DSPACE

https://dspace.org/

Factors associated with high caesarean section rates in Bertha Gxowa Hospital

Inyang-Otu, Ukeme Sunday

2014-08-27
http://hdl.handle.net/10539/15294

Downloaded from a DSpace repository. https://dspace.org/

FACTORS ASSOCIATED WITH HIGH CAESAREAN SECTION RATES IN BERTHA GXOWA HOSPITAL

Ukeme Sunday Inyang-Otu

Supervisor: Dr. M A Eyassu

Co-Supervisor: Dr. S Agbo

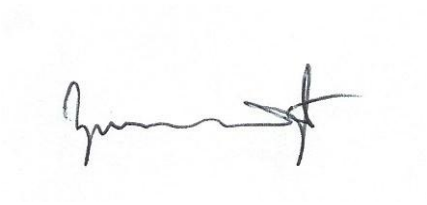
A research report submitted to Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree Master of Medicine in Family Medicine.



Johannesburg
5th May 2014.

DECLARATION

I, Ukeme Sunday Inyang-Otu hereby declare that this thesis “Factors associated with high Caesarean section rates in Bertha Gxowa hospital” is my own work. It is being submitted in partial fulfilment for the degree of Master of Medicine in Family Medicine in the University of the Witwatersrand, Johannesburg. It has not been submitted before for another degree or examination at this or any other university.



.....

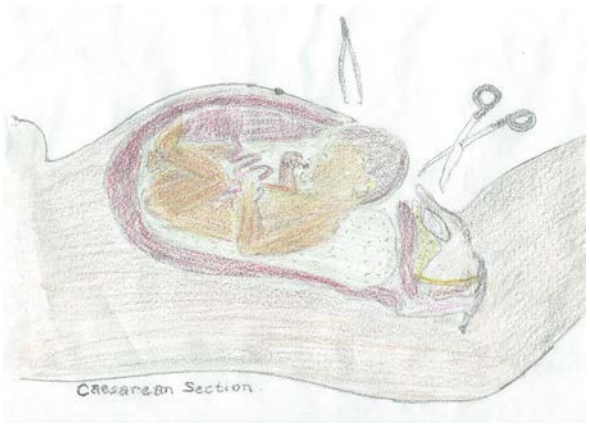
UKEME SUNDAY INYANG-OTU

5th MAY 2014.



DEDICATION

This research report is dedicated to my wife, Victoria and my daughters, Moriah and Neriah for their inspiration, love and support, and to our Lord Jesus Christ for making everything possible.



ABSTRACT

TITLE: Factors associated with high Caesarean section rates in Bertha Gxowa hospital.

BACKGROUND: Bertha Gxowa hospital, like other district hospitals in South Africa offers Caesarean section as an essential obstetric service to pregnant women. Caesarean section rates have been increasing worldwide, giving cause for concern because of increased maternal and perinatal morbidity and mortality associated with high Caesarean section rates. This study aims to describe factors associated with high Caesarean section rates in Bertha Gxowa hospital.

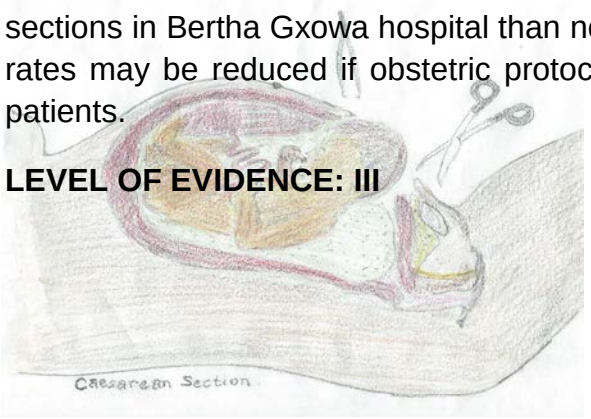
The researcher hypothesized that associated factors could be identified, and if demographic obstetric and non obstetric factors are described in relation to the context in which the Caesarean sections took place, it should be possible to identify significant modifiable factors. It is hoped that the findings of this study will help to shape local obstetric policy and practice, and lead to improved maternal and perinatal health.

METHODS: This study utilized a quantitative cross sectional descriptive design. Patient records were reviewed to obtain information on Caesarean deliveries performed between January and December 2011. Demographic, obstetric and non obstetric factors were described. Pearson's Chi-square, Fisher's exact and Student t tests were used as tests of association between independent variables and Caesarean section. A logistic regression model was used to describe risk factors associated with Caesarean section.

RESULTS: The results show that increasing parity was associated with Caesarean section (P = 0.004). Eighty six percent of the Caesarean sections were emergency Caesarean sections and 65% were primary Caesarean sections. The commonest obstetric indications were fetal distress, previous Caesarean section, cephalopelvic disproportion, poor progress and malpresentation. Women belonging to Robson classes 1 and 5 had more Caesarean sections than other classes. There was a significant association between Medical Officers and Caesarean section (P=0.001). There was no significant association between patient's demand, HIV status, Medical Officers' experience and Caesarean section.

CONCLUSION: Obstetric indications contributed more to the high Caesarean sections in Bertha Gxowa hospital than non obstetric factors. The Caesarean section rates may be reduced if obstetric protocols are implemented for certain classes of patients.

LEVEL OF EVIDENCE: III



ACKNOWLEDGEMENT

I wish to acknowledge the assistance of my supervisors Dr. M. Eyassu and Dr. S. Agbo who made constructive input and guided me through this project.

I wish to acknowledge the assistance of Dr. O. T. Owolabi (FCOG) my mentor, who read through this research report and made constructive criticism.

I also wish to acknowledge the assistance of Family Physicians in Ekurhuleni district particularly Dr. E. Rwakaikara who gave me guidance and encouragement in the formative and final stages of this project.

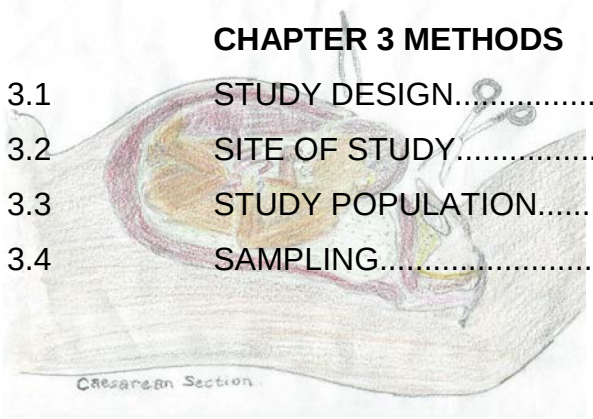
I am also grateful to the Management of Bertha Gxowa hospital for granting me access to patient records and a conducive environment to carry out this project.

I also wish to acknowledge the assistance of biostatisticians Asnat Chirwa and Glory Atilola who gave me guidance in the use of Stata software, in statistical commands, in cross tabulations and regression analysis.

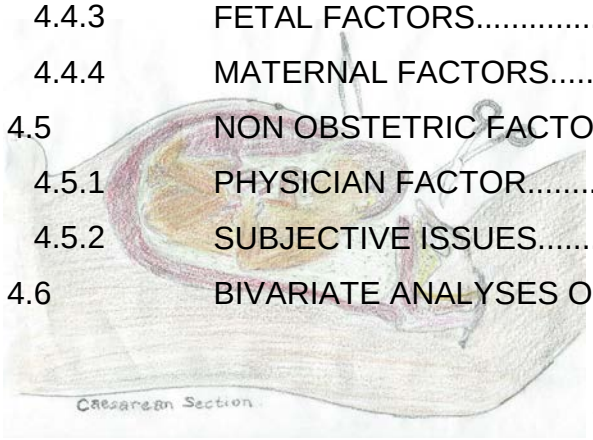


TABLE OF CONTENTS

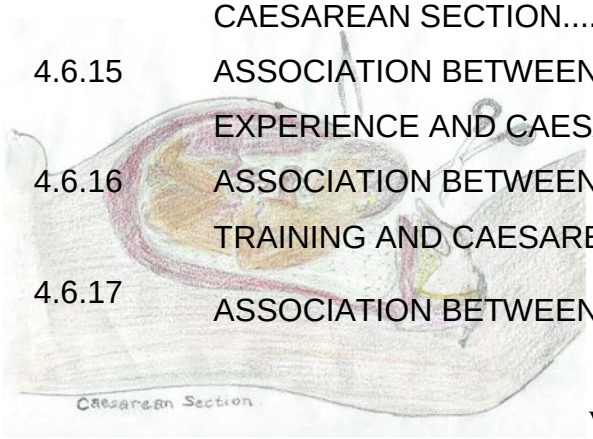
		PAGE
	TITLE PAGE	i
	DECLARATION	ii
	DEDICATION	iii
	ABSTRACT	iv
	ACKNOWLEDGEMENT	v
	LIST OF FIGURES	ix
	LIST OF TABLES	ix
	LIST OF ANNEXURES	x
	ABBREVIATIONS	xi
	DEFINITION OF TERMS	xii
	CHAPTER 1 INTRODUCTION	**1**
1.1	BACKGROUND	1
1.2	RATIONALE	2
1.3	AIM AND OBJECTIVES	4
	CHAPTER 2 LITERATURE REVIEW	**5**
2.1	CAESAREAN SECTION RATES IN SOUTH AFRICAN DISTRICT HOSPITALS	5
2.2	CAESAREAN SECTION RATES IN DEVELOPING COUNTRIES	5
2.3	CAESAREAN SECTION RATES IN DEVELOPED COUNTRIES	6
2.4	CONTRIBUTARY FACTORS TO HIGH C-SECTION RATES	6
2.5	DEMOGRAPHIC FACTORS ASSOCIATED WITH HIGH CAESAREAN SECTION RATES	6
2.6	CLINICAL FACTORS	7
2.7	NON CLINICAL FACTORS	9
2.8	STUDY DESIGNS OF PREVIOUS RESEARCHERS	10
	CHAPTER 3 METHODS	**12**
3.1	STUDY DESIGN	12
3.2	SITE OF STUDY	12
3.3	STUDY POPULATION	13
3.4	SAMPLING	13



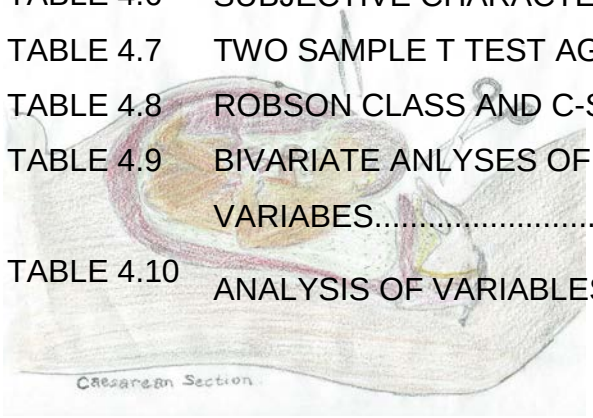
3.4.1	SAMPLE SIZE.....	13
3.4.2	SAMPLING METHOD.....	13
3.5	INCLUSION CRITERIA.....	13
3.6	EXCLUSION CRITERIA.....	14
3.7	PILOT STUDY.....	14
3.8	DATA COLLECTION TOOLS.....	14
3.9	DATA CAPTURE AND ANALYSIS STRATEGY.....	15
3.9.1	DATA ENTRY.....	15
3.9.2	DATA CLEANING.....	15
3.9.3	DATA CODING.....	15
3.9.4	DATA ANALYSIS.....	16
3.10	ETHICS.....	16
3.11	TIMING.....	17
	CHAPTER 4 RESULTS	**18**
4.1	C-SECTION RATES IN BERTHA GXOWA HOSPITAL.....	18
4.2	DEMOGRAPHIC CHARACTERISTICS.....	19
4.2.1	AGE.....	19
4.2.2	PARITY.....	19
4.2.3	RACE.....	19
4.2.4	MARITAL STATUS.....	19
4.2.5	EDUCATION.....	19
4.2.6	EMPLOYMENT STATUS.....	19
4.2.7	TRAVEL TIME TO HEALTH FACILITY.....	19
4.3	CAESAREAN SECTION CONTEXT.....	21
4.4	OBSTETRIC FACTORS.....	22
4.4.1	ROBSON CLASSIFICATION.....	22
4.4.2	NUMBER OF INDICATIONS FOR CAESAREAN SECTION	22
4.4.3	FETAL FACTORS.....	24
4.4.4	MATERNAL FACTORS.....	24
4.5	NON OBSTETRIC FACTORS.....	24
4.5.1	PHYSICIAN FACTOR.....	24
4.5.2	SUBJECTIVE ISSUES.....	24
4.6	BIVARIATE ANALYSES OF INDEPENDENT VARIABLES.....	27



4.6.1 ASSOCIATION BETWEEN AGE AND CAESAREAN SECTION..... 28
4.6.2 ASSOCIATION BETWEEN PARITY AND CAESAREAN SECTION..... 28
4.6.3 ASSOCIATION BETWEEN RACE AND CAESAREAN SECTION..... 28
4.6.4 ASSOCIATION BETWEEN MARITAL STATUS AND CAESAREAN SECTION..... 28
4.6.5 ASSOCIATION BETWEEN TRAVEL TIME AND CAESAREAN SECTION..... 29
4.6.6 ANALYSIS OF PRIMARY AND REPEAT CAESAREAN SECTIONS..... 29
4.6.7 ASSOCIATION BETWEEN MATERNAL OUTCOME AND CAESAREAN SECTION..... 29
4.6.8 ASSOCIATION BETWEEN ROBSON CLASS AND CAESAREAN SECTION..... 29
4.6.9 ASSOCIATION BETWEEN NUMBER OF INDICATIONS AND CAESAREAN SECTION..... 29
4.6.10 ASSOCIATION BETWEEN HIV STATUS AND CAESAREAN SECTION..... 29
4.6.11 ASSOCIATION BETWEEN ANTENATAL CARE AND CAESAREAN SECTION..... 29
4.6.12 ASSOCIATION BETWEEN PARTOGRAM USE AND CAESAREAN SECTION..... 29
4.6.13 ASSOCIATION BETWEEN CTG USE AND CAESAREAN SECTION..... 29
4.6.14 ASSOCIATION BETWEEN MEDICAL OFFICERS AND CAESAREAN SECTION..... 30
4.6.15 ASSOCIATION BETWEEN MEDICAL OFFICERS' EXPERIENCE AND CAESAREAN SECTION..... 30
4.6.16 ASSOCIATION BETWEEN OBSTETRIC POST GRADUATE TRAINING AND CAESAREAN SECTION..... 30
4.6.17 ASSOCIATION BETWEEN SECOND OPINION AND



	CAESAREAN SECTION.....	30
4.7	LOGISTIC REGRESSION ANALYSIS.....	33
	CHAPTER 5 DISCUSSION	**35**
5.1	CAESAREAN SECTION RATES.....	35
5.2	DEMOGRAPHIC CHARACTERISTICS.....	36
5.3	CAESAREAN SECTION CONTEXT.....	38
5.4	OBSTETRIC FACTORS.....	40
5.5	NON OBSTETRIC FACTORS.....	42
5.6	STRENGTHS.....	44
5.7	LIMITATIONS.....	44
	CHAPTER 6 RECOMMENDATIONS AND CONCLUSION	**46**
6.1	RECOMMENDATIONS.....	46
6.2	CONCLUSIONS.....	47
	REFERENCES.....	57
	LIST OF FIGURES	Ix
FIGURE 4.1	CAESAREAN SECTION RATES IN BERTHA GXOWA HOSPITAL.....	18
FIGURE 4.2	PROPORTIONS OF PRIMARY AND REPEAT C-SECTIONS....	21
FIGURE 4.3	PIE CHART OF PROPORTION OF OBSTETRIC AND NON OBSTETRIC FACTORS.....	21
	LIST OF TABLES	
TABLE 3.1	TIMING OF RESEARCH.....	17
TABLE 4.1	DEMOGRAPHIC CHARACTERISTICS.....	20
TABLE 4.2	VARIABLES OF CAESAREAN SECTION CONTEXT.....	23
TABLE 4.3	OBSTETRIC FACTORS.....	25
TABLE 4.4	FREQUENCY TABLE OF NON OBSTETRIC VARIABLES.....	26
TABLE 4.5	OBJECTIVE CHARACTERISTICS OF PHYSICIANS.....	27
TABLE 4.6	SUBJECTIVE CHARACTERISTICS OF PHYSICIANS.....	27
TABLE 4.7	TWO SAMPLE T TEST AGE BY CAESAREAN SECTION.....	28
TABLE 4.8	ROBSON CLASS AND C-SECTION.....	30
TABLE 4.9	BIVARIATE ANLYSES OF DEMOGRAPHIC VARIABES.....	31
TABLE 4.10	ANALYSIS OF VARIABLES OF CAESAREAN SECTION	



	CONTEXT.....	31
TABLE 4.11	NUMBER OF INDICATIONS FOR CAESAREAN SECTION.....	32
TABLE 4.12	BIVARIATE ANALYSES OF NON OBSTETRIC VARIABLES.....	32
TABLE 4.13	ANALYSES OF MEDICAL OFFICERS' CHARACTERISTICS.....	33
TABLE 4.14	LOGISTIC REGRESSION ANALYSIS.....	34
	LIST OF ANNEXURES.....	x
ANNEX I	DATA COLLECTION SHEET.....	48
ANNEX II	INSTITUTION DATA COLLECTION SHEET.....	51
ANNEX III	CONCEPTUAL FRAMEWORK.....	52
ANNEX IV	ETHICS CLEARANCE CERTIFICATE.....	53
ANNEX V	LETTER OF PERMISSION FROM HOSPITAL CEO.....	54
ANNEX VI	DHIS PERMISSION LETTER.....	55
ANNEX VII	DOCTORS' INFORMATION AND CONSENT SHEET.....	56



ABBREVIATIONS

ACOG	American College of Obstetricians and Gynecologists.
ANC	Antenatal care
Chi^2	Chi-Square test.
CPD	Cephalo-pelvic disproportion
C/S	Caesarean section
C-section	Caesarean section
CTG	Cardiotocograph
DHIS	District health information system.
HIV	Human Immunodeficiency Virus
ICU.	Intensive care unit.
LR	Likelihood ratio
MMR	Maternal mortality ratio.
MO	Medical Officer
NICE.	National Institute of Clinical excellence.
OR	Odds Ratio
PG	Post Graduate
PPIP	Perinatal Problem Identification Program
RCOG	Royal College of Obstetricians and Gynaecologists
TRIP	Turning Research Into Practice
UK	United Kingdom
VBAC.	Vaginal birth after Caesarean.
WHO	World Health Organisation



DEFINITION OF TERMS

The following terms used in this dissertation are defined using Williams Obstetrics 23rd edition[1] for obstetric terms, and Clinical Epidemiology and Evidence-Based Medicine[2] for epidemiological terms.

Abruptio placentae: This is a Latin term meaning the rendering asunder of the placenta. It refers to the premature separation from the wall of the uterus of a normally located placenta. It is a potentially serious problem for the mother and the baby.

Assisted delivery: Also known as operative vaginal delivery, this refers to the use of obstetric forceps or vacuum device to aid vaginal delivery.

Association: The appearance of a meaningful (i.e cause and effect) relationship between variables.

Bivariate analysis: Statistical analysis of the relationship between a single independent variable and a single dependent variable.

Breech Presentation: One or both feet, knees or buttock of the fetus is foremost within the maternal pelvis or in close proximity to it. The fetus is in longitudinal lie. The presenting part can often be felt through the cervix on cervical examination.

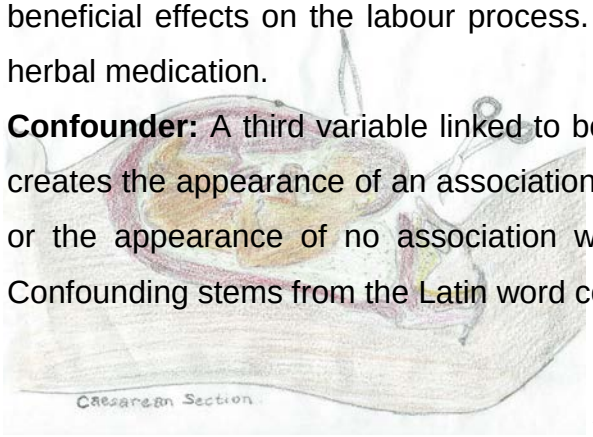
Caesarean section: Birth of a fetus through an incision in the abdominal wall and the uterine wall. This definition excludes removal of the fetus from the abdominal cavity in the case of rupture of the uterus or in the case of an abdominal pregnancy.

Caesarean section rate 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**.**

Cephalic presentation: The fetal head is the presenting part in close proximity to the maternal pelvis of a fetus in longitudinal lie.

Church water is a complementary alternative medicine. It is prepared and administered by some religious institutions. Pregnant women ingest it for perceived beneficial effects on the labour process. It is similar in many respects to traditional herbal medication.

Confounder: A third variable linked to both putative cause and effect variables that creates the appearance of an association when there is none (positive confounding), or the appearance of no association when there is one (negative confounding). Confounding stems from the Latin word confundere which means to mix together.



Context: The situation under which something happens.[3] Applied to Caesarean section, it is an attempt to gain contextual insight into the Caesarean section rate. Issues to consider include the health facility where it was performed, whether a Caesarean section was done as an emergency or elective operation, whether it was performed during normal working hours or after working hours or weekends. For patient's context, it also indicates whether it was a primary caesarean section or a repeat caesarean section for each patient, as well as the maternal and foetal outcomes of the Caesarean section.

Cross sectional study: A study often by survey, in which measures of outcome and exposure status are determined simultaneously. In this study, associated factors and the outcome (C-section) are observed at the time of delivery.

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.

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

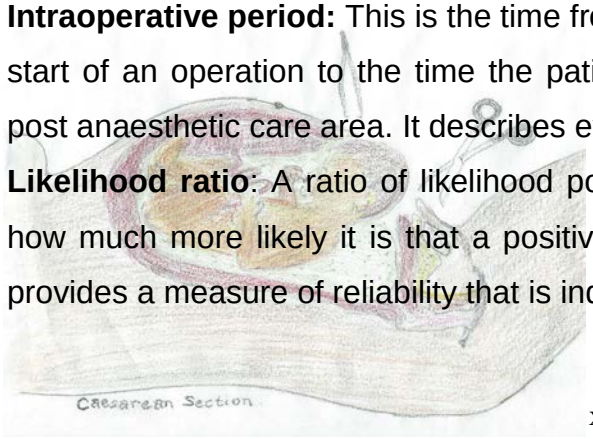
Fistula is an abnormal passageway in the body, making a communication between two epithelial surfaces. An example of obstetric fistula is vesico-vaginal fistula where the bladder communicates with the vagina resulting in constant leaking of urine.

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, fetal 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.

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 fetal 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 fetus 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.

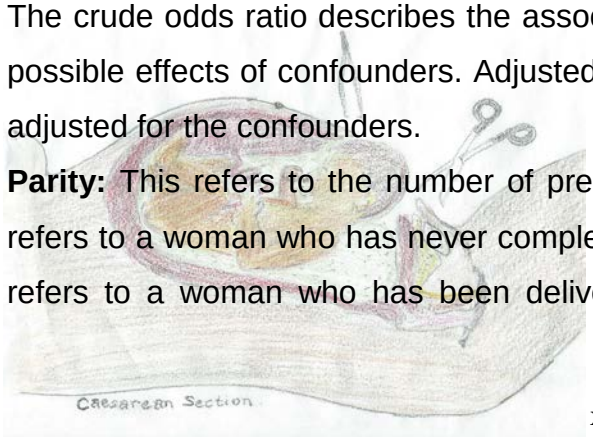
Myometrium: This is the smooth muscle of the uterus.

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, fetal or combined fetal 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. The crude odds ratio describes the association without taking into consideration the possible effects of confounders. Adjusted odds ratio describes the odds ratio having adjusted for the confounders.

Parity: This refers to the number of pregnancies carried to fetal viability. Nullipara refers to a woman who has never completed a pregnancy to fetal viability. Primipara refers to a woman who has been delivered only once of a fetus or fetuses who



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

Two-tailed test: The conventional approach to hypothesis testing in which the rejection region of the hypothetical distribution of trial outcomes is divided between the lower and upper tails of the curve.



CHAPTER 1.

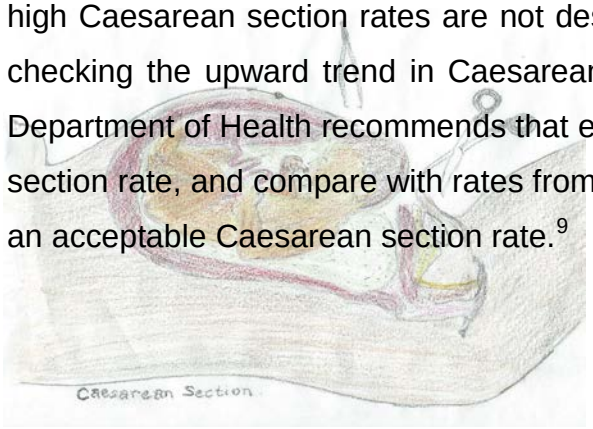
INTRODUCTION

1.1. BACKGROUND

Caesarean sections (C/S) have been performed in South Africa as early as 1826.[4] Since then, there has been a trend of increasing frequency, acceptance, and popularity of Caesarean sections. District hospitals in South Africa such as Bertha Gxowa hospital are equipped to provide obstetric services including Caesarean sections. Caesarean section used to be regarded as a last resort and a life saving measure, but as time went on, it became performed with greater safety and more frequently.[4] Caesarean sections in modern times have been performed also for non life threatening indications such as maternal request.

The main advantage of Caesarean section is the avoidance of adverse complications associated with vaginal delivery especially difficult deliveries and deliveries that pose a threat to the life of the unborn baby. Advances in medical knowledge over time and improvements in anaesthetic techniques and infection control have made Caesarean section to be a relatively safe operation to perform. In district hospitals in South Africa, most medical officers rate themselves as being proficient in performing Caesarean section operations.[5] Obstetric services are provided free of charge as a matter of government policy in public hospitals in South Africa. Consequently, pregnant women in need of this life saving procedure generally have access to care.[6]

Caesarean section rate is regarded as “an important indicator of access to essential obstetric care”.[7] There has been considerable interest in and debates about rising Caesarean section rates. In South Africa, Caesarean section rates in the private sector are a lot higher that rates in the public sector.[8] It is accepted nationally that high Caesarean section rates are not desirable. Targets have been set as a way of checking the upward trend in Caesarean section rates; the South African National Department of Health recommends that each district should calculates its Caesarean section rate, and compare with rates from similar districts as a way of working toward an acceptable Caesarean section rate.[9]



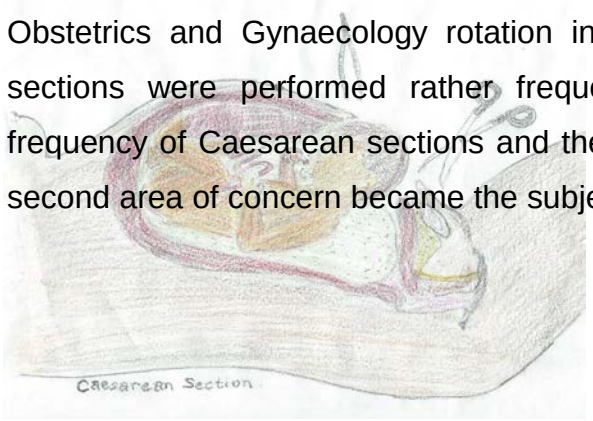
Caesarean delivery has its risks; there are risks related to the surgical procedure as well as risks related to the anaesthetic procedure. Compared with other modes of delivery, Caesarean delivery involves more resources and increased length of stay in hospital. Efforts at reducing high Caesarean section rates aim to improve maternal and child health outcomes but also have as a secondary aim, reduction of expenditure. The World Health Organization (WHO) has recommended a Caesarean section rate of between 10 and 15% (average 12.5%) as an acceptable level.[10] This recommendation, the consensus of an expert committee more than two decades ago has formed the basis on which Caesarean rates have been considered normal, low or high.

It is necessary to understand the factors that drive the high Caesarean section rates in order to put in place interventions to reduce the rates. In district hospitals in South Africa, the decision to perform a Caesarean section is usually taken by the medical officer on duty, who may be the only doctor working in the obstetric unit of the hospital. Some of the medical officers have limited practical experience. Often times, the work load is too much for one doctor to handle. Missed opportunities and mistakes occur sometimes resulting in maternal or perinatal mortality.

In Bertha Gxowa hospital, for clinical governance, maternal mortality and morbidity meetings are held following any adverse maternal outcome. For adverse fetal outcomes, perinatal problem identification program (PPIP) templates are used for analyses. In these meetings, health care workers' contributions and shortcomings are addressed. A district specialist obstetrician and gynaecologist was appointed in 2012 for Ekurhuleni district, a member of the district specialist team, an aspect of the re-engineering of primary health care to strengthen clinical governance.

1.2. RATIONALE

The researcher, who has an interest in women's health, observed during his Obstetrics and Gynaecology rotation in Bertha Gxowa hospital, that Caesarean sections were performed rather frequently. He became concerned about the frequency of Caesarean sections and the reasons for the Caesarean sections. The second area of concern became the subject of this research.

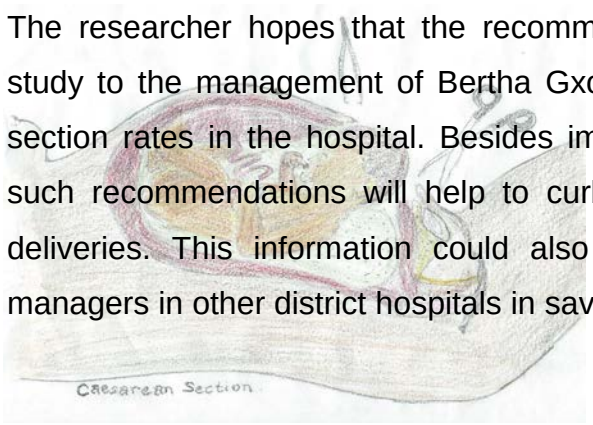


High Caesarean section rates while indicating adequate access to essential and life saving obstetric care, have not been shown to be associated with improved maternal and fetal outcomes; in fact in studies, such as a survey in 2005 on maternal and perinatal health in Latin America, Villar and other researchers found that high Caesarean section rates were associated with harm.[11] In South Africa, data from the fifth report (2008-2010) of confidential enquiry into maternal deaths indicate that there is a steady increase in institutional maternal mortality ratio, and that a woman has an increased risk of dying if she is delivered by Caesarean section compared with vaginal delivery.[12]

The increased risks of maternal and perinatal morbidity and mortality associated with high Caesarean section rates underlie the growing concern by health professionals; Obstetricians in the UK have instituted studies to address the issue.[13] A woman who delivers by Caesarean section gets a uterine scar. This scar has important implications for future pregnancies; she is predisposed to uterine rupture, placenta praevia and placenta accreta.[1] Induction of labour in a woman with previous C-section carries a higher risk of uterine rupture than in a woman with no previous C-section.[1,14] Consequently, avoidance of unnecessary primary Caesarean sections should be one of the goals of every facility that offers obstetric services. Identification of factors associated with high Caesarean sections in Bertha Gxowa hospital is a step toward this goal.

There are very few studies that explain the factors responsible for high Caesarean section rates in a district hospital setting in South Africa. The researcher hopes to provide research findings that will bridge this information gap. It is hoped that the information provided through this study will inform local hospital policy and also impact on clinical practice in Bertha Gxowa hospital for improved fetal and maternal outcomes.

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



The researcher hopes to contribute to the realization of the 5th millennium development goal in South Africa. The fifth millennium development goal seeks to improve maternal health and reduce maternal mortality.[15]

1.3. AIM AND OBJECTIVES.

AIM:

To describe the factors that were associated with the high Caesarean section rates in Bertha Gxowa hospital in 2011.

OBJECTIVES:

1. To describe the socio-economic and demographic factors associated with Caesarean section in Bertha Gxowa hospital in 2011.
2. To describe the context in which Caesarean sections were performed in Bertha Gxowa hospital in 2011.
3. To describe the obstetric factors associated with Caesarean sections in Bertha Gxowa hospital in 2011.
4. To describe non-obstetric factors associated with Caesarean sections in Bertha Gxowa hospital in 2011.



CHAPTER 2

LITERATURE REVIEW

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

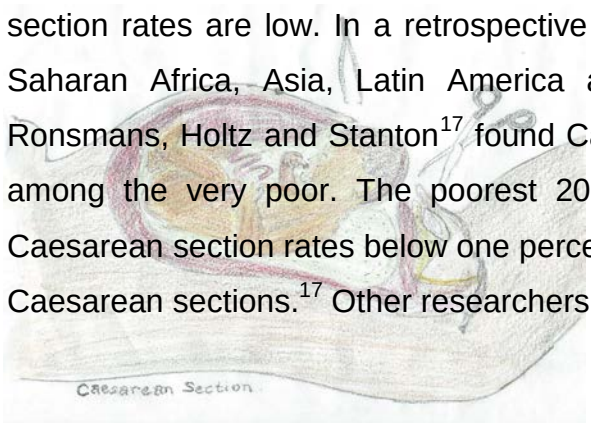
2.1. Caesarean Section Rates in South African District Hospitals

In South Africa the Department of Health maintains records of Caesarean section rates in district hospitals through the district health information system. The average Caesarean section rate in district hospitals in 2010/2011 was 18.8%, and ranged from a low of 5.8% in Frances Baard (Northern Cape Province) to a high of 39.9% in Nelson Mandela Bay Metro (Eastern Cape Province).[16]

There was a 6.3% increase in Caesarean section rates of district hospitals in South Africa in eight years, from 12.5% in 2003/2004 to 18.8% in 2010/2011[16]. The two provinces with the highest rates were Kwazulu Natal, (26.4%) and Western Cape (23.3%).[16] In 2010/2011, the Caesarean section rate in Gauteng province was 19.5%.[16] The South African National Caesarean Section target of 15% for district hospitals is yet to be met. In 2010/2011, 36 districts (82%) had caesarean section rates outside the 10-15% range recommended by the WHO.[16]

2.2. Caesarean Section Rates in Developing Countries

In poor, developing countries, access to health service is limited and Caesarean section rates are low. In a retrospective analysis of data from 42 countries in sub-Saharan Africa, Asia, Latin America and the Caribbean carried out in 2006, Ronsmans, Holtz and Stanton[17] found Caesarean section rates to be extremely low among the very poor. The poorest 20% of the population in 20 countries had Caesarean section rates below one percent implying very limited access to lifesaving Caesarean sections.[17] Other researchers[18,19] had similar findings and suggested that



Caesarean section rate of at least 3.6%- 6.5% is needed to address basic obstetric complications in West Africa.

Similarly, in poorer African countries such as Somalia where access to health services remains a challenge, Caesarean section rates are low and women resist Caesarean sections.[20] There are cultural and sometimes economic reasons for their refusal to consent to Caesarean sections. In Ethiopia, where C-section rates are low and many deliveries are not attended by skilled health care personnel, the Government has attempted to improve access to care by training Non Physician Clinicians to perform Caesarean sections.[21]

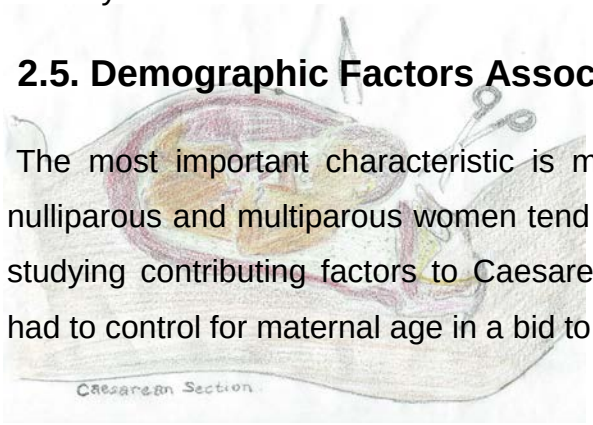
2.3. Caesarean Section Rates in Developed Countries

In United States, Menacker and Hamilton who studied trends in Caesarean section rates in United States between 1996 and 2008 reported that the Caesarean section rate rose to 32.3% in 2008, from 20.7% in 1996, marking a 12th consecutive year of increase.[22] Caesarean section rate variability between different regions in United States ranged from 25% to 38%.[22,23] In New South Wales, Australia, Stavrou et al in a population based study reported that Caesarean section rate increased from 19.1% in 1998 to 29.5% in 2008.[24] In Canada, the Caesarean section rate quadrupled from 6% in 1970 to 26% in 2006.[25]

2.4. Contributory Factors to High Caesarean Section Rates

In developed countries, studies have been done to show reasons for the high and increasing Caesarean section rates[26,27] as well as efforts to reduce the Caesarean section rates.[23] Some of the identified factors are, demographic such as maternal age and parity, others are obstetric such as failure to progress in labour and yet other factors are non obstetric such as maternal request for Caesarean delivery.[26,27,28]

2.5. Demographic Factors Associated with High C-Section Rates



The most important characteristic is maternal age. Older (more than 35 years) nulliparous and multiparous women tend to deliver more by Caesarean section.[11] In studying contributing factors to Caesarean delivery rates some investigators have had to control for maternal age in a bid to eliminate confounders in their results.[29]

Other independent demographic variables found to be positively associated with Caesarean section rates are increase in parity and increase in body mass index.[30] In Bertha Gxowa hospital, patients' heights are not usually recorded in the files; the researcher will not be able to determine an association between increased body mass index and Caesarean section.

Other investigators tried to link Caesarean section rates with race; authors of a South African survey reported that Caesarean section rate was higher in women classified as white or coloured than those classified as black[31]. The authors, Matshidze and others however concluded that neither demographic risk factors for assisted delivery nor access to private health care explained the different Caesarean rates among different population groups. They attributed their findings to physicians' bias in decision making.[31]

In a national audit report of Caesarean sections in the UK, Parajothy and Thomas[13] found higher Caesarean section rates in black and Caribbean women than in white women. It was also observed that certain complications of pregnancy such as hypertensive disorders and diabetes are more prevalent in blacks and that HIV infection is more prevalent in blacks. These factors were believed to be responsible for the higher Caesarean section rates observed in black women.

2.6. Clinical Factors

The commonest five clinical indications for Caesarean section found in many studies were; non-reassuring fetal status or fetal distress, failure to progress in labour or arrest of dilatation, previous Caesarean delivery, malpresentation and hypertensive disorders in pregnancy (pre-eclampsia and eclampsia).[26,27,28]

In developed countries, the increase in Caesarean section rates was more related to previous Caesarean delivery than other clinical factors[27] whereas in developing countries, it was more related to fetal distress and dystocia.[18,19] Consequently, there is a trend of performing more elective Caesarean deliveries in developed countries than in developing countries where majority of Caesarean sections are performed as emergency procedures.

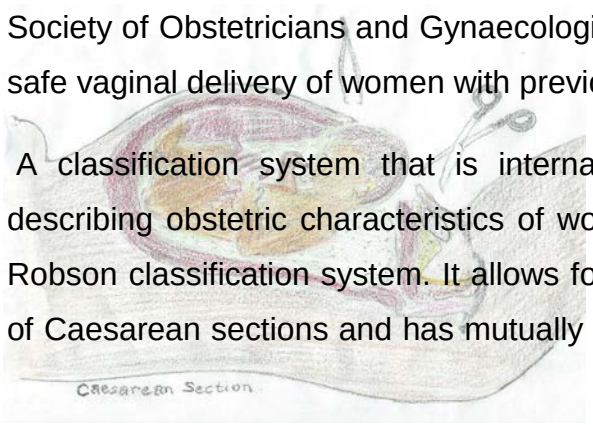


In a study that used physician documented indications for Caesarean section to describe factors contributing to increases in Caesarean delivery rate in United States, Barber and others found that primary Caesarean sections contributed to 50% of the increase in Caesarean section rate, the rest being repeat Caesarean sections. Considering the primary Caesarean sections, more subjective indications like non-reassuring fetal status contributed more to the rates than the more objective indications like malpresentation, cord prolapse and abruptio placenta.[26] The researchers concluded that modifiable factors were involved and that it is possible to reduce Caesarean section rates.

Other clinical factors like multiple pregnancy, macrosomia, ante partum haemorrhage, and failed induction contributed less significantly to the rise in Caesarean section rates.[26] Of the maternal indications, prevention of transmission of infections like HIV and Herpes has not been found to contribute significantly to rising Caesarean section rates as would be expected in Sub-Saharan Africa.[19] More research is needed to clarify this.

Caesarean section outcomes are often studied while describing clinical factors associated with Caesarean section rates. In Sub-Saharan Africa as well as in Latin America, such studies have shown correlation between high Caesarean section rates and maternal and peri-natal outcomes[11,32]; high Caesarean section rates have been found to be associated with increased maternal and peri-natal morbidity and mortality.

Prior to the 1990s many primary care physicians and obstetricians adopted the position “once a Caesarean, always a Caesarean”. However in response to growing concerns about rising Caesarean section rates, as research progressed, professional bodies like the Royal College of Obstetricians and Gynaecologists of England,[33,34] the American College of Obstetricians and Gynaecologists[35] and the Society of Obstetricians and Gynaecologists of Canada developed guidelines for the safe vaginal delivery of women with previous Caesarean section.[36]



A classification system that is internationally applicable and simple to use in describing obstetric characteristics of women undergoing Caesarean section is the Robson classification system. It allows for analysis of determinants and implications of Caesarean sections and has mutually exclusive and totally inclusive categories of

pregnant women.[37] The researcher hopes to identify those categories of women according to Robson classification with high Caesarean section rates in Bertha Gxowa hospital for whom interventions to reduce Caesarean section rates would be most beneficial.

2.7. Non- Clinical Factors

Just as there has been growing concern about rising Caesarean section rates, there has been an increase in the number of women in the United States who choose to have an elective Caesarean delivery; the Caesarean section on demand. In a statement released in 2013, the ACOG recommends that in the absence of medical indications, vaginal delivery should be recommended. However, if Caesarean section is performed on maternal request, it should not be performed before 39 weeks of gestation and it should not be motivated by absence of effective pain management.[38]

The popular press criticized a popular model and footballer's wife in the UK for having her three children by Caesarean saying she was 'too posh to push'.[39] In South African studies, Caesarean on demand is not a major contributor to Caesarean section rates in public hospitals; it probably plays a greater role in the private hospitals where Caesarean section rates of up to 60% have been reported. Pregnant medical professionals have been reported to have a high Caesarean delivery rate in South Africa.[40]

Fear of litigation also affects the attitude of many doctors who have a low threshold for Caesarean section.[41] Obstetricians who have suffered litigations or higher liability insurance premiums have been found to have higher Caesarean section rates than others who do not have similar history.[41] Clinicians in developed countries have admitted that the medico-legal environment influences their decision making.[41] In the researcher's opinion, fear of litigation may not be a strong contributing factor to high Caesarean rates in South African district hospital setting as clinicians employed in the public sector are indemnified by the Government.



One of the arguments in support of a low Caesarean threshold is that Caesarean sections are becoming safer for the mother and baby with fewer incidences of obstetric fistula and of pelvic floor problems like urinary incontinence.[42] It has been

suggested that financial incentive also influenced some doctors to perform unnecessary Caesarean sections in the private sector as more money is made in performing a Caesarean delivery than a vaginal delivery.[43]

In managed care processes where Health Maintenance Organizations co-ordinate health care services and remunerate contracted physicians for services rendered, opportunities exist to regulate Caesarean section rates. This could be in form of incentives and penalties; funders of medical schemes could insist on specific evidence-based practice protocols, paying only for medically indicated Caesarean deliveries. They could also reward physicians for conducting successful VBACs or pass the financial burden of Caesarean deliveries with no medical indications to the members of medical schemes.[44,45]

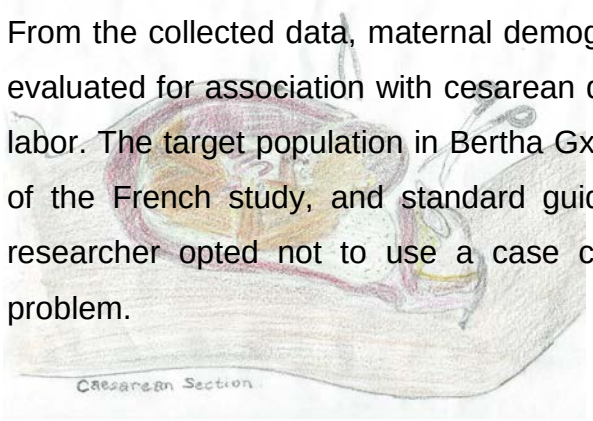
In the United States, managed care resulted in some reductions in Caesarean section rates in some managed care plans compared with state-wide average rates.[46]. In South Africa, reduction in caesarean section rates may be one of the auditable standards that will be used to evaluate the success of the National Health Insurance Scheme which has been piloted in some areas.[47]

2.8. Study Designs of Previous Researchers

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

One study that used a case-control design looked at factors associated with Caesarean section among nulliparous women with type 1 diabetes.[48] This French study has an evidence rating of II and its strength lies in the fact that data was collected over 11 years from a cohort of women with type 1 diabetes who were managed according to standardized institutional management protocols.

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



There are other notable studies which utilized cross sectional descriptive methods with qualitative components. In one such study, carried out by the Reproductive Care Program of Nova Scotia, across four sites, selected health records were used to obtain data for quantitative analysis. In the same study, focus group interviews were used to obtain qualitative results.[25]

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



CHAPTER 3

METHODS

3.1. Study Design

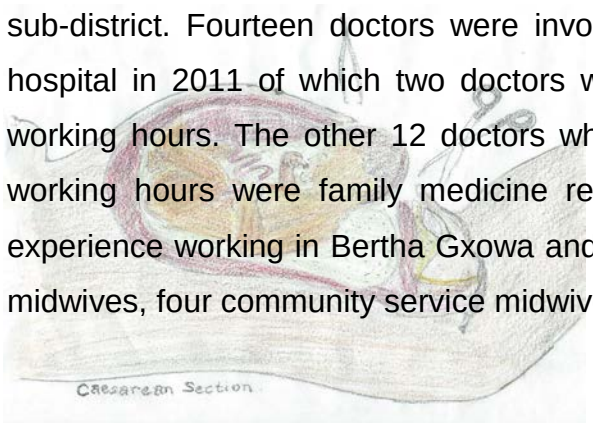
This was a quantitative cross sectional descriptive study using a retrospective review of patients' files. The quantitative design was chosen so that collected data could be analysed for statistical significance of associations between predictor and outcome variables. Medical officers' documented indications for each Caesarean section were used.

3.2. Site of Study

This study was conducted in Bertha Gxowa Hospital, formerly known as Germiston hospital which is located in Germiston city. Germiston is located in the East Rand area of Ekurhuleni district in Gauteng province of South Africa, about 21 Km from the O R International airport. It is the administrative headquarters of Ekurhuleni metropolitan municipality. Bertha Gxowa hospital is a public district hospital that provides primary (level one) care and it is the only district hospital in Ekurhuleni health district.

It offers comprehensive obstetric services including Caesarean sections. It has an operating theatre that functions 24 hours a day and access to a blood bank. Bertha Gxowa hospital refers patients with serious conditions to a level two hospital, Natalspruit hospital where there are Specialist Obstetricians. Bertha Gxowa Hospital also serves as a training site where registrars in Family Medicine carry out clinical rotations.

Bertha Gxowa hospital had a 28 bed maternity ward in 2011. The Maternity unit caters for patients most of whom are low income patients from Ekurhuleni southern sub-district. Fourteen doctors were involved in rendering obstetric services in the hospital in 2011 of which two doctors worked in the maternity unit during normal working hours. The other 12 doctors who provided obstetric services after normal working hours were family medicine registrars and other doctors with obstetrics experience working in Bertha Gxowa and other hospitals. There were five advanced midwives, four community service midwives and 11 professional nurses.



3.3. Study Population.

The target population comprised women who delivered in Bertha Gxowa hospital in 2011. The study population comprised women who delivered by Caesarean section from 1st January 2011 to 31st December 2011.

3.4. Sampling.

3.4.1. Sample Size: This sample size was calculated using a web based automated calculator, Raosoft software[49] with a 5% margin of error and a confidence level of 95%. From the records of the District Health Information System, and the operating theatre register, there were 4224 women who delivered in 2011 out of whom 776 women delivered by Caesarean section. From the above study population, the calculated sample size was 258.

3.4.2. Sampling Method: Systematic random sampling method was used to select patients' files. All patients who delivered by Caesarean section from 1st January 2011 to 31st December 2011 were identified from the operating theatre register and a list was made. From this list, 258 patients' files were chosen. The sampling fraction was determined by dividing the population, 776 by the sample size, 258 giving a sampling fraction of one in three.

The first file was randomly selected from the first three on the list and thereafter, every third file was selected until 258 files were selected. Expecting that some files may be missing or incomplete during files retrieval, and based on the proportion of missing and incomplete files found during the pilot study, the researcher selected an extra 10%, that is 26 extra patients' files in the same way, for files retrieval. The researcher retrieved files of the randomly selected patients from the medical records unit of Bertha Gxowa Hospital. The retrieved files were checked to ensure that each file contained the Maternity Case records. Files retrieval stopped when 258 files containing maternity records have been retrieved.

3.5. Inclusion Criteria.

Files of women who delivered by Caesarean section between 1st January 2011 and 31st December 2011 were included if they contained maternity case records.



3.6. Exclusion Criteria.

Files of patients with missing maternity case records or missing information on key variables were excluded.

Information on maternal or perinatal complications encountered after patients' discharge from hospital or re-admissions following Caesarean section were excluded from analysis.

3.7. Pilot Study.

A pilot study was done to test the information available in the patients' case files, the adequacy of the data collection tool for extracting the needed information and to estimate the proportion of missing patients' files. There were no major adjustments in the data collection sheets. Minor changes were made on the arrangement of fetal and maternal factors, (each recorded indication was represented as a separate variable) for better data capturing.

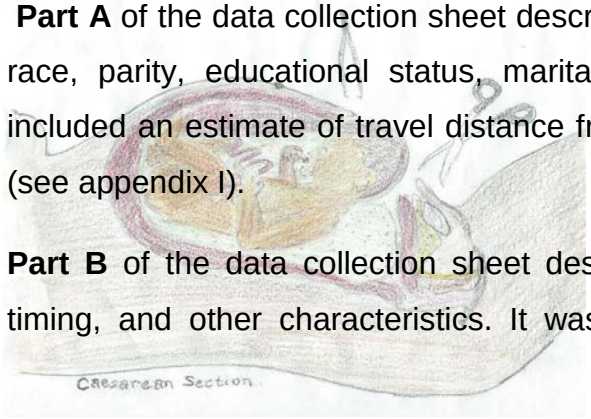
A randomly selected sample of 30 files of patients who had Caesarean section was used for the pilot study. Findings of the pilot study were not used in writing the research report.

3.8. Data Collection Tools

Two data collection tools were used in this study; a patient data collection sheet for individual patient files, and a summary sheet of statistics of Caesarean deliveries per month for 12 months. The researcher collected data from patients' files using patient data collection sheets. This tool was developed by the researcher based on the findings of previous researchers who did similar studies, with the research objectives in mind. There are four parts of the patient data collection sheet.

Part A of the data collection sheet described demographic information such as age, race, parity, educational status, marital status, and employment status. It also included an estimate of travel distance from the patient's home to the health facility (see appendix I).

Part B of the data collection sheet described the Caesarean section in terms of timing, and other characteristics. It was designed to describe the context under



which it was performed. It also described the immediate fetal and maternal outcomes (see appendix I).

Part C of the data collection sheet described obstetric factors using the Robson ten-point classification or obstetric grouping of each patient. The use of this classification system helped the researcher to correct typographical errors in data capturing of recorded indications for Caesarean section during data cleaning. This part also described fetal factors, maternal factors, and factors relating to the feto-placental unit as documented by the attending Medical Officers (see appendix I).

Part D of the data collection sheet specified non-obstetric indications for each operation such as HIV status and patient's demand for Caesarean delivery (see appendix I).

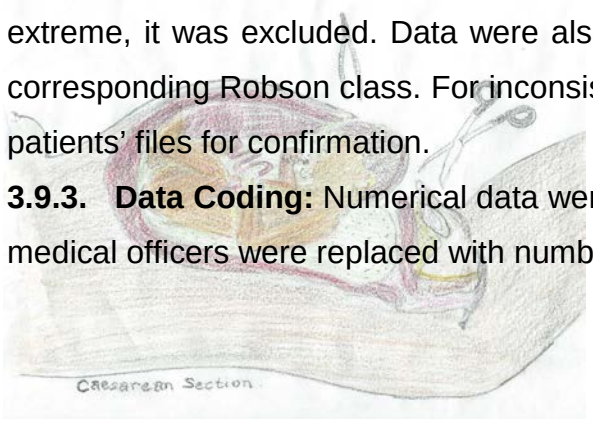
The summary sheet of Caesarean deliveries each month provides a second set of data. These data were obtained from records of the District Health Information system, as well as records of the Perinatal Program Identification Program (PPIP) which are kept by the Information Officer of Bertha Gxowa hospital. This set of data comprised total numbers of deliveries and total numbers of Caesarean sections performed each month, from January to December 2011 (see appendix II). From these, the Caesarean section rates per month were calculated.

3.9. Data Capture and Analysis Strategy

3.9.1. Data Capture: Data from patients' files were captured in a Microsoft Excel spreadsheet for data cleaning and coding.

3.9.2. Data Cleaning: For missing values, the researcher retrieved information from the patients' files for confirmation; if they had missing information on key variables, they were excluded. For extreme values that were captured, information was also retrieved from patients' files for confirmation; if the information was extreme, it was excluded. Data were also checked for consistency by checking the corresponding Robson class. For inconsistent values, information was retrieved from patients' files for confirmation.

3.9.3. Data Coding: Numerical data were grouped for analysis purposes. Names of medical officers were replaced with numbers that could not be used to identify them.



3.9.4. Data Analysis: The researcher held discussions with statisticians from The University of Witwatersrand regarding data analysis approach. Data in Microsoft Excel spreadsheet were imported to statistical software, STATA (version 10.1) for data analysis. Frequencies of different variables were tabulated. Bivariate analyses of demographic variables, obstetric and non obstetric variables were done using Chi square and Fisher's exact tests. These variables were tested for association with C-section. C-section was described as binary outcomes, elective and emergency C-sections. Finally, logistic regression model was used to describe some risk factors identified in bivariate analyses as well as other risk factors of interest. The information obtained in the different analyses was presented on tables.

3.10. Ethics.

The researcher obtained permission to access information from the district health information system through the Information Management Directorate of Ekurhuleni Health District regarding records of Caesarean sections and vaginal deliveries in Bertha Gxowa hospital (see appendix vi).

The researcher also obtained clearance from the Human Research Ethics Committee of the University of the Witwatersrand to carry out this study; the protocol number for this study is M130247 (see appendix iv).

He also obtained permission from the Chief Executive Officer of Bertha Gxowa hospital to carry out the study (see appendix v). The identities of patients and doctors were not disclosed and their confidentiality was maintained; data from the patients files were password protected on the researcher's computer.

Data collected from the patient's files and analysed as described above are presented in the next chapter.

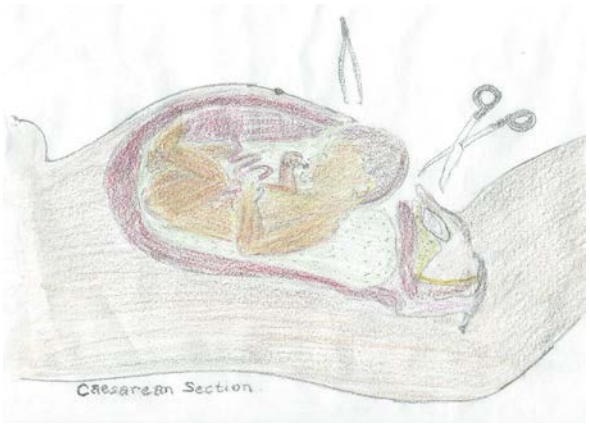


3.11 Timing

This research report passed through a number of stages as tabulated below.

Table 3.1. Timing of research.

DATES	ACTIVITY
3rd October 2010	Research topic was chosen; Topic and Scope Paper was submitted to Department of Family Medicine.
8th August 2011	Literature review was submitted to Department of Family Medicine.
11 October 2012	Protocol was submitted to Assessor Group.
22nd November 2012	Protocol was submitted to Ethics Committee.
24th April 2013	Protocol was approved by Ethics Committee.
30th April – 14th May 2013	Pilot study was conducted.
15th May – 1st July 2013	Data collection was undertaken.
2nd July – 16th August 2013	Data analysis was performed.
16th August – 10th September 2013	Research report was written.
10th Sept 2013	Draft report was submitted to supervisors.
25th September 2013	Research report was submitted to Department of Family Medicine.
16th December 2013	Revised report was submitted to supervisors
January 2014	Research report was resubmitted to Department of Family Medicine.



CHAPTER 4

RESULTS

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

4.1. **Caesarean Section Rates in Bertha Gxowa Hospital**:

The Caesarean section rates in Bertha Gxowa hospital ranged from 14.7% in the month of August 2011, to a high of 21.2% in the month of December 2011, with an annual Caesarean section rate of 18.4% for 2011. It was only in August that the rate fell below 15%. Figure 4.1 presented below shows the rates of caesarean sections each month from 1st January 2011 to 31st December 2011.

The minimum number of deliveries was 316 in January and the maximum number was 378 in March. There was no clear seasonal pattern in total number of deliveries per month or Caesarean section rates.

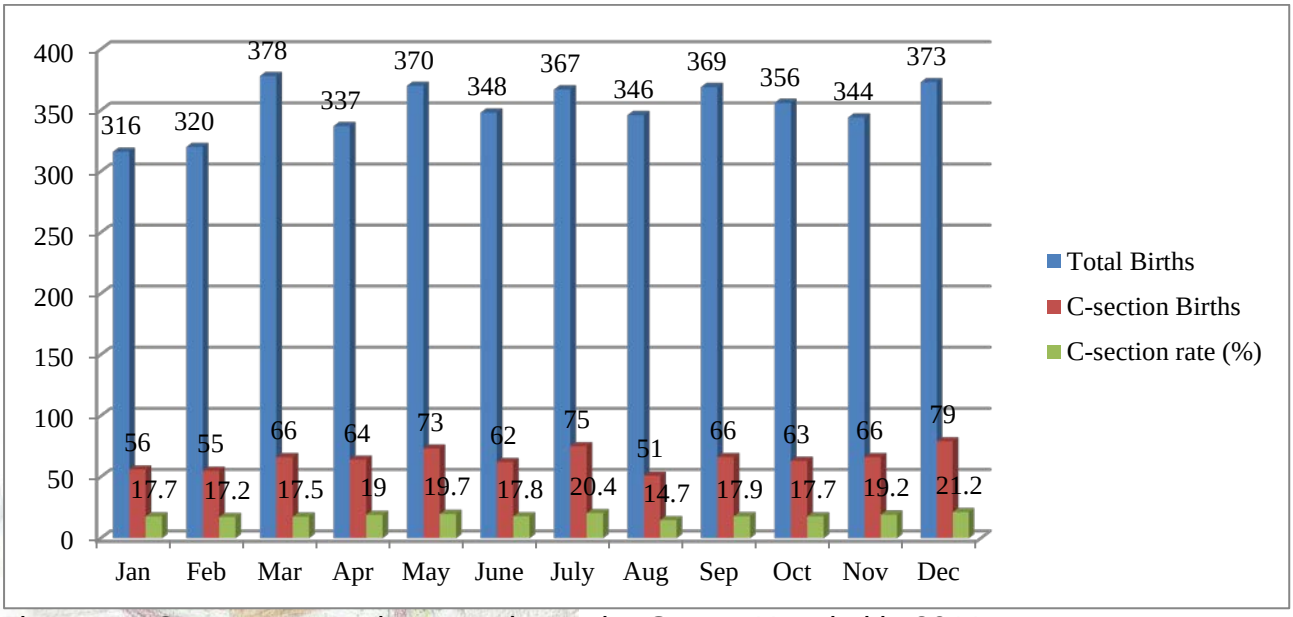
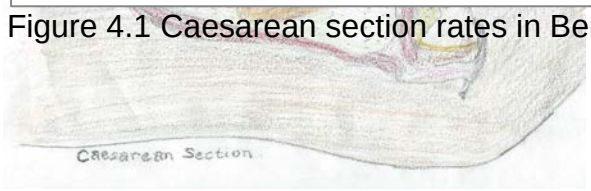


Figure 4.1 Caesarean section rates in Bertha Gxowa Hospital in 2011.



4.2. Demographic Characteristics:

4.2.1. Age: The participants in this study had ages ranging from 15 years to 43 years, with a mean of 26.4 years and a standard deviation of 5.89. Of these, 32 patients were aged below 20 years, being teenage deliveries and 30 patients were aged 35 years and above, being advanced maternal age deliveries. Table 4.1 shows the age groupings and their frequencies.

4.2.2. Parity: There were five categories of parity ranging from 0 to 4, with first time deliveries (Para 0) being 103 (39.9%) and constituting the largest category as shown below in table 4.2. More than three quarters of the patients, 201 (77.9%), were Para 0 and Para 1.

4.2.3. Race: The races were represented as they were usually recorded in the patient files as White, African, Coloured and Asian. By far the greatest majority, 241 (93.4%) of patients were African.

4.2.4. Marital Status: As shown in Table 4.1, 73.6% of the patients (190) were single, 24.8% (64) were married as shown below. Two patients were divorced and one was widowed. One patient had no record of her marital status.

4.2.5. Employment Status: As shown in Table 4.1, 69.4% (179) of the patients were unemployed, reflecting the low socio economic status of majority of the study population, 25.2% (65) were employed. Information on employment status was missing in 5.4% (14) of the patient files. Details of the type of occupation or average monthly income were not recorded in the patients' records.

4.2.6. Travel time to Health Facility: This estimated travel time by public transport was divided into two main categories, less than 1 hour if the patient resided within the Greater Germiston area and more than 1 hour if the patient resided outside the Greater Germiston area. The estimation took into account the average delays in getting access to public transportation or public service ambulance. Majority of the patients (72.9%) lived within the greater Germiston area and could access the hospital within 1 hour.

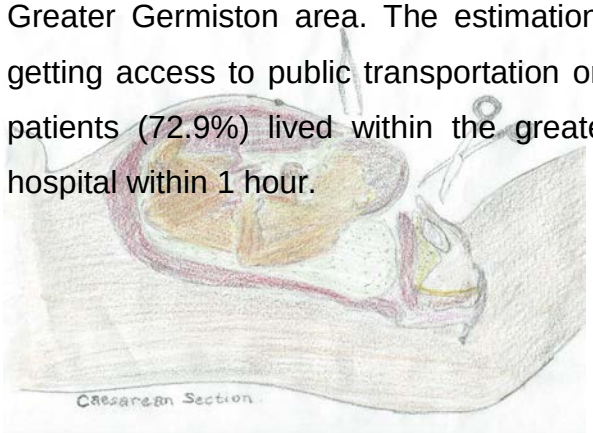
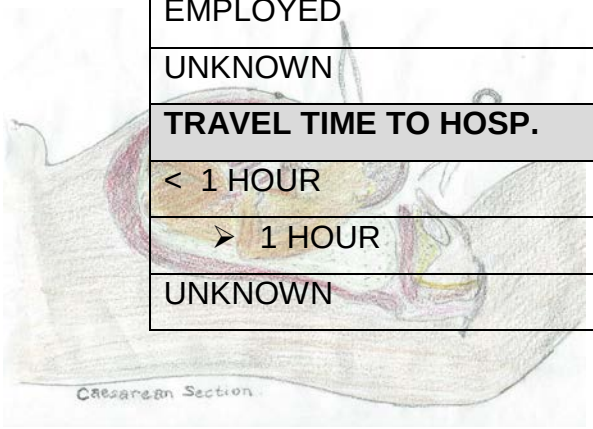


Table 4.1. Demographic Characteristics of patients who delivered by Caesarean section in 2011 in Bertha Gxowa Hospital.

CHARACTERISTIC	N= 258	PERCENTAGE (%)
AGE		
15-19	32	12.4
20-34	196	76.0
35-43	30	11.6
PARITY		
0	103	39.9
1	98	38.0
2	44	17.1
3	11	4.3
4	2	0.8
RACE		
WHITE	12	4.7
AFRICAN	241	93.4
COLOURED	4	1.6
ASIAN	1	0.4
MARITAL STATUS		
SINGLE	190	73.6
MARRIED	64	24.8
DIVORCED	2	0.8
WIDOWED	1	0.4
UNKNOWN	1	0.4
EMPLOYMENT STATUS		
UNEMPLOYED	179	69.4
EMPLOYED	65	25.2
UNKNOWN	14	5.4
TRAVEL TIME TO HOSP.		
< 1 HOUR	188	72.9
➢ 1 HOUR	68	26.4
UNKNOWN	2	0.8



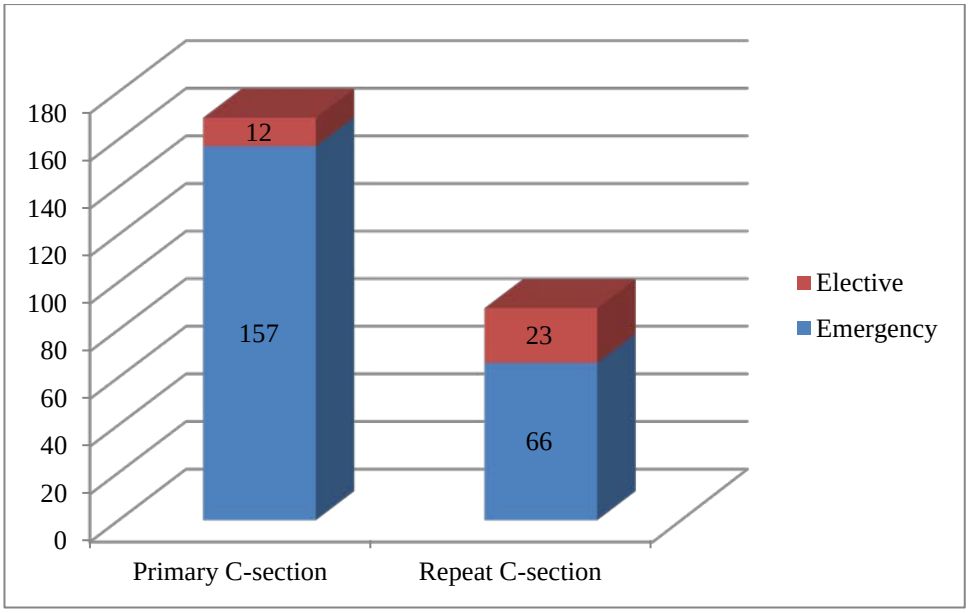


Figure 4.2. Proportions of primary and repeat C-sections.

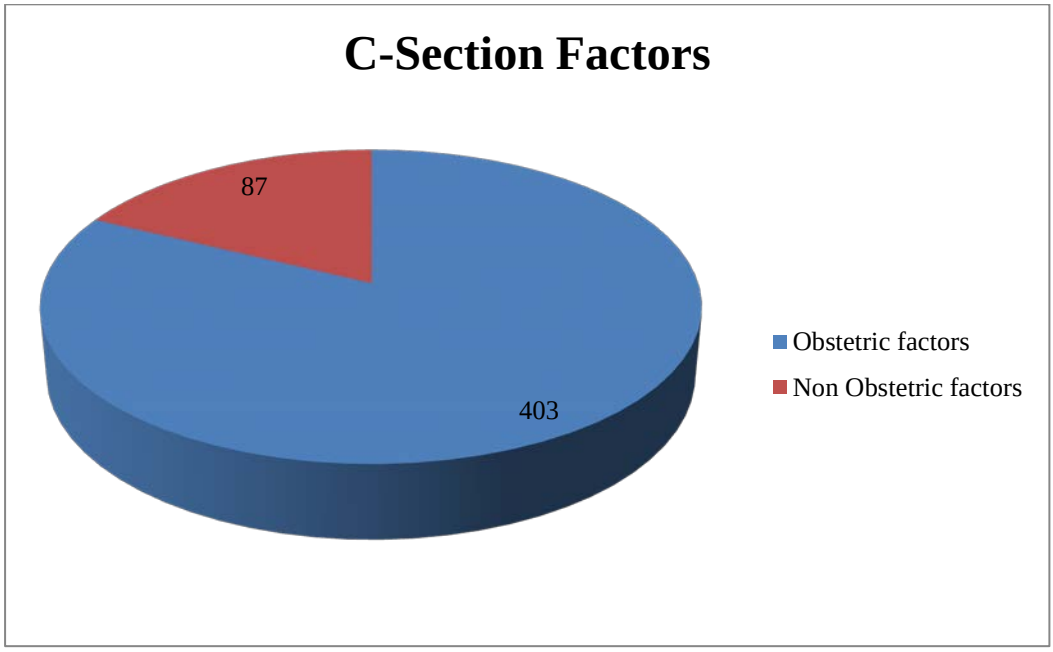
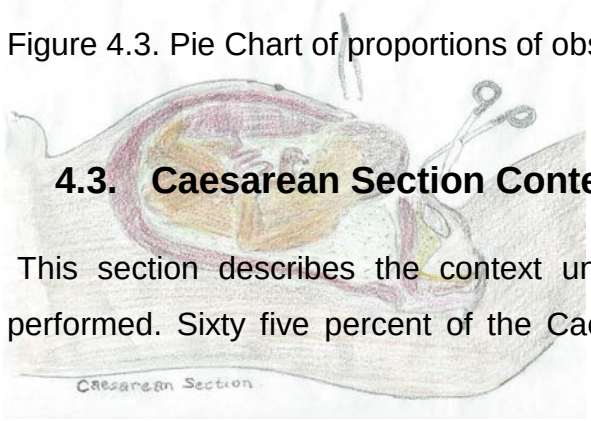


Figure 4.3. Pie Chart of proportions of obstetric and non obstetric factors.



4.3. Caesarean Section Context:

This section describes the context under which the Caesarean sections were performed. Sixty five percent of the Caesarean sections were primary Caesarean

sections. As shown in Table 4.2, by far the greater proportion, 86.4% of the operations were performed as emergencies. In this study, a delivery was classified as an emergency C-section if the decision to operate was taken after onset of labour whether spontaneous or induced. Fifty one percent of the operations were done during normal working hours where as 48.8% of the operations were done during after- hours and weekends.

In ten percent of the operations there were records of maternal complications, the most common being post partum haemorrhage. In our sample there was one maternal death (0.4%). In three percent of the deliveries, there were records of fetal complications, the most common being birth asphyxia.

4.4. OBSTETRIC FACTORS

This section describes the Robson classes and other obstetric characteristics and indications that occur with each Caesarean section. In 246 patients (95.4%), there were maternal indications for C-section, whereas fetal indications were recorded in 157 patients (60.9%). The most common obstetric indications for C-section were fetal distress, previous C-section, CPD, poor progress, malpresentation and post maturity. In this study, C-sections were done for post maturity if there was failed induction, bad obstetric history or previous Caesarean section. The obstetric variables are tabulated in Table 4.3.

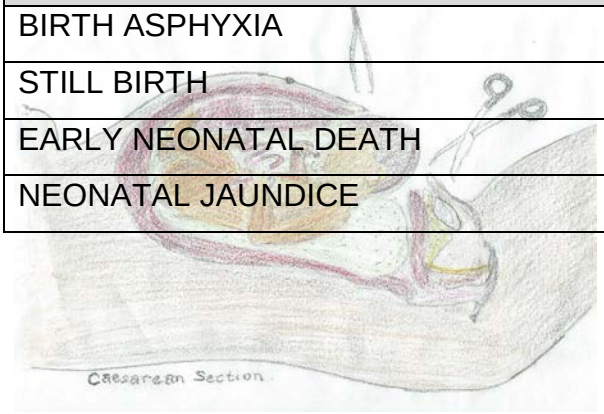
4.4.1. Robson Classification: The two Robson classes that had Caesarean sections more frequently than others were classes 1 and 5 as shown in Table 4.3. Class 1 refers to a nulliparous patient with a singleton pregnancy at 37 or more weeks of gestation that went into labour spontaneously. Class 5 refers to a patient with previous Caesarean section with a singleton pregnancy at 37 or more weeks of gestation. The Robson classification is found in Anexure I section C.

4.4.2. Number of Indications for Caesarean Section: This section describes the number of recorded indications for each Caesarean section. Half (50.4%) of the Caesarean sections were performed for a single indication. 43% of C-sections were done for two indications.



Table 4.2. Variables that describe the context under which Caesarean sections were performed in 2011. (Variables occurring frequently are highlighted).

VARIABLE	**NUMBER**	**PERCENTAGE**
TIME OF OPERATION.	**N=258**	**%**
AFTER HOURS	126	48.8
NORMAL HOURS	132	51.2
TYPE OF OPERATION	**N=258**	**%**
EMERGENCY	223	86.4
ELECTIVE	35	13.6
CAESAREAN INCIDENT	**N=258**	**%**
FIRST (PRIMARY) CAESAREAN	168	65.1
REPEAT CAESAREAN	90	34.9
NUMBER OF PREVIOUS C/S	**N=258**	**%**
0	168	65.1
1	71	27.5
2	19	7.4
IMMEDIATE MATERNAL OUTCOME	**N=258**	**%**
UNCOMPLICATED	230	89.2
COMPLICATED	28	10.9
TYPE OF MATERNAL COMPLICATION	**N=28**	**%**
POST PARTUM HAEMORRHAGE	26	92.9
MATERNAL DEATH	1	3.6
INFECTION	1	3.6
IMMEDIATE FETAL OUTCOME	**N=258**	**%**
UNCOMPLICATED	249	96.5
COMPLICATED	9	3.5
TYPE OF FETAL COMPLICATION	**N=9**	**%**
BIRTH ASPHYXIA	5	55.6
STILL BIRTH	1	11.1
EARLY NEONATAL DEATH	1	11.1
NEONATAL JAUNDICE	2	22.2



4.4.3. Fetal Factors: The fetal indications identified in this study were: fetal distress, big baby, malpresentation, post maturity, multiple pregnancy, intra uterine growth retardation and cord prolapse. As shown in Figure 4.5, the more frequently recorded fetal indications were fetal distress (58.6%), malpresentation (17.2%), and post maturity (16.s6%). Fetal distress included various fetal heart abnormalities or abnormal CTG tracings with or without meconium staining of liquor. Malpresentation included breech presentation, transverse lie and face presentation in this study.

4.4.4. Maternal Factors: The maternal indications for Caesarean section identified in this study were: previous Caesarean section, poor progress or prolonged labour, CPD, hypertensive disorders, bad obstetric history, failed induction, small or inadequate pelvis, genital lesions, and request for sterilization. The most common maternal indication was previous Caesarean section. CPD and poor progress were also common indications (Table 4.3).

4.5. Non Obstetric Factors

This section describes non obstetric characteristics that occurred with each Caesarean section. These variables are tabulated in Table 4.4.

4.5.1. Physician Factor: There were nine male and four female doctors who performed C-sections. 12 of the doctors had more than 10 years post qualification experience and two had post graduate training in obstetrics. 57% of the C-sections were performed by two of the doctors (Table 4.5).

4.5.2. Subjective Issues: A Second opinion was sought about a decision to perform C-section in three (1.2%) instances. There were diagnostic problems in seven (2.7%) instances, most of which were related to errors in assessment of patients. There was no instance where a doctor documented his/her preference for C-section rather than vaginal delivery where C-section was not absolutely indicated (Table 4.6).



Table 4.3.Obstetric factors of patients who delivered by Caesarean section in 2011 in Bertha Gxowa Hospital. (Characteristics with large frequencies are highlighted).

ROBSON CLASS	**FREQUENCY**	**PERCENTAGE**
1	**84**	**32.6**
2	9	3.5
3	40	15.5
4	15	5.8
5	**82**	**31.8**
6	9	3.5
7	8	3.1
8	4	1.6
9	1	0.4
10	6	2.3
TOTAL	258	100
NUMBER OF INDICATIONS	**N= 258**	**PERCENTAGE**
1	130	50.4
2	112	43.4
3	15	5.8
4	1	0.4
FOETAL INDICATION	**FREQUENCY (N=157)**	**PERCENTAGE**
FOETAL DISTRESS	**92**	**58.6**
MALPRESENTATION	**27**	**17.2**
POST MATURITY	**26**	**16.6**
MULTIPLE PREGNANCY	5	3.2
BIG BABY	5	3.2
I.U.G.R	1	0.6
CORD PROLAPSE	1	0.6
MATERNAL INDICATION	**FREQUENCY (N=246)**	**PERCENTAGE**
PREVIOUS C/S	**85**	**34.6**
CPD	**79**	**32.1**
POOR PROGRESS	**39**	**15.9**
HYPERTENSIVE DISORDERS	12	4.9
PREMATURE RUPTURE OF MEMBRANES	7	2.9
FAILED INDUCTION	7	2.9
GENITAL LESIONS	5	2.0
BAD OBSTETRIC HISTORY	4	1.6
SMALL PELVIS	4	1.6
REQUEST FOR STERILIZATION	3	1.2
OLIGOHYDRAMNIOS	1	0.4

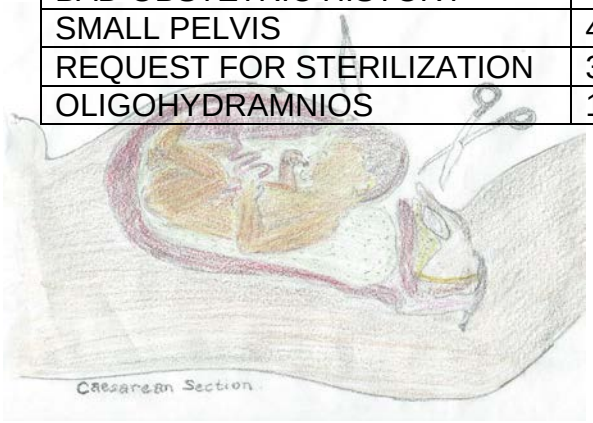


Table 4.4 Frequency Table of Non Obstetric Variables of patients who delivered by Caesarean section in 2011 in Bertha Gxowa Hospital.

VARIABLE	FREQUENCY	PERCENTAGE
DEMAND FOR CASESAREAN		
YES	6	2.3
NO	252	97.7
MEDICAL CONDITION PRESENT		
YES	9	3.5
NO	249	96.5
TYPE OF CONDITION		
CARDIOVASCULAR	1	11.1
RESPIRATORY	3	33.3
GENITOURINARY	5	55.6
DRANK HERBAL MEDICINE		
YES	3	1.2
NO	255	98.8
DRANK CHURCH WATER		
YES	5	1.9
NO	253	98.1
H I V STATUS		
POSITIVE	64	24.8
NEGATIVE	193	74.8
UNKNOWN	1	0.4
RECEIVED A N C		
YES	255	98.8
NO	3	1.2
PARTOGRAM USED		
YES	81	31.4
NO	147	57.0
NOT APPLICABLE	30	11.6
CARDITOCOGRAPH USED		
YES	258	100.0
NO	0	0

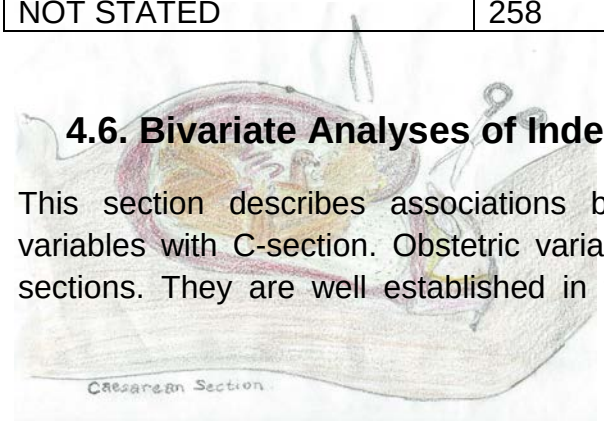


Table 4.5. Objective Characteristics of Physicians who rendered obstetric services in Bertha Gxowa Hospital in 2011.

MEDICAL OFFICER	GENDER	EXPERIENCE (YEARS)	OBSTETRIC POST GRAD TRAINING	FREQ	PERCENTAGE
MO. 1	M	>10	NO	88	34.1
MO. 2	M	>10	NO	61	23.6
MO. 3	F	<5	NO	15	5.8
MO. 4	M	>10	NO	29	11.2
MO. 5	F	>10	NO	10	3.9
MO. 6	F	>10	NO	9	3.5
MO. 7	M	>10	YES	19	7.4
MO. 8	M	>10	NO	3	1.2
MO. 10	M	>10	YES	9	3.5
MO. 11	F	>10	NO	1	0.4
MO. 12	M	>10	NO	11	4.3
MO. 13	M	>10	NO	2	0.8
MO. 14	M	>10	NO	1	0.4
TOTAL				258	100

Table 4.6. Subjective Characteristics of Physicians who rendered obstetric services in Bertha Gxowa Hospital in 2011.

CHARACTERISTIC	FREQUENCY	PERCENTAGE
2ND OPINION SOUGHT		
YES	3	1.2
NO	255	98.8
DIAGNOSTIC PROBLEM		
YES	7	2.7
NO	251	97.3
TYPE OF ERROR		
ERRORS IN ASSESSMENT	6	85.7
ERRORS IN CLINICAL REASONING/ MANAGEMENT	1	14.3
PREFERENCE FOR C/S		
STATED	0	0
NOT STATED	258	100



4.6. Bivariate Analyses of Independent Variables.

This section describes associations between demographic and non obstetric variables with C-section. Obstetric variables were the medical reasons for the C-sections. They are well established in the literature; they were not analysed for

association with Caesarean section in the bivariate analyses. A significance level of 0.05% was used in this study.

For demographic variables, age and parity showed statistically significant association with Caesarean section. For race, marital status, and travel distance, there was no statistically significant association with Caesarean section.

4.6.1. Association between Age and C-section: A two tailed Student's t test was used to compare the mean age for elective C-section and the mean age for emergency C-section. The results show that there was a trend of women undergoing elective C-section to be older than women undergoing emergency C-section. (Student's t test Alternate hypothesis Ha >0, P = 0.00423). These findings are illustrated in Table 4.7. Two criteria for the use of a two tailed Student's t test are, the sample should be a random sample and the distribution should follow a normal distribution. These criteria were met in this study.

Table 4.7. Two Sample T Test with Equal Variances of Age by C/S

C/S GROUP	OBSERVATION	MEAN AGE	STD ERROR	STD DEVIATION	95% CONF INTERVAL
ELECTIVE C/S	35	28.03	0.89	5.28	26.21 - 29.84
EMERGENCY C/S	223	26.11	0.42	6.20	25.29 – 26.93
COMBINED	258	26.37	0.38	6.11	25.62 – 27.12

Difference = Mean age for elective C/S minus mean age for emergency C/S.

(Null Hypothesis) Ho difference = 0, P = 1.7317.

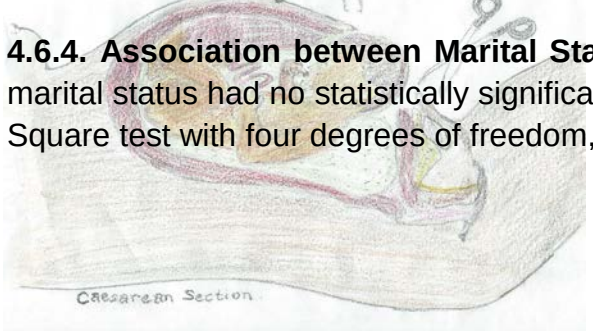
(Alternate hypothesis) Ha diff < 0, P = 0.9577.

Ha diff > 0, P = 0.00423. This indicates that there is a significant difference between the two means and the difference is more than zero, i.e. Mean age for elective C-section is more than mean age for emergency C-section. (P = 0.00423).

4.6.2. Association between Parity and C-section: As tabulated in Table 4.8, the results show a statistically significant association between parity and C-section (Chi square test with 4 degrees of freedom = 15.600, p = 0.004).

4.6.3. Association between Race and C-section: The results show that race had no statistically significant association with C-Section (Pearson's Chi2 with 3 degrees of freedom = 2.1398, p = 0.544). Table 4.8 illustrates this association.

4.6.4. Association between Marital Status and C-section: The results show that marital status had no statistically significant association with Caesarean section (Chi-Square test with four degrees of freedom, p = 0.457).



4.6.5. Association between Travel Time to Health Facility and C-section: The results show that there was no statistically significant association between the travel time and C-section, Chi- square test with 2 degrees of freedom =0.1733, p value= 0.917 (Table 4.8).

4.6.6. Analysis of primary and repeat C-sections: Seventy percent of the emergency C-sections were primary C-sections whereas 65% of the elective C-sections were repeat C-sections (Table 4.9).

4.6.7. Association between immediate maternal outcome and C-section: There were more complications (11.2%) with emergency C-sections than with elective C-sections (8.6%). There was no statistically significant association between immediate maternal outcome and Caesarean section, Chi-square with two degrees of freedom = 0.3193, p = 0.852 (Table 4.10).

4.6.8. Association between Robson class and C-section: There was a statistically significant association between Robson class and C-section (Pearson's Chi-square test with 9 degrees of freedom = 41.3908, p = 0.000). This relationship is illustrated in Table 4.11.

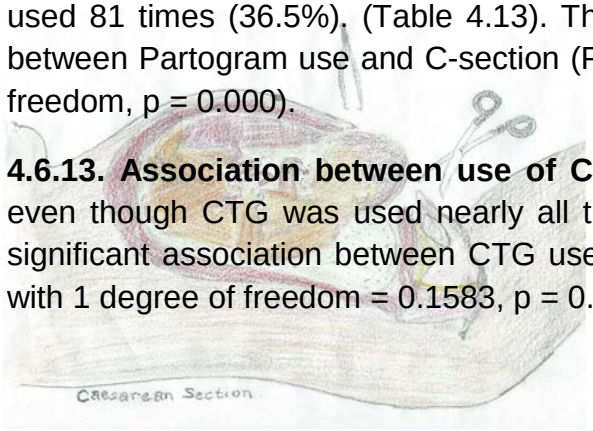
4.6.9. Association between number of indications and C-section: There was a statistically significant association between the number of indications and Caesarean section, as shown in Table 4.12 (Pearson's Chi-square test with three degrees of freedom = 11.3614, P = 0.010.)

4.6.10. Association between HIV status and C-section: The results show as illustrated in Table 4.13 that there was no statistically significant association between HIV status and C-section (Pearson's Chi square test with one degree of freedom = 0.3900, p = 0.672).

4.6.11. Association between Antenatal care and C-section: There was no statistically significant association between receiving or not receiving ANC and C-section as shown in Table 4.13 (Pearson's Chi square test with 1 degree of freedom = 0.4807, p-value = 0.488).

4.6.12. Association between Partogram use and C-section: The results show that most of the time (56.8%), partogram was not used. For elective C-sections, partogram was not used at all (0%), but for emergency C-sections partogram was used 81 times (36.5%). (Table 4.13). There was statistically significant association between Partogram use and C-section (Pearson's Chi square test with 2 degrees of freedom, p = 0.000).

4.6.13. Association between use of CTG and C-section: The results show that even though CTG was used nearly all the time (99.6%), there was no statistically significant association between CTG use and C-section, Pearson's Chi-square test with 1 degree of freedom = 0.1583, p = 0.691 (Table 4.13).



4.6.14. Association between Medical Officer and C-section: The association between medical Officers' characteristics and C-section is illustrated in Table 4.14. There were 13 medical officers who performed C-sections on the patients whose files were sampled for data analysis. The results show that there was statistically significant association between medical officers and C-section (Pearson's Chi square test with 12 degrees of freedom = 34.6613, p = 0.001).

4.6.15. Association between Medical Officer's Experience and C-section: There was one medical officer with less than five years post qualification experience. The other 13 medical officers had more than 10 years post qualification experience. The results showed no statistically significant association between years of experience and C-section (Pearson's Chi square test with one degree of freedom = 2.3054, p = 0.129).

4.6.16. Association between Obstetric Post Graduate Training and C-section: There were two Medical Officers with Obstetric post graduate training. The results showed no statistically significant association between post graduate training and C-section (Pearson's Chi square test with 1 degree of freedom = 0.119, p = 0.913).

4.6.17. Association between Second Opinion on Decision to Perform C-section and C-section: There were only three instances where a medical officer on duty sought and documented a second opinion on the decision to perform C-section on a patient as shown in Table 4.13. The results show no statistically significant association between seeking second opinion (or not) and C-section (Pearson's Chi square test with 1 degree of freedom = 0.0115, p = 0.315).

Table 4.8 Robson Class and C-section

ROBSON CLASS	ELECTIVE C/S		EMERGENCY C/S	
	FREQUENCY	PERCENTAGE	FREQUENCY	PECENTAGE
1	0	0	84	37.8
2	3	8.6	6	2.7
3	0	0	40	18.0
4	3	8.6	12	5.0
5	23	65.7	59	26.6
6	3	8.6	6	2.7
7	1	2.9	7	3.2
8	1	2.9	3	1.4
9	0	0	1	0.5
10	1	2.9	5	2.3
TOTAL	35	100.0	223	100.0

Pearson's Chi2 (9) = 41.3908, Pr = 0.000, Fisher's Exact = 0.000

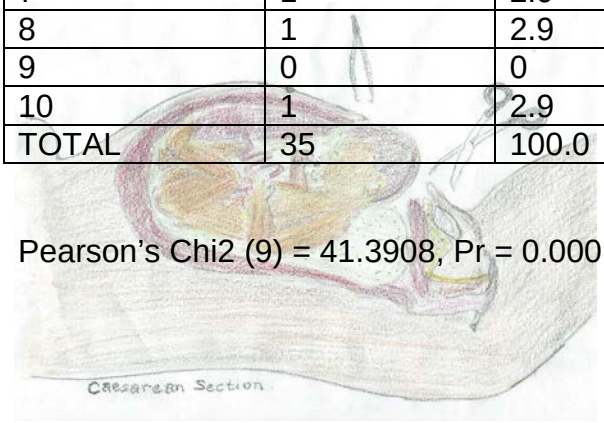


Table 4.9. Bivariate Analysis of Demographic Variables

CHARACTERISTIC	ELECTIVE C/S (%)	EMERGENCY C/S (%)	TOTAL(%)	PEARSON'S CHI^2 (DEGREES OF FREEDOM)	P VALUE
PARITY				**15.600 (4)**	**0.004**
0	6 (17.2)	97 (43.5)	103 (39.9)		
1	15 (42.9)	83 (37.2)	98 (38.0)		
2	13 (37.1)	31 (13.9)	44 (17.1)		
3	1 (2.9)	10 (4.5)	11 (4.3)		
4	0 (0)	2 (0.9)	2 (0.8)		
RACE				**2.1398 (3)**	**0.544**
WHITE	3 (8.6)	9 (4.0)	12 (4.6)		
AFRICAN	32 (91.4)	209 (93.7)	241 (93.9)		
COLOURED	0 (0)	4 (1.8)	4 (1.6)		
ASIAN	0 (0)	1 (0.5)	1 (0.4)		
MARITAL STATUS				**3.6327 (4)**	**0.457**
SINGLE	23 (65.7)	167 (75.2)	190 (73.9)		
MARRIED	11 (31.4)	53 (23.9)	64 (24.9)		
DIVORCED	1 (2.9)	1 (0.5)	2 (0.8)		
WIDOWED	0 (0)	1 (0.45)	1 (0.39)		
TRAVEL TIME				**0.1733 (2)**	**0.917**
< 1 HOUR	26 (74.3)	162 (72.6)	188 (72.9)		
> 1 HOUR	9 (25.7)	59 (26.5)	68 (26.4)		
UNKNOWN	0 (0)	2 (0.9)	2 (0.8)		

Table 4.10. Analysis of Variables Describing C/S Context.

CHARACTERISTIC	ELECTIVE C/S (%)	EMERGENCY C/S (%)	TOTAL (%)	PEARSON'S CHI^2 (^{0} OF FREEDOM)	P VALUE
PRIMARY OR REPEAT C/S				**17.5079 (2)**	**0.00**
PRIMARY C/S	12 (34.3)	157 (70.4)	169 (65.5)		
REPEAT C/S	23 (65.7)	66 (29.6)	89 (34.5)		
MATERNAL OUTCOME				**0.3193 (2)**	**0.852**
NO COMPLICATION	32 (91.4)	198 (88.8)	230 (89.2)		
COMPLICATED	3 (8.6)	25 (11.2)	28 (10.9)		

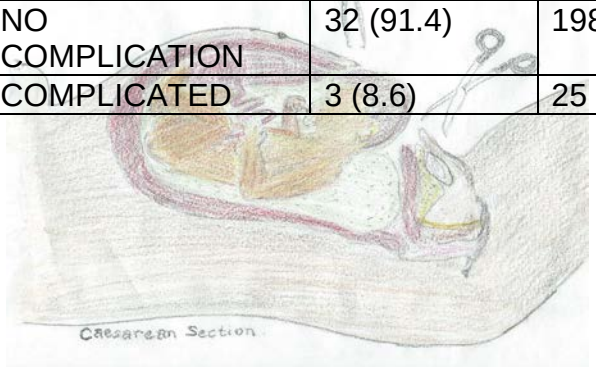


Table 4.11. Number of indications and C-section.

C/S GROUP	NUMBER OF INDICATIONS FOR C/S				TOTAL
	1	2	3	4	
ELECTIVE C/S FREQUENCY	9	24	2	0	35
ELECTIVE C/S PERCENTAGE	25.7	68.6	5.7	0	100
EMERGENCY C/S FREQUENCY	121	88	13	1	223
EMERGENCY C/S PERCENTAGE	54.3	39.5	5.8	0.5	100
TOTAL	130	112	15	1	258

Pearson's Chi2 (3) = 10.9550, Pr = 0.012, Fisher's Exact = 0.005.

Table 4.12 Bivariate Analysis of Non Obstetric Variables.

CHARACTERISTIC	ELECTIVE C/S (%)	EMERGENCY C/S (%)	TOTAL (%)	PEARSON'S CHI^2 (^{0} OF FREEDOM)	P VALUE
HIV STATUS				**0.390 (1)**	**0.532**
POSITIVE	7 (20.6)	57 (25.6)	64 (24.9)		
NEGATIVE	27 (79.4)	166 (74.4)	193 (75.1)		
ANTENATAL CARE				**0.4808 (1)**	**0.448**
RECEIVED ANC	35 (100)	200 (98.7)	255 (98.8)		
NO ANC	0 (0)	3 (1.4)	3 (1.2)		
PARTOGRAM USE				**142.398 (2)**	**0.00**
USED	0 (0)	81 (36.5)	81 (31.5)		
NOT USED	10 (28.6)	136 (61.3)	146 (56.6)		
NOT INDICATED	25 (71.4)	5 (2.3)	30 (11.7)		
CTG				**0.1583 (1)**	**0.691**
USED	35 (100)	221 (99.6)	256 (99.6)		
NOT USED	0 (0)	1 (0.5)	1 (0.4)		
2ND OPINION				**1.0115 (1)**	**0.315**
SOUGHT	1 (2.9)	2 (0.9)	3 (1.2)		
NOT SOUGHT	34 (97.1)	221 (99.1)	255 (98.8)		

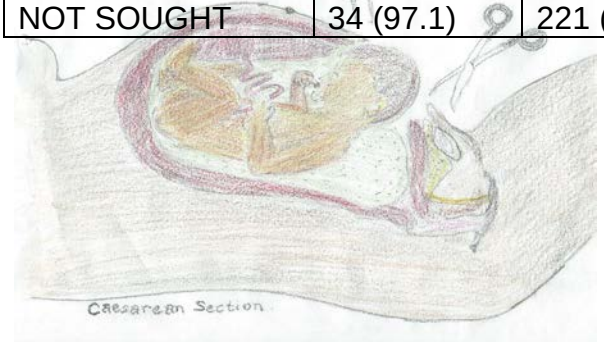
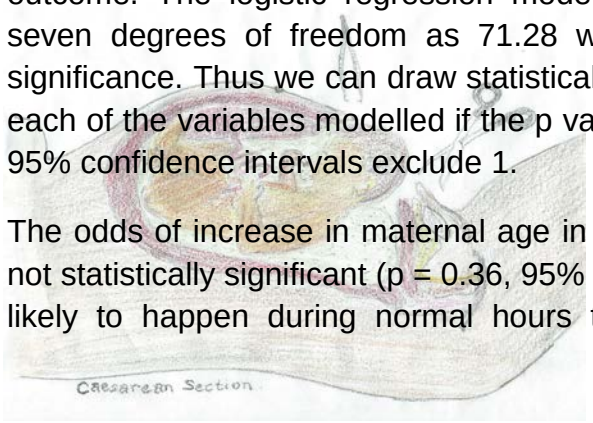


Table 4.13. Bivariate Analysis of Medical Officers' Characteristics.

CHARACTERISTIC	ELECTIVE C/S (%)	EMERGENCY C/S (%)	TOTAL (%)	PEARSON'S CHI^2 (^{0} OF FREEDOM)	P VALUE
MEDICAL OFFICER				**34.6613 (12)**	**0.001**
MO 1	24 (68.6)	64 (28.7)	88 (34.1)		
MO 2	3 (8.6)	58 (28.0)	61 (23.6)		
MO 3	4 (11.4)	11 (4.9)	15 (5.8)		
MO 4	0 (0)	29 (13.0)	29 (11.2)		
MO 5	0 (0)	10 (4.5)	10 (3.9)		
MO 6	0 (0)	9 (4.0)	9 (3.5)		
MO 7	1 (2.9)	18 (8.1)	19 (7.4)		
MO 8	0 (0)	3 (1.4)	3 (1.2)		
MO 10	3 (8.6)	6 (2.7)	9 (3.5)		
MO 11	0 (0)	1 (0.5)	1 (0.4)		
MO 12	0 (0)	11 (4.9)	11 (4.3)		
MO 13	0 (0)	2 (0.9)	2 (0.8)		
MO 14	0 (0)	1 (0.5)	1 (0.4)		
MEDICAL OFFICER'S EXPERIENCE				**2.3054 (1)**	**0.129**
< 5 YEARS	4 (11.4)	11 (4.9)	15 (5.8)		
5-10 YEARS	0 (0)	0 (0)	0 (0)		
> 10 YEARS	31 (88.6)	212 (95.1)	243 (95.2)		
P G TRAINING				**0.119 (1)**	**0.913**
HAD PG TRAINING	4 (11.4)	24 (10.8)	28 (10.9)		
NO PG TRAINING	31 (88.6)	199 (89.2)	230 (89.2)		

4.7. Logistic Regression Analysis:

This section describes the probability of certain dependent variables influencing the likelihood of having the outcome, Caesarean section. The variables of interest that were included in the logistic model are age, time of operation, Robson class, number of previous Caesarean operations, patient demand, HIV status, and maternal outcome. The logistic regression model gave a Likelihood ratio Chi-square with seven degrees of freedom as 71.28 with p value of 0.000 indicating statistical significance. Thus we can draw statistical conclusions on the adjusted odds ratios of each of the variables modelled if the p values generated are less than 0.005 and the 95% confidence intervals exclude 1.



The odds of increase in maternal age in predicting C-section was 0.96 but this was not statistically significant (p = 0.36, 95% CI 0.88-1.05). C-section was 21 times more likely to happen during normal hours than after hours after adjusting for other

variables, OR 21.4, p value 0.00, CI 5.34-85.86. Interestingly, the odds of patient demand increasing the likelihood of C-section was only 0.8. This was statistically significant (p value 0.046, CI 0.0069-0.956) indicating that in our study, patient demand did not play a major role in the high C-section rates. The likelihood of HIV status and maternal outcome in increasing C-section rate were not shown to be statistically significant as their p values were more than 0.05.

Table 4.14. Logistic Regression.

C-SECTION	ADJUSTED ODDS RATIO	STD ERR	P VALUE	95% CONFIDENCE INTERVAL
AGE	0.9600862	0.424248	0.357	0.8804342 1.046944
TIME OF OP	21.41823	15.17293	0.000	5.342969 85.85878
ROBSON CLASS	1.473694	0.1919104	0.003	1.141722 1.902191
NO OF C/S	3.148236	1.155993	0.002	1.532911 6.465733
PATIENT DEMAND	0.810773	0.1020542	0.046	0.0068781 0.9557178
HIV STATUS	1.79259	1.045541	0.317	0.5714934 5.622773
MATERNAL OUTCOME	0.3232942	0.241949	0.131	0.745724 1.401579
CONSTANT	0.0014793	0.0032362	0.003	0.0000203 0.1076834



CHAPTER 5.

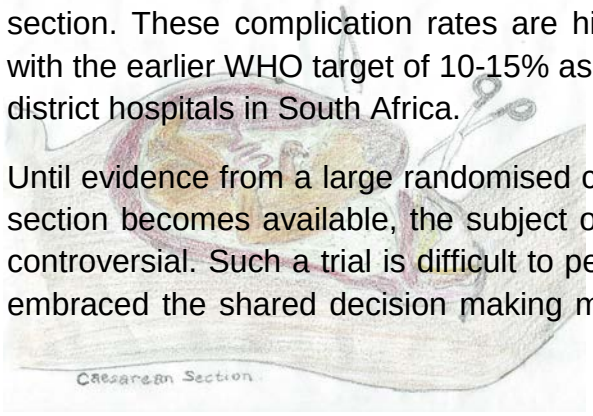
DISCUSSION

The results show that obstetric factors contributed more to the high C-section rates than non obstetric factors in Bertha Gxowa hospital. Majority, 86% of the C-sections were emergency procedures of which 70% were primary C-sections. Patients belonging to Robson classes 1 and 5 constituted 64.4%, almost two thirds of C-sections. Para 0 and Para 1 patients constituted 77.9%, more than three quarters of all C-sections in this study. The implications are that efforts at reducing primary C-section rates especially among Para 0 and Para 1 patients, and the practice of offering VBAC to patients with previous C-section who do not have contraindications may lead to significant reductions in Bertha Gxowa hospital's C-section rates. These reductions in C-section rates could be achieved if obstetric protocols and guidelines are followed in assessment and management of obstetric problems.

5.1. Caesarean Section Rates

This study confirms that Caesarean section rates in Bertha Gxowa hospital in 2011 were higher than the 15% target set for district hospitals in South Africa. The18.4% C-section rate for 2011 found in our institution, though above target, is slightly below the national average C-section rate for district hospitals in 2010/2011 of 18.8%.[10] One can therefore say that less than one in five women attending Bertha Gxowa hospital for child birth deliver by Caesarean section. The WHO has admitted in a statement released in 2010 that there is no empiric evidence for an optimal C-section rate; their 1985 recommendation of 10-15% C-section rate is no longer prescriptive but merely a guide.[50] For district hospitals, research such as this may contribute to the determination of an optimal C-section rate.

A Caesarean section rate of 15-20% has been argued to be a reasonable rate by Gibbons et al.[51] In advocating for an optimal C-section rate for district hospitals in South Africa, one has to consider the risks associated with the prevailing C-section rates. As pointed out in the literature review, it is easier for a woman to die during childbirth if she delivers by C-section, (especially emergency C-section as shown in our study) than if she delivers vaginally. This study showed that more than 10% of women who had C-sections recorded complications. There was a maternal mortality recorded in our sample of 258 patients which occurred following an emergency C-section. These complication rates are high. In view of this, the researcher agrees with the earlier WHO target of 10-15% as a reasonable institutional C-section rate for district hospitals in South Africa.



Until evidence from a large randomised controlled trial on vaginal versus Caesarean section becomes available, the subject of optimal C-section rate will continue to be controversial. Such a trial is difficult to perform in that modern obstetric practice has embraced the shared decision making model in which the preferences of a patient

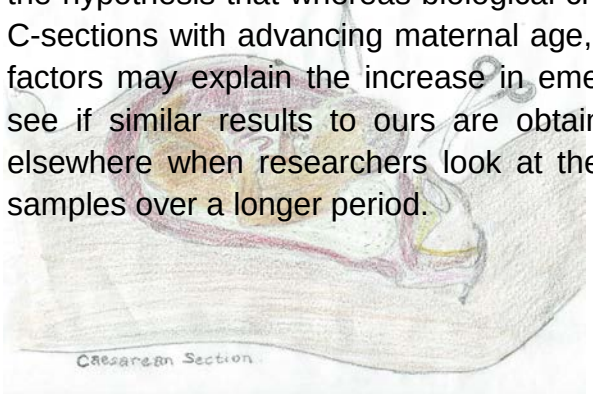
are taken into consideration. Interfering with an important decision in a woman's life such as mode of delivery through a trial is a difficult thing to accomplish. The absence of evidence from a large randomised controlled trial is the reason the WHO has admitted that there is no empirical evidence for an optimal C-section rate. However, in the absence of a large randomised trial, the researcher hopes to contribute to future studies such as meta-analysis on Caesarean section rates through the results of this study.

5.2. Demographic Characteristics

In this study, the researcher adopted a similar approach to that of Menacker[24] in classifying deliveries under 20 years as teen deliveries and over 35 years as advanced maternal age. The results show that maternal age was higher with elective C-sections than with emergency C-sections. When age as a whole was modelled, the probability of increases in maternal age predicting C-section was not sustained in the regression model after adjusting for other variables (adjusted odds ratio 0.96, p value 0.357). This is an interesting finding which contrasts with results of previous studies from developed countries. In other studies on C-section determinants, advanced maternal age was consistently significantly associated with C-section even after adjusting for other variables.[11,26]

These studies were done in developed countries where there are proportionately more elective C-sections than emergency C-sections compared to developing countries. Also, other researchers did not choose elective and emergency C-section as binary outcomes of interest. While some looked at primary versus repeat C-sections, others looked at vaginal versus Caesarean delivery. This study had predominance of emergency C-sections, and our patients were analysed as either having emergency or elective C-sections. Our predominance of emergency C-sections may explain the difference.

Many theories have been put forward to explain the influence of advancing maternal age on delivery mode. Liston[52] attributed it to evolution and ecological changes in humans. A common assumption is that physician and patient preferences are responsible. A more objective approach towards a biological explanation was adopted in a Scottish study[53] where myometrial strips were biopsied at elective C-section. The results of that study showed declining myometrial contractility with advancing maternal age. In the light of these findings, this study therefore supports the hypothesis that whereas biological changes may explain the increase in elective C-sections with advancing maternal age, non biological factors and non age related factors may explain the increase in emergency C-sections. It will be interesting to see if similar results to ours are obtained in future studies in South Africa and elsewhere when researchers look at the same binary outcomes with much larger samples over a longer period.

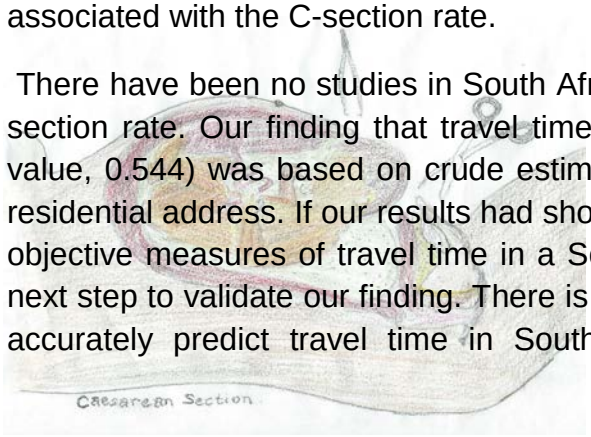


Parity was shown to be significantly associated with C-section (p value 0.004). This finding is similar to results from other studies[13]. The findings were consistent in studies where C-section rates were very high like the study by Ribeiro et al in Brazil,[54] and in studies where the C-section rates were low, like the study by Hiasat.[55] In our study, 77.9% of patients had parity of zero and one. One of the reasons for the increase of C-section rates with increasing parity is the tendency for babies to get bigger with successive pregnancies.[1] With bigger babies, the delivery process gets more difficult as the size of the mother's bony pelvis remains constant. The clinical implication is that effects of increasing maternal age and parity on delivery mode should be incorporated in shared decision making and in counselling women in Bertha Gxowa hospital about reproductive choices and family planning.

Race, marital status and travel time to health facility did not show statistically significant associations with C-section. The findings regarding race and marital status correlate with what is already known. Our study however described a predominantly African sample. Inconsistent results were obtained in earlier studies where certain racial groups were hypothesised to be more associated with C-sections than others. In the UK Caesarean section audit report, African and black Caribbean women had higher C-section rates than white women.[13] In a South African study, C-section rates were higher among women classified as whites or coloured than those classified as blacks.[31] Obstetric services offered in Bertha Gxowa hospital are mainly utilized by women of low socio economic status most of whom (93.4% in this study) are African. We cannot therefore attribute the high C-section rates to racial factor.

One of the demographic factors tested for association with C-section in this study was travel time from the patient's home to the health facility. The researcher wanted to establish if travel time was a contributor to the high C-section rates. Transportation is one of the major problems of lower socio economic class in South Africa and hypothetically could lead to delay in seeking care by a pregnant woman. In the fifth report of confidential enquiry into maternal deaths in South Africa,[12] patient related avoidable factors, mostly delay in seeking care were present in 33.6% of deaths due to obstetric haemorrhage. In that report, the major cause of death from haemorrhage was bleeding associated with C-sections. Also, lack of transport from home to health facilities was implicated in 3% of administrative factors causing maternal deaths.[12] Our study showed that travel time from patient's home to the hospital was not associated with the C-section rate.

There have been no studies in South Africa that tried to correlate travel time and C-section rate. Our finding that travel time was not a statistically significant factor (p value, 0.544) was based on crude estimates made using the patient's documented residential address. If our results had shown statistically significant association, more objective measures of travel time in a South African situation would have been the next step to validate our finding. There is need for the development of a tool that can accurately predict travel time in South Africa. Current web based applications



calculate travel time based on measured distances between two points, as the crow flies. These estimates are not reliable.

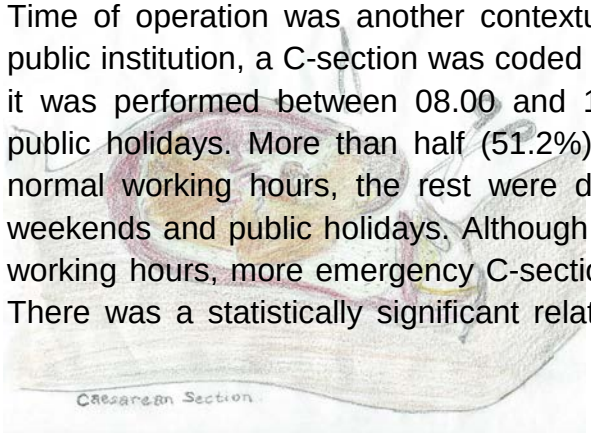
5.3. Caesarean Section Context

The results show that 86% of the C-sections were emergency C-sections. Although this finding is in keeping with other studies which showed that in developing countries, majority of the C-sections are emergencies rather than elective procedures,[11] our figure of 86% is higher than that of other researchers. This implies that most of the problems are picked up during labour; an example being fetal distress which was the most frequent fetal indication in this study. This has important clinical implications as well. Morrison and Mackenzie in their study noted that maternal mortality is known to be higher with emergency C-sections than with elective C-sections especially when labour is prolonged.[56]

Contrary to the position of Australasian investigators,[57] who believed that dividing Caesarean sections into elective and emergency would not yield definitive results, our study has yielded reliable results. The Australasian researchers were concerned that a range of definitions are used across different institutions for what constitutes elective and what constitutes emergency C-sections. The doctors in Bertha Gxowa hospital were uniform in their classification of C-sections as elective if the decision to do C-section was taken before onset of labour. All intrapartum Caesarean interventions were correctly recorded as emergency C-sections.

Regarding emergency C-sections, the researcher agrees with the recommendations of NICE for a more uniform grading system for better communication between health care providers.[34] NICE recommends four grades of urgency: (1) immediate threat to the life of the woman or fetus, (2) maternal or fetal compromise which is not immediately life threatening, (3) no fetal or maternal compromise but needs early delivery and (4) delivery timed to suit the woman or staff. In our study, patients classified as emergencies belonged to grades one to three. Consequently, for patients scheduled for emergency C-sections who are of less emergent grade (grade two or three), manoeuvres that may increase the likelihood of vaginal delivery could be considered. Such manoeuvres may include external cephalic version for breech presentation and Oxytocin augmentation for ineffective uterine contractions that cause poor progress in labour.

Time of operation was another contextual factor examined in this study. Being a public institution, a C-section was coded as occurring during normal working hours if it was performed between 08.00 and 16.00 hours, Monday to Friday, excluding public holidays. More than half (51.2%) of the C-sections were performed during normal working hours, the rest were done after normal working hours including weekends and public holidays. Although more C-sections were done during normal working hours, more emergency C-sections were done after normal working hours. There was a statistically significant relationship between time of operation and C-

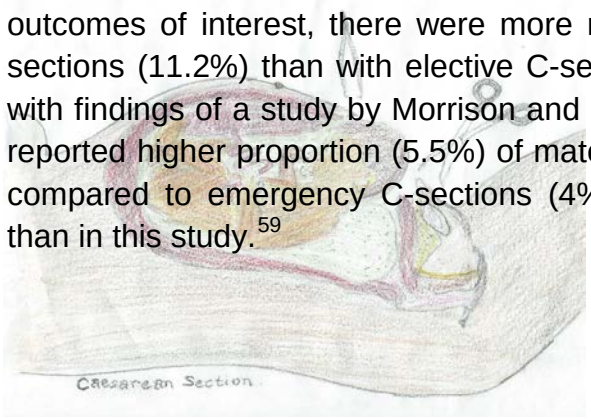


section, (OR 21.42, p-value 0.000, 95% CI 5.343- 85.859). This is similar to the findings of an earlier study in Soweto, South Africa where there was a tendency for more C-sections to be performed during normal working hours.[30]

This study also showed that almost two thirds (65.1%) of the C-sections were primary C-sections. Of the emergency C-sections, 70.4% were primary C-sections. Primary C-section rates vary widely as reported by Clark et al in an American study.[58] In that study, up to 37% of the C-sections in some states were primary C-sections. A primary C-section has far reaching implications on subsequent deliveries as already stated in the rationale for this study. Thus a decision to perform a primary C-section should not be taken perfunctorily. Much has been written on measures to reduce high primary C-section rates, mostly in developed countries. An understanding of local context is necessary in order to design applicable strategies to reduce the primary C-section rates. The results of this study indicate that primiparous women in labour at term (Robson class 1) are more likely than other women to have an emergency primary C-section; therefore they are candidates for interventions aimed at avoiding unnecessary emergency C-sections.

Maternal and fetal outcomes were described in this study as complicated or uncomplicated. The researcher adopted an approach similar to those of Shah et al[32] who studied C-section outcomes in Africa, and Villar et al[11] who did a similar study in Latin America. These investigators recorded maternal and perinatal complications if they occurred before discharge of the patients from hospital. For this study, in order to obtain reliable patient records, the time frame decided by the researcher for inclusion as an immediate outcome was from delivery (if elective) or onset of labour (if emergency) to discharge from hospital which was usually on the third post operative day. If there was an adverse incident warranting re-admission after the discharge from hospital, it was not described as an immediate complication. The reason for non inclusion of such is that sometimes another patient file is opened for the re-admission; data collected over a longer period would not have been all inclusive. The term immediate serves to differentiate the recorded complications from those that could have occurred after discharge from hospital.

A U-shaped relationship has been documented between C-section rates and maternal or perinatal outcomes; extremes of C-section rates are associated with higher incidences of adverse maternal and perinatal outcomes.[11] In this study 10.9% of C-sections had records of immediate maternal complications. Comparing the two outcomes of interest, there were more maternal complications with emergency C-sections (11.2%) than with elective C-sections (8.6%). This finding is in agreement with findings of a study by Morrison and Mackenzie.[56] Investigators in Latin America reported higher proportion (5.5%) of maternal complications with elective C-sections compared to emergency C-sections (4%) but their complication rates were lower than in this study.[59]



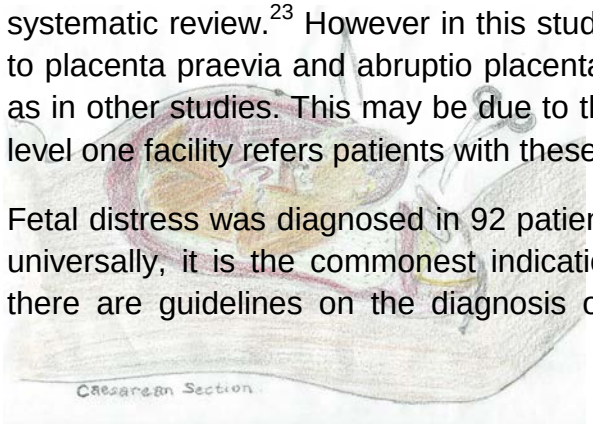
The lower complication rates in the Latin American study cited above may be due to their inclusion criteria. They included women who had blood transfusions, hysterectomies, ICU admissions and deaths; whereas the researcher included women who had records of blood loss of 1000mls or more irrespective of blood transfusion. Although there was no statistically significant association between immediate maternal outcome and C-section in this study, it is of clinical importance. The fact that one in ten women undergoing C-section gets a complication is a high number needed to harm. Some women requesting for C-section may have a rethink if they know that they stand a 10% change of having a complication.

Majority (92.9%) of the maternal complications were post partum haemorrhages, defined as blood loss of 1000mls or more following C-section.[1] This finding is in agreement with findings of the fifth report of confidential enquiries into maternal deaths in South Africa, which identifies post partum bleeding as a major problem; one of the 'big five'.[12] It also highlights the importance of ensuring that health care providers are proficient in managing intra-operative and post-operative Caesarean bleeding as recommended in the district hospital service package for South Africa[60].

5.4. Obstetric Factors.

The Robson classification allowed for comparisons of findings across different institutions and different countries.[61] The results show that nulliparae at term belonging to Robson class 1, (32.6%) and multiparae having repeat C-sections belonging to Robson class 5, (31.8%) constituted 64.4% of the C-sections. A study in Nova Scotia, Canada also found that women in Robson classes 1 and 5 contributed more to C-section rates than other groups. However in the Nova Scotia study, the proportions differed in favour of Robson Class 5 (23%) compared to Robson Class 1 (15%).[25] This is similar to the findings of a study in New South Wales, Australia. They also used the Robson classification to describe Caesarean births over a 10 year period.[24] The difference between the findings of the three studies is that the multiparous women undergoing repeat C-sections in our study had mostly emergency deliveries whereas in New South Wales and in Nova Scotia, they had mostly elective repeat C-sections.

The results of this study show that the five most common obstetric indications for C-section were fetal distress, previous C-section, CPD, poor progress, and malpresentation. Similar findings were obtained in many studies as noted in a systematic review.[23] However in this study, there were no records of C-sections due to placenta praevia and abruptio placenta, both causes of antepartum haemorrhage as in other studies. This may be due to the fact that Bertha Gxowa hospital, being a level one facility refers patients with these conditions to a level two hospital.

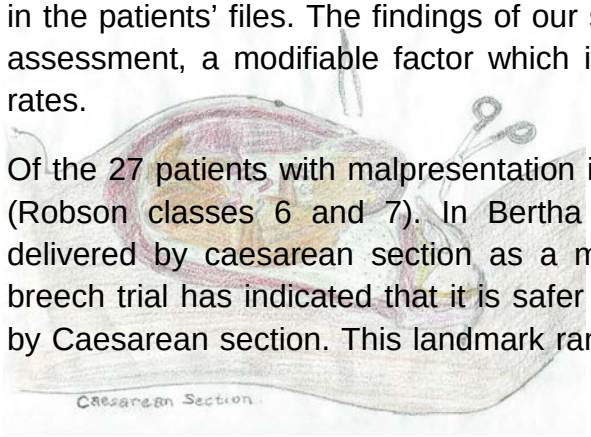


Fetal distress was diagnosed in 92 patients (35.7% of patients) in this study. Almost universally, it is the commonest indication for emergency C-section. Even though there are guidelines on the diagnosis of fetal distress, in practice however what

constitutes fetal distress may differ from one clinician to another based on inter and intra-observer differences in interpretation of fetal heart rate patterns.[62] Ideally suspicion of foetal distress should be confirmed with fetal scalp blood sampling for pH and lactate determination. Owing to the high prevalence of HIV and the absence of fetal blood sampling kits, the procedure was not performed in Bertha Gxowa hospital. The result is that many C-sections were performed for presumed fetal distress based on abnormal CTG tracings when there may have been no distress. The fetal outcomes did not correlate with the clinical diagnosis; out of 92 fetuses diagnosed with fetal distress, there were five babies with birth asphyxia, one still birth and one early neonatal death, there were no records of abnormalities at birth for the rest of babies. Most doctors would prefer to err on the side of caution and deliver by C-section a normal baby suspected of having fetal distress than to lose a baby while trying to be conservative or more objective.

Previous C-section was shown to be a major contributor to the C-section rates; it was the most common maternal indication in this study. Up to 76% repeat C-section rates have been reported in New South wales[24] and 71% in UK. Up to 70% of the repeat C-sections in the UK study were elective.[63] The National Institute for Clinical Excellence and Royal College of Obstetricians and Gynaecologists of England have released guidelines for safe conduct of VBAC. However, concerns about possible uterine rupture have made clinicians to perform more elective repeat C-sections in developed countries and more emergency repeat C-sections in developing countries in preference to VBAC.

In this study, Cephalopelvic disproportion (CPD) was recorded as the indication for C-section in 79 patients (30.6% of patients). It was a subjective assessment made by the attending medical officer based on physical examination findings during labour. Studies in other countries used different terminology such that head to head comparisons could not be made. Such terminologies as arrest of dilatation, arrest of descent and dystocia could have been recorded in the patient records in our study as poor progress or CPD. This highlights the need for medical officers to properly characterize problems in labour in Bertha Gxowa hospital. If an assessment of arrest of descent is made, then it becomes obvious that contractions need to be evaluated next; if weak contractions are enhanced, the patient would deliver vaginally. On the other hand if an assessment of CPD is made, it implies that the woman cannot deliver vaginally with safety. The criteria for diagnosis of CPD were often not stated in the patients' files. The findings of our study suggest a bit of subjectivity in clinical assessment, a modifiable factor which if addressed could lead to lower C-section rates.



Of the 27 patients with malpresentation in this study, 17 were breech presentations (Robson classes 6 and 7). In Bertha Gxowa hospital term breech babies are delivered by caesarean section as a matter of local hospital protocol. The term breech trial has indicated that it is safer to deliver women with breech presentation by Caesarean section. This landmark randomised controlled trial[64] has impacted on

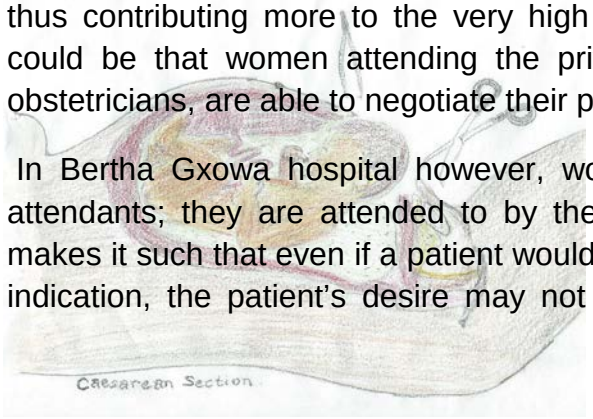
modern obstetric practice; up to 90% C-section rates have been reported for breech presentations.[41] The findings of this study are thus consistent with current evidence based obstetric practice.

The results of this study showed that post maturity contributed to 26 of the C-sections (10.1%). These patients were delivered by emergency C-sections following failed inductions or as elective repeat C-sections. Post maturity is a known risk factor for perinatal mortality. A study in Edinburgh reported 6-8% prevalence of postdates pregnancies,[65] many of whom were delivered by elective induction of labour. However in this study, majority of patients assessed as post mature were not certain of their last menstrual dates; their expected delivery dates were therefore not certain. Assessments made at the time of labour or late in pregnancy were not accurate. This may explain the high proportion of Caesarean deliveries due to post dates pregnancy; the inductions of labour may have failed because the patients were induced too early.

5.5. Non Obstetric Factors

Researchers in other countries attributed a sizeable proportion of Caesarean births to non obstetric factors but in this study, non obstetric factors did not play a major role in the high C-section rates. Health system factors such as financing structure were significant factors in high C-section rates in developed countries.[27] In this study all patients received free obstetric services thus influences from differential financing were eliminated. Perverse financial incentives have also been suggested; Grant noted in his study in the United States, that privately insured mothers had more C-sections than non-insured women,[43] but in this study, it could not have played a role as there was no added incentive for the doctors whether a woman delivered vaginally or by C-section.

This study showed that maternal request for C-section was not a major factor in increasing C-section rates (OR 0.81, P value 0.046). Indeed, of the six patients recorded to request for C-section, three of them had previous C-sections and made a request for sterilization also, which could have been the motivation for the request. The other three also had other obstetric indications. This in sharp contrast to studies in China,[66] Brazil,[54] and USA[23] where maternal request was often the only documented indication for C-section. In the private health sector in South Africa, patient preferences for C-section seem to be much higher than in the public sector, thus contributing more to the very high C-section rates in private hospitals.[31,40] It could be that women attending the private health facilities, having chosen their obstetricians, are able to negotiate their preferences with their obstetricians.



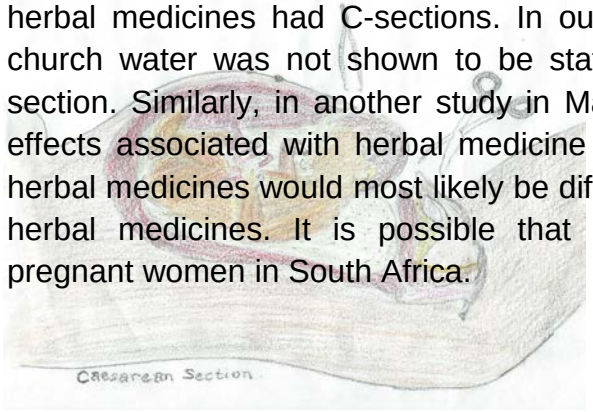
In Bertha Gxowa hospital however, women do not get to choose their medical attendants; they are attended to by the MO on duty. Also, the heavy work load makes it such that even if a patient would desire a C-section, if there was no medical indication, the patient's desire may not be documented and would be denied. In

some other public health facilities in South Africa, there have been reports of very impolite and unprofessional treatment of patients who requested for C-sections.[67] It appears therefore that ongoing reforms of health care in the public sector may lead to further increases in C-section rates if patients' preferences are taken into account in shared decision making regarding mode of delivery. The current unwritten local hospital policy of not acceding to a woman's request for C-section in the absence of obstetric indications may well be put in writing.

In this study partogram was used in 36.5% of the patients who had emergency C-sections. Guidelines for management of labour recommend use of partogram to record and monitor the progress of labour.[68] Studies have shown that with the use of partogram to monitor progress of labour, C-section rates can be reduced.[69] It can therefore be argued that if partogram use is improved in Bertha Gxowa hospital, C-section rates may decrease. Failure to use the partogram in Bertha Gxowa hospital was attributed to staff shortage and work overload at a maternal mortality review meeting which the researcher attended in 2012.

The results of this study did not show any significant association between HIV status and C-section (OR 1.079, p value, 0.315). This is contrary to speculations from Matshidze and other researchers that it could be a significant factor.[31] Local obstetric protocols differ from hospital to hospital regarding management of HIV infected pregnant women. In private health facilities, because of the protective effect of C-section on mother to child transmission of HIV,[70] most HIV infected pregnant women are delivered by elective C-section. In some public health facilities, an HIV infected woman is offered an elective C-section if there is any other obstetric factor e.g. previous C-section. In Bertha Gxowa hospital, women were not offered elective C-sections based on their HIV status. This practice is in accordance with national guidelines.[71] This may explain why HIV status did not show any statistically significant association with C-section.

Some patients adopt help seeking behaviours from the traditional sector such as ingestion of herbal medicines or church water. These are believed to have protective effects on the unborn baby and to help speed up the process of labour. Some women who adopt these practices present in labour with hypertonic uterine contractions. These strong contractions sometimes cause fetal heart abnormalities according to an earlier study in South Africa.[72] In that study, up to 55% of the pregnant women ingested herbal medicines and up to 38% of those who ingested herbal medicines had C-sections. In our study, ingestion of herbal medication or church water was not shown to be statistically significant as association with C-section. Similarly, in another study in Malaysia, the researchers found no adverse effects associated with herbal medicine ingestion.[73] The content of the Malaysian herbal medicines would most likely be different from the content of the South African herbal medicines. It is possible that behaviour patterns are changing among pregnant women in South Africa.



The variable Medical Officer showed a statistically significant association with C-section in the bivariate analyses (Pearson's Chi square test P value, 0.001). This correlates with our finding that a bit of subjectivity exists in assessment of patients and decision making and may explain why there were more emergency C-sections than in other studies. Interestingly, the experience of medical officers and possession or non possession of obstetric post graduate training did show statistically significant association with C-section. Seeking of a second opinion before deciding to perform a C-section, a practice known to reduce C-section rates[74] was not practiced often in Bertha Gxowa Hospital. This may explain why it was not found to be statistically significant. In 2011, there was no consultant Obstetrician in Bertha Gxowa hospital to reach for a second opinion in the hospital.

5.6. Strengths

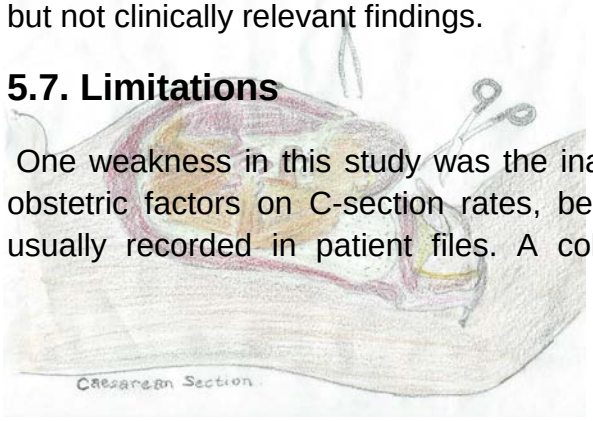
One of the strengths of this study is that the variables are described in relation to the context of the Caesarean section. Context is important in Family Medicine and the researcher attempted to provide deeper insight into the association between various variables and C-section by describing two outcomes, elective C-section and emergency C-section. The random sampling method employed reduced the possibility of sampling bias and also enabled statistical deductions to be made on data analysis.

Our data sources were reliable; they were hospital patient records not population surveys. This further eliminated errors due to participants' recall and errors due to coding of deliveries as elective or emergency C-sections, a concern encountered by several investigators who used data from population surveys. This concern was the focus of a study by Roberts and Bell.[75] They found up to 84% agreement between data in population surveys and hospital records with respect to coding of elective and emergency Caesarean deliveries. Any possible errors in our data codes would have been identified and rectified because we used the Robson classification for patients. For example a nulliparous patient who went into spontaneous labour and had an emergency section at term for fetal distress (Robson class 1) could not have been coded as having an elective C-section in our data.

The use of the Robson classification in this study enabled us to make comparisons with other studies, draw conclusions and make practical recommendations targeted at specific obstetric patient groups, rather than a set of vague statistically significant but not clinically relevant findings.

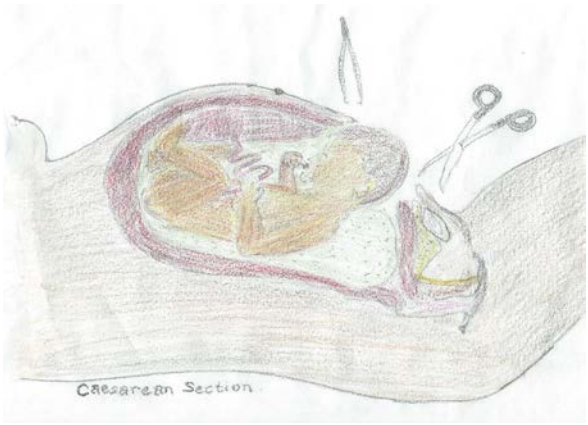
5.7. Limitations

One weakness in this study was the inability to fully investigate the effects of non obstetric factors on C-section rates, because the necessary information was not usually recorded in patient files. A cohort study that incorporates a qualitative



component could achieve that. The time constraints of a Masters Degree dissertation did not permit such a research design.

The main limitation of this study was the incomplete recording of all subjective issues in the patients' files. If for instance a doctor decided to terminate a VBAC trial by performing a C-section on a patient with a previous C-section due to uncertainty about the integrity of the patient's uterine scar, such uncertainty would not be recorded as the reason for the C-section. A demographic variable of interest was patients' education. This could not be tested for association with C-section in this study as the patients' records did not contain this information in most of the patients.



CHAPTER 6

RECOMMENDATIONS AND CONCLUSIONS

6.1 Recommendations

1. Antenatal surveillance should be improved. A dedicated medical officer should be deployed to see antenatal patients in Bertha Gxowa hospital especially nulliparous women and other high risk pregnancies. A delivery plan should be discussed with the patient and recorded. This will allow problems to be identified early and corrected where possible or for elective C-sections to be scheduled instead of emergency procedures which have been shown in this study to have more complication rates.

For all patients, especially those with uncertain last menstrual dates, early ultrasound scans should be done for dating so as to avoid unnecessary interventions for presumed post dates pregnancy.

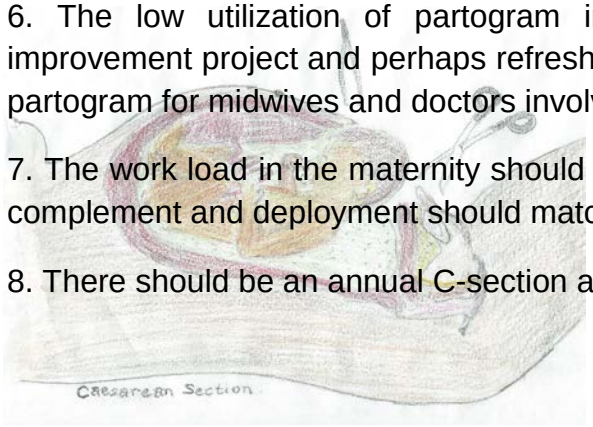
2. There should be a second opinion by a senior doctor regarding scheduled emergency C-sections. This will reduce the number of emergency C-sections especially among Robson class 1 women. A low intervention approach should be adopted in labour especially for low risk pregnancies. Thus low risk women with less degrees of urgency should benefit from procedures that increase the likelihood of vaginal delivery.

3. Guidelines for the safe conduct of VBAC should be reviewed and followed to reduce the number of Robson class 5 women that deliver by C-section.

4. Clinical support should be offered to Medical officers who perform C-sections in the form of opportunity to attend refresher courses in emergency obstetric care. This will capacitate them on management of bleeding during C-sections leading to a reduction in the complication rate.

5. Guidelines on diagnosis and management of fetal distress should be reviewed and followed; CTG abnormalities should be interpreted in relation to uterine contractions, stage of labour and presence or absence of other obstetric parameters. Where there is uncertainty, a second opinion should be sought. This will reduce the number of C-sections performed for fetal distress.

6. The low utilization of partogram in our study sample calls for a quality improvement project and perhaps refresher courses on charting and interpretation of partogram for midwives and doctors involved in rendering obstetric care.



7. The work load in the maternity should be managed to optimize performance; staff complement and deployment should match the patient load.

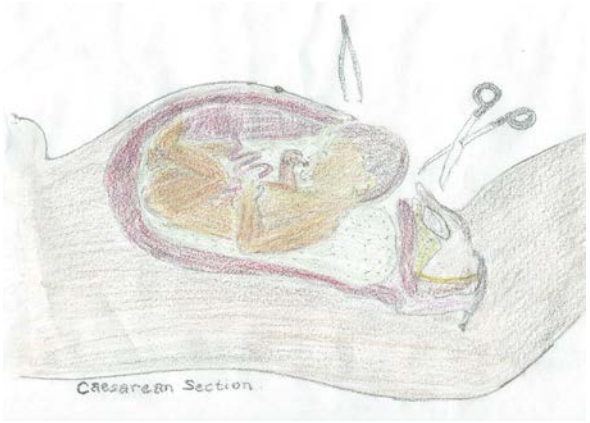
8. There should be an annual C-section audit.

6.2 Conclusions

This study shows that Caesarean section rates are high in Bertha Gxowa hospital. Obstetric factors contributed more to the high C-section rates than non obstetric factors. Of the obstetric factors, fetal distress, previous C-section, CPD, poor progress, malpresentation and post maturity were the major contributors to the high C-section rates. Institution of proper protocols could lead to a reduction in the C-section rates. The complication rates associated with the C-sections are such that efforts should be made to reduce the rates.

Eighty six percent of the C-sections were emergencies, of which 70.4% were primary C-sections. Sixty five percent of the C-sections were primary C-sections. Consequently efforts at reducing C-section rates should aim at reducing emergency C-sections, and primary C-section rates. These efforts should target women in Robson classes one and five as they were the greater majority having Caesarean deliveries.

Non obstetric factors such as HIV status and maternal request did not play a major role in the high C-section rates. However in view of the finding that the variable Medical Officers was significantly associated with C-sections, and the finding that partogram use was poor, reflecting inadequate monitoring during labour, it is reasonable to conclude that some of the intrapartum C-sections could have been avoided if there had been better monitoring. It becomes imperative to involve all Midwives and Medical Officers who render obstetric services in remedial efforts. The high Caesarean section rates could be reduced and maternal health improved if protocols and guidelines for management of labour and obstetric problems are implemented.



ANNEXURE 1.

PATIENT DATA COLLECTION SHEET:

SERIAL NUMBER: CODE NUMBER: DATE:

PART A: DEMOGRAPHIC DATA.

1. Age in years.....
2. Parity: 0, 1, 2, 3, 4, 5, >5. (Circle one)
3. Race: ( ) White, ( ) African ( ) Coloured, ( ) Asian.
4. Marital status: ( ) Single, ( ) Married ( ) Divorced ( ) Separated ( ) Widowed
5. Education: ( ) None, ( ) Primary, ( ) Secondary, ( ) Tertiary.
6. Employment status: ( ) Unemployed, ( ) Employed. ( ) Unknown
7. Travel time from home to health facility. ( ) < 1 hour ( ) > 1 hour

PART B: CAESAREAN SECTION CONTEXT

8. Date and time: Date of Decision .....Time of Decision.....
   Date of Operation..... Time of Operation.....

   ( ) Weekend/ Public Holiday (After hours) ( ) Weekday (Working hours)

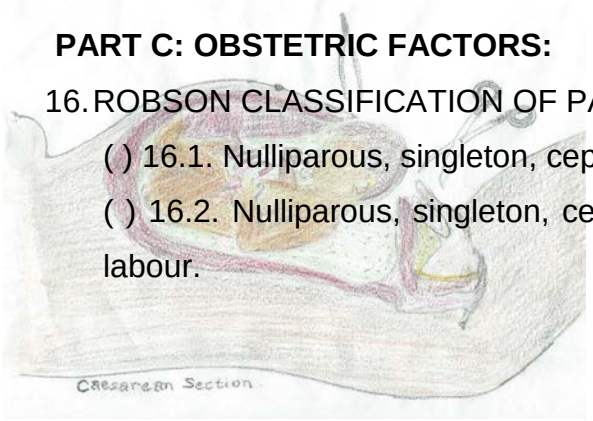
9. Type of operation: ( ) Elective, ( ) Emergency
10. ( ) First Caesarean Section ( ) Repeat Caesarean Section
11. Number of Previous Caesarean Sections.....
12. Immediate maternal outcome: ( ) No Complication. ( ) Complication
13. Type of Maternal Complication.....
14. Immediate foetal outcome ( ) No complication ( ) Complication
15. Type of Foetal Complication.....

PART C: OBSTETRIC FACTORS:

16. ROBSON CLASSIFICATION OF PATIENTS: (TICK ONLY ONE)

    ( ) 16.1. Nulliparous, singleton, cephalic, >/ 37 weeks in spontaneous labour.

    ( ) 16.2. Nulliparous, singleton, cephalic >/ 37 weeks, induced or C/S before labour.



( ) 16.3. Multiparous, singleton, cephalic >/ 37 weeks, in spontaneous labour (excluding previous C/S)

( ) 16.4. Multiparous, singleton, cephalic >/ 37 weeks, induced or C/S before labour (excluding previous C/S)

( ) 16.5. Previous C/S, singleton, cephalic, >/ 37 weeks.

( ) 16.6. All nulliparous breeches

( ) 16.7. All multiparous breeches including previous C/S

( ) 16.8. All multiple pregnancies including previous C/S

( ) 16.9. All abnormal lie including previous C/S

( ) 16.10. All singleton cephalic </ 37 weeks including previous C/S.

17. RECORDED NUMBER OF INDICATIONS FOR CAESAREAN SECTION.....

Foetal factors.

18 ( ) Foetal distress. 19 ( ) Big Baby 20 ( ) Malpresentation. 21 ( ) Post Maturity. 22. ( ) Intra Uterine Growth Retardation. 23 ( ) Multiple Pregnancy. 24 ( ) Cord Prolapse

Maternal Factors.

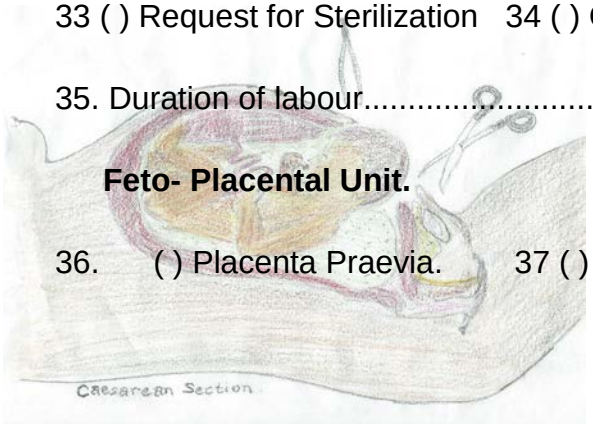
25 ( ) Previous Caesarean 26 ( ) Poor Progress 27 ( ) CPD

28 ( ) Hypertensive disorders 29 ( ) Bad Obstetric History

30 ( ) Failed Induction 31 ( ) Inadequate Pelvis 32 ( ) Genital lesions

33 ( ) Request for Sterilization 34 ( ) Others

35. Duration of labour.....



Feto- Placental Unit.

36. ( ) Placenta Praevia. 37 ( ) Abruptio Placenta. 38. ( ) PROM

39 ( ) Oligohydramnios.

PART D: NON-OBSTETRIC FACTORS:

40. Patient Demanded for Caesarean: ( ) Yes ( ) No

41. Medical Condition associated. ( ) Yes ( ) No

42. Type of Condition .....

43. Herbal remedy: ( ) Yes, ( ) No.

44. Drank Church Water: ( ) Yes, ( ) No

45. HIV status: ( ) +ve, ( ) -Ve, ( ) Unknown

46. Received ANC: ( ) Yes, ( ) No.

47. Partogram was used during labour ( ) Yes, ( ) No. ( ) N/A

48. Cardiotocograph (CTG) was used. ( ) Yes ( ) No

49. Health Care worker: Surgeon (Code Number).....

50. Experience.....Years.

51. Obstetric Postgraduate training. ( ) Yes ( ) No

Subjective Issues:

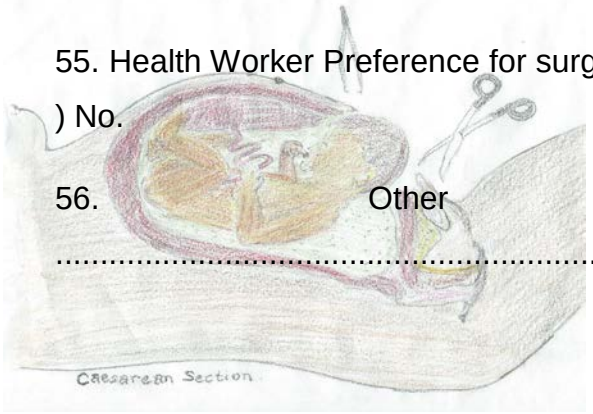
52. Second opinion on decision for C/S sought ( ) Yes ( ) No.

53. Diagnostic problems: ( ) Yes ( ) No.

54. Specify type of diagnostic problem.....

55. Health Worker Preference for surgical intervention stated in records ( ) Yes ( ) No.

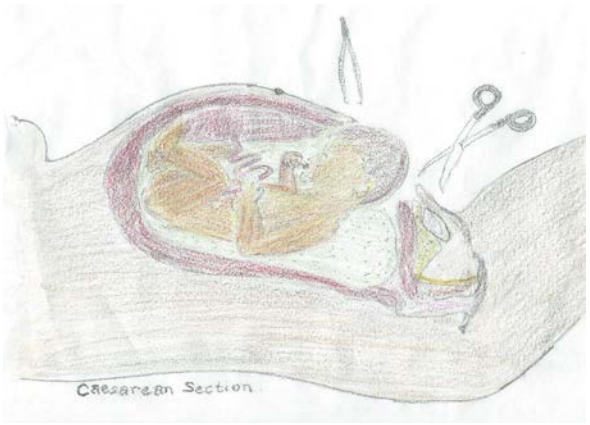
56. Other factors (specify): .....



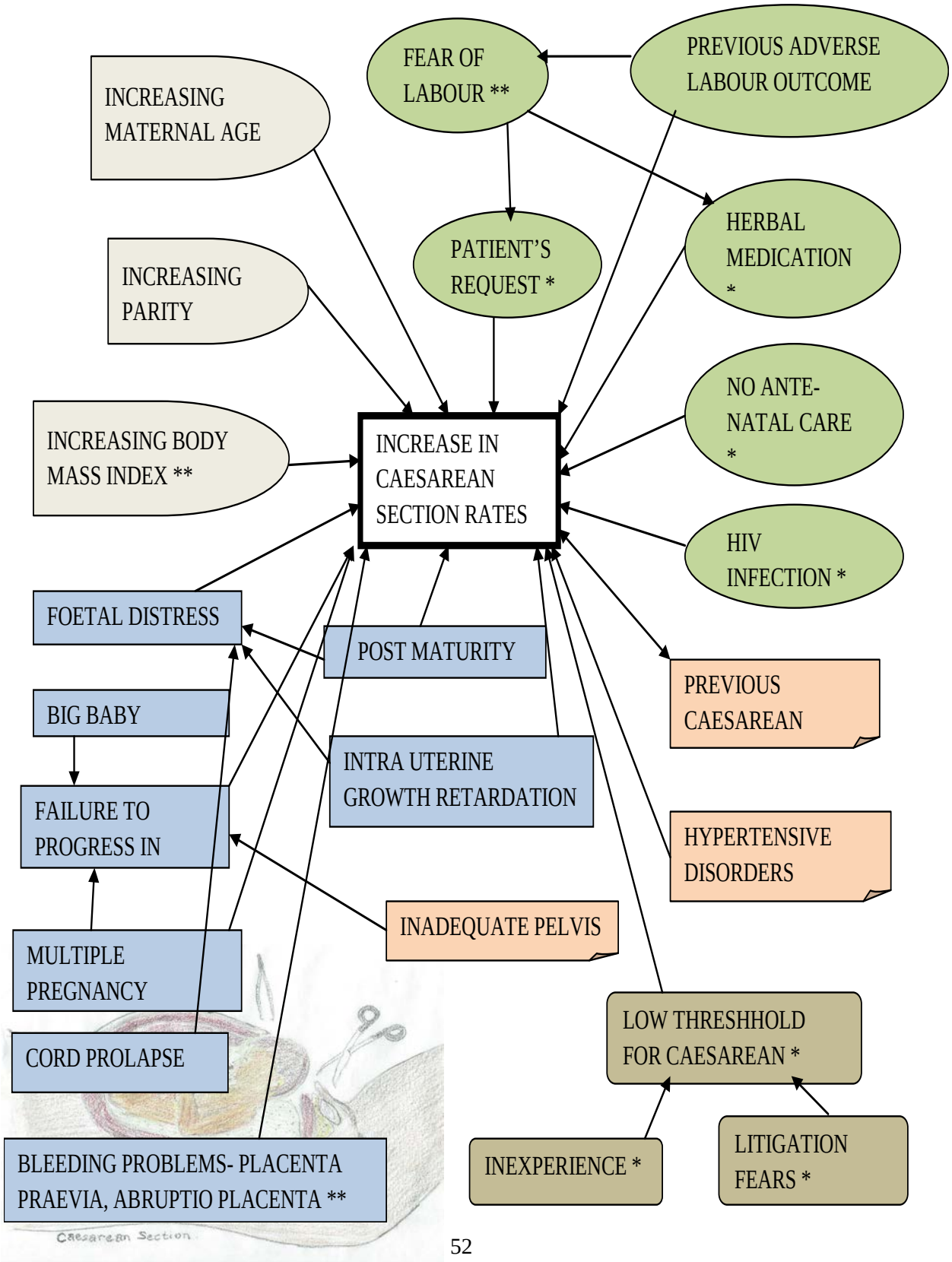
ANNEXURE II

INSTITUTION DATA COLLECTION TABLE

	Jan 2011	Feb. 2011	Mar 2011	Apr 2011	May 2011	Jun 2011	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011
Caesarean sections												
Total number of deliveries												
Caesarean section rate												



ANNEXURE III. Conceptual Framework: Factors That Affect Caesarean Section Rates. The following diagram gives a bird's eye view of the interplay of the main factors that affect Caesarean section rates as identified in literature. ** Not tested in this study. * Found not to be significant in this study.



ANNEXURE IV: ETHICS CLEARANCE CERTIFICATE

R14/49 Dr Ukeme Inyang-Otu

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M130247

NAME: (Principal Investigator)	Dr Ukeme Inyang-Otu
DEPARTMENT:	Division of Family Medicine Medical school
PROJECT TITLE:	Factors Associated with High Caesarean Section Rates in Bertha Gxowa Hospital
DATE CONSIDERED:	22/02/2013
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr S Agbo
APPROVED BY:	Professor PE Cleaton-Jones, Chairperson, HREC (Medical)

DATE OF APPROVAL: 24/04/2013

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/We undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.**

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Caesarean Section

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

EKURHULENI HEALTH DISTRICT
BERTHA GXOWA HOSPITAL
OFFICE OF THE CHIEF EXECUTIVE OFFICER
Enquiries: Mrs. M. C. Mndaweni
Tel no: +27 11 345 – 1267/9
Fax no: +27 011 825 – 5425
E-mail: Christina.Mndaweni@gauteng.gov.za
24 July 2012

Dr. Ukeme Inyang-Otu – Register in Family Medicine
Family Medicine Department
Ekurhuleni Health District

Cell No: 0798748622
E-mail: ukemeinyangotu@gmail.com

Dear Doctor

REQUEST TO UNDERTAKE AND RESEARCH PROJECT

Thank you for choosing Bertha Gxowa Hospital.

The topic of your research, study is very interesting and could resolve a long standing Auditor Generals query, as this hospital has not been able to meet the required Caesarean Section rate of 12.5%.

The rate has now been increased to 15% however the hospital performance is still higher than the norm.

Permission is therefore granted for you to undertake the study.

Please forward your research / ethics approval from University of Witwatersrand

Kind regards,

Mrs. M.C. Mndaweni
Chief Executive Officer

Received by:

Date: 27/07/2012

Private Bag x 1035, Germiston 1400 – C/O Angus and Joubert Street – Germiston 1400

health and social development
Department: Health and Social Development
GAUTENG PROVINCE

Department of Health
Directorate: Information Management
Ekurhuleni HIS
Enquiries: Ms. M.O. Semenya & Dr. Kellerman
Tel: 011 878 8500/7, Fax: 0866581363, Cell: 071 673 2632 &
011 876 1762, 0722592288

Data Request Registration form

Details of person requesting data	
Names:	UKEME SUNDAY (DR)
Surname:	INYANG-OTU
Faculty:	HEALTH SCIENCES (FAMILY MEDICINE)
Institution:	UNIVERSITY OF THE WITWATERSRAND
Contact No. (work)	0115738585 (cell) 0798748622
Email address:	ukemeinyangotu@gmail.com.

Data request	
1.	Purpose of request: Research project "Factors associated with high Caesarian section rates in Germiston Hospital"
2.	Specify data required (actual indicators, data elements): Caesarian Nr + Rate, Total Nr of Caesarians, Total Nr of Live births,
3.	Period of data requested: JANUARY 2011 – DECEMBER 2011
4.	Benefits of research/analysis to (GDoH)- Ekurhuleni Health District: FINDINGS WILL CONTRIBUTE TO IMPROVEMENT IN LOCAL POLICY AND PRACTICE IN GERMISTON HOSPITAL MATERNITY
5.	How will the results be availed to (GDoH)- Ekurhuleni Health District: I WILL HAND IN COMPLETED RESEARCH PAPER
6.	When will the results be availed to (GDoH)- Ekurhuleni Health District: AT COMPLETION OF MY RESEARCH = JUNE 2013.

Obligation

I, Dr. Ukeme Inyangotu studying/working at University of Witwatersrand; in terms of **Access to Information Act**, undertake to avail the findings to the Gauteng Department of Health and understand that the Department will use the information to effect improvement in service delivery.

Signature of persons requesting data
Date: 25/01/2012

NB: The form should be signed and send/ faxed to Ms. M.O. Semenya at 0866581363. No data will be availed before receipt of this copy.

Authorization

Request Approved/Not Approved

Ms. M.O. Semenya
Date 25/01/2012

Dr. R. Kellerman
Date 25/01/2012.

Caesarean Section

ANNEXURE VII

INFORMED CONSENT FOR RESEARCH PROJECT

Dear colleague,

Good day. I will be conducting a research on “Factors Associated with High Caesarean Section Rates in Bertha Gxowa Hospital”. The research is part of my training for M.Med in Family Medicine. I have obtained permission from the hospital management to undertake the study.

As part of the study, maternity records of some patients who had Caesarean delivery will be reviewed retrospectively and data collected. Data analysis will identify patterns and associations between different factors and Caesarean Section. One of the hypotheses to be tested is that experience of the health care worker has a relationship to Caesarean Section rates. Names of health care workers will not be disclosed in the analysis or research report; confidentiality will be maintained.

Since a bit of personal information is involved (years of experience and qualifications), it is ethical for me to seek your consent before making use of such information for analysis, even though it will be done anonymously. I believe the research will benefit the hospital and also contribute to the growth in knowledge concerning determinants of Caesarean Section at a local level.

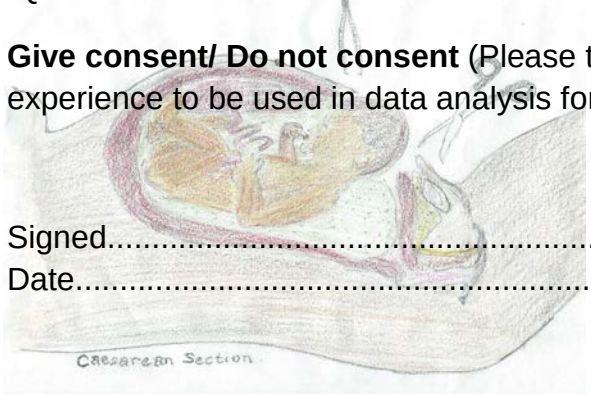
Kindly indicate below if you give consent for your information to be used for data analysis or not. You are at liberty to consent or decline. For further information on the subject, you may contact the Co-ordinator of Family Medicine Registrars Training in Ekurhuleni, Dr. M. Eyassu on 0824202039, or the Department of Family Medicine, University of the Witwatersrand, on 011 7172095. Thank you.

Dr. U S Inyang-Otu.

I .....,

Qualifications....., Years of Experience.....

Give consent/ Do not consent (Please tick one) for my qualification and years of experience to be used in data analysis for the above research.



Signed.....
Date.....

REFERENCES:

[1] Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CY, editors. Williams obstetrics 23rd ed. New York (NY): McGraw Hill; 2010.

[2] Katz DL. Clinical epidemiology and evidence-based medicine. London: Sage Publications; 2001.

[3] Merriam Webster Online Dictionary. Merriam Webster Inc. Available at: www.merriam-webster.com/dictionary/context. Accessed Oct 20, 2012.

[4] Van Dongen PWJ. Caesarean section etymology and early history. SAJOG 2009;15(2):1162-65.

[5] Erumeda NJ. A self assessment study of procedural skills in medical officers at district hospitals in region b Gauteng province South Africa. (dissertation) Johannesburg: Wits Univ.; 2011.

[6] Coovadia H, Jewkes R, Barron P, Sanders D, McIntyre D. The health and health system of South Africa: historical roots of current public health challenges. Lancet 2009; 375(9692):817-34.

[7] Stanton C, Darburg D, De Brouwere V, Pujades M, Rosman . Reliability of data on Caesarin section in developing countries. Bull World Health Organ 2005;83:449-455.

[8] Naidoo N, Moodley J. Rising rates of Caesarean section: an audit of Caesarean sections in a specialist private practice. SA Fam Pract 2009; 51(3): 254-8.

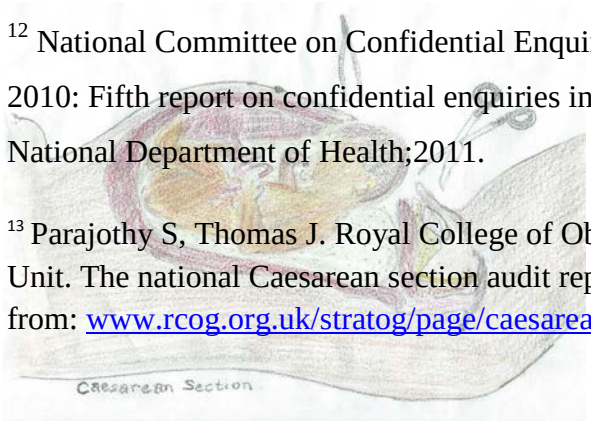
[9] Pattinson RC, Suliman C. Audit of ceasarean sections. In: Moodley J, editor. Saving mothers: caesarean section monograph 2013. Pretoria: National Department of Health;2013.89-91.

[10] World Health Organization. Appropriate technology for birth. Lancet 1985;2:436-7.

[11] Villar J, Valladares E, Wojdyla D, Zavaleta N, Carroli G, Valasco A et al. Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America. Lancet 2006 Jan 3;367(9525):1819-29.

[12] National Committee on Confidential Enquiry into Maternal Deaths. Saving mothers 2008-2010: Fifth report on confidential enquiries into maternal deaths in South Africa. Pretoria: National Department of Health;2011.

[13] Parajothy S, Thomas J. Royal College of Obstetricians and Gynaecologists Clinical Support Unit. The national Caesarean section audit report. London: RCOG Press; 2001. Available from: www.rcog.org.uk/stratog/page/caesarean_section_2. Accessed 15th August 2010.



[14] Guidelines and Audit Committee of the RCOG. Green-top guideline no 45: Birth after previous Caesarean birth. London: RCOG Press; 2010. Available from: www.rcog.org.uk/files/rcog/GTG4511022011.pdf .Accessed December 2, 2013.

[15] WHO. Accelerating progress towards the health-related millennium development goals. WHO; 2010. Available from: http://www.int/topics/millinnium_development_goals/MDG-NHPS_brochure_2010.pdf. Accessed December 8, 2013.

[16] Day C, Barron P, Massyn N, Padarath A, English R, editors. District Health Barometer 2010/2011. Durban: Health Systems Trust; January 2012.

[17] Ronsman C, Holtz S, Stanton C. Socioeconomic differentials in Caesarean section rates in developing countries: a retrospective analysis. Lancet 2006 Oct 28;368(9546):1516-23.

[18] Buekens P, Curtis S, Alayon S. Demographic and health surveys: Caesarean section rates in sub-Saharan Africa. BMJ. 2003 Jan 18;326(7381):136.

[19] Dumont A, de Bernis L, Bouvier-Colle MH, Breart G, MOMA study group. Caesarean section rate for maternal indications in Sub-Saharan Africa: a systematic review. Lancet 2001 Oct 20; 358(9290):1328-33.

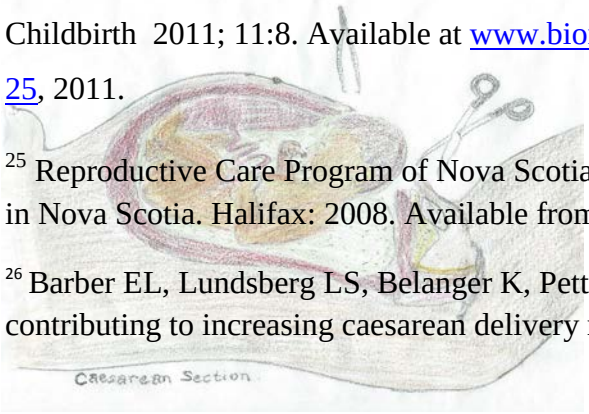
[20] Borkan A. Rejecting vulnerability: Somali women's resistance to cesarean section in Columbus Ohio. Honours thesis in cultural anthropology. 2010. Available from http:// deepblue.lib.umich.edu/bitstream/2027.42/77628/1/aborkan.pdf. Accessed July 24 2011.

[21] Fesseha N, Getachew A, Hilus M, gegrehiwot Y, Bailey P. A national review of caesarean delivery in Ethiopia. Int J Gynecol Obstet. 2011 Oct;115(1):106-11.

[22] Menacker F, Hamilton BE. Recent trends in Cesarean delivery in United States. NCHS Data Brief, No 35. Hyattsville, MD: National Centre for Health Statistics. 2010.

[23] Evidence-based Practice Center Systematic Review Protocol. Strategies to reduce Cesarean. 2010 May 6. Available from: www.effectivehealthcare.ahrq.gov. Accessed 27th July 2011.

[24] Stavrou E.P, Shand A.W, Morris J.M, Roberts C.L. Epidemiology and trends for Caesarean section births in New South Wales Australia: a population based study. BMC Pregnancy and Childbirth 2011; 11:8. Available at www.biomedcentral.com/1471-2393/11/8. Accessed July 25, 2011.



[25] Reproductive Care Program of Nova Scotia. Best practices in the use of Cesarean sections in Nova Scotia. Halifax: 2008. Available from http://rcp.nshealth.ca

[26] Barber EL, Lundsberg LS, Belanger K, Pettker CM, Funai EF, Illuzzi JL. Indications contributing to increasing caesarean delivery rate. Obstet Gynecol. 2011;118:29-38.

[27] Lauer JA, Betran AP, Merialdi M, Wojdyla D. Determinants of Caesarean section rates in developed countries; supply, demand and opportunities for control. World Health Report 2010. Background paper 29. WHO.

[28] Main EK, Morton CH, Hopkins D, Giuliani G, Meslop K, Gould JB. Cesarean deliveries, outcomes and opportunities for change in california: toward a public agenda for maternity care sefety and quality. Palo Alto, CA. CMQCC:2011. Available from www.cmqcc.org/resources/2079/download. Accessed Dec 6, 2013.

[29] MacDorman MF, Menacker F, Declerq E. Cesarean birth in United States: epidemiology, trends and outcomes. Clin Perinatol 2008;35: 293-307

[30] Galtier-Dereure F, Boegner C, Bringer J. Obesity and pregnancy, complications and cost. Am J Clin Nutr. 2000 May; 71(5 Suppl):1242S-8S.

[31] Matshidze KP, Richter LM, Ellison GT, Levin JB, McIntyre JA. The effect of population group classification as a specific instance of racial categorization on Caesarean-section rates in South Africa. PMC. 2007 May 25. Available from: www.ncbi.nlm.nih.gov/pmc/articles/pmc1876943/. Accessed 15th August 2010.

[32] Shah A, Fawole B, M'Imunya JM, Amokrane F, Nafiou I, Wolombi J et al. Caesarean delivery outcomes from WHO global survey on maternal and perinatal health in Africa. Int J. Gynecol Obstet. 2009 Dec;107(3):191-7

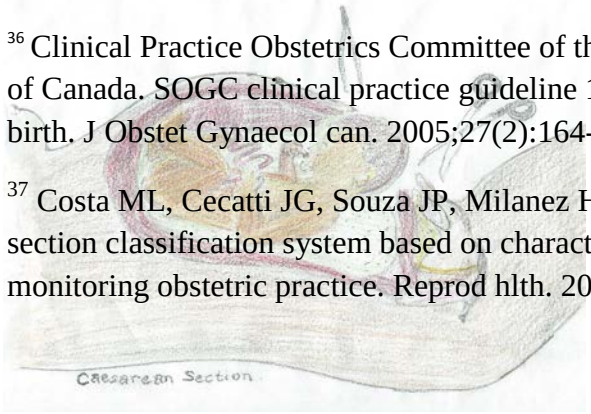
[33] RCOG,RCM,RCA,RCPH. Safer childbirth. Minimun standards for the organization and delivery of care in labour. London. RCOG Press; 2007. Available from: http://rcog.org.uk/resources/public/pdf/safer_childbirth_report_web.pdf. Accessed July 26 2011

[34] National Collaborating Centre for Women's and Children's Health. Clinical guideline 13 Caesarian section. London: NICE.; 2004. Available from http://www.nice.org.uk/nicemedia/pdf/CG013 fullguideline.pdf. Accessed June 15 2011.

[35] National Institutes of Health Consensus Development Conference Statement: Vaginal birth after cesarean: new insights. March 8-10, 2010. Obstet Gynecol 2010; 115 (6):1279-1295.

[36] Clinical Practice Obstetrics Committee of the Society of Obstetricians and Gynaecologists of Canada. SOGC clinical practice guideline 155: guidelines for vaginal birth after Caesarean birth. J Obstet Gynaecol can. 2005;27(2):164-174.

[37] Costa ML, Cecatti JG, Souza JP, Milanez HM, Gulmezoglu MA. Using a Caesarean section classification system based on characteristics of the population as a way of monitoring obstetric practice. Reprod hlth. 2010;7:13.



[38] Committee on Obstetric Practice. Cesarean delivery on maternal request. ACOG Committee Opinion. ACOG April 2013;559.

[39] Macrae F. Too posh to push:Caesareans more commom among the middle class. The daily Mail. 2011 May 18. Available at: www.dailymail.co.uk/health/article-1388203/Too-posh-to-push-caesareans-more-common-middle-class.html. Accessed June 10, 2011.

[40] Lawrie TA, de Jager M, Hofmeyer GJ. High Caesarean section rates for pregnant medical practitioners in South Africa. Int J Gynecol Obstet. 2001 Jan;72(1):71-3.

[41] Murthy K, Grobman WA, Lee TA, Holl JL. Association between rising professional liability insurance premiums and primary Cesarean delivery rates. Obstet Gynecol. 2007;110:1264-9.

[42] Singer B. Elective Cesarean sections gaining acceptance. CMAJ. 2004;170:775

[43] Grant D. Explaining source of payment differences in U.S. Cesarean rates: why do privately insured mothers receive more Cesareans than mothers who are not privately insured? Hlth Care Manag Sci. 2005;8(1):5-17.

[44] Mawson AR. Reducing Cesarean delivery rates in managed care organizations. Am J Manag Care 2002; 8(8):730-40.

[45] Rothberg AD, McLeod H. Private-sector caesarean sections in perspective. SAMJ. April 2005; 95(4):257-9.

[46] Roohan PJ, Josberger RE, Gesten FC. Risk adjusted primary Caesarean delivery rates for managed care plans in New York State, 1998. Mat and child Hlth J. Sept 2001;5(3):169-177.

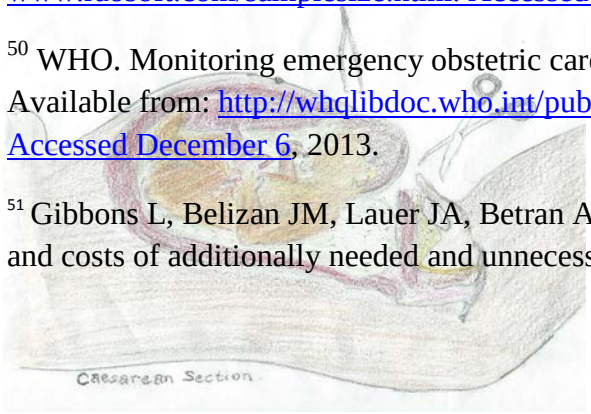
[47] Matsotso MP, Fryatt R. National health insurance the first eighteen months In: Pradarath A, English R, editors. South African Health Review 2012/2013. Durban. Health Systems Trust; 2013.

[48] Lepercq J, Le Meaux JP, Agman A, Timsit J. Factors associated with caesarean section in nulliparous women with type 1 diabetes mellitus. Obstet Gynecol. 2010;115:1014-20.

[49] Raosoft Version 206-525-4025(US) 1996-2011. Raosoft Inc. Available from: www.raosoft.com/samplesize.html. Accessed 8th Feb 2012.

[50] WHO. Monitoring emergency obstetric care: a handbook. Geneva: WHO Press; 2009. Available from: http://whqlibdoc.who.int/publications/2009/9789241547734-eng.pdf. Accessed December 6, 2013.

[51] Gibbons L, Belizan JM, Lauer JA, Betran AP, Merialdi M, Althabe F. The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year:



overuse as a barrier to universal coverage. Geneva: WHO;2010.World health report (2010). Background paper 30.

[52] Liston WA. Rising cesarean section rates: can evolution and ecology explain some difficulties of modern childbirth? J R Soc Med. 2003; 93:559-61.

[53] Smith GCS, Cordeaux Y, White IR, Pasupathy D, Missfelda-Lobos H, Pell JP et al. The effect of delaying childbirth on primary Cesarean section rates. PloSMed. 2008;5(7):e144. Available from http://www.plosmedicine.org/article/info%3.Adoi%2F10.1371%2Fjournal.pmed.0050144. Accessed August 15, 2013.

[54] Ribeiro VS, Figuereido FP, Silva AAM, Bettiol H, Batista RFL, Coimbra LC, et al. Why are rates of cesarean section in Brazil higher in more developed cities than in less developed ones? BJMBR. 2007;40:1211-20.

[55] Hiasat MS. The impact of maternal age and parity on the caesarean section rate. JRMS 2005;12(1): 30-34.

[56] Morrison J, Mackenzie IZ. Caesarean section on demand. Semin Perinatol. 2003; 27:20-33.

[57] Council on Safety and Quality in Health Care. Supporting excellence in maternity care: the core maternity indicators project. Turner, ACT: Women's Hospitals Australasia; 2007.

[58] Clark SL, Belfort MA, Hankins GD et al. Variations in the rates of operative delivery in the United States. Am J Obstet Gynecol. 2007; 196: 526e1-5.

[59] Villar R, Zavaleta N, Donner A, Wojdyla D, Faundes A, Velazco F et al. Maternal and neonatal individual risks and benefits associated with cesarean delivery: multicentre prospective study. BMJ. 2007; 335:1025.

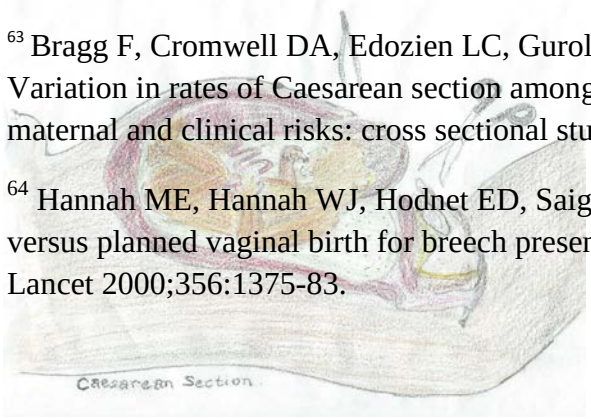
[60] Couper I, Elgoni AG, Engelbrecht E, Kgabo E, Morris E, Anozie E et al. A district hospital service package for South Africa: a set of norms and standards. Pretoria: National Department of Health; May 2002.18-20.

[61] Robson M. Classification of caesarean sections. Fetal Matern Med Rev. 2001;12:23-39.

[62] Beaulieu MD, Fabia J, Leduc B, Brisson J, Bastide A, Blouin D et al. The reproducibility of intrapartum cardiotocograph assessments. Can Med Assoc J. 1982;127:214-6.

[63] Bragg F, Cromwell DA, Edozien LC, Gurol-Urganci I, Mahmood TA, Templeton A, et al. Variation in rates of Caesarean section among English NHS trusts after accounting for maternal and clinical risks: cross sectional study. BMJ. 2010;341:c5065

[64] Hannah ME, Hannah WJ, Hodnet ED, Saigal S, Willan AR. Planned Caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Lancet 2000;356:1375-83.



[65] Denison FC, Price J, Graham C, Liston WA. Maternal obesity, length of gestation, risk of postdates pregnancy and spontaneous onset of labour at term. BJOG. 2008 May;115(6):720-5.

[66] Feng XL, Xu L, Guo Y, Ronsmans C. Factors influencing Caesarean section rate in China between 1988 and 2008. Bull World Health Organ. 2012;90:30-39A

[67] Human Rights Watch: "Stop making excuses" accountability for maternal health care in South Africa. Human Rights Watch. New York (NY); 2011:21-37.

[68] Department of Health. Guidelines for maternity care in South Africa a manual for clinics, community health centres and district hospitals. 3rd edition. National Department of Health. Pretoria. 2007.

[69] World Health Organization. Partograph management in labour. Lancet 1994;343(8910): 1399-1404.

[70] Reed JS, Newell MK. Efficacy and safety of cesarean delivery for prevention of mother-to-child-transmission of HIV 1. Cochrane Database Syst Rev. 2005 Oct 19;(4):CD005479

[71] South African National AIDS Council. Clinical guidelines: PMTCT (prevention of mother-to-child-transmission). Pretoria: National Depatrment of Health; 2010:27.

[72] Mabina MH, Pitsoe SB, Moodley J. Effects of traditional herbal medicines on pregnancy outcomes:the King Edward VIII hospital experience. S Afr Med J. 1997 Aug;87(8):1008-10

[73] Rahman AA, Sulaiman Z, wan Daud NW, Hamid AM. Prevalence and pattern of use of herbal medicines during pregnancy in Tumpat district Kelantan. Malays J Med Sci. 2008 July;15(3):40-48.

[74] Khunpradit S, Tavenda E, Lunbiganon P, Laopaiboon M, Wasiak J, Gruen RL. Non clinical interventions for reducing unnecessary cesarean section(review). Cochrane Database of Syst Rev. 2011;(6):CD005528.

[75] Roberts CL, Bell JC, Ford JB, Morris JM. Monitoring of the quality of maternity care: how well are labour and delivery events reported in population health data? Paediatr Epidemiol . 2009;23(2):144-52.

