INCIDENCE OF REGIONAL ANAESTHESIA CONVERSION TO GENERAL ANAESTHESIA DURING CAESEREAN SECTION AT THE OBSTETRIC THEATRE, KENYATTA NATIONAL HOSPITAL

DISSERTATION SUBMITTED TO THE ANAESTHESIA DEPARTMENT IN PARTIAL FULFILLMENT OF THE REQUIRMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN ANAESTHESIOLOGY, UNIVERSITY OF NAIROBI

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DECLARATION

I declare that this dissertation is my original work and has not been submitted for a degree award in any university.

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DEDICATION

To my husband Allan, my children Luckiey and Kriss for their perseverance.

To my parents Christopher Simiyu and Gladys Simiyu for their love and support.

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This dissertation would have never been accomplished without the tireless guidance and mentorship of my supervisor Dr. Mark Gacii.

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I would like to thank Mr. Meshack, my statistician for efficiently and tirelessly working on my data.

LIST OF ABBREVIATIONS

C/S……Caesarean section

EMNOC…….Emergency comprehensive obstetric and neonatal care

G/A…….General anaesthesia

HND……Higher national diploma

KNH……Kenyatta National Hospital

MMED……Masters in Medicine.

R/A……Regional Anaesthesia

RCA……Royal College of Anaesthesiologists

RSI…….Rapid sequence induction

List of tables and figures

Tables **page**

Figures

ABSTRACT

Background/Introduction: Caesarean section is an abdominal surgery that is increasingly being done in developing countries. Mode of anaesthesia used during this procedure is a marker of good quality care. Regional anaesthesia being the most favoured mode was introduced in 1899 by Bier. However, general anaesthesia still has a role to play in obstetric anaesthesia in situations where regional anaesthesia is contraindicated.

Exposure of a mother to both modes of delivery predisposes her to complications of both. This study looked at the incidence of conversion rates of regional anaesthesia to general anaesthesia in mothers undergoing caesarean section.

Objective: To determine the incidence rate of conversion from regional anaesthesia to general anaesthesia during caesarean section at the obstetric theatre, Kenyatta National Hospital.

Materials and methods: 576 mothers who had caesarean section under spinal anaesthesia were recruited and the study duration was six weeks. Time of conversion, reason of conversion and type of conversion were recorded.

Results: Incidence of conversion was 5.8%. In this study 9.7% of elective cases and 5.1% of emergency cases were converted to general anaesthesia, this is a higher rate compared to recommendations by the Royal College of Anaesthetist (RCA) recommendations. Preoperative failure was 41.9% while intraoperative failure was 58.1% of those who converted. The major reason for conversion was prolonged surgery.

Conclusion: The conversion rate was higher than the RCA recommendations. Intraoperative conversion rate was higher than preoperative conversion. There was no association between classification of caesarean section and converse

OPERATIONAL DEFINITIONS

Anaesthesiologist

A physician trained in administering anaesthesia.

Anaesthesia provider

A health provider trained in administering anaesthesia.

Caesarean section

Is a surgical procedure in which one or more incision is made through the mother's abdomen and the uterus to deliver one or more foetuses.

Registered clinical officer anaesthetist

A health provider trained in administering anaesthesia with higher national diploma qualifications in clinical medicine.

General anaesthesia

Is the reversible loss of consciousness, inhibition of sympathetic, sensory, and motor nerve transmission at the level of the brain leading to lack of sensation and loss of consciousness.

Registrar

Trainee in MMED programmes.

Chapter 1

1.0 Introduction

Caesarean section rate is increasing in developing countries as the only other way of delivery apart from spontaneous vertex delivery. In 1996 caesarean section rate was at 30% [1] compared to 40% in 2013 according to Health information records, Kenyatta National Hospital. This is a comparable to United States of America where the rates were 20 % in 1996 and 33% in 2011 [2].

Regional, general, or local anaesthesia are the three modes of anaesthesia offered during caesarean section without which no surgery can take place. Regional anaesthesia (R/A) is the primarily recommended and most commonly used mode while general anaesthesia (G/A) is indicated in cases where there is a contraindication to regional anaesthesia or on patient's request. General anaesthesia is sometimes instituted even when regional anaesthesia has already been administered.

Conversion from regional to general anaesthesia does occur either pre- or intra-operatively exposing a patient to complications of both modes of anaesthesia. Conversion poses a challenge to the attending anaesthetist and the entire team as a whole. There are several reasons why conversion may occur. Documentation of events leading to conversion will aid the future anaesthetist in appropriate obstetric patient handling. It is also important that the client appreciates the reasoning behind the changes and application of anaesthetics.

1.2. Literature review.

Caesarean section

Caesarean section (C/S) refers to the delivery of foetus/foetuses who have attained a viable gestational age, together with the placenta and foetal membranes through abdominal and uterine incisions. This is performed in cases where vaginal delivery is either not feasible or would impose undue risks to the mother, baby or both [3]. The first modern C/S was performed in the nineteenth century [4].

It was developed to resolve obstetric complications that can result if vaginal delivery was to occur. Caesarean sections have been noted to be as high as 40% in some developed countries with some developing countries having a low rate of up to 1% [4]. Caesarean section is the commonest obstetric surgery performed and there are increasing rates probably due to high risk mothers attending hospitals.

Classification of caesarean section

Caesarean section can be classified as emergency or elective depending on the threat of life of the woman or baby. An emergency caesarean section is performed when there is an immediate threat to the life of the woman or baby, or when there is maternal or foetal compromise which might not immediately be life –threatening but requiring early intervention. Whereas elective caesarean section is performed at a time that suits both the mother and the maternity team. However not every non-elective case is an emergency [5], there are times when elective cases turns to emergency cases.

There are four categories of caesarean section according urgency of caesarean section [6-7] as recommended by the National Institute of Clinical Excellence in 2004 and the choice of anaesthesia as shown below.

Table 1.Categories of caesarean section and the choice of anaesthesia.

Category	Implication	Mode of anaesthesia
Category 1	Immediate threat to mother or foetus life	General
Category 2	Maternal or foetal compromise which is not immediately life threatening	Regional
Category 3	Early delivery but mother or foetal compromise is absent	Regional
Category 4	Delivery is timed to suit the mother and maternity team	Regional

In the above table, categories 1-3 are declining urgencies and category 4 is considered elective. Regarding first choice of anaesthesia category 2-4 regional anaesthesia is used while in situations associated with category 1 general anaesthesia is applied.

According to American college of obstetricians and Gynaecologists, it is recommended that health facilities that are able to offer emergency comprehensive obstetric and neonatal care [EMNOC] should have a decision -to-delivery-time of 30 minutes for the operation to qualify as an emergency caesarean section [8].

Rates of emergency caesarean section tend to be higher than elective procedures. This trend is also reflected locally at the Kenyatta National Hospital; in 2013 total number of emergency caesarean sections was 3976 (85.5%) while to elective sections was 674 (14.5%).

Similarly in a Nigerian review of 414 mothers undergoing caesarean section under spinal anaesthesia, elective cases were 110 (26.6%) while emergency was 304(73.4%) [9].This study was carried out in a teaching hospital in South Western Nigeria.

Indications for caesarean section

There are several maternal and foetal indications for caesarean section. They vary in different hospital depending on who decides on the caesarean section. There is no universal standard classification system that exists for the different indications of caesarean section [10-11]. A systemic review on caesarean section rate for maternal indication in Sub-Saharan countries revealed that proctrated labour, abruption placenta, previous caesarean section,eclampsia malpresentation and placenta previa as main indications for operative intervention [12].

The passenger, being the baby provides certain implications on operative mode of delivery. Large foetuses, foetal distress, malformed baby, conjoined term babies, cord prolapsed, malpresentation, among others will result in a caesarean section.

The conduit, being the birth canal will dictate the mode of delivery as well; contracted pelvis, cephalopelvic disproportion, pelvic bones fractures among others will result in caesarean section.

However, there are cases when the mother dictates on mode of delivery in requesting for caesarean section as a choice of delivery after appropriate counselling and education but also in certain medical conditions in which labour and vaginal delivery may not be optimal for the maternal outcome desired.

Anaesthesia for caesarean section

Anaesthesia is a pharmacologically induced and reversible general or regional insensibility to pain with or without loss of consciousness.

There are three types of anaesthesia for caesarean section namely; local anaesthesia, regional anaesthesia and general anaesthesia. In regional anaesthesia there are different types of blocks; subarachnoid block, epidural block or combined.

One type of anaesthesia can be used as a sole choice or in combination depending on anaesthesia provider clinical discretion hence the need for him /her to be familiar with all modes.

The Kenyatta National Hospital obstetric anaesthesia service has a customised protocol for spinal anaesthesia that we normally use for caesarean section being the mostly used mode of anaesthesia.

Regional anaesthesia

In caesarean section, regional anaesthesia is now the most common used technique [10,12-13] even though there is no demonstrable superiority of one type of anaesthesia over the other in terms of major maternal and neonatal outcomes [14].Regional anaesthesia is nowadays used in situations that used to be considered

primarily indicated for general anaesthesia like cord prolapsed, preeclampsia and placenta previa [15].

It is the preferred option when calculating the risks and benefits for the mother and the foetus because of the ease, effectiveness, and rapidity [16-19].

The Royal College of Anaesthetist audit guidelines suggest that greater than 95% and 85% of elective and emergency caesarean section respectively should be conducted under regional anaesthesia and the conversion to general anaesthesia should be less than 3% for emergency and less than 1% in elective surgery [20].

Advantages of regional anaesthesia

- ✓ It has really gained popularity since its introduction in 1899 by August Bier.
- ✓ Its use avoids the complications of general anaesthesia. It is simple, reliable, and cheap.
- ✓ With several attempts it's easy to master although it fails in very experienced hands.
- ✓ Avoids manipulation of the airway.
- ✓ Rapid onset time, good analgesia during and after operation.
- ✓ Reduced cardiovascular response to surgically induced stress.
- ✓ Both partners can take part in birthing process and actually see the baby after delivery.
- ✓ Avoidance of neonatal depression that occurs with general anaesthesia.
- ✓ Preservation of consciousness.
- ✓ Mothers bonds with the baby faster as the mother is allowed to breastfeed earlier than mothers who are under G/A

Challenges with regional anaesthesia

- Obesity

Weight gain leading to obesity in pregnancy is a risk factor for anaesthetic-related maternal mortality [21]. For practicability purposes, they pose a challenge on location of midline for regional anaesthesia. The adipose tissue obliterates the obviously palpable landmarks. Study done by Hood DD, shows that regional anaesthesia is feasible but there was initial high failure rate that required replacement of epidural catheter [21]. However .Tonidandil revealed that obesity is not a determining factor during conversion[33].Failed spinal do occur even in experienced hands and this is the most absolute reason for conversion to general anaesthesia. The anaesthetist should always be ready and familiar with plan B incase the first choice of anaesthesia fails.

Complications of regional anaesthesia are unpleasant to the patient, surgeon, and the mother. Some of the complications are discussed below.

- Hypotension

Hypotension is the major drastic drawback in regional anaesthesia that occurs due to extensive sympathetic blockade. It reduces utero-placental circulation although a short period of less than 2 minutes of hypotension before delivery has no significant effect neither on neonatal Apgar score, neonatal acidemia, nor frequency use of vasopressors [22].

- Intraoperative pain

Intra-operative pain causes distress to the mother and it is a non-enabling environment for the surgeon to continue his work.

The RCA recommends less than 5%,less than 15% and less than 20% of cases in categories 4,1-3 and 1 respectively to have intraoperative pain, sometimes supplemental analgesia is used intraoperatively.Hugo and his colleagues carried out a study on this, they found out that among the subjects,15% experienced intra-operative pain and 11% required supplemental analgesia [23].

- Post Dural headache

This happens due to large sized needles but with the introduction of small sized needles as well as modification of needle types used in clinical areas, the rates have come down.

Multiple punctures as we try to locate the correct interspace might lead to nerve injury and haematoma formation.

2.4.2 General anaesthesia

General anaesthesia is described simply as pharmacologically induced reversible loss of consciousness. There is inhibition of sympathetic, sensory, and motor nerve transmission at the level of the brain leading to lack of sensation and loss of consciousness.

Although regional anaesthesia is the preferred mode of anaesthesia during caesarean section, there remain some indications for general anaesthesia.

Indications

General anaesthesia is commonly applied in situations of urgency, maternal refusal of regional anaesthesia, anticipated large blood loss [4,16,24] and inadequate or failed regional anaesthesia.

Sometimes patient's factors are the major contraindications to regional anaesthesia like coagulopathy, spinal deformity, open or infected wound around the lumbar region, sepsis and coma. Therefore, general anaesthesia is indicated in the high risk mother who is already in compromised state. In a study done by Samin et al, patient's refusal to regional anaesthesia, anaesthetist choice, surgeon's choice, and lack of time were reasons why general anaesthesia was used [5].

Advantages

- ✓ Rapid induction.
- ✓ Less hypotension.
- ✓ Better cardiovascular stability.
- ✓ Better control of mother's airway.
- ✓ Uterine relaxation for extraction of very difficult breech presentation, removal of retained placenta and conduct of utero-foetal surgeries.

Challenges associated with general anaesthesia

In pregnancy there are physiological changes that contribute to challenges of general anaesthesia and they are shown below together with actions that might reduce their occurrences.

Table 2: challenges in pregnancy during general anaesthesia.

System	Challenges	Action
Respiratory	Increased risk of difficult intubation; ✓ airway oedema ✓ Enlarged breast and weight gain Rapid desaturation on induction due to; ✓ displaced diaphragm and reduced FRC ✓ increased closing capacity and small airway closure ✓ Increased oxygen consumption.	Regular failed intubation drill Access and familiarity with difficult airway equipment Attention to effective preoxygenation.
Cardiovascular	Decreased preload, decreased cardiac output and placental perfusion due to aorto-caval compression by gravid uterus	Maintain left lateral tilt of 15% during induction till baby is born. Recognition that pregnant women

	Expanded plasma volume, physiological anaemia, decreased peripheral vascular resistance, and increased cardiac output.	may appear relatively stable but may decompensate quickly.
Coagulation	Hypercoagulable state.	Consideration thromboprophylaxis,early mobilisation
Gastrointestinal	Increased intraabdominal pressure and progesterone mediated reduction in lower oesophageal sphincter tone increase risk of reflux and Mendelson's syndrome	Prophylaxis with H2 receptor antagonists
	Labour reduces gastric emptying, especially if opioid use	RSI

Aspiration is the major cause of maternal death that is anaesthesia related contributing to 6% mortality rate in pregnant women [11].Before provision of any form of anaesthesia ,the patient should have informed consent. This sometimes never happen in patients undergoing emergency C/S under general anaesthesia [25]. Informed consent should be sought during prenatal visits from high risk mothers who might end up with general anaesthesia. In a prospective study by Samina, most patients prefer G/A because of poor counselling [5].

Instrumentation of the oro-nasal airway has to be meticulous as there is high risk of bleeding due to mucosa with increased vascularity.

In 30% of parturients there is decreased level of plasma cholinesterase hence patients undergoing general anaesthesia with succinylcholine will have to be ventilated for a longer period due to delayed recovery of muscle power [26].

Another drawback in the use of general anaesthesia is that the mother won't be able to see the baby immediately after delivery because of unconsciousness.

Local anaesthesia

This type of anaesthesia is carried out by a surgeon not an anaesthetist. The agent is infiltrated on the skin, rectus sheath and both the peritoneum. This method has been used in very poor clinical state like eclampsia [23].It may be needed in area where anaesthetic resources including anaesthetic expertise are limited.

Nevertheless, supplementation has to be used to achieve good anaesthesia although most of them have deleterious effects on the baby hence given after clamping the cord. It's contraindicated in two previous scar, associated adnexal pathology, obese patient, placenta previa, or apprehensive cases.

Reasons for conversion from regional to general anaesthesia.

Conversion to general anaesthesia is sometimes inevitable. The attending anaesthesia provider has to be prepared for general anaesthesia at all times when regional anaesthesia has been chosen as the mode for facilitating caesarean section.

Failure of regional anaesthesia

Success and functionality of regional anaesthesia comes with experience and anatomical knowledge. Location of correct interspace, puncture of dura with leakage of cerebrospinal fluid has to occur before introduction of the anaesthetic cocktail although you can get dry tap. Location of interspace is a challenge especially in obese patients and trainee anaesthesiologist hence several attempts are made. This leaves the mother sore in pain, the major reason for refusal for regional anaesthesia in subsequent caesarean section [9].Failure of regional anaesthesia means a) conversion to general anaesthesia b) conversion to any different form of anaesthesia and c) pain during surgery [19].It may occur preoperatively or intraoperatively.

Preoperative failure means failure before the start of caesarean section, inability to execute anaesthesia, inability to get the correct space or inability to get satisfactory block. Intraoperative failure means unsatisfactory anaesthesia requiring another form of analgesia or anaesthesia after surgery has began.

At the Kenyatta National Hospital, bupivacaine is the main local anaesthetic agent used. Failed spinal in regard to this agent means that after successful intrathecal deposition and within 10 minutes for heavy bupivacaine and 25 minutes for plain bupivacaine there is no effective anaesthesia and analgesia [27].

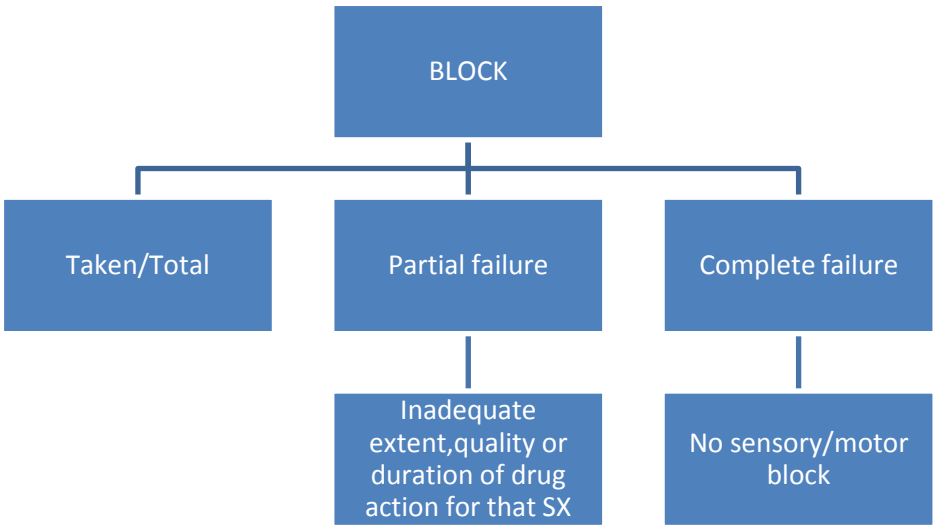
Technical errors

They may also cause failure of the applied regional anaesthetic. These include less drug dosage which may be caused by spillage, improper rate of injection, deposition of the drug in the wrong place, failure to recognize dural puncture, improper placement of the needle and lack of co-operation [27].

Accidental puncture of dural vessels and the resulting bloody tap introduces the potential of pseudo-cholinesterase metabolism of ester type of local anaesthetic agents. Exposure to light for longer period for some agents will reduce potency, while concentration error and high glucose content cause hyperalgesia and spotty anaesthesia [28] contributing to preoperative failure.

The blocks attained in regional approach may be categorised as (a)impossible block whereby the anaesthetist cannot perform the block,(b) inadequate block that can not allow acceptable surgical conditions even though assisted by light sedation or inadequate for surgery, and (c) total spine that requires mechanical respiration. Categorisation of these blocks is schematically demonstrated in the flowchart as shown below.

Figure 1: Types of blocks



Conversion from regional anaesthesia to general anaesthesia exposes a mother to complications of both anaesthesia methods. It would have been better to give general anaesthesia as a primary choice if conversion was predictable. The following table shows some of the conversion rates proposed by The Royal College of Anaesthetist in UK;

Table 3: Proposed standard for best practice by The Royal College of Anaesthetist [20]

	Category 4 CS	Category 1-3 CS	Category 1 CS
CS under RA	>95%	>85%	>50%
RA to GA conversion	<1%	<5%	<15%
Intraop- pain	<5%	<15%	<20%

RCA proposes that conversion rate from regional anaesthesia to general anaesthesia should be less than 1% in category 4, less than 3% in category 1-3 and less than 15% in category 1 of all case.

Numerous reviews on the conversion rates and adoption of general anaesthesia in caesarean deliveries have shown varied rates on intervention and causation of failure. In a prospective study at a University teaching hospital in South-Western Nigeria, conversion rate of spinal anaesthesia to general anaesthesia was 6.0%, 2.7% was due to complete failure while 3.4% had inadequate block [9].

A cross sectional prospective study in Karachi reviewing spinal anaesthesia inadequacies,3.8% had failed spinal,1.94% anaesthetist were unable to institute regional anaesthesia and the remaining 1.94% was due to incomplete or inadequate block hence all converted to general anaesthesia. In addition 6 patients were given general anaesthesia to expedite delivery with working labour epidural in situ [5].

Carin and his colleagues carried out a retrospective study on aetiology and incidence of endotracheal intubation following spinal anaesthesia for caesarean section at the Hermann Hospital in Texas .This study looked at 743 parturients 2% had spinal failure necessitating general anaesthesia,1.9% had partial or no analgesia after apparent satisfactory block [11].

Kinsella carried out a prospective audit in 2005 .For 5 years, rate of conversion was 8% in category 1 compared to 0.5 % in category 4, in spinals and for epidural the rate was 25% and 2.4% in categories 1 and 3 respectively for emergency cases, preoperatively 83% conversion occurred in emergency in spinal while 90% with top-up epidurals in contrast to 68% in all spinals and 68% in all top-up epidurals [29].

Pokhara .A demonstrated a 1.5% total failure requiring repeat spinal in study of 1197 parturients.After the repeat, only 1 patient was converted to general anaesthesia and another 1 had a high spinal requiring intravenous anaesthesia supplementation and support [27]. From this study, it was proposed that repeat spinal may actually reduce the risk of conversion to general anaesthesia. However, urgency of caesarean section will dictate which method will be used and it might also affect the conversion.

Retrospective study was carried out in Jawaharlal Institute of Postgraduate Medical Education and Research in India on general endotracheal anaesthesia for lower

segment caesarean section. In this study, 2,610 parturients were looked at, 1.9% had failed spinal necessitating general anaesthesia. While 2.2% had endotracheal intubation after surgery had began due to a) prolonged surgery, b) hemodynamic instability, and c)inadequate block [19].

Total /high spinal.

The height of block is appropriate for caesarean section in the presence of loss of touch from sacral levels to T5 and loss of cold up to T4 with bilateral lower limb motor blockade. Significant complications associated with spinal anaesthesia itself like high or total spinal may introduce the need for controlled ventilation [30].

Total spinal was an absolute indication for conversion [11] in the Texas study in which 15.7% of the parturients had higher than T4 blockade with 1.2% reaching C2-C3 but their ventilation, oxygenation and hemodynamic status remained well preserved.

Obstetrician's factors

Most patients are not aware of the different modes of anaesthesia and they rely on their obstetrician to choose for them. Obstetricians believe regional anaesthesia is time consuming in preparation and administration [5] hence their choice as the mode of anaesthesia tend to be general. The obstetrician's distress also has an implication on mode of anaesthesia and may lead to use of sedation and general anaesthesia in place where regional anaesthesia could have been used like repeat spinal after failed spinal. [5]

Duration of surgery

Duration of surgery have an implication on the need for conversion, if surgery takes long regional anaesthesia might wear off necessitating conversion. Complications of surgery or change of plan of surgery might prolong time of surgery leading to wearing off of the anaesthetic agent.

Retrospective study was carried out in Jawaharlal Institute of Postgraduate Medical Education and Research in India on general endotracheal anaesthesia for lower segment caesarean section. In this study, 2,610 parturients were looked at and 2.2% had endotracheal intubation after surgery had begun due to a) prolonged surgery, hemodynamic instability, and inadequate block [19].

Carin and his colleagues carried out a retrospective study on aetiology and incidence of endotracheal intubation following spinal anaesthesia for caesarean section at the Hermann Hospital in Texas .This study looked at 743 parturients 0.1% had hysterectomy prolonging the surgery hence the need for conversion to general anaesthesia. [11].

Complications of conversion from regional anaesthesia to general anaesthesia.

Exposure of the mother to both regional and general anaesthesia exposes the mother to complications of both modes. Every party involved in caesarean section is disadvantaged once any complication occurs.

Kinsella et al reviewed regional anaesthesia failure in caesarean section. In this review 1.6% of the incidents related to general anaesthesia were tied to conversion. Among them were hypotension, bradycardia, pulmonary oedema, bronchospams and persistent hypoxaemia.Some mothers ended up in intensive care unit because of the morbidities [29].

Chapter 2

2.1 OBJECTIVES

2.1.1 Broad objective:

To determine incidence of conversion of regional anaesthesia to general anaesthesia in mothers during caesarean section at the obstetric theatre, Kenyatta National Hospital.

2.1.2 Objectives:

1. To determine incidence of conversion of regional anaesthesia to general anaesthesia during caesarean section at Kenyatta National Hospital.

2. To identify the reasons for conversion of regional anaesthesia to general anaesthesia.

3. To identify at what point the conversion occurs.

4. To determine the association between classification of caesarean section and the need for conversion from regional anaesthesia to general anaesthesia.

2.4 JUSTIFICATION.

1. Regional anaesthesia is the preferred mode of anaesthesia for caesarean section as it avoids the possibility of failed intubation and aspiration. It's increasingly being used in the world for the procedure compared to general anaesthesia. There is no data indicating rate of regional anaesthesia Vs general anaesthesia in KNH.

2. There is no data available in KNH on incidence of conversion from regional anaesthesia to general anaesthesia.

Chapter 3

3.1 METHODOLOGY

3.1.1 Study site:

This study was carried out in the obstetric theatre, KNH.

3.1.2 Study duration

The study was conducted between 20th April -26th May 2015.

3.1.3 Research method:

Cross sectional, observational study.

3.1.4 Sampling technique:

Consecutive sampling technique

3.1.5 Study population:

All mothers scheduled for caesarean section under regional anaesthesia in the obstetric theatre, KNH

3.1.6 Sample size

Sample size was estimated using the formula of cross sectional studies [31] This is appropriate since the study was designed to identify the proportion of scheduled regional anaesthesia converted to general anaesthesia. After substitution:

$$n = \frac{Z^2 \times P(1-P)}{d^2}$$

n=sample size required to estimate the scheduled regional anaesthesia patients.

z=1.96(95% confidence interval)

p=Estimated conversion rate to general anaesthesia, that was determined during this study (50% was assumed to yield maximum sample size)

d=Margin of error (precision error) ±5%

After substitution in the above formula:

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384.16 \approx 384\ respondents$$

The sample size adopted in this study was 576 respondents (inclusive of 50% attrition rate) to enhance precision of study findings.

3.2 Eligibility criteria

3.2.1 Inclusion criteria:

1. All who gave informed consent.
2. Parturients who were planned caesarean section under regional anaesthesia
3. Parturients that were weighed and their heights taken.

3.2.2 Exclusion criteria:

1. Parturients planned for general anaesthesia.
2. Parturients who refused to participate.
3. Parturients in whom we couldn't obtain height and weight.

3.3 Data collection procedure

The eligible patient or their next of kin for those who were unable to consent gave informed consent and completed a consent form before being involved in the study. The consenting process involved explaining to the patients or next of kin the aim of the study, confidentiality, and use of the results. This was done by the primary researcher or research assistant. This took approximately seven minutes or more to ensure the patient or next kin has understood the content of the informed consent form. The consent was administered in labour ward for emergency cases and other obstetric wards for elective cases scheduled for regional anaesthesia.

The data was collected using a questionnaire which was partly filled by the investigator in the ward and the last part in theatre as the operation went on. Once the

patients signed consent, patient's details were entered including age, weight and height, indication for caesarean section and parity.

In theatre we observed the administration of spinal anaesthesia, cadre of anaesthetist, position during administration, anaesthetic agents that were used and the height of block during spinal anaesthesia were recorded.

We also recorded the cadre of the obstetrician, duration of surgery and estimated blood loss during surgery. In case conversion occurred, time of conversion, type of conversion and complication of conversion were recorded. Total of 580 mothers were recruited, 4 mothers developed complications that I took part in their management hence excluded them during analysis of my data because this was purely observational.

3.4 ETHICAL CONSIDERATION

1. Permission was sought from Kenyatta National Hospital/ University of Nairobi Ethics and Research Committee.

2. The nature of the study was explained to the subject and study was carried out on patients or next of kin of patients who gave informed consent.

3. The study was not harmful on the subject.

4. There was no cost implication on the parturients.

5. Confidentiality of information was maintained at all times.

6 Study findings will be availed to the Ethics and Research Committee of Kenyatta National Hospital and The University of Nairobi, and departments of obstetrics and gynaecology and surgery- anaesthesia for their appropriate action.

3.5 Data management and presentation

Data entry and analysis was done using SPSS version 22.0. Continuous variables were summarised into means or medians while categorical data were presented as percentages. Patients who converted from regional to general anaesthesia were presented as a percentage with a 95% confidence interval. Similarly indications for conversion were analyzed and presented as percentages. In addition, incidence of conversion was stratified by the type of caesarean section. Selected patient's details were compared between patients converted and those who didn't convert. Conversion to general anaesthesia was associated with other categorical variables using Chi square/Fisher's exact test while means/medians was compared using Student's t/Mann Whitney U .All statistical tests were done at 5% level of significance(significantly p values less or equal to 0.05).Study findings were presented in tables and graphs.

Chapter 4

RESULTS AND DISCUSSIONS

4.1 Results

The details of the respondents, incidence of conversion of regional anaesthesia to general anaesthesia during caesarean section at Kenyatta National Hospital, reasons for conversion, point of conversion and the association between classification of caesarean section and the need for conversion are presented herein.

During this study, there was a total of 671 caesarean sections, all elective cases were done under spinal anaesthesia, but 2.1% of emergency were done under general anaesthesia while 97.9% of emergency cases were done under spinal anaesthesia.

In this study 576 mothers were recruited of which 31(5.4%) were elective cases and 545(94.6%) mothers were emergency cases.

Patient's details

The mean age of respondents was 27.64(±0.41) years with a standard deviation of 5.04 years. 139(24.1%) of the respondents were aged between 25 and 28 years as shown in the graph below;

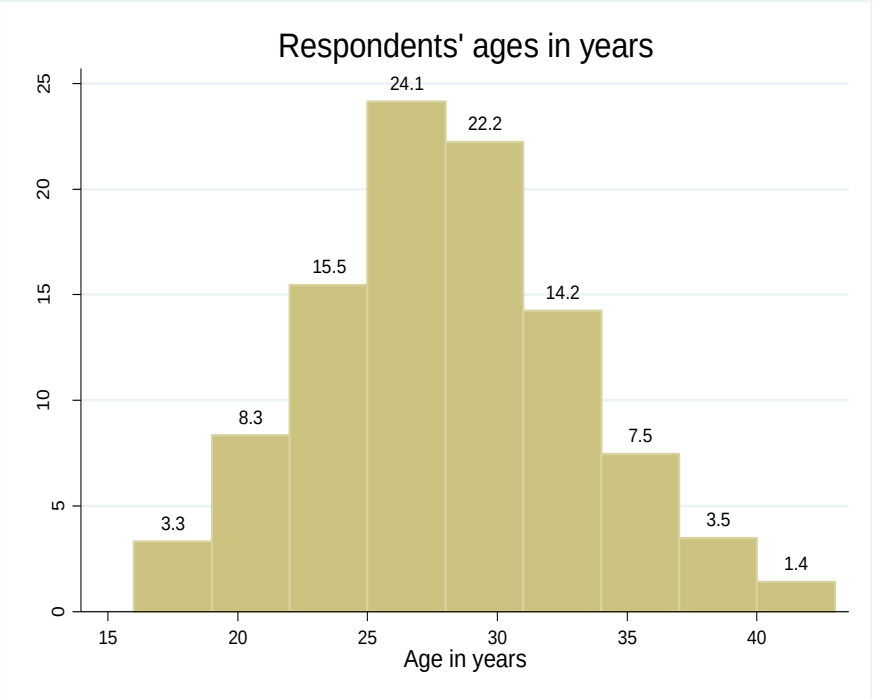


Figure 2: Age of Respondents

To assess the body mass index (BMI) of the respondents the weights were divided by the square of their heights. 105(18.2%) of the respondents had a BMI of between 25 and 27 kg/m^2 as shown in the graph below;

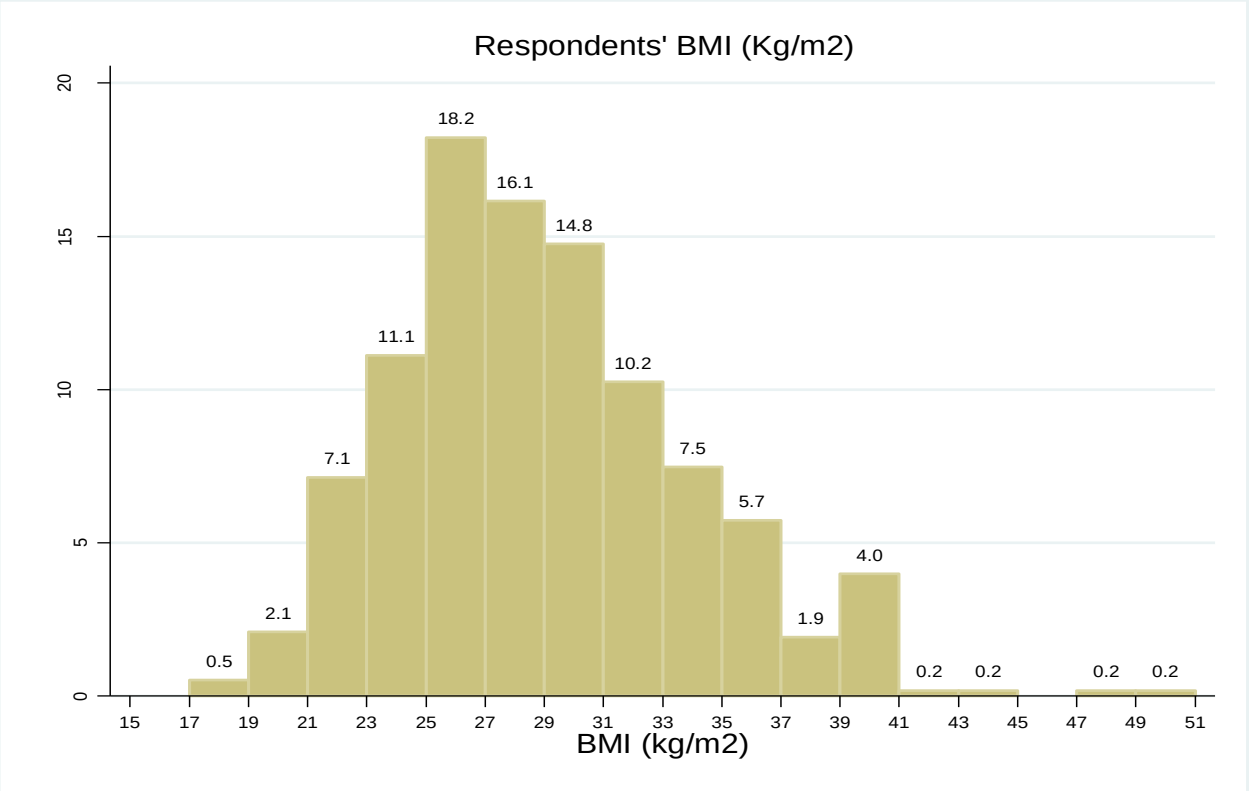


Figure 3: Respondents' BMI

The table below tabulates the parity of the respondents and majority 194(33.7%) had a parity of 1+0.

Table 5: Respondent's parity

Parity	Frequency	Percent
0+0	173	30.0
0+1	14	2.4
0+2	3	.5
0+3	3	.5
1+0	194	33.7
1+1	6	1.0
1+2	7	1.2
1+4	2	.3
2+0	110	19.1
3+0	35	6.1
3+1	2	.3
3+2	4	.7
4+0	16	2.8
5+0	3	.5
6+0	4	.7

Cadre of anaesthetist performing spinal anaesthesia

Majority 319(55.4%) of the spinal anaesthesia was done by registered clinical officer anaesthetist. Others were performed by higher diploma clinical officers 159(27.6%), registrars 92(16.0%) and consultants 6(1.0%) as shown below;

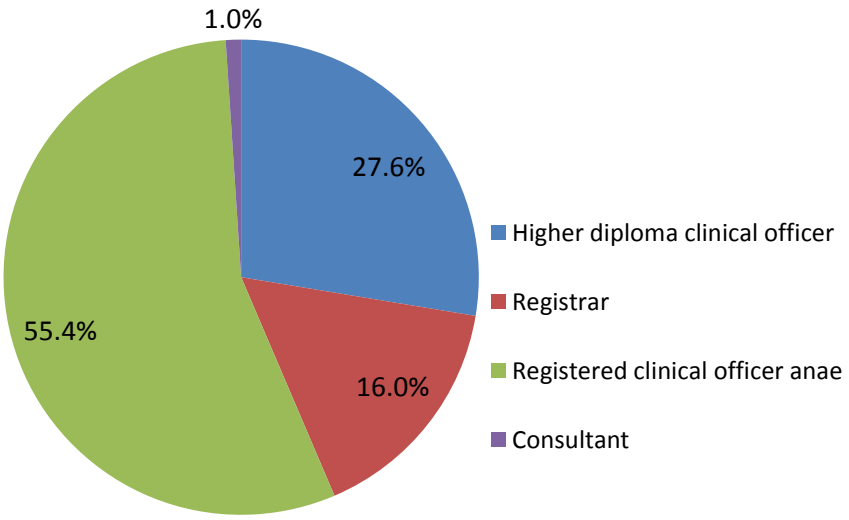


Figure 4: Cadre of anaesthetist performing the procedure

Majority (142) of the trainees were clinical officer HND trainee while 102 were registrar trainees. Majority 126(90.0%) of the clinical officer HND trainees were on year 1 while majority 88(84.6%) of the registrar trainees were in year 2 as shown below;

	Conversion to general anaesthesia.						
	Converted		Not converted		Total		
	Frequency	Percent	Frequency	Percent	Frequency	Percent	P-value
Cadre of year 1 trainees							**.298**
Clinical officer HND trainee	8	6.3%	118	93.7%	126	52.1%	
Registrar	0	0.0%	16	100.0%	16	6.6%	
Cadre of year 2 trainees							**.542**
Clinical officer NHD trainee	2	14.3%	12	85.7%	14	5.8%	
Registrar	8	9.1%	80	90.9%	88	36.4%	

Table 6: Trainee cadre Vs year of training

Classification of caesarean section

The graph below shows that majority 545(94.6%) of the Caesarean sections were emergency cases while 31(5.4%) were elective cases. Z-test (p-value < .001) indicated that the proportion of emergency caesarean section was significantly higher than the proportion of elective caesarean sections

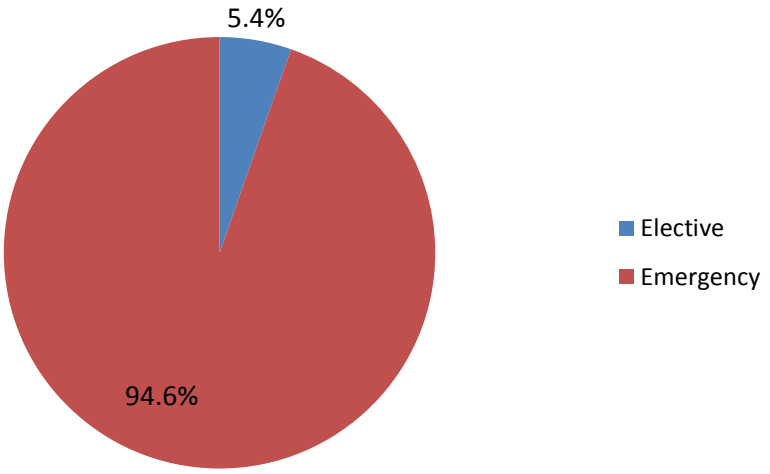


Figure 5: Classification of Caesarean section

Indication for caeserean

Most 319(55.4%) of the Caesarean sections were done due to foetal reasons. Z-test (p-value = .002) indicated that the proportion of caesarean section done due to foetal reasons was significantly higher than the proportion of caesarean section done due to maternal reasons.

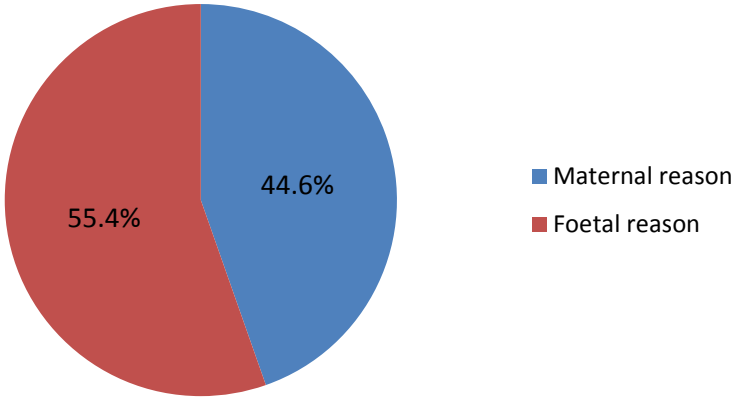


Figure 6: Indication for Caesarean Section

Patient position during anaesthesia

Nearly all patients 573(99.5%) the spinal procedure for subarachnoid block was done while seated as shown below;

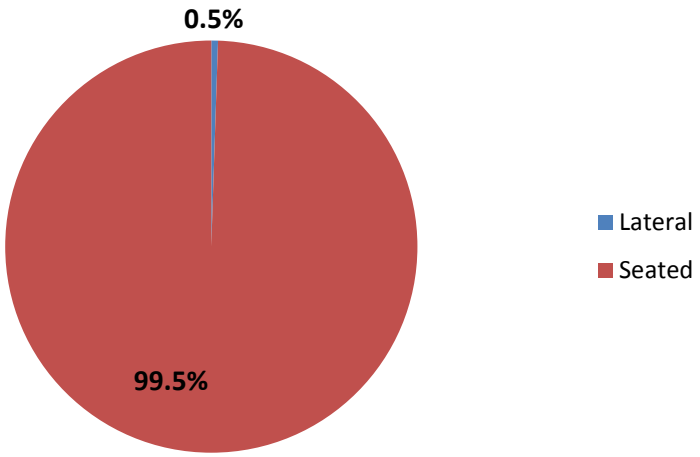


Figure 7: Patient's Position during Anaesthesia Administration

Plain bupivacaine was the mostly used local anaesthetic agent 554(97.8%).Fentanyl 550(98.9%) was the major opioid used intrathecally. Other drugs that were used are as shown in the table below;

Table 7: Drugs Used

Drugs used	Frequency	Percent	Mean dosage	Dosage Standard deviation
Hyperbaric bupivacaine	12	2.2	7.5	-
Plain bupivacaine	554	97.8	7.5	1.8
Morphine	6	1.1	0.1	
Fentanyl	550	98.9	25.1	-
Ketamine	21	3.6	60.2	7.0
Midazolam	1	.2	2.0	-

Height of sensory

Majority 183(31.8%) of the patients attained a sensory block height of T6 after the spinal. Other sensory blocks heights were as shown in the graph below.

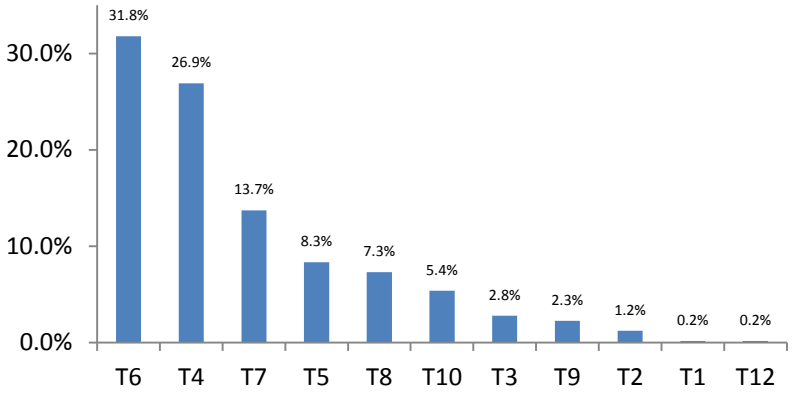


Figure 8: Height of Sensory Block

Motor grading according Bromage scale

Majority 450(78.1%) of the patients had a motor grading scale of 3 according to Bromage scale as shown below;

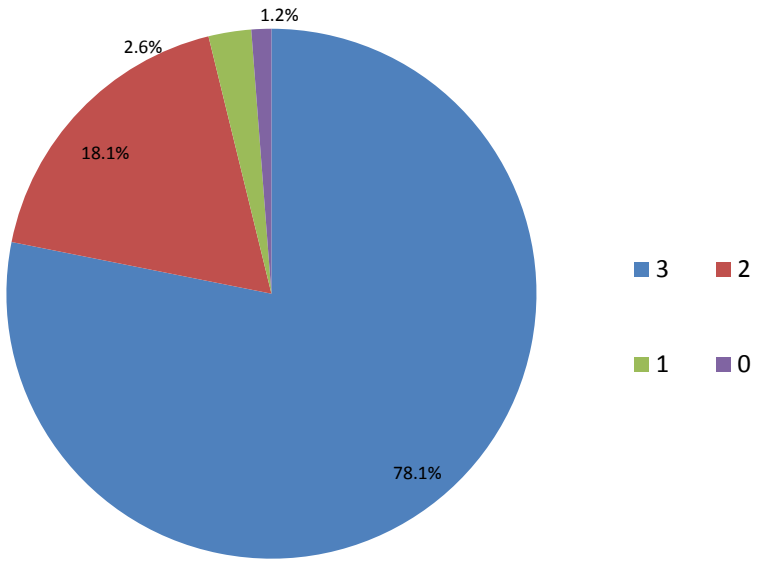


Figure 9: Motor Grading According to Bromage Scale

Cadre and experience of surgeons

Majority 494(85.8%) of the surgeries were done by registrar surgeons, 81(14.1%) by consultant surgeons while 1(0.2%) by medical officer intern.

The medical intern had an experience of less than 5 years.359(72.7%) of the registrars also had experience of less than 5 years while majority 45(55.6%) of the consultant surgeons had experience of between 5 and 10 years.

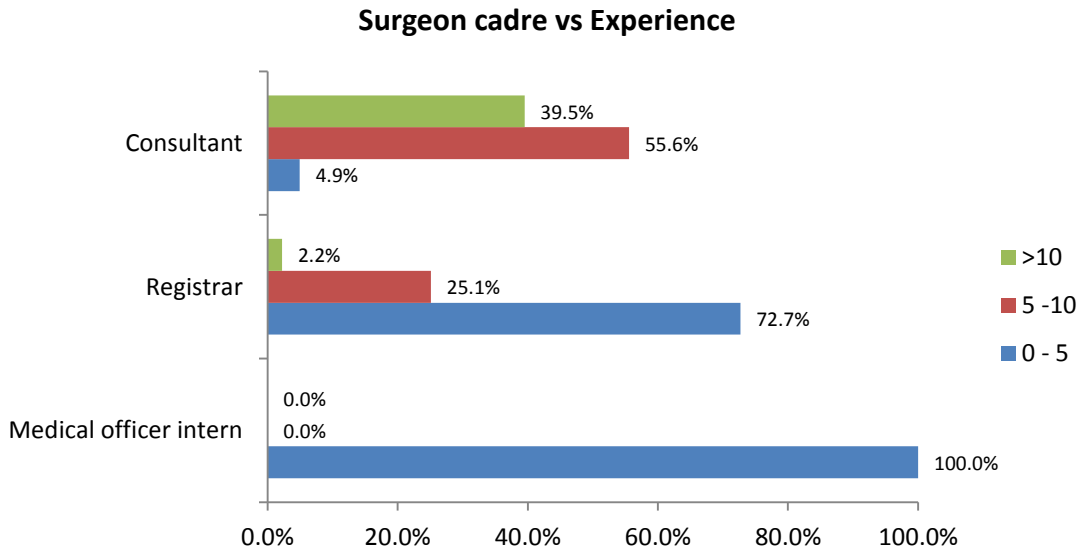


Figure 10: Surgeon cadre VS Experience

Estimated blood loss

The estimated blood loss was 0.5-1litre in most of the patients 93.8% as shown below;

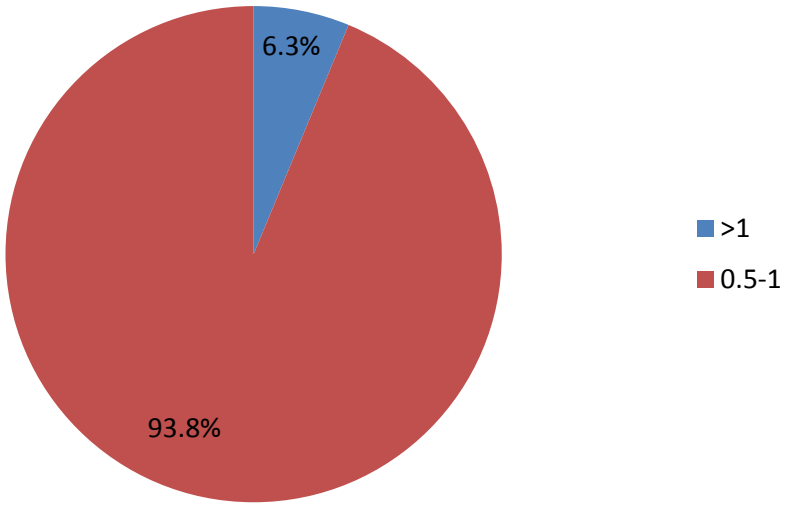


Figure 11: Estimated Blood Loss

Duration of surgery

Majority 344(59.7%) of the surgeries took between 45 and 60 minutes as shown below;

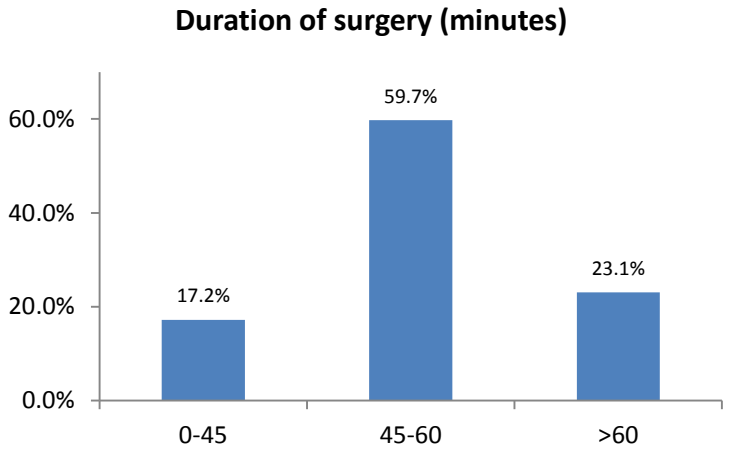


Figure 12: Duration of Surgery

Conversion rate

In this study 31(5.4%) of the patients administered regional anaesthesia were converted to general anaesthesia while majority 545(94.6%) of the patients were not converted to general anaesthesia as depicted in the diagram below;

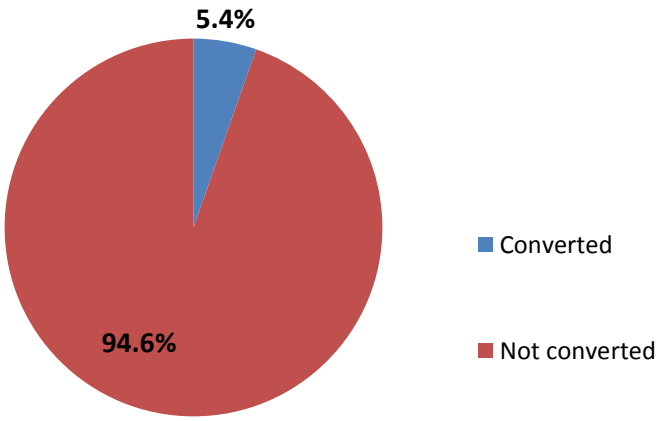


Figure 13: Conversion to General Anaesthesia

Point of conversion

Majority of the conversion was done after 60 minutes 14(45.2%) intra-operatively. There was no statistical significance (Chi-square test p-value = .102) in the proportion of the conversion times as shown below;

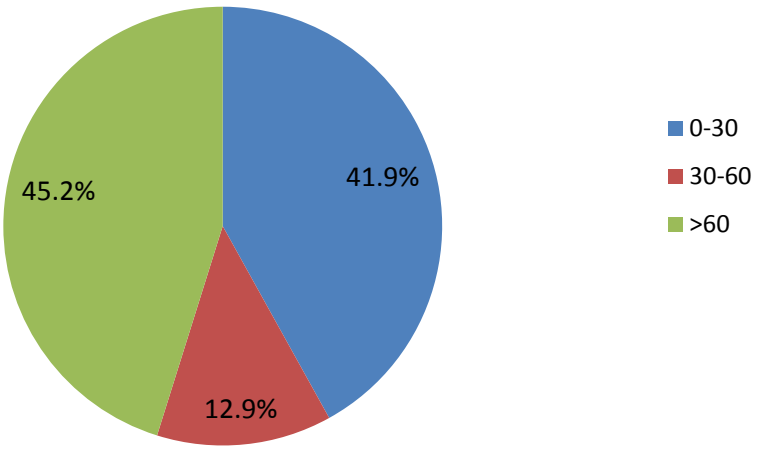


Figure 14: Time of Conversion

Type of conversion

Majority 17(54.8%) of the respondents underwent conversion by ketamine with mask before intubation while 14(45.2%) underwent conversion by intubation under muscle relaxant as depicted below;

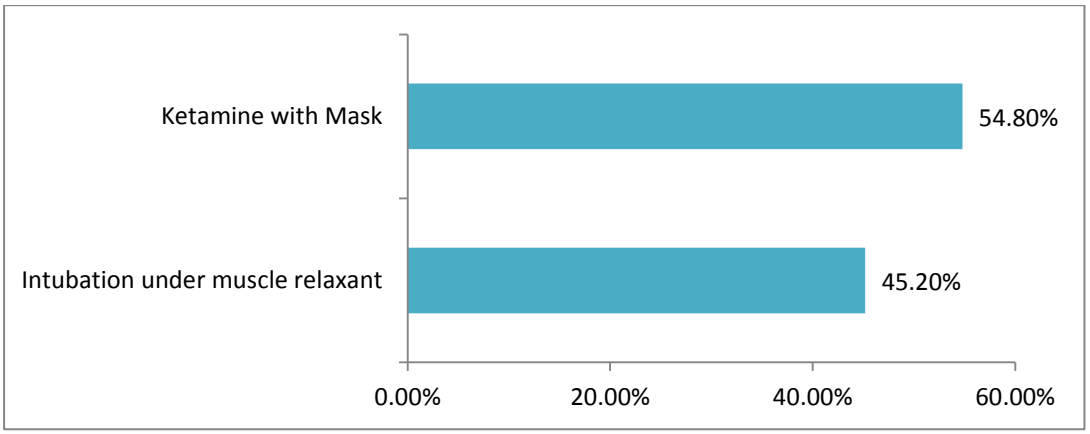


Figure 15: Type of Conversion

Reasons for conversion

Majority 18(58.1%) of the respondents underwent conversion due to prolonged surgery while 13(41.9%) underwent conversion due to failed spinal as shown in the graph below.. There was no statistical significance (Z-test p-value = .204) in the proportion of the reason for conversion.

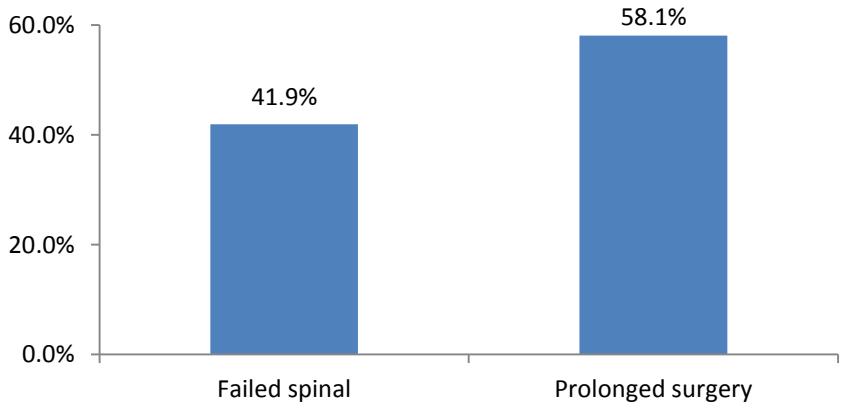


Figure 16: Reason for Conversion

Conversion Complications

There was 1 case of a patient who had preeclampsia who convulsed intraoperatively.After conversion; there was difficulty intubation, poor reversal hence taken to intensive care unit for further management.

Table 8: Summary table on statistical significance among different determinants of conversion.

	Conversion to general anaesthesia.						
	Converted		Not converted		Total		**P-**
	Frequency	Percent	Frequency	Percent	Frequency	Percent	**value**
Classification of caesarean section.							**.276**
Elective	3	9.7%	28	90.3%	31	5.4%	
Emergency	28	5.1%	517	94.9%	545	94.6%	
Indication for caesarean section.							**.667**
Maternal reason	15	5.8%	242	94.2%	257	44.6%	
Foetal reason	16	5.0%	303	95.0%	319	55.4%	
Cadre of anaesthetist performing the procedure.							**.195**
Higher diploma clinical officer	11	6.9%	148	93.1%	159	27.6%	
Registrar	8	8.7%	84	91.3%	92	16.0%	
Registered clinical officer anaesthetist	12	3.8%	307	96.2%	319	55.4%	
Consultant	0	0.0%	6	100.0%	6	1.0%	
Patient position during anaesthesia.							**<.001**

Lateral	2	66.7%	1	33.3%	3	0.5%	
Seated	29	5.1%	544	94.9%	573	99.5%	
Local anaesthetic drug used.							**.317**
Hyperbaric bupivacaine	0	0.0%	12	100.0%	12	2.1%	
Plain bupivacaine	31	5.5%	523	94.5%	554	97.9%	
Other drug used							**.018**
Fentanyl	21	3.7%	539	96.3%	560	96.2%	
Morphine	0	0.0%	6	100.0%	6	1.1%	
							.126
Height of sensory block.							
Less than T5	11	6.2%	167	93.8%	178	30.9%	
T5 to T10	16	4.4%	350	95.6%	366	63.5%	
More than T10	4	12.5%	28	87.5%	32	5.6%	
Motor grading according to Bromage scale							**<.001**
0	0	0.0%	7	100.0%	7	1.2%	
1	6	40.0%	9	60.0%	15	2.6%	
2	8	7.7%	96	92.3%	104	18.1%	
3	17	3.8%	433	96.2%	450	78.1%	
Cadre of surgeon							**.047**
Medical officer intern	0	0.0%	1	100.0%	1	0.2%	
Registrar	22	4.5%	472	95.5%	494	85.8%	
Consultant	9	11.1%	72	88.9%	81	14.1%	

Duration of surgery (minutes)							**<.001**
0-45	2	2.0%	97	98.0%	99	17.2%	
45-60	13	3.8%	331	96.2%	344	59.7%	
>60	16	12.0%	117	88.0%	133	23.1%	
Estimated blood loss.							
0.5-1	20	3.7%	520	96.3%	540	93.8%	
>1	11	30.6%	25	69.4%	36	6.3%	

4.2 DISCUSSION

The overall incidence of conversion from spinal anaesthesia to general anaesthesia was 5.4%.This is comparable to Nigeria which had incidence of conversion of 6%.

Classification of caesarean section as emergency or elective was seen as a determinant of conversion. However, in this study most of the elective cases turned into emergencies as they waited theatre space. This was because of the high rate of emergencies occasioned by referrals and hence only a few elective cases got theatre space. The conversion rate among elective caesarean section was 9.7% as compared to 5.1% among emergency caesareans section which was dissimilar to a study by Samina et al where the conversion rate was 1.4% and 2.4% in elective and emergency cases respectively. There was no statistical significance (Z-test p-value = .276) in conversion rates in classification of caesarean section.

RCA recommendation for conversion rates is <1% for elective cases and 3% for emergency cases. On analysing the compliance with the recommendations, 5.4% cases were converted compared to 6% in the Nigerian study. We are far from meeting the RCA recommendations.

The mean age of respondents who were converted to general anaesthesia was 28.0(±2.10) years while the mean age of respondents who were not converted to general anaesthesia was 27.62(±0.42) years. There was no statistical significance (Mann Whitney U test p-value = .625) in age difference between respondents who were converted to general anaesthesia and respondents who were not converted.

To determine whether conversion rate differed with occurrence of obesity, respondents BMI was grouped into obese (BMI ≥ 30 kg/m2) and not obese (BMI < 30 kg/m2). There were 214(37.2%) obese respondents while 362(62.8%) were not obese. The conversion rate among obese respondents was 6.1% while among non-obese respondents

was 5.0%. There was no statistical significance in conversion rate among obese and non-obese respondents (Z-test p-value = .569). Compared to a study done by Hood DD, that revealed regional anaesthesia being feasible but there was initial high failure rate that required replacement of epidural catheter among the obese patients. Likewise in a study by Tonidandil there was no statistical significance in the obese and non-obese patients who underwent conversion. Unfortunately we lacked pregestational body mass indices hence used term body mass indices.

The conversion rate among caesarean section done due to maternal reasons was 5.8% as compared to 5.0% among caesarean section done due to foetal reasons. There was no statistical significance (Z-test p-value = .667) in conversion rates among caesarean section done due to maternal reasons and those done due to foetal reasons. This was dissimilar to a study done by Carin that revealed overlapping reasons for caesarean section. Some of the foetal reasons included foetal distress, non-reassuring foetal status, twin pregnancy, and breech presentations. Maternal reasons included 1 previous scar, preeclampsia, and uterine fibroids in pregnancy, genital warts, and HIV positive patient. This being a training institution we had trainees at different levels under supervision during execution of spinal anaesthesia. We had few consultants 6 (1%) performing the spinal because they were supervisors. Year 1 trainees had a conversion rate of 5.6% while year 2 trainees had a conversion rate of 9.8%. There was no statistical significance (Z-test p-value = .219) in conversion rates between year 1 trainees and year 2 trainees because most of the spinals were done by second year trainees hence the higher rate of conversion in the cadre.

Among year 1 trainees, the conversion rate among clinical officer HND trainees was 8(6.3%) as compared to 0% among registrars but there were few year 1 registrars since they attended theatre only three days per week compared to HND trainees who attended

five days in a week both day and night. Among year 2 trainees, the conversion rate among clinical officer HND trainees was 2(14.3%) as compared to 8(9.1%) among registrars. There was no statistical significance in conversion rate among cadres of trainees both in year 1 (Z-test p-value = .298) and year 2 (Z-test p-value = .542).

The conversion rate among patients administered anaesthesia by higher diploma clinical officers was 11(6.9%), for those administered by registrars was 8(8.7%) while those administered by consultants was 0%. There was no statistical significance (Chi-square test p-value = .195) in the conversion rates among different cadres of anaesthetists.

This being a training institution almost all of the spinals are done when the patient is seated hence the low numbers in the lateral position. The conversion rate among patients administered anaesthesia while in a lateral position was 2(66.7%) as compared to 29(5.1%) among patients administered while seated. The conversion rate among patients administered while in lateral position was significantly (Z-test p-value < .001) higher as compared to patients administered while seated. Patients who were administered anaesthesia in lateral position were 37.517 times more likely to be converted to general anaesthesia as compared to patients administered while seated (Odds ratio = 37.517, p-value = .003).

The conversion rate among patients administered hyperbaric bupivacaine was 0% as compared to 31(5.5%) among patients administered plain bupivacaine. There was no statistical significant (Z-test p-value = .317) in conversion rates between patients administered hyperbaric bupivacaine and patients administered plain bupivacaine. Comparing morphine and fentanyl, no patient who received morphine was converted although we had very few patients who received morphine.

Among patients who received ketamine 17(80.9%) were converted but 4(19.1%) patients received sub-anaesthetic doses of ketamine .14 patients were intubated under ketamine while 14 patients were intubated under muscle relaxant 92% of these were preoperative and the rest intraoperative. Ketamine was used in haemodynamicaly unstable patients.

Cold (spirit swabs) were used to determine the height of sensory block. Conversion rates among patients with sensory height less than T5 was 11(6.2%), whereas among patients with sensory height of between of between T5 and T10 it was 16(4.4%) while those with sensory height of more than T10 were 4(12.5%). There was no statistical significance (Chi-square test p-value = .126) in conversion rates among patient's sensory height. Conversion occurred in patients who had adequate block at first mainly as a result of prolonged surgery.

The conversion rate according to Bromage Scale was; grade 0 (0%), grade 1 (40%), scale 2 (7.7%) and scale 3 (3.8%). The conversion rates varied significantly (Chi-square test p-value < .001) with motor grading. Some of the patients had a higher grade at the beginning but were converted because of prolonged surgery.

On analysing conversion rates among different cadres of surgeons, surgeries performed by medical interns were 0% because there was only 1 intern. Surgeries done by registrar surgeons were 4.5% while surgeries done by consultant surgeons were 11.1%. There was statistical significance (Chi-square test p-value = .047) in conversion rates among surgeries done by different cadre of surgeons. The conversion rate among surgeries done by consultant surgeons was significantly the highest the reason being the consultants operated on complicated cases i.e. fibroids with pregnancy, more than 3previous scars hence the surgeries were long. We had 1 most complicated case that

took 4 hours due to postpartum haemorrhage hence subtotal; hysterectomy was done. The ureters were also repaired and haemostasis achieved. Majority (75.0%) of the patients who underwent conversion were operated on by registrar surgeons. Similarly majority (85.2%) of the patients who did not undergo conversion were operated on by registrar surgeons.

Duration of surgery affected intraoperative conversion in that the longer the surgery took the more likelihood of conversion. Conversion rates for surgeries done in less than 45 minutes was 2.0%, among surgeries done between 45 and 60 minutes was 3.8% while for surgeries done for more than 60 minutes was 12.0%. Conversion rates (Chi-square test p-value < .001). Conversion rates among surgeries done for more than 60 minutes was significantly the highest and this presents prolonged surgeries. This was a higher rate compared to different studies by Carin 0.1% converted due to hysterectomy that prolonged surgery and Kundra 2.2% who had prolonged surgery hemodynamic instability and inadequate block.

Conversion rates among patients who lost blood between 0.5 and 1 litre was 3.7% while the conversion rates among patients who lost more than 1 litre of blood was 30.6%. The conversion rate among patients who lost more than 1 litre of blood was significantly (Z-test p-value <.001) higher than the conversion rates among patients who lost blood between 0.5 and 1 litre. This is probably due to complications like post-partum haemorrhage that resulted in longer surgeries hence the conversions in this group.

Conversions do occur preoperatively or intraoperative depending on commencement of surgery. In this study 13(41.1%)patients converted preoperatively 10 of whom had no spinal anaesthesia instituted due to failure to locate the correct space and 3 had inadequate block 18 (58.9%) were converted intraoperatively due to either to prolonged surgery or intraoperative pain.

Study limitation

We lacked pregestational body mass index.

Conclusion

Compliance to RCA recommendation in all aspects is a big challenge. Conversion rate was at 9.7% for elective cases and 5.1 % for emergency cases much higher than the RCA recommendations of <3% for elective cases and <1% for emergency cases.

Most of the conversion occurred intraoperatively the reason being prolonged surgery by the consultants who had complicated cases.

There was no association between the classification of caesarean section and conversion rate.

High blood loss was associated with higher probability of conversion due to prolonged surgery.

Recommendation

1. Pregestational body mass index should be indicated in antenatal clinic book.
2. Standardized protocols on when should a consultant obstetrician come for help intraoperatively should be put up.
3. More time and larger sample needed to compare conversion rate among those seated Vs lateral position in another study.

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APPENDIX 1:

COVER LETTER

My name is Nabukwangwa Simiyu undertaking my MMED programme in Anaesthesia.Am carrying out a research as part of my programme. I would like to explain to you what the research entails.

Purpose of research

The purpose of this research is to find out the portion of mothers who were planned for caesarean section via injection on the back to alleviate pain during surgery but they had to be given other medicine because surgery couldn't go ahead. I would like to find out why mothers scheduled for injection at the back had to be given other medicine and at what point did the anaesthesia provider give the medicine. I will indicate if any the complications of injection at the back that led you to be given other medicine and complications of other medicine so that your anaesthesia provider is aware in future for your proper management. I will be observing from the time the injection is given at the back till the surgery is over for the aforementioned things. Am not going to participate in your management but incase of life threatening event like difficult intubation or cardiac arrest then I will have to help in your management .This study will be conducted by my co-investigator or me by filling an attached questionnaire. All this information will be used for better management of our patients.

Research intervention

This research is purely observational and it will not involve any intervention unless there is a life threatening event like cardiac arrest or difficult intubation.

Voluntary participation

Your participation in this research is solely voluntary. You are free to with draw from the study at any time.

Duration

This will take seven minutes getting your details but the rest of the questionnaire will be filled as the operation goes on.

Risks

By participating in this research you will not be exposed to any risks.

Benefits

No monetary benefits will be offered to you.

Confidentiality

Any information that I will collect from you in this research will be confidential. The information will have your initials to which a serial number will be assigned instead of your name

Who to contact

If you have any queries or need any clarification now during or after the study contact Nabukwangwa Miriam Simiyu on 0710900312

Dr.Gacii-supervisor.Telephone number 0733709953

KNH/UON-Ethics &Research Committee.Prof.A.N Guantai,Chair,Telephone number_2726300 Ext.44102 or uonknh_erc@uonbi.ac.ke

Appendix 2:

CONSENT FORM

I/next of kin of …….hereby consent to be included in the study that involves looking at the portion of mothers giving birth via operation after an injection at the back that necessitate surgery but convert (change of plan from your initial plan or recourse in this case ; change of type of medicine you are given to necessitate surgery) to general anaesthesia(sleep-induced by our drugs during surgery ,you are neither awake nor will you fell pain during surgery) .The aim is to observe for any recourse ,at what point will the recourse take place ,why did the recourse take place ,drugs used after conversion, and any problems that came up after conversion. All this information will be documented in my file incase there is change of plan from the already started plan to help the future anaesthesia provider in your future management. The primary investigator will not take part in my management unless there happens to be a life threatening event like difficult intubation or cardiac arrest.

I confirm that I have read the cover letter outlines the nature of the study and understand that confidentiality will be maintained.

I fully understand that I can withdraw from the study at any time without victimization.

I hereby give consent to be included in this study.

Name_____

Thumb print_____

Signature _____ Date_____

Statement by the researcher

I confirm that the participant/next of kin was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered. I confirm that the individual volunteered to participate in the study and consent has been given freely.

Name_____Signature_____Date_____

Swahili version

Maelezo

Jina langu ni Daktari Nabukwangwa Simiyu., mwanafunzi wa shahada ya pili katika chuo kikuu cha Nairobi.Kama sehemu ya masomo yangu, nastahili kufanya utafiti wa kitibabu.Lengo langu ni kufanya utafiti kwenye uzazi ukumbi katika Hospitali ya Taifa ya Kenyatta.Nia yangu,ni kujua kiwango cha mama watakao jifungulia anesthesia ujumla ilhali walipangiwa anesthesia kikanda.Sababu na wakati ambao uongofu ulitukia.Lengo la utafiti huu ni kusaidia madaktari kuboresha huduma unaotolewa kwa wagonjwa. Taarifa zote zilizokusanywa zitashughulikiwa na usiri. Hakuna majina au vitambulisho vingine zitakavyotumika katika utafiti. Kwa hiyo nitahitaji idhini yako / mwenzako kuwa mshiriki katika utafiti huu.Sitakua kati ya ile timu ya kukutibu lakini tukio kubwa likifanyika kama moyo kusimama kusukuma damu ama kuwa na ugumu wakati wa kuingiza mpira wa hewa kwenye koo ya pumzi nita wasaidia kukushughulikia.

Ushiriki wako katika utafiti huu ni kwa hiari yako na unaweza kuondoka / kuondoa mwenzako katika hatua yoyote bila kuathiri matibabu utakayopewa atakayopewa mwenzako kwa njia yeyote. Taarifa zote zitakazopatikana katika mwendo wa utafiti huu ni manufaa kwa mgonjwa.

Kwa maelezo zaidi na ufafanuzi,unaweza kuwasiliana na:

Nabukwangwa Miriam Simiyu nambari ya simu_ 0710900312

Dr.Gacii-supervisor.Nambari ya simu_ 0733709953

KNH/UON-Ethics &Research Committee.

Prof.A.N Guantai, Chair_ Telephone number_2726300 Ext.44102 or uonknh-_erc@uonbi.ac.ke

Kibali cha mgonjwa

Mimi…….kutoka……...ama jamaa wa karibu wa……. Kutoka……..nimekubali kushiriki katika utafiti wa mama ambao hupangiwa anesthesia kikanda(kupeana dawa kwenye mgongo kupitia sindano ili hujihisi kutoka matiti kurudi chini ndiposa upasuaji uendelee,utakua macho,utamwona mwana akishazaliwa) lakini mabadiliko hutukia baadaye katika uzazi ukambi,KNH.Badilisho hili huwezesha daktari kukupa dawa zingine ili ulale kabisa usielewe kinachoendelea wakati wa upasuaji. Mtafiti hatakua kati ya ile timu ya kukutibu lakini tukio kubwa likifanyika kama moyo kusimama kusukuma damu ama kuwa na ugumu wakati wa kuingiza mpira wa hewa kwenye koo ya pumzi ataingilia kati.Lengo la mtafiti haswa ni kuchunguza ni wakati upi ambao mabadilisho ya dawa ya kuwezesha upasuaji utafanyika.Ni sababu zipi ztakazofanya ubadili utukie,Dawa zitazotumiwa na maafa yatayotukia baada ya kubadili mpango ule wa Dawa uliopangiwa mwanzo.Haya yote atayafanya ili aone venye matibabu ya wagonjwa yataboreshwa.

Ninaelewa ya kwamba uchunguzi utafanyika bila madhara yoyote Kwa mgonjwa.

Nina uhuru wa kujiuzulu kutoka kwa utafiti huu wakati wowote ule.

Sahihi_____Finyo kidole cha gumba_____ Tarehe_____

Ninathibitisha ya kwamba nimemweleza mgonjwa Kwa ukamilifu kuhusu utafiti huu.

Sahihi_____ Tarehe_____

Appendix 3:

QUESTIONNARE

1. Patient's details

Patient's initials…… Age (years)……..Parity…..

Weight..... (Kg) Height…….. (cm) BMI…….. Kg/m2

2. Classification of caesarean section

A) Elective

b) Emergency

3. Indication for caesarean section

a) Maternal reason

b) Foetal reason

4. Cadre of anaesthetist performing the procedure

a) Higher diploma clinical officer trainee

b) Registrar

c) Registered clinical officer anaesthetist

d) Consultant

5. Categorization of the trainees.

Cadre	Year 1	Year2	Year 3
Clinical officer HND trainee			
Registrar			

6. Position of patient during administration of regional anaesthesia

a) Lateral

b) Seated

7. Drugs used:

	Drug	Dosage
Local anaesthetic: hyperbaric bupivacaine-		
plain bupivacaine-		
Others	Fentanyl/morphine	
	Ketamine	
	Midazolam	

8. Height of sensory block……

9. Motor grading according to Bromage scale

Grade		Indicate with x
0		
1		
2		
3		

10. Cadre of the surgeon

a) Medical officer intern

b) Registrar

c) Consultant

11. Experience (years)

a) 0-5

b) 5-10

c)>10

12. Duration of surgery (minutes)

a) 0-45

b) 45-60

c)>60

13. Estimated blood loss (litres)

a) 0.5-1

b)>1

14. Conversion to general anaesthesia

a) Yes

b) No

If there is conversion, proceed to question 14.

14. Time of conversion (minutes)

a) 0-30

b) 30 -60

c)>60

15. Type of conversion

a) Intubation under muscle relaxant.

b) Ketamine with mask.

c) Others……(specify)

17. Reasons for conversion

1. Failed spinal

2. Prolonged surgery

3.Complication of regional anaesthesia.

1.Total spinal

2.High spinal

3.Others…….

4. Others…….

18. Complications of conversion.

1. Difficult intubation

2. Failed intubation.

3. Aspiration

4. Pulmonary oedema

5. Others…… (Specify)

APPENDIX 4:

SPINAL ANAESTHESIA PROTOCOL KENYATTA NATIONAL HOSPITAL MATERNITY THEATRE.

1. Know the indications & contra-indications
2. Inform the patient what you wish to do and have their cooperation
3. Inform the rest of the team in theatre so you can be assisted appropriately
4. Insert a good gauge I/V cannulise (20 or larger)
5. Pre-load with ½ -1L N/saline / Hartman's over 30- 60mins
6. Install your monitors (pulse, respiration, SPO2, BP, and ECG) and take baseline readings
7. Position the patient either sitting or lateral knee-chest. Make the patient comfortable
8. Open your Spinal Tray & clean the site & drape.

Spinal Tray should contain:-

a) Sterile towels for draping the patient

b) 2 gulley pots for holding cleaning solutions

c) Appropriate spinal needle (with introducer where required)

d) 2 syringes & Needles

I. 5ml syringe for infiltration of L.A to the site

Ii. 2ml syringe for administering the spinal medication

iii. Sterile gauze pads for cleaning & dressing

9. Reconfirm the position of the patient (knee chest)
10. Identify the site: mid-line L3-4/ 4-5 & administer 3ml of 1% lignocaine using a gauze 21 needle to maximum depth. Withdraw the needle as you continue to administer L.A and raise a skin wheal.

11. Give 1-2 minutes for the L.A to take effect as you re-assure & position patient (if administered well, this usually covers one vertebra above & below, should you need to alter position of lumbar puncture)

12. While waiting for L.A to take effect, prepare your appropriate drug. You must have decided whether using plain or heavy L.A

a) Remember Heavy L.A is position dependent. The patient must be appropriately positioned after injection to allow desired distribution.

b) Bupivacaine is usually 0.5% concentration. The highest volume in tall patients will be 4 ml (20mg). Most patients will require between 7.5mg (1.5mls) to 15 mg (3ml).

c) Obstetric patients are more sensitive and will require between 10mg (2ml) to 12.5mg (2.5ml). Aim for a block up to T6. Test and record level of block.

d) Additive: 25mg Fentanyl (0.5ml) is a useful additive to prevent the discomfort of gut handling during CS etc. This must still make up the total volume of 2-2.5 ml of drug injected into the spinal canal. Other drugs have been used as additives but its best to avoid them unless you have been trained to use them. The haphazard use of additives into the CSF may have disastrous results.

e) Remember for CS the volume & position is critical to achieve a good or disastrous spinal block. Aim for a block up to T6.

13. Confirm the L.A has taken effect and note level/site for the block.

Insert the spinal needle. Usually there is a sudden give when the needle goes through the dura. Withdraw the styled and check for CSF flow. Do not allow unnecessary drainage of CSF. Use the stylet to stop the flow temporarily, if you cannot administer the spinal drug immediately.

14. Administer the drug, dress the puncture site, and position the patient appropriately to allow planned distribution of drugs. Rapid positioning after administration is critical if the drug used is hyperbaric (heavy).

15. Start your post-spinal monitoring & make adjustments accordingly. It is recommended to repeat BP readings at 1 minute intervals. You will need to respond rapidly to the initial changes in pulse & BP. Ask the patient to inform you immediately if nausea occurs. Nausea in spinal anaesthesia is most likely due to hypotension. It is an early warning sign that you must not ignore.

16. Test the level of the block. The tilt of the bed may have to be adjusted if using hyperbaric Local Anaesthetic to change drug distribution. This manipulation may only work within the first 10-20 minutes after administration of the L.A into the CSF.

17. Post-operative pain management - I/M Pethidine 1mg/kg 4-6 hourly for 24 hours

- Diclofenac suppository (or equivalent) stat & 12 hourly for 48 hours then orals.

- Follow up visit, within 24 hours.

18. Critical observation

a) Pulse – symptomatic bradycardia – Atropine 0.1 -0.6mg

b) SPO2 saturation ≤90% - Increase the O2 flow.

c) BP –symptomatic Hypotension

-Ephedrine -5mg-10mg PRN (you may occasionally need an infusion)

- Phenylephrine

- Adrenaline

d) Respiration –falling respiratory rate (usually temporary)

-Give oxygen

-Assist with respiration briefly if required

-Reassure

e) Total Spinal Anaesthesia

i. Convulsions /loss of consciousness

ii. Respiratory failure

iii. Cardiovascular collapse

Intubate, ventilate, cardiac massage, vasopressors, anticonvulsants till vital signs stabilize.

f) Post spinal headaches

May occur post operatively. Are worse on standing & relieved by lying down.

Management

i. Bed rest

ii. Plenty of fluids

iii. Non-Steroidal Anti-inflammatory Drugs (NSAIDS)

iv. Epidural blood patch as a last resort

19. Post-Operatively –monitor BP ¼ hourly for 2hrs.

Positioning –make patient comfortable with pillow under the head.

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8th April, 2015

Dr. Nabukwangwa Simiyu
School of Medicine
Dept. Anaesthesiology
University of Nairobi

Dear Nabukwangwa

Research Proposal: Incidence of Regional Anaesthesia Conversion to General Anaesthesia During Caesarean Section at the Obstetric Theatre, Kenyatta National Hospital (P722/12/2014)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 8th April 2015 to 7th April 2016.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website **www.erc.uonbi.ac.ke**

Yours sincerely,

PROF. M. L. CHINDIA
SECRETARY, KNH/UON-ERC

c.c. The Principal College of Health Sciences, UoN
The Deputy Director CS, KNH
The Chair, KNH/UoN-ERC
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