study:

A pilot study was led to test the accessible information in the patients' case documents, the suitability of the information assortment device for getting the data required and to estimate the extent of missing patients' records. Proper adjustments were made if major defects are realized in the data collection sheets. Data obtained in the pilot was only used to strengthen our data collection methods. However, information obtained from the pilot study was not be used in final analysis or in writing the thesis report.

CHAPTER FOUR

RESULTS

4.0 Data collection site and relative proportions of caesarean section delivery rates.

Data was collected in three (3) main health facilities offering obstetric services in the northern region. Namely; Tamale Teaching Hospital (TTH), Tamale Central Hospital (TCH) and Savelugu Municipal Hospital (SMH) respectively. Data from the daily health management system shows that, the caesarean section delivery rates were 23.5%, 7.6% and 7.7% **(**Figure 4.1a**)** respectively.

A total of 170 (89.9%) out of the 189 questionnaires administered were completely filled and retrieved successfully. Of the 170 questionnaires that were completed and retrieved successfully, 129 (75.9%) were from the Tamale Teaching hospital (TTH), followed by 22 (12.0%) from the TCH and 19 (11.20%) from the SMH (figure 4.1b).

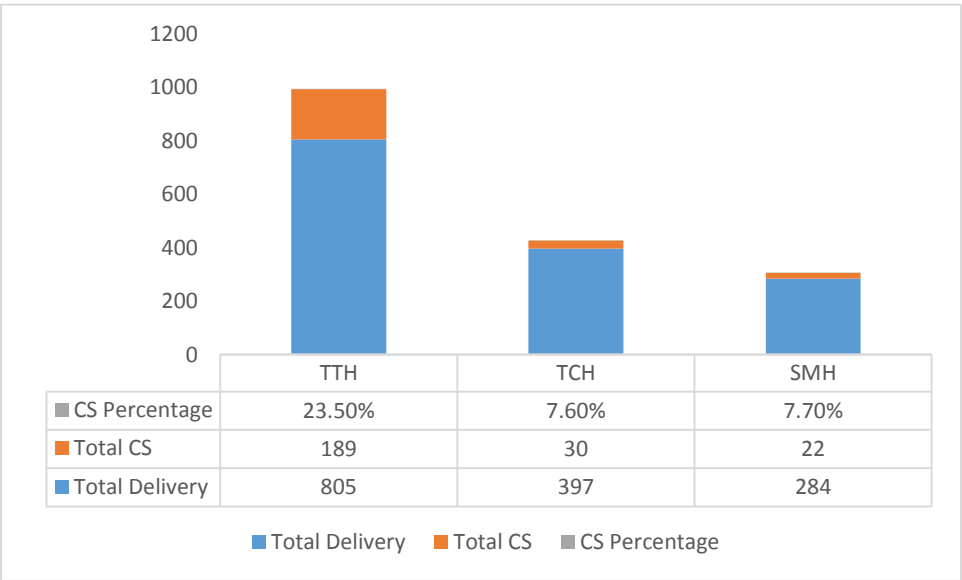

Figure 0.1a: Total number of deliveries and caesarean section rates

Source: Daily Health Information Management Systems (DMIMS).

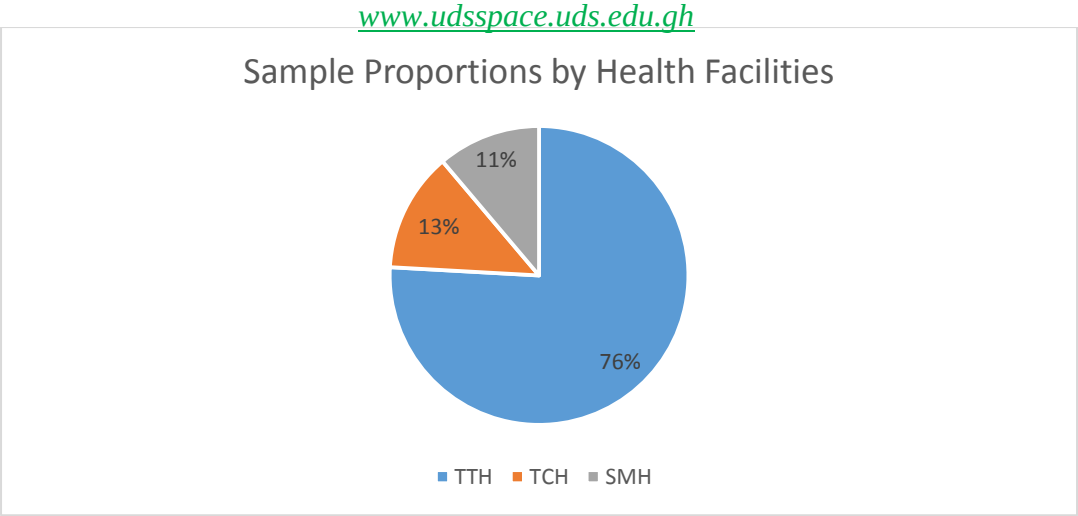

Figure 0.2b: Relative Proportions of Caesarean Section Delivery Rates by Health facility

Source: field survey, 2020

4.1 Caesarean section proportions and distribution by type of operation

Of the 129 Caesarean sections being recorded at the Tamale Teaching Hospital, elective caesarean sections were 39.0%, remaining were classified as emergency caesarean sections. Similarly, at the Tamale Central Hospital a little above half (54.5%) were emergency CS. However, at the Savelugu Municipal Hospital, a little above half (52%) were emergency CS (figure 4.1b).

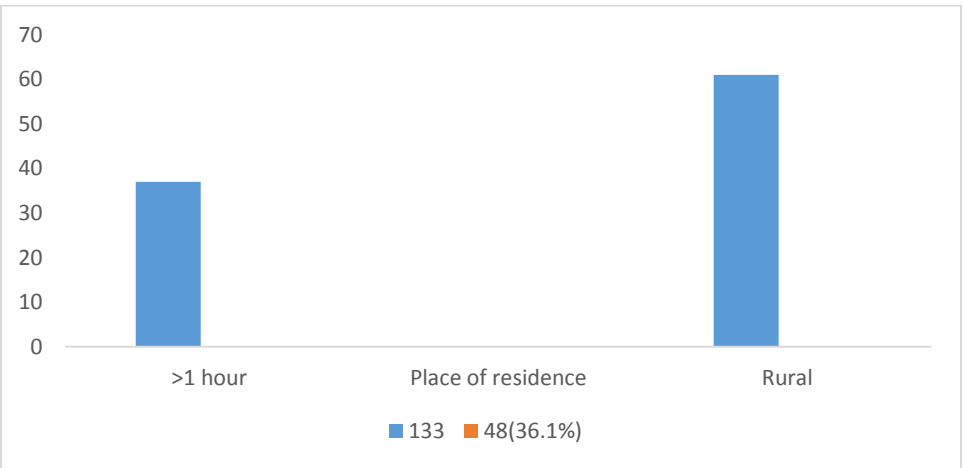

Figure 0.3: Caesarean Section Proportions and Distribution by Type of Operation

Source: Field survey, 2020

4.2 Socio-demographic characteristics of women who undergo caesarean section operation at the study facilities in March, 2020

4.2.1 Age distribution of women undergoing CS deliveries

The ages of the 170 women who had CS delivery ranges from 14 to 45 with a mean age of 29 ± 0.55 years, median age of 30 years, and a modal age group of 24 – 34 years. Only 2 (1.2%) of the participants were less than 18 years and a total of 27 (15.9%) were classified under advance maternal age starting from 35 and above (Table 4.3.1).

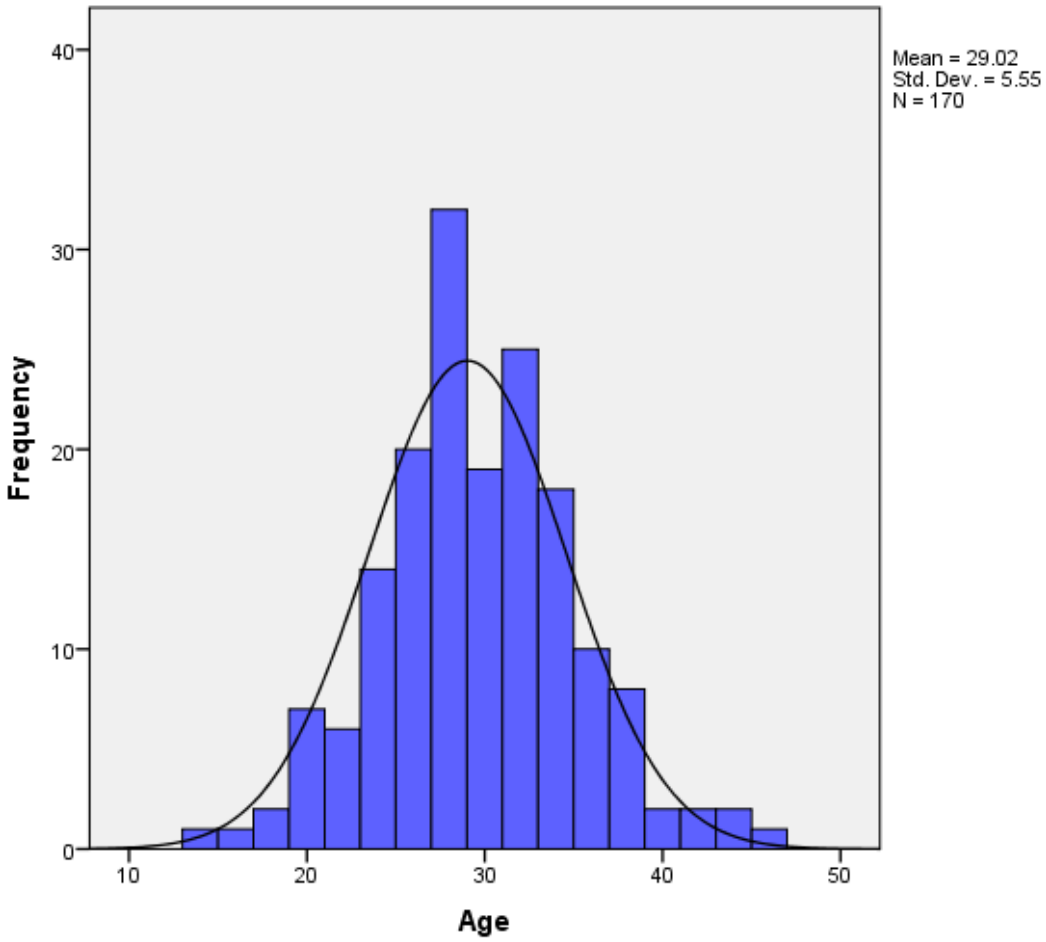

Figure 0.4: Age distribution of mothers undergoing caesarean section

4.2.2 Other demographic factors of women undergoing CS section operations

The great majority (91.86%), of the women were married, (Table 4.3.1). A total of 106 (62.4%) of the respondents had some form of formal education compared to 64 (37.6%) who have no formal education. Of 106 women who had formal education; many of 41 (37.6%), had basic education followed by 39 (36.8%) with tertiary education (Table 4.3.1). A little above half (55.9%) of the participants were working in the informal sector followed 22.9% of the women who work in the formal sector **(**Table 4.3.1). Of the 170 participants, more than half (64.1%) were from urban communities compared to their counterparts who reside in rural areas (Table 4.3.1). An estimated one-hour travel time was chosen for communities in and around Tamale to be less than an hour and patients who were traveling pass two districts were classified above an hour including other associated delays such as acquisition of vehicle to the health facility for delivery. A total of 133 (21.8 %) of the women travelled from a distance less than an hour to the health facility **(**Table 4.3.1).

The educational level of the husbands of women who had caesarean section delivery ranged from no formal education to formal education. A total of 52 (30.6%) of husbands of women who deliver by caesarean section have no formal education, compared to the 118 (69.4%) with some form of education. Of those who had formal education, many 41 (37.6%) had basic education, followed by 30.6% of those with tertiary education. On employment status of the husbands, a little over half (61.8%) of them work in the informal sector whiles 37.1% of them work in the formal sector (Table 4.3.1). Majority (78.2%) of the women travel less than an hour to the receiving health facility for delivery.

Parity of the women who had CS range from zero (0) to five (5), with mean = 1 ± 0.67, SD = 1.55, and median parity of 1. Approximately a third (31.2 %), of the participants who delivered by caesarean section at the participating health facilities were first time deliveries (para zero), followed by para one (20.6%) and para two (18.8%) respectively (Table 4.1).

Table 0.1: Other Demographic characteristics of women undergoing CS operations

Variable	frequency	Percentage
Age (years)		
<18	2	1.2
18-24	31	18.2
25-34	110	3
35-39	20	11.8
≥40	7	4.1
Educational Status of women		
No Formal Education	64	37.6
Formal Education	106	62.4
Basic	41	38.7
Secondary	26	28.5
Tertiary	39	36.8
Employment Status of Women		
Formal	39	22.9
Informal	95	55.9
Unemployed	36	21.2
Educational Status of husbands		
No Formal Education	52	30.6
Formal Education	118	69.4
Basic	34	30.6
Secondary	20	11.8
Tertiary	64	37.6
Employment status of husband		
Formal	63	37.1
Informal	105	61.8
Unemployed	2	1.2
Residential status of participants		
Rural	61	35.9
Urban	109	64.1
Travel time from home to the health facility by car		
< 1 hour	133	78.2
> 1 hour	37	21.8
Parity		

0	53	31.2
1	35	20.6
2	32	18.8
3	25	14.7
4	15	8.8
5	10	5.9
Total	170	100

Source: field survey, 2020

4.3 Obstetric characteristics of women who have caesarean section delivery

This part of the results describes some important obstetric characteristics of participants alongside the Robson classification for mothers undergoing caesarean section operations. The gestational age of women undergoing CS at the participating facilities ranged from a minimum of 28 to a maximum of 37 weeks (Table 4.4). Majority 126 (74.1%), were at term during the caesarean section operation. The commonest mode of presentation at the time of delivery was cephalic 150 (88.2%). A total of 14 (9.9%) have multiple gestation (Table 4.4). A little above half (54.1%) of the women had spontaneous labour and only 3 had their labours induced (Table 4.4).

According to Robson classification of caesarean section Group 5, multiparous women with at least one previous caesarean section and a single cephalic pregnancy ≥ 37 weeks of gestation were the commonest (25.9%), followed by Groups 10, all women with single cephalic pregnancy with <37 weeks gestation including women with previous caesarean section delivery (20.6%), Group 1, nulliparous women with a single cephalic pregnancy ≥ 37 weeks of gestation with a spontaneous labour (12.5%) and Group 3, multiparous women without a previous caesarean section, with a single cephalic pregnancy ≥ 37 weeks of gestation in spontaneous labour (Table 4.2**)**.

Table 0.2: Obstetric characteristics of women undergoing caesarean section delivery

Variable	Frequency	Percentage
Gestational age at birth		
28	2	1.2
28-31	4	2.4
32-36	38	22.4
37	126	74.1
Presentation of foetus		
Breech	20	11.8
Cephalic	150	88.2
Multiple gestation		
No	127	90.1
Yes	14	9.9
Labour onset		
Induced labour	3	1.8
Pre-labour CS	75	44.1
Spontaneous	92	54.1
Robson Classification	**Frequency**	**Percentage**
1	23	13.5
2	10	5.9
3	19	11.2
4	11	6.5
5	44	25.9
6	8	4.7
7	13	7.6
8	7	4.1
9	0	0
10	35	20.6
Total	170	100

Source: field survey, 2020

4.4 Contribution of foetal factors to caesarean section delivery

The great majority 149 (87.6%), of the babies delivered by CS were not in foetal distress. A total of 156 (91.9%) of the babies have no features consistent with foetal macrosomia. Foetal mal-presentation accounted for 24 (14.1%) of all cases. The great majority, 161 (94.7%) of the foetuses were delivered within term. Post maturity was found in only 9 (5.3%) of the cases of caesarean section deliveries. Intra uterine growth restriction (IUGR) was found in only 5 (2.9%) of the cases of caesarean sections. Of all the women, 72 (42.9%) had at least one foetal factor as an indication for caesarean section delivery (Table 4.3).

Table 0.3: Foetal indications for caesarean section deliveries

Foetal distress	Frequency	Percentage
No	149	87.6
Yes	21	12.4
Macrosomia		
No	156	91.9
Yes	14	8.2
Mal-presentation		
No	146	85.9
Yes	24	14.1
Post Maturity		
No	161	94.7
Yes	9	5.3
IUGR		
No	165	97.1
Yes	5	2.9
Multiple pregnancy		
No	154	90.6
Yes	16	9.4
At least one foetal factor		
Yes	73	42.9
No	97	57.1
Total	**170**	**100**

Source: field survey, 2020

4.5 Contribution of maternal factors to caesarean section delivery

A little below half 79 (46.5%) of the women who delivered by caesarean sections had at least one maternal factor. Majority 110 (64.7 %) of the deliveries were primary caesarean section compared to a third of the participant who have previous caesarean section. Of the 60 participants who have previous caesareans sections, over half 36 (60 %) of them did not have trial of labour (Table 4.6). A total of 22 (12.9 %) of the participants have poor progress. Inadequate pelvis was recorded in only 6 (3.5 %) cases of caesarean section deliveries (Table 4.6). A total of 10 (5.9%) of the participants have bad obstetric history. Only one (0.6%) person had genial lesions (Table 4.4).

Table 0.4: Maternal factors which contribute to the caesarean section deliveries among participants

Variables	Frequency	Percentage
Previous CS		
No	110	64.7
Yes	60	35.3
Trial of labour		
No	36	60
Yes	24	40
Total	60	100
Poor progress		
No	148	87.1
Yes	22	12.9
Inadequate pelvis		
No	164	96.5
Yes	6	3.5
Bad obstetric history		
No	160	94.1
Yes	10	5.9
Genital lesions		
No	169	99.4
Yes	1	0.6
At least one maternal factor		
Yes	79	46.5
No	91	53.5
Total	**170**	**100**

Source: field survey, 2020

4.6 Contribution of maternal pathological condition present among women at the time of caesarean section delivery

A little above half, 115 (67.6 %) of the women who delivered by caesarean section had maternal pathological conditions (Table 4.5). Only 2 (1.2 %) of the participants have obesity. The great majority 140 (99.3 %) of the participants did not have any maternal cardiac disease (Table 4.5). A total of 6 (3.5 %) participants had anaemia, only 2 (1.2 %) women have gestational diabetes and about 40 (23.5 %) of the participants had gestational hypertension (Table 4.5).

Table 0.5: Maternal pathological condition present among women at the time of caesarean section delivery

Variable	Frequency	Percentage
Obesity		
No	167	98.2
Yes	2	1.2
Maternal CD		
No	140	99.3
Yes	2	1.2
Anaemia		
No	136	96.5
Yes	6	3.5
Gestational diabetes		
No	168	98.8
Yes	2	1.2
Hypertensive disorders		
No	130	76.5
Yes	40	23.5
At Least One Pathological		
Yes	115	67.6
No	55	32.4
Total	**170**	**100**

Source: field survey, 2020

4.7 Contribution of foeto-placental factors to caesarean section deliveries

The great majority 159 (93.5 %) of the women who delivered by caesarean sections did not have placenta praevia. A total of 12 (7.1 %) of the participants had abruption placenta (Table 4.6). Only 8 (4.7 %) of the women were diagnosed with oligohydramnios. About 37 (21.8 %) of the participants have preeclampsia. In total foeto-placental factors were present in 68 (40 %) of all the women who have caesarean section delivery (Table 4.6).

Table 0.6: Foeto-Placental Factors Which Contributes to Caesarean Section Delivery rates

Variable	Frequency	Percent
Placenta praevia	Freq	Percent
No	159	93.5
Yes	11	6.5
Abruptio Placenta	Freq	Percent
No	158	92.9
Yes	12	7.1
Oligohydromnios	Freq	Percent
No	162	95.3
Yes	8	4.7
Preeclampsia	Freq	Percent
No	133	78.2
Yes	37	21.8
At least one foeto-placental factor		
No	102	60
Yes	68	40
Total	170	100

Source: field survey, 2020

4.8 Contribution of other obstetric indications for caesarean section delivery among participants

Other important obstetric factors which were not captured by the study instrument were also present in a number of participants. This cuts across all the preceding factors i.e. maternal, foetal, or placental factors.

Table 0.7: Other obstetric indications for caesarean section delivery among participants

Other conditions	Frequency (n)	Percentage (%)
No	140	82.4
Anhydramnios	2	1.2
Antepartum Haemorrhage	2	1.2
Bleeding PV	1	0.6
Cephalo-pelvic disproportion	3	1.8
Intrauterine Foetal Delivery	4	2.4
Labour onset	1	0.6
Obstructed labour	2	1.2
Primary dysfunctional labour	1	0.7
short stature	3	1.8
Unfavourable Cervix	6	3.5
Uterine Rupture	5	2.9
Total	170	100

Source: field survey, 2020

4.9 Number of indications for caesarean section delivery

A number of factors contributing to the caesarean section deliveries were counted for each patient. Some participants could have single maternal, foetal, placental or a combination of many of these factors which resulted in the decision to schedule a caesarean section operation. The number of indications for caesarean section operation for women who have caesarean section in this study ranged from a minimum of 0 and maximum of 4. The mean number indications for caesarean section is 1±0.59, with SD= 0.90, Median= 1, and Mode= 1.A total of 12(7.1 %) of the women no (0) indication for caesarean section compared to majority 158 (92.9 %) of the participants who have one form of the indication or the other. About 76 (44.7 %) of the women have one indication while 56 (32.9 %) have two indications (Table 4.8).

Table 0.8: Number of indications for caesarean section among women

Number of Indications	Frequency	Percent
0	12	7.1
1	76	44.7
2	56	32.9
3	21	12.4
4	5	2.9
Total	170	100

Source: field survey, 2020

4.10 Non-obstetric factors and context of caesarean section delivery

The section presents the non-obstetric and context under which caesarean section deliveries were carried. Only 4 (2.4 %) of the women who had caesarean section was based on request by the pregnant woman. The great majority 166 (97.6 %), of women who had caesarean section operation received ANC services. In many instances, more than half, 107 (62.9%) of the participants were not monitored with a partograph, a total of 33 (19.4%) cases were monitored with a partograph (Table *4.9*). A third, 53 (31.2 %) of the women have associated medical conditions (Table *4.9*). Most, 120 (70.6 %) of the physicians who carried the caesarean section operations have no postgraduate medical training. A third, 59 (34.7 %) of the women who have caesarean sections were referred from other health facilities. More than half 112 (65.9 %) of the women have emergency caesarean section compared to those who had elective caesarean section delivery (Table *4.9*). A total of 60 (35 %) of the caesarean section operations were repeat caesarean section deliveries (Table *4.10.2*). Of the repeat caesarean sections, 37 (61.6 %) had one previous caesarean section, followed by 15 (25 %) of the women who had their second repeat caesarean section (Table *4.9*)

Table 0.9: Non-obstetric factors and context of caesarean section delivery

Variable	Frequency	Percentage
Demand for CS		
No	166	97.6
Yes	4	2.4
Medical conditions associated		
No	117	68.8
Yes	53	31.2
Received ANC		
Yes	166	97.6
No	4	2.4
Partograph used		
No	107	62.9
Unknown	30	17.6
Yes	33	19.4
Postgraduate training		
No	120	70.6
Yes	50	29.4
Referred from another facility		
Yes	59	34.7
No	111	65.3
Type of operation		
Elective	58	34.1
Emergency	112	65.9
Repeat CS		
No	110	65
Yes	60	35
Number of previous CS		
0	115	67.6
1	37	21.8
2	15	8.8
3+	3	1.8
Total	**170**	**100**

Source: field survey, 2020

4.11 The number of ANC visits by pregnant women

The number of ANC visits for women who have caesarean section operation ranged from 0 to 9. The mean number ANC visits was 4±0.89, with SD= 1.65, median= 5, and a mode= 4. A little below half, 48.0% of the women have 4 ANC visits, followed by 45.0% with5 visits.

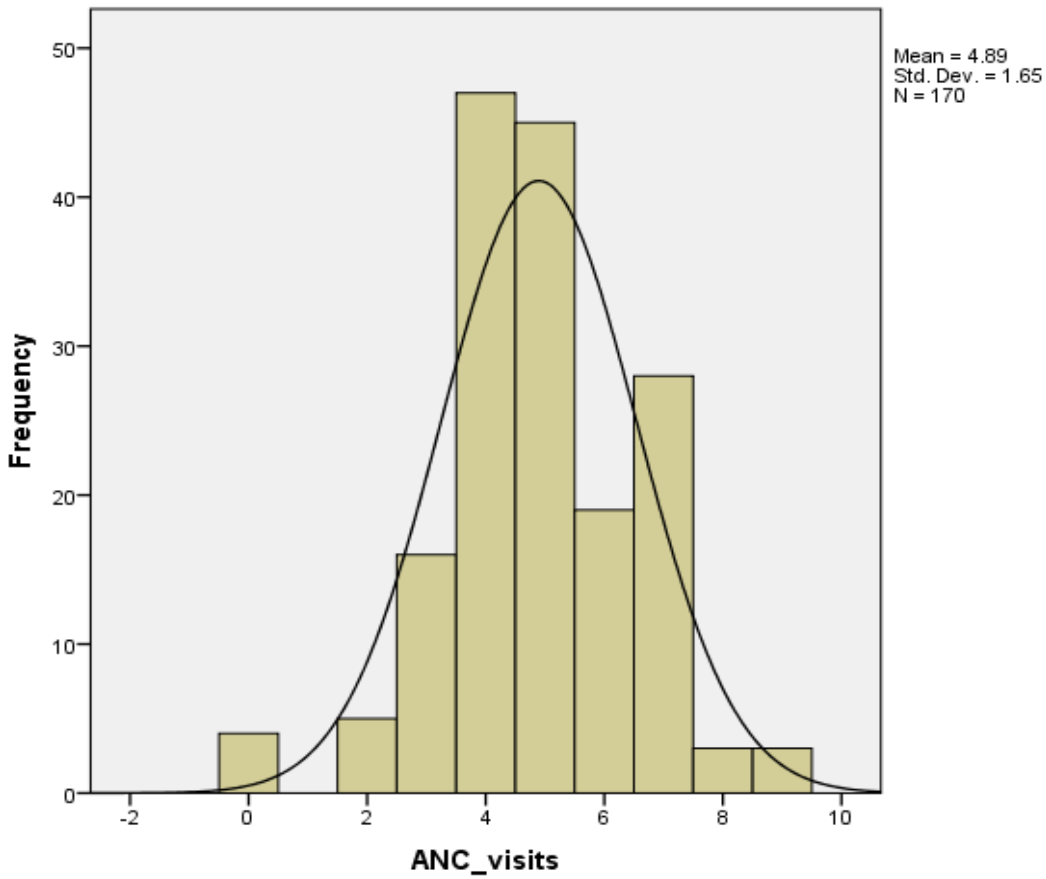

Figure 0.5: Distribution of number of ANC visits among women undergoing CS

Source: field survey, 2020

4.12 Birth outcomes of women who have undergone CS at the various health facilities

Majority, 133 (78.2 %) of the women who had caesarean section did not have any immediate adverse maternal outcome compared to 37 (21.8%) with adverse outcome (*Table* 4.10). Of the 37 women, 21(12.4 %) and 9 (5.3 %) were diagnosed with

hypertension eclampsia respectively (*Table* 4.10). About 153 (90.0 %) of the babies had no foetal complications compared to 17 (10 %) with complications. Of the 17 births with adverse foetal outcome, 8 (47 %) were low birth weight with6 (35 %) foetal deaths (*Table* 4.10).

Table 0.10: Birth outcomes of women who have undergone CS at the various health facilities

Variable	Frequency	Percentage
Immediate maternal outcome/complication		
Yes	37	21.8
No	133	78.2
Type foetal complication (morbidity/mortality)		
No	132	77.6
Anaemia	7	4.1
Eclampsia	9	5.3
Hypertension	21	12.4
Intra-abdominal abscess	1	0.6
Immediate foetal outcome		
Complication	17	10
No Complication	153	90
Type of foetal Complication (Morbidity/mortality)		
No	153	90
Birth asphyxia	1	0.6
Foetal death	6	3.5
Low birth weight	8	4.1
Preterm	2	1.2
Total	170	100

Source: field survey, 2020

4.13 Chi square test on health facility and type of operation

This part determines the relationship between the health facility and type of caesarean section. Using Chi- square test the relationship between the health facility and type of

caesarean section was low; the calculated chi square value (□2) is 3.608 with a P-value=0.165.

Table 0.11: Relationship between type of facility and type of operation

Type of facility	N	Elective	Emergency	Test Statistic
Savelugu	19	9 (47.4%)	10(52.6%)	
Tamale Central Hospital	22	10(45.5%)	12(54.5%)	□2=3.608, P-value=0.165
Tamale Teaching Hospital	129	39(39.2%)	90(69.8%)	
Total	170	58(34.1%)	112(65.9%)	

Source: field survey, 2020

4.14 Test of associations between demographic characteristics of women who deliver by cs and type of caesarean section operations

This part of the results describes the relationship between demographic characteristic of women who had CS as a mode of delivery. The types of statistical test instruments used to determine the relationships were: chi-square, Fishers exact and independent sample t-test.

There was significant difference in the ages for emergency caesarean section (M= 28.38, SD=5.585) and elective caesarean section (M=30.26, SD=5.313) operations; t = -2.109, P- Value = 0.036 (Table 4.13). Base on chi-square analysis there was no significant association between marital status and type of caesareans section delivery (□2=0.017, P-Value =0.895).

Educational status of participants was also found not to be significantly associated with type of caesarean section delivery (□2=5.081, P-value=0.166). Employment status did not show any significant association with the type of caesarean section operation. There is no relationship between travel time from home to the nearest facility and the type of caesarean section of operation (□2=1.058, P- Value=0.304). Base on the chi-square results (□2=0.075, P-value=0.784), place of residence and type of caesarean section operation were not dependent (Table 4.12). Parity has high association the type of caesarean section delivery (□2=19.200, P. Value= 0.002). In particular, emergency caesarean section was higher among para zero women, 46 (86.8%), followed by para two representing 22 (68.8%).

Table 0.12: Relationship between Age and type of caesarean section operation

	Type of operation	N	Mean	SD	Test stats
Age	Emergency	112	28.38	5.585	t = -2.109, P- Value = 0.036
	Elective	58	30.26	5.313	

Source: field survey, 2020

Table 0.13: Association between Other Demographic Characteristics and type of caesarean section operation

Variable	N	Elective	Emergency	Test Statistic
Maternal age categories				
<18 years	2	0(0.0%)	2 (100%)	
18-24 years	32	8(25.8%)	23 (74.2%)	
25-34 years	110	38(34.5%)	72 (64.5%)	F-test=3.289, P-value=0.511
35-39 years	20	8(42.1%)	11 (57.9%)	
≥40	7	3(43%)	4 (57%)	
Marital status				
Married	156	53(34%)	103(66%)	
Single	14	5(35.7%)	9(64.3%)	□2=0.017,P-Value =0.895
Educational status of woman				
None	64	21 (32.8%)	43(67.2%)	
Basic	41	9(22%)	32(78%)	
Secondary	26	11(42.3%)	15(57.7%)	□2=5.081, P-value=0.166
Tertiary	39	17 (43.6%)	22 (56.4%)	
Employment status of woman				
Formally Employment	39	15(38.5%)	24(61.5%)	
Informal Employment	95	28(29.5)	67(70.5%)	□2=2.152, P-value=0.341
Unemployed	36	15(41.7%)	21(58.3%)	
Journey from home to the facility				
<1 hour	133	48(36.1%)	85(63.9%)	
>1 hour	37	10(27%)	37(73%)	□2=1.058, P-Value=0.304
Place of residence				
Rural	61	20(32.8%)	41(67.2%)	
Urban	109	38(34.9%)	71(65.1%)	□2=0.075, P-value=0.784
Parity				
Para 0	53	7 (13.2%)	46 (86.8%)	
para 1	35	16 (45.7%)	19 (54.3%)	
para 2	32	10 (31.2%)	22 (68.8%)	□2=19.200, P. Value= 0.002
para 3	25	14 (56%)	11 (44%)	
para 4	15	6 (40%)	9 (60%)	
para 5	10	5 (50%)	5 (50%)	

Source: field survey, 2020

4.14.1 Association between educational and employment status of husbands of women who deliver by caesarean section.

Base on the chi-square test, there was no significant association between educational status of participants' husbands and type of caesarean section delivery (□2=1.066, P-value=0.785). Similarly, Fishers exact test of association shows that employment status did not have any significant association with the type of caesarean section operation (F-Test=0.877, P-value=0.661).

Table 0.14: Association between Educational and Employment status of Husbands of women who deliver by caesarean section

Variable	N	Type of CS Operation		Test Statistic
		Elective	Emergency	
Educational status				
None	52	15(28.8%)	37(71.2%)	
Basic	34	12 (35.3%)	22(64.7%)	
Secondary	20	8 (40%)	12(60%)	□2=1.066, P-value=0.785
Tertiary	64	23(35.9%)	41(64.1%)	
Employment status				
Formal Employment	63	23(36.5%)	35(67.3%)	
Informal Employment	105	34(32.4%)	69(69%)	F-Test=0.877, P-value=0.661
Unemployed	2	1(50%)	1(50%)	

Source: field survey, 2020

4.14.2 Bivariate test of Associations between Obstetric characteristics and type of caesarean section operation

In this section the Fishers exact test was used to test for association between maternal characteristics and some important obstetric characteristics. Based on the fisher's exact test, there was no significant association between gestational age and type of caesarean section operations (F-test=5.057, P-value=0.125). The test also shows that there was no relationship between onset of labour and type of caesarean section (F-test=49.318, P-value=0.001). However, there was a significant association between Robson 10 group classification and type of caesarean section operation was high. The fishers exact test was F-test = 50.934, and a P – value < 0.001 showing statistically significant association.

Table 0.15: Bivariate test of associations between Obstetric characteristics and type of caesarean section operation

		Type of CS Operation		
Variable	N	Elective	Emergency	Test Statistic
Gestational Age				
<28 weeks	2	0(0.0%)	2(100%)	
28-31 weeks	4	2(50%)	2 (50%)	
32-36 weeks	38	8 (21.1%)	30(78.9%)	F-test=5.057, P-value=0.125
≥37	126	48 (38.1%)	78 (61.9%)	
Labour on set				
Induction of labour	3	1 (33.3%)	2 (66.7%)	
Pre-labour caesarean section	75	47 (62.7%)	28 (37.3%)	F-test=49.318, P-value=0.001

Spontaneous	92	10 (10.9%)	82 (89.1%)	
Robson's 10 Group classification of CS				
1	23	1 (4.3%)	22 (95.7%)	
2	10	5 (50%)	5 (50%)	
3	19	2 (10.5%)	17 (89.5%)	
4	11	10 (90.9%)	1 (9.1%)	
5	44	23 (52.3%)	21 (47.7%)	F-test = 50.934, P < 0.001
6	8	0 (0%)	8 (100%)	
7	13	6 (46.2%)	7 (53.8%)	
8	7	5 (7.4%)	2 (28.6)	
10	35	6 (17.1%)	29(82.9%)	
Total	170	58 (34.1%)	112 (65.9%)	

Source: field survey, 2020

4.14.3 Bivariate Test of independence between Foetal Factors and type of Caesarean Section Delivery.

In this section both chi-square and fishers exact test were used to test for association between foetal factors and type of caesarean section operation depending on the suitability of the test. Based on the fisher's exact test results, there a strong positive relationship between foetal distress and type of operation (F-test, P-value=0.001). The chi square test output (□2= 1.712, P-value = 0.191) showed no significant association between foetal microsomia and type of caesarean section. Similarly, with a chi square result of □2= 1.712 and a P-value = 0.191, there was no statistically significant evidence that foetal mal-presentation and type of caesarean section operations are associated.

Table 0.16: Bivariate test of independence between foetal factors and type of caesarean section delivery

		Type of CS Operation		
Variable	N	Elective	Emergency	Test Statistic
Foetal distress				
Yes	149	58 (38.9%)	91 (61.1%)	
No	21	0(0.0%)	21 (100%)	F-test, P-value=0.001
Foetal Microsonia				
Yes	14	7 (50%)	7 (50%)	
No	156	51 (32.7%)	105 (67.3%)	□2= 1.712, P-value = 0.191
Foetal Malpresentation				
Yes	24	8 (33.3%)	16 (66.7%)	
No	146	50 (34.2%)	96 (65.8%)	□2=0.008, P-value= 0.930
Post maturity				
Yes	9	5 (55.6%)	4 (44.4%)	
No	161	53 (32.9%)	108 (67.1%)	F-test, P-value= 0.277
IUGR				
Yes	5	1 (20%)	4 (80%)	
No	165	57 (34.5%)	108 (65.5%)	F-test, P-value = 0.662
Multiple pregnancy				
Yes	16	9 (56.2%)	7 (43.8%)	
No	154	49 (31.8%)	105 (68.2%)	□2=3.849, P-value=0.05
At least one foetal factor				
Yes	73	26 (35.6%)	47 (64.4%)	
No	97	32 (33%)	65 (67%)	□2=0.128, P-Value=0.721

Source: field survey, 2020

4.14.4 Bivariate test of independence between maternal factors and type of Caesarean Section delivery

Based on the chi-square test results, there was a significant relationship between previous caesarean section delivery and type of operation (□2 = 6.496, P- value = 0.011). There were also significant association between trial of labour and type of caesarean section delivery with a fisher's exact test showing a P-value < 0.05 (Table 4.17). In terms of poor progress, the fishers exact test shows a statistically significant result of P-value = 0.001. Similarly, inadequate pelvis and bad obstetric history were both shown to have relationship with type caesarean section operation. With P – Values greater > 0.05 showing statistical insignificant association (413.6).

Table 0.17: Bivariate test of independence between maternal factors and type of caesarean section delivery

		Type of CS Operation		
Variable	N	Elective	Emergency	Test Statistic
Previous CS				
Yes	60	28(46.7%)	32 (53.3%)	
No	110	30(27.3%)	80 (72.7%)	□2=6.496, P-value =0.011
Trial of labour				
Yes	24	1 (4.2%)	23 (95.8%)	
No	146	57 (39%)	89 (61%)	F-test, P-value=0.001
Poor progress				
Yes	22	0(0.0%)	22 (100%)	
No	148	58 (39.2%)	90 (60.8%)	F-test, P-value=0.001
Inadequate Pelvis				
Yes	6	1 (16.7%)	5 (83.3%	
No	164	57 (34.8%)	107 (65.2%)	P-Value = 0.665
Bad Obstetric history				
Yes	10	2 (20%)	8 (80%)	
No	160	56 (35%)	104 (65%)	F-test, P-value = 0.497

Source: field survey, 2020

4.14.5 Test of association between Maternal Pathological Condition and type of Caesarean Section delivery

Based on fisher's exact test analysis, there is no relationship between maternal obesity and type of caesarean section operations (P- value =0-538). Equally, the there was no relationship between hypertension and the type of caesarean section delivery with a □2=1.016, and a P- value = 0.313.

Table 0.18: Bivariate Test of Independence between maternal pathological conditions and Type of Caesarean Section Operations

Variable	N	Elective	Emergency	Test Statistic
Maternal obesity				
Yes	2	1(50.0%)	1(50.0%)	
No	139	44(31.7%)	95(68.3%)	P-Value 0.538
Hypertensive Disorder				
Yes	40	11 (27.5%)	47 (36.2%)	
No	130	47(36.2%)	83 (36.2%)	X2=1.016, P-value 0.313

Source: field survey, 2020

4.14.6 Bivariate test of independence between foetal placental factors and type of caesarean section operation.

Based on the chi-square test results, there is no significant relationship between placenta praevia and type of operations with a P- value =0.751. There was also no significant association between abruption placenta and type of caesarean section

delivery=0.61 (Table 4.13.8). Oligohydramnios equally has an insignificant relationship with type of operations with a p-value of 0.267. At least 1 foeto-placental factor however has a significant relationship with type of operation with p-value of 0.042 (Table 4.19)

Table 0.19: Bivariate test of independence between foetal placental factors and type of caesarean section operation

		Type of CS Operation		
Variable	N	Elective	Emergency	Test Statistic
Placenta praevia				
Yes	11	3 (27.3%)	8 (72.7%)	
No	159	55 (34.6%)	104 (65.4%)	P-Value 0.751
Abruptio Placenta				
Yes	12	1 (8.3%)	11 (91.7%)	
No	158	57 (36.1%)	101 (63.9%)	P-Value 0.61
Oligohydramnios				
Yes	8	1 (12.5%)	7 (87.5%)	
No	162	57 (35.2%)	105 (64.8%)	P-Value 0.267
At least 1 foeto-placental factor				
Yes	25	4 (16%)	21 (84%)	
No	154	54 (37.2%)	91 (62.8%)	F-Test, P-Value = 0.042

Source: field survey, 2020

4.14.7 Test of association between Non-obstetric factors and type of Caesarean Section delivery

The outcomes show that there is no connection between caesarean section demand and caesarean section operation. The calculated fishers exact test of significance showed a P-Value > 0.05 (table 4.13.9). Based on the chi-square test, there was a relationship between associated medical condition and the type of caesarean section operation. The calculated chi-square test result is □2 = 6.118, P-Value = 0.013. Fishers exact test result has indicated that antenatal visits didn't have any measurably significant relationship with caesarean section type, showing a p- value > 0.05 (table 4.20). Equally, a chi square test on partograph use and type of caesarean section operation did not show any significant association (□2-Value = 4.698). Similarly, obstetric postgraduate training showed a chi-square □2-Value = 0.475, P-Value 0.491, indicating that there is no statistically significant association. However, there was statistically significant association between referral cases and the type of caesarean section operation showing a chi square output □2 = 5.870, and P - value = 0.015 (table 4.20).

Table 0.20: Bivariate test of independence between non-obstetric factors and type of Caesarean Section operation

		Type of CS Operation		
Variable	N	Elective	Emergency	Test Statistic
No	166	56 (33.7%)	110 (66.3%)	
Yes	4	2 (50%)	2 (50%)	F-Test, P-Value = 0.606
Medical Condition associated				
Yes	53	11 (20.8%)	42 (79.2%)	
No	117	47 (40.2%)	70 (59.8%)	x= 6.118, P-Value = 0.013
ANC Visits				
Yes	166	57 (34.3%)	109 (65.7%)	
No	4	1 (25.0%)	3 (75%)	P-Value 1.000
Partograph used				
Yes	33	6(18.2%)	67 (62.6%)	
No	107	40 (37.4%)	18(60.0%)	X^2-Value = 4.698, P-Value 0.095
Unknown	30	12(40.0%)		
Postgraduate obstetric training				
Yes	50	19 (38.0%)	31(62.0%)	
No	120	39 (32.5%)	81 (67.5%)	□2-Value = 0.475, P-Value 0.491
Referral status				
Referred	59	13 (22%)	46 (78%)	
Not referred	111	45 (40.5%)	66(59.5)	□2 = 5.870, P - value = 0.015

Source: field survey, 2020

4.14.8 Independent Sample T-Test of Relationship between type of Caesarean Section Operation and ANC Visits.

An independent sample t-test was conducted to compare type of caesarean section operation and number of ANC visits. There was no significant difference in the ages for emergency caesarean section (M= 5.01, SD=5.156) and elective caesarean section (M=4.67, SD=1.877) operations; t = 1.263, P- Value = 0.208 (Table 4.21).

Table 0.21: Relationship between ANC visits and type of operation

	Type of operation	N	Mean	SD	Test stats
ANC Visits	Emergency	112	5.01	5.156	t = 1.263, P- Value = 0.208
	Elective	58	4.67	1.877	

Source: field survey, 2020

4.15 Logistic regression analysis

The probability of certain dependent variables influencing the likelihood of having the outcome of caesarean section operation were described in this section using binary logistic regression. All statistically significant variables from the bivariate (such as Chi – square, Fisher's exact test and Independent sample t-test) analysis of independence were selected using SPSS. The variables of interest included both continuous (Age) and categorical variables (Parity, previous CS presentation, labour onset, Robson classification, number of indications for CS and associated medical condition with patient). In all, about 7 variables were tested with the binary logistic regression to ascertain the relationship or the ability of the aforementioned independent variables to

predict the outcome (Caesarean section operation). Statistical conclusions are made on adjusted odds ratios of each independent variable selected if the p – values obtained are less than 0.05 and the confidence interval exclude 1.

Base on the SPSS, output results in the table below (table 4.10),' age, parity, previous CS, labour onset, Robson classification and associated medical conditions significantly predict the likelihood of patients (mothers) to have a particular type of caesarean section operation.

As the age of women increases, the probability that a participant will need an emergency caesarean section decreases by 0.939 (P- Value = 0.039, CI: 0.885 - 0.997). The odds of parity increasing the likelihood of emergency caesarean section operation was 0.717. This was statistically significant (P- Value = 0.002, CI: 0.58 - 0.886) indicating that with increase in parity rate emergency caesarean section decreases. Caesarean section was 2.333 times more likely to occur among women with previous caesarean section operation (P- Value = 0.012, OR: 2.333, CI: 1.208- 4.507). labour onset (Patients who deliver through spontaneous or pre-labour caesarean sections) were 0.107 times less likely to increase the likelihood of caesarean section emergency caesarean section (P- Value 0.001, OR: 0.107, CI: 0.051- 0.225). Women who had associated medical conditions were 0.068 times less likely to have undergone emergency caesarean section. This statistical significance (P-Value = 0.009, AOR: 0.068, and 95% C.I: 0.009 - 0.517). The likelihood of foetal presentation and Robson classification increasing caesarean section was shown not be statistically significant- they presented higher P-Values greater than 0.05 (Table 4.22).

Table 0.22: Logistic regression

Variable	Adjusted Odds Ratio	STD ERROR	P - VALUE	95% CONFIDENCE INTERVAL Lower	Upper
Age	0.939	0.03	0.039	0.885	0.997
Parity	0.717	0.108	0.002	0.58	0.886
Previous CS	2.333	0.333	0.012	1.208	4.507
Presentation	1.639	0.544	0.364	0.564	4.76
Robson Classification	0.989	0.054	0.834	0.889	1.099
No. of Indications	1.378	0.19	0.091	0.95	1.999
Medical Condition Ass	0.068	1.035	0.009	0.009	0.517

Source; survey, march, 2020

CHAPTER FIVE

DISCUSSION

This section of the research discusses the outcome of the study on indications for caesarean section deliveries in the Northern Region, Ghana. The overall objective of the study was to investigate the rates, indications and outcome of caesarean section delivery in the northern region. The study was conducted in northern Ghana involving both district and tertiary health facilities offering obstetric services. It is the first of its kind in this part of the country. The study has identified the caesarean section rates in these facilities and established a number of important obstetric and non-obstetric factors that determine the caesarean section delivery rates in the northern region. The findings of the study clearly showed a number of indications or risk factors for caesarean section delivery rates at these health facilities. The most common indications for caesarean section delivery in this study in descending order of magnitude were; history of a previous caesarean section (35.3%), poor progress of labour (12.9%), foetal distress (12.4%), and multiple gestation (9.4%).

5.1 Caesarean section rates among women of reproductive age in the Northern Region

Far from the reports of low caesarean sections rates in developing and resource poor areas in sub-Saharan Africa, the findings of this current study conducted in the northern Ghana show disparity in the rates of caesarean sections deliveries across different facilities. Similar studies conducted in multi-facility or from different nations have always found differences in the rates of caesarean sections (CDC, 2019; OECD, 2017). An inter-country study of caesarean section rates in Sub-Saharan African countries has also reflected such disparities (Yaya et al., 2018). In this study, the Tamale Teaching Hospital recorded a higher number of caesarean section deliveries compared to Tamale

Central Hospital and Savelugu Municipal Hospital respectively. The sample data analysed quite reflects the District Health Information Management Systems (DHIMS) monthly (March, 2020) reported figures which showed caesarean section records of 189 for Tamale Teaching Hospital, 30 for Tamale Central Hospital and 20 for the Savelugu Municipal Hospital. According to the DHIMS data, total deliveries for the three hospitals were 1,486, in March, 2020 and a total caesarean section delivery of 241 284 for TTH, TCH and the SMH respectively. Consequently, caesarean section rates for the three hospitals are; 23.5% (TTH), 7.6% (TCH), and 7.7% (SMH), Villar et al., (2006) found institutional complexity to influence the caesarean section rates as institution specific caesarean section rates appear differently. After adjusting for demographic, obstetric factors and pre-existing medical conditions, Cáceres et al., (2013), found that there were still variations in hospital level caesarean section rates.

The results of this study seem to confirm the usual claim that referral status of hospitals is partly responsible for the higher rates of caesarean sections as the TTH shows higher rates more than the average 10%-15% rates. As expected, referrals in this study was statistically associated (□2 = 5.870: P — value = 0.015) with type of caesarean section operation. The findings support McIlwaine, Cole, & Macnaughton, (1985) who reported 37.0% caesarean section delivery rate at referral hospitals. It is also in agreement with Apanga & Awoonor-Williams (2018), who reported that women referred from other hospitals have higher odds of caesarean section which has a consequential impact in the total caesarean section rate for the hospital. Whiles TCH and the SMH have rates within the 10%-15% WHO benchmark, Tamale central (which is also a referral hospital) rate makes the referral arguments quite debatable. Even though it can also be argued that the Tamale Teaching Hospital has a wider scope of referrals from the northern belt. Contextual difference in the study facilities makes

comparison between them very cumbersome. Referral cases were expectedly higher at the Tamale Teaching Hospital compared to the Tamale Central Hospital to examine its impact on the caesarean section rates. Whiles referral cases were obviously higher at TTH, it is difficult to explain the higher caesarean section rates within the context of referred cases. However, it is interesting to observe that both SMH and TCH have similar caesarean rate at 7.0%. These are district level rates similar to the 6.7% rate reported by Manyeh. et al, (2018) at a district health facility in Doodowa. In kenya, Gichangi, (2001) also found a hospital level caesarean section rate of 6.3%. With the continuing uncertainty or lack of conscientiousness about the optimum rate of caesarean sections at all levels (Gupta et al., 2015), this finding could be beneficial to the realization of acceptable caesarean section rate at municipal and district levels.

Gibbons, et al., 2010 advances the argument that caesraen section rates of 15% — 20% is more reasonable. While these rates may be proposed to ensure greater access to caesarea section services, it can only be applicable at certain areas where adverse caesarean outcomes are proven to be low. The caesarean section rate of 7.6% and 7.7% for TCH and SMH with no adverse perinatal or foetal outcome also supports the reported midwifery study which supposes that caesarean section rates less than 10% can be achieved with minimal or no adverse perinantal outcome (Savage, 2007).

The modified Grossman model of household production of health care perfectly explains this study's findings on demographic characteristic of the participants. The Grossman model assumes that individuals inherit an initial stock of health which depreciates with an increasing rate with one's age overtime. And that death occurs when the stock of health falls a creation level but individuals have the choice to choose their length of life. This study confirms that age is indeed an important demographic factor when discussing caesarean sections. As showed in the age distribution of

mothers undergoing caesarean section in figure 4.3.1, the data was normally distributed with a mean age of 29.02 and standard deviation (SD) is 5.55. Participants within the age group 24-35 have the largest (110) representation of the total sample constituting 65% of the total study population. The findings of this study slightly depart from Kaur et al., (2013), which reported higher caesarean section rates among women within the ages of 21 – 30 years whiles confirming the findings of Manyeh (2018), that women at age 34 have the propensity to undergo caesarean section delivery. Contextually, therefore, this study can explain based on the Grossman age postulate that women at their adult life inherit an initial stock of normal delivery which depreciates with an increasing age with time. After adjusting for confounders such as smoking, obesity and parity, Nieto et al.(2019) reported that women with advanced age were still at high risk of pathological conditions such as diabetes and hypertention and supported by (Nilsen, 2014; Suzuki & Nakata, 2013).

Research has shown that other demographic factors such as marital status, level of education, occupation, parity, place of residence and socio-economic status affect rates of caesarean section. Except parity, these factors are classified under the Grossman's model termed as environmental factors affecting demand for health. They did not show any statistically significant relationship with caesarean section delivery rates. The study showed that a lot of the delivering mothers at the study facilities are of low educational status. This can be explained by the wide sample of emergency caesarean section. Out of 58 elective caesarean section deliveries, 48% of the participants had secondary or tertiary school qualification and the remaining were either having basic or no education at all. It is quite interesting to observe from the results that the rate of emergency caesarean section delivery decreases with increase in educational level. It is suspected that women with higher educational status have better appreciation of their condition

which enables them to make better judgement of their choice of care. They may go for an elective caesarean section or, better still, change another health provider for specialist care. Despite this observation, the research found no statistically significant evidence to suggest an association between the educational status of women and the type of caesarean section delivery. However, Nilsen, (2014) has a confirmation of the association between the level of education of women and their husbands being associated with a higher chance of caesarean section delivery. The fact that women with tertiary education will likely deliver by elective caesarean section implies that with demographic transition and as women continue to acquire higher education, higher elective caesarean sections are expected from educated mothers and thereby prompt a rise in the rates.

Like the women in this study, a few husbands had tertiary education. However, it is quite revealing to observe that though there was no statistical significance between husbands education and type of operation (□2=1.066, P-value=0.785), 23 out of the 58 elective caesarean section belongs to the husbands with tertiary education group representing 40%. An important question associated with this is whether the husbands have any influence in the decision to have a caesarean section or not. The researcher concludes that husbands have no decision role in their wives with regards to caesarean section, keeping in mind these women are almost always conscious and give informed consent before the procedure is done. With free maternal health care provision under the Ghana National Health Insurance Scheme (NHIS), all delivering women are placed within the same level in terms of access to the caesarean section services, limiting the study's ability to assess the economic situation of participants in terms of access to caesarean section services and the consequential rise or decrease in rates. Out of pocket payment for services may exist in the private care facilities which were other

researchers have reported to have high caesarean section rates, further research in the subjected matter will therefore need to expand the scope to include the privates health facilities to ensure better assessment of the relationship of household purchasing power and the decision to deliver by caesarean section.

During the period of this study, the proportion of urban mothers delivering at the health facilities was high. As expected, the TTH recorded the highest urban participants as accessibility to urban residence is quite easy. About 109 of our study participants were from urban settlements representing 64.1%. This is quite huge as it is almost doubled the rural population of 35.9%. This is in contrast with Azene's findings that caesarean section is more common among rural folks (Azene, 2019). As shown in a previous study, women with previous successful vaginal delivery are deemed to have a pelvis that is safe for vaginal delivery in their subsequent pregnancies until their 5th birth where the risk of caesarean section delivery increases (Mgaya, 2013). True to that fact, this study has confirmed a decreasing trend of caesarean section delivery with increase in parity. Parity is significantly associated with higher caesarean section delivery rates (OR: 0.1717, P- Value = 0.002, CI: 0.58-0.886). Similar observation of association has been made by Kaur et al. (2013). The higher likelihood of emergency caesarean sections among study participants could be because of delays in observing elective caesaren section delivery due to the assurances that women who had previous vaginal delivery would most likely have a subsequent vaginal delivery. Overall, the findings shows that socio-demographic factors such as age, parity, and educational backgroud are important determinants of caesarean section deliveries at the study facilities. A similar conclusion has been arrived at by Manyeh et al.(2018) at a district health facility in Southern Ghana.

The study has demonstrated that there is an increased risk of both elective and emergency caesarean section with gestational age of 36 onwards. Women who delivered at the participating health facilities were of gestational age greater or equal to 37 weeks. About 74.1% of the women were ≥37-week gestation period. Followed by women delivered at the gestational age range of 32-36 representing 22.4 percent. Women giving birth at 28 gestational ages was rare, occurring 2 times. Emergency caesarean section was higher across all gestational age categories compared to elective caesarean with 56% and 34% respectively. There is no statistical significance between gestational age and type of caesarean section (P- Value = 0.002, CI: 0.58-0.886). Even though the chi-square analysis has shown that there was no statistically significant association between gestational age and caesarean section rates, another study has clearly shown that women with higher gestational age have higher association with emergency caesarean section delivery (Mendis, 2018).

Most of the women who were included in this study had spontaneous onset of labour. The study found that 54.1% of the deliveries were spontaneous labour. A significant number of the participants also had pre-labour caesarean sections and induction of labour occurred only 3 times, representing 1.8%. Therefore, the researcher can report based on this study finding that patrons of caesarean sections in these three health care facilities rarely have induction of labour. The study found three cases of caesarean section that started with induction of labour. It is instructive to note that in these 3 instances where there was induction of labour, the induction either failed and ended up in a primary caesarean section as the study finds that these deliveries did not attempt vaginal birth and were not associated with any previous caesarean section. Because the study participants were basically women who had caesarean section deliveries, it lacks insight into the number of successfully induced pregnancies. Further, studies in this

area may consider adjusting the methodology to assess cases and controls. In the pre-labour caesarean section group, only 41% were previous caesarean section and 59% were primary caesarean sections. Beyond the inherent health risk of complications to both the mother and the foetus, it also has a huge consequential effect on women in their subsequent deliveries in the future. The spontaneous group had 69% primary caesarean sections compared to the 31% repeat caesarean sections. This has reflected in the number of emergency and elective caesarean sections. Almost 63% of the women who had pre-labour caesarean sections were elective caesarean sections, while the remaining 37% were emergency caesarean sections. In the spontaneous onset of labour group, 11% had an elective caesarean section and as much as 89% ended as emergency caesarean sections. With singleton non-breech presentation in a spontaneous labour, vaginal delivery is expected. The fact that these women ended up in emergency caesarean section delivery raises questions about the capacity of the health service to provide skilled vaginal deliveries and the need to ensure quality vaginal delivery services. The study reveals that there is a significant association between labour onset and type of caesarean section operation (F-test=49.318, P-value=0.001).

The Robson 10 Group classification was an important component of this study as it summaries all the important obstetric attributes expressed above. These groupings are simple, robust, reproducible, clinically relevant, and prospective and allow the comparison of rates of caesarean section among and within women in the respective groupings and facilities (WHO, 2017). The findings of this study are that women who delivered at these facilities were mostly from two Robson groups 5, 10 and 1. All multiparous women with at least one previous uterine scar, with a single cephalic pregnancy ≥ 37 weeks gestation constituting Robson group 5 (26 %), all women with a single cephalic pregnancy < 37 weeks gestation, including women with previous

caesarean scars constituting Robson group 10 (22 %) and nulliparous women with single cephalic pregnancy, ≥ 37 in spontaneous labour (17) forming a combined percentage of 65 of the 170 participants. We observe that emergency caesarean section was higher in groups except group 5 which had elective caesarean section more than emergency caesarean section. This observation is not surprising as the results also showed significant association (F-test = 50.934, P-value = 0.001) between the Robson 10 group classification and type of caesarean section.

On several instances, foetal distress was an important indication influencing the decision to carry out caesarean section delivery. In this study, foetal distress was present in 21 cases representing 12.4%. We also found that the relationship between foetal distress and type of emergency caesarean section operation is high (F-test, P-value=0.001). Another foetal indication for caesarean section in this study was macrosomia (Big baby). Even though we observe only 14 cases of macrosomia, only 3 of the participants tried labour before caesarean section delivery. It is therefore reasonable to argue in support of the claim that foetal macrosomia contributes to increases in caesarean section deliveries. This position has been favoured by Fuchs, et al., (2017) that maternal obesity has an impact on foetal macrosomia leading to increase in caesarean section deliveries.

From the results, it is clear that maternal factors were important contributors to increased caesarean section rates. About 91 of the women in this study had one or more maternal indications. The most important maternal indications for caesarean section deliveries were previous caesarean section, trial of labour, poor progress of labour, which also have significant associations with the type of caesarean section delivery. Other maternal indications which did not show any statistical significance were inadequate pelvis, bad obstetric history, and failed induction etc.

The findings of this study confirm that previous caesarean section is an indication for caesarean section which has an impact on the increase in caesarean section rates among and within health facilities. Primary caesarean sections totalled 110 of all 170 caesarean deliveries representing 64.7%. The rest were women who had prior to caesarean section delivery, with a prevalence of 60, culminating into 35.3%. Even though 47 percent of the women with previous caesarean section were elective caesarean section, they were 2.333 times more like to undergo emergency caesarean section compared to elective caesarean operation (P- Value = 0.012, OR: 2.333, CI: 1.208- 4.507).

The Royal College of Obstetrics and Gynaecologist (ACOG) guideline ''B'' expressly provided that vaginal birth after prior caesarean section is suitable for the majority of women who have one previous caesarean section operation with a single cephalic presentation at term or post maturity with or without previous caesarean section delivery (Gupta, 2015). Despite this clear indication from the above, it is interesting to observe that of the 60 women whose delivery was indicated by previous caesarean section, only 24 of them went through a trial of vaginal delivery prior to a repeat caesarean section representing 40% of a total 60 caesarean section deliveries from the three hospitals respectively.

Poor progress of labour was another important maternal indication for caesarean section delivery. In about 22 cases, the indication for performing a caesarean section on a patient was as a result of poor progress representing 12.9% of all caesarean section deliveries. As expected, all caesarean deliveries indicated by poor progress of labour were by emergency caesarean section. There was statistically significant association between poor progress and type of caesarean section operation (F-test, P-value=0.001).

The study revealed that maternal pathological conditions were not an important characteristic of the participants undergoing caesarean section at the various facilities. The study highlights that maternal pathological conditions such as obesity, maternal age more than 40, maternal cardiac disease, severe anaemia and gestational diabetes have less impact on the caesarean section deliveries. The most important maternal pathological condition was hypertensive disorders of pregnancy with prevalence of 24%. The study also noted that 32.4% of the women had at least one pathological condition. As some of these maternal pathological conditions could modify or confound some of the variables (indications) for caesarean section in the analysis. Like Mendis et al., (2017) however, this study found no risk of caesarean section delivery associated with the afforementioned conditions. One of the attributable reasons, according to Mendis et al., is that patients with such conditions may have labour induction when medical officers determined the risk of delivery was relatively low (Mendis. et al., 2017). It could also be argued that these conditions were missed or not diagnosed at all, considering the context and health-seeking behaviour of patients.

A good number of caesarean sections were performed as a result of foeto-placental factors. At least 68 of the caesarean section operations were indicated by foeto-placental factors representing 40 percent of the total 170 caesarean section cases. The implication is that a consolidated number of foeto-placental factors contributed to the caesarean sections rates. This has significant association with the type of caesarean section operation with a p-value of 0.042. The most important foeto-placental factor that influenced caesarean sections delivery was pre-eclampsia/eclampsia. About 22% of all caesarean section deliveries were indicated by pre-eclampsia. Other were placenta praevia, abruptio placenta, oligohydramnios. Major placenta praevia was an indication for caesarean sections in 7 percent of the overall caesarean section deliveries; placental

abruption was present in 12 patients who had caesarean section representing 7.1 percent of the 170 women understudied, while oligohydramnios was indicated in 5% of the overall caesarean section deliveries. It is instructive to report that these indications were more associated with emergency caesarean sections than in elective caesarean sections. Inference can therefore be made that this has resulted because of poor ANC attendance or incomplete services or change of services because major placenta praevia for instance, could easily be picked at the ANC and appropriately scheduled for elective caesarean section delivery.

Overall, 45% of the participants had only 1 form of indication, be it maternal, foetal or placental factor. Forty percent of the women had between 2 and 4 indications for caesarean sections. Despite the low number of caesarean sections on demand, the findings indicated that 7% of the women had no form of indications contained in the patient folder. Unlike the advanced world, we found that the decision to deliver by caesarean section was not an individual patient choice but the choice of the medical officer. All caesarean section deliveries were primarily carried by physicians across all three facilities. However, the majority of these surgeries were performed by doctors without obstetric postgraduate training. The frequency of doctors without obstetric postgraduate training carrying out caesarean section deliveries were 120, representing 70.6% of operations. On 50 instances, the caesarean operations were done by doctors with postgraduate obstetric training representing 29.4% of total deliveries under the studyHowever, there was no significant association between medical officers with postgraduate training and type of caesarean section operation (□2-Value = 0.475, P-Value 0.491). Higher caesarean sections in resource poor areas have been linked with medical officers' decision. In Latin America, the doctor has the most say on the choice of birth for a mother (Anderson, 2018). Studies have shown that demand for caesarean

section is partly responsible for the rise in caesarean sections (Schantz., 2019). This results revealed that demand for caesarean section delivery was less important as women generally prefer vaginal delivery to caesarean section. Only 4 of a total 170 women demanded caesarean section delivery representing as low as 2.1 percent of the women included in the study. This study supports Gulati & Hjeld, (2012), findings of only 0.2% maternal request for caesarean section at the Korle Bu. The implication is that the decision to deliver by caesarean section is the top-bottom approach. As the choice of delivery is driven largely by the decision of the health professional (physician). Whiles this is generally the case at government-owned facilities, it is unclear whether it is the same in private practice where patients' preferences may be considered.

Adequate antenatal care for pregnant women can help detect pregnancy induced conditions such as hypertension, oligohydramnios IUGR, etc. for early management to avoid any resultant adverse event (Kaur, et al., 2013). It is therefore encouraging to observe that almost all women who participated in this study committed to Antenatal Care Visits (ANC). Only 4 of the women did not have any antenatal care visits representing 2.4%. The remaining 137 had all visited the hospital for antenatal care representing 97.2%. The highest number of ANC visits are between 4 and 5. This is quite impressive because as women continue to go for ANC visits, it gives the health personnel an opportunity to properly manage their clients' health conditions, through periodic monitoring, reviewing, and appropriately choosing the right services (interventions) for each patient. The continuous use of the ANC services may well be influenced by the free ANC services provided by the government. The study, however, did not show any relationship between the number of patient's ANC visit and type of caesarean section.

Partograph is a tool used by health professionals present at delivery to monitor the progress of labour. In the majority (63 %) of the cases, participants did not use partograph during the process, over 17% of the participants did not have a clear idea if partograph was used on them while the remaining 19 percent used partograph. Almost all the patients who used partograph were delivered by emergency caesarean section. With a significant number of participants not going through the use of partograph, instances where elective caesarean section could easily be prescribed would be missed, and the use of caesarean section can be said to have been delayed leading to the higher number of emergency cases among the 33 patients. The study found that the relationship between Postgraduate Training for the physician and type of caesarean section operation is low (□2-Value = 0.475, P-Value 0.491).

Some researchers have suspected referral admissions as being the reason for high caesarean section in certain health facilities. Fifty-nine of the patients were referred cases from other peripheral primary health care facilities representing 35%. With as much as 59 percent of the patients undergoing caesarean sections upon referrals, this study rightly confirms the suspicion that referral cases contribute to the rise in caesarean section numbers, especially at TTH.

Emergency caesarean section was the most frequent type of caesarean section compared to elective caesarean section deliveries in this study. About 66% of the cases were emergency caesarean sections and the remaining 34 were elective caesarean sections. The study shows that the relationship between type of admission and type of caesarean section deliveries was high (□2 = 5.870, P — value = 0.015).

The study confirms that a lot of the elective caesarean sections were indicated by previous caesareans section. Out of 58 elective caesarean sections in this study, over 48

percent were associated with previous caesarean sections. The number of previous caesarean sections affects the chances of a repeat caesarean section. In this study, 40% of women who had previous caesarean section delivery went for elective caesarean sections. This is a worrying trend and every effort should be made to avoid primary caesarean section delivery once there is still room for vaginal delivery.

5.2 Health-related outcomes and experiences of women who have undergone C/S in northern region

Maternal and foetal outcome has been classified as having complication, or not. Complications were determined by a woman having any morbidity or mortality after the caesarean section delivery. This information was basically obtained from an individual's patient files as indicated by the physician or midwives. We found that the majority of the women did not have any major complications. Only 22% of the participants presented with one form of complications or the other. There were mild complications and sometimes unavoidable conditions during pregnancy and child birth. As contained in patients' records, severe anaemia, eclampsia, hypertension and intrauterine abscess were recorded as complications. We observe that the classification of these as complications was not constant across all patients.

Ten 10 percent of the women were found to be presenting with foetal complications. The most important foetal complications specified in the patients' records were foetal death and low birth weight which occurred 6 and 8 times across all three facilities each representing 3.5% and 4.1%respectively. Whiles the procedure (CS) maybe not be blameable for the low birth weight, an indication such as feto-placental insufficiency could be the cause of such an outcome. The remaining were prematurity which occurred 2 times with a percentage of 1.2 and birth asphyxia occurring only once (1) representing 0.6 percent. Emergency caesarean section deliveries accounted for 14 of

the adverse foetal outcomes raising questions about the timing of the caesarean section interventions. The 14 cases of adverse foetal outcome at the TTH compared to the combined 3 of TCH and SMH is giving credence to the accession that higher caesarean section rates are related to foetal complication. It is important however, to note that, the higher adverse outcome at the TTH compared to the other two facilities cannot be explained in the realm of efficiency of service provision without considering the position of the TTH as a tertiary health care hospital which has the propensity of receiving relatively high risk pregnancies including but not limited to referrals from other hospitals which may result in the high caesarean section rates. The research enhances the evidence that shows that caesarean section delivery is a safe surgical intervention for the mother. However, it remains a procedure which is associated with undesirable foetal outcomes such as foetal death. This finding supports Villar., et al., (2006) claim that caesarean section rates between 10% and 20% are associated with increased preterm delivery and neonatal mortality rates. Therefore, it is imperative for hospital administrators to regulate the rates of caesarean section delivery carefully to reduce the chances of foetal and maternal morbidity and mortality.

Even though the frequency of adverse foetal outcome is small compared to the maternal outcome in this study, the gravity of the complications is more of concern. It leaves a poor statement on our performance as a middle-income country towards meeting the sustainable development goals (SDG3), in particular, target 3.1 and 3.2 respectively whose aim is to reduce maternal and neonatal mortality (WHO, 2020). It is significant to observe that higher adverse foetal outcomes are more associated with emergency caesarean section than elective caesarean section with similar observations made by Gulati and Hjelde (2012), at korle Bu Teaching Hospital.

CHAPTER SIX

SUMMARY, STRENGTH, LIMITATION CONCLUSION AND RECOMMENDATION

6.1 Summary of the study

This was a novel multi-facility observational study on the rates, obstetric and non-obstetric indications; and outcomes of caesarean section deliveries in the northern region of Ghana.

Data was collected in three (3) main health facilities offering obstetric services in the northern region. Namely; Tamale Teaching Hospital (TTH), Tamale Central Hospital (TCH) and Savelugu Municipal Hospital (SMH) respectively.

Actual caesarean section rates according to data from the daily health management system shows that the caesarean section delivery rates were 23.5%, 7.6% and 7.7% respectively. Of the 170 questionnaires that were completed and retrieved successfully, 129 (75.9%) were from the Tamale Teaching hospital (TTH), followed by 22 (12.0%) from the TCH and 19 (11.20%) from the SMH. The mean age of the participants was 29 ± 0.55 years, median age of 30 years, and a modal age group of 25 – 34 years. Only 2 (1.2%) of the participants were less than 18 years and a total of 27 (15.9%) were classified under advance maternal age starting from 35 and above (Table 4.3.1).

The most important demographic characteristics of the participants with significant association with type of CS were advance maternal age and parity. There was significant difference in the ages for emergency caesarean section (M= 28.38, SD=5.585) and elective caesarean section (M=30.26, SD=5.313) operations; t = -2.109, P- Value = 0.036 (Table 4.13) and Parity had high association the type of caesarean

section delivery (□2=19.200, P. Value= 0.002). In contrast, there was no association between type CS and demographic variable such as educational status (□2=5.081, P-value=0.166) and residential status (□2=0.075, P- value=0.784). The gestational age of women undergoing CS at the participating facilities ranged from a minimum of 28 to a maximum of 37 weeks. About 74.1% were at term during the caesarean section operation. However, there was no significant association between gestational age and type of caesarean section operations (F-test=5.057, P-value=0.125). Robson Group 5, which comprises multiparous women with at least one previous caesarean section and a single cephalic pregnancy ≥ 37 weeks of gestation were the commonest (25.9%), followed by Groups 10, referring to all women with single cephalic pregnancy with <37 weeks gestation including women with previous caesarean section delivery (20.6%).

A number of factors contributing to the caesarean section deliveries were counted for each patient. Some participants could have single maternal, foetal, placental or a combination of many of these factors which resulted in the decision to schedule a caesarean section operation. The number of indications for caesarean section operation for women who have caesarean section in this study ranged from a minimum of 0 and a maximum of 4.

The findings of this study confirmed that maternal, foetal, and placental variables such s previous CS, foetal distress, poor progress, multiple gestation, foetal macrosomia, bad obstetric history, small pelvis etc are indications for caesarean section which has an impact on the increase in caesarean section rates. However, only prior CS, foetal distress and poor progress has significant association with the type of CS with each having a p- value < 0.05.

6.2 Strength

One of the strengths of this study is that the participants were selected prospectively based on the number of people available at the facility upon delivery. The fact that patience were immediately interviewed to obtain information while they are on admission reduces the incidence of data losses. Further, data sources for obstetric factors were obtained from relevant hospital records containing patient information such as the patient folder, the maternity record book which further reduces the participant recall bias.

Unlike other retrospective studies which relied on only data provided in the patient folder, this study combined carefully, data from relevant patient records and prospective face-to-face interview with patients which complement each other to reduce the incidence of missing data while ensuring that detailed information on maternal and neonatal outcomes are taken.

With different health facilities at various levels selected and this study being the first of its kind in the northern region, caesarean section delivery characteristics for each hospital are adequately described which can be used as a primary source of information for planning and development of hypothesis.

6.3 Limitation

The initial inclination of the research was to conduct a case control study capable of establishing causality. But this meant that women who had normal vaginal delivery without complications and immediately discharged upon delivery would be required. This hastened discharge of patients was necessary to reduce the spread of COVID19. Despite this challenge, a cross sectional study design which is capable of being conducted within a short period of time was adopted to provide information about the

rates (prevalence), risk factors (indications) and outcome. This is crucial in establishing hypothesis. The study was carried out in a limited number (3) of facilities in the northern region, and, for that matter, selection bias could not be excluded. Further, private health facilities which have been sighted for higher caesarean section deliveries by researchers and are likely to attract wealthy or highly educated clients were not selected. Even though the number of hospitals included were few, it included both primary and tertiary level health facilities. Because data was collected at the peak of the COVID 19 pandemic, hospital policies favoured immediate discharge of patients after delivery, limiting the chances of these patients being included in the study and the study period could not also be extended due to the time lines required for the completion of the study. The sample size for the study was small, limiting its generalizability to the entire region. It is imperative, however, to learn that this type of study is allowed at the individual hospital level to properly respond to the obstetric needs of patients. The use of the Robson classification in the audit of caesarean section deliveries at the hospital level is acceptable and widely used for the same purpose.

6.4 Conclusion

The study has demonstrated that caesarean section delivery rate at the SMH and TCH hospitals are within the range recommended by the WHO, while the rate at the TTH as a tertiary hospital is well above the 15% threshold. Untimely referral of cases from primary health care facilities contribute to the rates of CS, especially at the teaching hospitals. Previous CS, foetal distress, advance maternal age and parity are vital indications for CS delivery at the various health facilities. Prior caesarean section delivery as an indication for caesarean section can be managed by encouraging trial of labour at various health facilities. Improvement in the use of medical technology such as cardiotograph in labour monitoring would reduce over diagnosis of foetal distress

and thereby reduce the caesarean section delivery rates. To provide low-risk caesarean section delivery services, government should endeavour to provide postgraduate obstetric training to doctors to increase access to skilled delivery and ensure efficient management of complicated pregnancies. Birth asphyxia, foetal death, low birth weight are the most important foetal complications experienced during child birth.

6.5 Recommendations

Hospital policies should ensure;

- Enhanced antenatal surveillance should be ensured by a dedicated clinical official to promptly distinguish problem pregnancies and rectify them or plan for elective CS rather than emergency CS which appeared in this investigation to have more adverse health outcomes. In this manner, a plan of delivery should be examined with the patient and recorded. This will permit for problem pregnancies to be distinguished early and rectified where conceivable or for elective CS to be booked rather than emergency CS which has been shown in this investigation to have more adverse health outcomes.
- Further improvement in the utilization of clinical innovation, for example, cardiotograph in labour checking would lessen over determination of foetal distress and consequently diminish the caesarean segment delivery rates.
- A low CS intervention strategy should be employed in labour units particularly for generally safe pregnancies. Hence, ladies with lesser degrees of distress should profit from strategies that improve the probability of vaginal delivery.
- Prior caesarean section delivery as an indication for caesarean schedule can be managed by encouraging attempt of labour at various health facilities. Safe and skilled VBAC ought to be offered to mothers who had past fruitful vaginal birth

Government

- Government should endeavour to provide postgraduate obstetric training or other supplemental classes in emergency obstetric care to clinicians. In particular, medical officials who perform CS to increase their capacity in the field and thereby enhance access to skilled delivery and ensure efficient management of complicated pregnancies. This would not only guarantee delivery of quality obstetric services but also, prompt decrease in the complications rate due to CS, including but not limited to foetal death.

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Appendix I: Questionnaire

INFORMED CONSENT FOR MASTERS THESIS DATA COLLECTION

Dear participant,

Good day. My name is Buhari Yussif Gunu. I will be conducting a research on the topic "INDICATIONS FOR C AESAREAN SECTIONS DELIVERY IN NOTHERN REGION; A CASE CONTROL". The research is an essential component of my postgraduate training in Master of Public Health (Epidemiology and Biostatistics) at the Department of Community Health and Family Medicine of the university for Development studies, Tamale. I have obtained permission from the hospital management to undertake the study.

Maternity records and face-to-face interviews will be conducted with patients who have both caesarean delivery and spontaneous delivery. The data analysis will identify trends and associations between different dependent variables and caesarean sections.

Even though the study is going to be non-invasive and analysed anonymously, I believe it is ethical for me to seek your consent before collecting or making use of such information since a little of personal information is involved. I trust that the findings of this study will benefit the hospital and also contribute to the growth of knowledge concerning determinants

Do you Agree Yes () No()

Health Facilitiy Name ..... Serial Number..... Tell.....

Delivery type: Spontaneous () Ceasarean ()

Section A: Demoraphic Characteristics

1) Age in years.....
2) Marital status: ( ) Single, ( ) Married ( ) Divorced ( ) Separated ( ) Widowed
3) Education: ( ) None, ( ) Basic, ( ) Secondary, ( ) Tertiary. () post graduate
4) Husbands level of education: () None, () Basic, () Secondary, () Tertiary+
5) Employment status: ( ) Unemployed, ( ) formal Employment. ( ) informal
6) Specify husband's employment.....
7) Travel time from home to health facility. ( ) < 1 hour ( ) > 1 hour
8) Place of residence. () Rural () urban
(State area or town name .....)
9) Ethnicity (specify).....

SECTION B: OBSTETRIC FACTORS

10) **Maternal age:**

()<18 years

()18-24 years

()25-34 years

()35-39years

()>40 years

11) **Parity:**Number births or children delivered in the past

0, 1, 2, 3, 4, 5, >5.

12) **Gestational age:**How many weeks was the pregnancy before birth?

()<28 weeks

() 28-31 weeks

()32-36 weeks

()>37 weeks

13) **Previous caesarean section**: has the woman delivered via Caesarean section before

() Yes

() No

14) Presentation:

() Cephalic() Breech() Other

15) Multiple pregnancies: please indicate yes if the children are twins or more than 1

() Yes

() No

16) Labour onset

() Spontaneous

() Induction

() Pre-labour caesarean section

17) **Mode of delivery**

() Vaginal spontaneous

() Vaginal operative

() Caesarean section

18) Recorded number of indications for caesarean section.....

19) **Foetal factors.**

Select all applicable foetal factors below:

( ) Foetal distress.
( ) Macrosornia(Big Baby)
( ) Malpresentation.
( ) Post Maturity.
( ) Intra Uterine Growth Restriction (IUGR).
( ) Multiple Pregnancy.
( ) Cord Prolapse

20) **Maternal Factors.**

Select all applicable maternal factors bellow:

( ) Previous Caesarean
() If previous caesarean, trial of labour
( ) Poor Progress
( ) Bad Obstetric History
( ) Failed Induction
( ) Inadequate Pelvis
( ) Genital lesions

21) **At least one maternal or foetal pathological conditions**

Select all applicable maternal conditions below:

() Obesity (BMI > 27.5)*
() Maternal age > 40 years
() Maternal cardiac disease(CPD)
() Severe anaemia (Hb <7)
() Chorioamnionitis

22) () Pre-gestational diabetes
23) () Gestational diabetes, total

24) Hypertensive disorders of pregnancy, any
() Yes
() NO
25) Specify any Other Condition.....
26) Duration of labour.....

27) **Feto- Placental factors.**

Select all applicable foetal placental conditions bellow:

( ) Placenta Praevia.
() Abruptio Placenta.
() Oligohydramnios.
()Polyhydramnios

SECTION C: NON-OBSTETRIC FACTORS:

28) Patient Demanded for Caesarean: ( ) Yes ( ) No
29) Medical Condition associated. ( ) Yes ( ) No
30) Specify medical Condition .....
31) HIV status: ( ) +ve, ( ) -Ve, ( ) Unknown
32) Received ANC: ( ) Yes, ( ) No.
33) Number ANC visits .....
34) Partogram was used during labour ( ) Yes, ( ) No. ( ) N/A
35) Cardiotocograph (CTG) was used. ( ) Yes ( ) No
36) Health Care worker: Surgeon (Code Number).....
37) Obstetric Postgraduate training. ( ) Yes ( ) No

CAESAREAN SECTION CONTEXT

Processes leading to delivery whether Caesarean or spontaneous

Date and time:

38) Date of Decision .....
39) Date and Time of Operation
....

40) Type of operation: ( ) Elective, ( ) Emergency ( ) Planned
41) Number of Previous Caesarean Sections ( ) 1 ( ) 2 ( ) 3 + ( ) None
42) Immediate maternal outcome: ( ) Complication. ( ) No Complication
43) Type of Maternal Complication.....
44) Immediate foetal outcome ( ) No complication ( ) Complication
45) Type of Foetal Complication .....
46) Type of admission. ( ) Referral ( ) not referred
47) If referred, specify reason for referral
48) Name of hospital referred from

Appendix II: Letters of Request and Permission

UNIVERSITY FOR DEVELOPMENT STUDIES

School of Medicine and Health Sciences

(Department of Community Health and Family Medicine)

Tel : 03720 - 93295
E-Mail :
Local : 5:7811/106.15
Internet: www.uds.edu.gh

Post Office Box TL 1883,
Tamale, Ghana, West Africa.

Office of the Head 10/12/19

The Head of Research
Tamale Teaching Hospital
Tamale, N/R

LETTER OF INTRODUCTION

Buhari Yussif Gunu

This is to introduce to you, Mr Buhari Yussif Gunu, a Master of Public Health student of School of Medicine and Health Sciences of the University for Development Studies. Mr Buhari is currently working on his thesis titled: ***Indications for caesarean section deliveries in northern region: a case control study***. Mr Buhari wants to have some information from the hospital to enable him to carry out this important academic exercise. I would be grateful if you could provide him with this information and any other assistance he may need.

Thank you.

Yidana Adadow *(PhD)*
(HoD, CH&FM)

Dr. Yidana Adadow
SENIOR LECTURER HOD
DEP. OF COM. HEALTH & FAM MED
SMHS-UDS, TAMALE

UNIVERSITY FOR DEVELOPMENT STUDIES

School of Medicine and Health Sciences

(Department of Community Health and Family Medicine)

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Internet: www.uds.edu.gh

Post Office Box TL 1883,
Tamale, Ghana, West Africa.

Office of the Head

10/12/2019

The Regional Director of Health Services
Northern Regional Health Directorate
Tamale.

LETTER OF INTRODUCTION

Buhari Yussif Gunu

This is to introduce to you, Mr Buhari Yussif Gunu, a Master of Public Health student of School of Medicine and Health Sciences of the University for Development Studies. Mr Buhari is currently working on his thesis titled: ***Indications for caesarean section deliveries in northern region: a case control study***. Mr Buhari wants to have access to Tamale Central Hospital and Savelugu Municipal Hospital to carry out this important academic exercise. I would be grateful if could grant him access and any information he may need from these two facilities.

Thank you.

Yidana Adadow *(PhD)*
(HoD, CH&FM)

Dr. Yidana Adadow
SENIOR LECTURER HOD
DEP. OF COM. HEALTH & FAM MED
SMHS-UDS, TAMALE

Cc: *The Administrator, Savelugu Municipal Hospital, Savelugu*
The Administrator, Tamale Central Hospital, Tamale

GHANA HEALTH SERVICE

Regional Health Directorate
Ghana Health Service
P.O. BOX99
Tamale

OUR CORE VALUES:
1. People-Centered
2. Professionalism
3. Team work
4. Innovation
5. Discipline
6. Integrity

My Ref No. GHS/NR/18-0/786
Your Ref No: .....

8th January 2020

Tel: (233) (03720) 22912, 22710, 22146
Fax: (233) (03720) 22941
Email: rdhs.nr@ghsmail.org

THE MEDICAL SUPERINTENDENTS
- TAMALE CENTRAL HOSPITAL
- SAVELUGU MUNICIPAL HOSPITAL

LETTER OF INTRODUCTION
BUHARI YUSSIF GUNU

The above named is a Master of Public Health student from the School of Medicine and Health Sciences of the University for Development Studies.

He is undertaking a study titled "Indications for caesarean section deliveries in Northern Region: a case control study" and I would be grateful if he is accorded the needed support in the data collection process.

Thank you.

DR. JOHN BERTSON ELEEZA
REG. DIRECTOR OF H/SERVICES
NORTHERN REGION

Admin.
approved.
30/01/2020

Department of Research &Development
Tamale Teaching Hospital

TTH/R&D/SR/157
20/12/2019

TO WHOM IT MAY CONCERN

CERTIFICATE OF AUTHORIZATION TO CONDUCT RESEARCH IN TAMALE TEACHING HOSPITAL

I hereby introduce to you **Mr. Buhari Yussif Gunu,** a Master of public Health student of the School of Medicine and Health Sciences, Department of Community Health and Family Medicine, University for Development Studies (UDS). The candidate has been duly authorized to conduct a study titled **"Indications for Caesarean Section Deliveries in Northern Region: A Case Control Study".**

Please accord the candidate the necessary assistance to enable him completes the study. If in doubt, kindly contact the Research Unit on the second floor of the administration block or on Telephone 0209281020. In addition, kindly report any misconduct of the Researcher to the Research Unit for necessary action.

The candidate is required to furnish the hospital a copy of the dissertation/Study upon completion.

Please note that this approval is given for a period of six months, beginning from 30th of December, 2019 to 29th of June, 2020.

Thank You.

ALHASSAN MOHAMMED SHAMUDEEN.