Prevalence and factors associated with failed spinal anaesthesia in failed spinal anaesthesia undergoing caesarean section at Muhimbili National Hospital Dar-Es-Salaam, Tanzania.

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MMed (Anaesthesiology) Dissertation
Muhimbili University of Health and Allied Science
October, 2019
Muhimbili University of Health and Allied Sciences

Department of Anaesthesiology

PREVALENCE AND FACTORS ASSOCIATED WITH FAILED SPINAL ANAESTHESIA IN PREGNANT WOMEN UNDERGOING CAESAREAN SECTION AT MUHIMBILI NATIONAL HOSPITAL DAR-ES-SALAAM, TANZANIA

By

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A Dissertation Submitted in (Partial) Fulfillment of the Requirement for the Degree of Master of Medicine (Anaesthesiology) of

Muhimbili University of Health and Allied Science
October, 2019

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: **''*Prevalence and factors associated with failed spinal anaesthesia for caesarean section at Muhimbili National Hospital, Dar-es-salaam, Tanzania*'',** in (partial) fulfillment of the requirements for the degree of Masters of Medicine (Anaesthesiology) of the Muhimbili University of Health and Allied Sciences

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Date

DECLARATION AND COPYRIGHT

I**, Kilawe Advesta**, declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature…….. **Date** ……

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ACKNOWLEDGEMENT

My heart is full of joy to accomplish this dissertation. I would like to express my great thanks to all the people who contributed in one way or another way for its realization.

First, I thank God for his grace and truth; He is always faithful in his promises to us.

I would like to express my gratitude to the Ministry of Health and Muhimbili National Hospital for their vision and Sponsorship which allowed me to study a master's degree at MUHAS.

I would like to address special thanks to my supervisor Dr Respicious Boniface for his support, advice and endless patience in improving my work.

I would like to thank DR Godfrey Sama for his guidance, assistance to my research proposal and dissertation.

Special thanks go to my beloved son, Deogratius Jr who has been my greatest motivation throughout my study period.

I am also grateful to my family members, parents, young sisters, my brother for their trust in my personality and their constant encouragement during my study period.

Finally, for all of you, who I did not mention the names but you helped me in one way or another, please receive my feeling of great thanks.

DEDICATION

To my beloved son Deogratius Jr, and you who I am expecting to be born,

To my parents Mr and Mrs Ponsian Kilawe,

To my sisters,

To my brother,

I dedicate this work.

ABSTRACT

Introduction

The use of spinal anaesthesia has increased in the last three decades and is the recommended anaesthetic of choice for better fetal and maternal outcomes in caesarean delivery. Failed spinal anaesthesia exposes patients to the unfavourable experience of pain and the potential complications of general anaesthesia that are being avoided in the first instance. Previous studies have shown the safety of spinal anaesthesia over general anaesthesia.

Objective This study aimed to determine the prevalence and factors associated with failed spinal anaesthesia among pregnancy women undergoing caesarean section at MNH.

Methodology

This was a descriptive quantitative cross-sectional study that was done from October 2018 to January 2019 at Muhimbili National. Pregnant women who were scheduled for elective or emergency caesarean section under spinal anaesthesia in the theatre were recruited for this study. For each consenting pregnant woman, a research questionnaire was completed, documenting demographic information, clinical information anaesthetic and surgical information. Statistical Package for Social Scientists (SPSS) version 20 was used for analysis. Continuous variables were presented as mean, standard deviation and categorical variables were presented as a percentage. Association was tested via Chi-square test for categorical variables. A p-value of 0.05 was used for statistical significance.

Results:

The prevalence of failed spinal anaesthesia in pregnant women who underwent a caesarean section at MNH was high (18.2%). Majority of the failed block were partial and all occurred intraoperatively.).Majority of pregnant women were anaesthetized by a nurse anaesthetist (51%) Failed spinal anaesthesia was associated with the experience of the anaesthesia provider, multiple skin attempts at the puncture site and the level of block achieved (p value<0.001). Obesity, previous spinal anaesthesia, emergency caesarean section, the rank of training, position during induction and, blood CSF did not show a significant association with

failed spinal anaesthesia at MNH. Low APGAR Score was also found not to be associated with failed spinal anaesthesia. The complications of spinal anaesthesia were hypotension (30.9%), vomiting (3.6%), high spinal (1.8%) and shivering (9.7%).

Conclusion and recommendations

The prevalence of failed spinal anaesthesia in pregnant women who underwent a caesarean section at MNH was high (18.2%). The majority of failed spinal anaesthesia was partial and occurred intraoperatively. Prevalence of failed spinal anaesthesia was associated with multiple skin attempts at the puncture site, height of the block and experience of the anaesthesia provider. Majority of the pregnant women were anaesthetized by nurse anaesthetists. The complications of spinal anaesthesia were hypotension, vomiting, high spinal and shivering and they were all managed depending on the perception and knowledge of the anaesthesia provider. Presence of senior anaesthesia provider, educating the anaesthesia provider the importance of checking the level of a block after giving spinal, having a protocol on how to proceed after a failed spinal should be considered as preventive strategies to reduce failed spinal anaesthesia prevalence at MNH.

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LIST OF ABBREVIATIONS

ASA	American Society of anaesthesiologists
CRF	Case Report Form
RCoA	Royal College of Anaesthetists
C/S	Caesarean section
EMNOC	Emergence comprehensive obstetric and neonatal care
GA	General Anaesthesia
FSA	Failed spinal anaesthesia
MUAC	Mid upper arm circumference
MNH	Muhimbili National Hospital
MMED	Masters in medicine
RA	Regional anaesthesia
RSI	Rapid sequence induction
SAB	Subarachnoid block

DEFINITIONS OF KEY TERMS.

- **Anaesthesiologist**- A physician trained in administering anaesthesia
- **Nurse anaesthetist**- He/ she are a nurse with special additional training in the science, practice and administration of anaesthesia.
- **Anaesthesia provider**- He/she is a health provider trained in administering anaesthesia.
- **Caesarean section**- This 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 foetus.
- **Body mass index**-This is the ratio of the weight of the patient in kilogram to height in a square meter.
- **Spinal anaesthesia**- This is a form of regional anaesthesia involving the injection of local anaesthesia into the subarachnoid space, generally through a fine needle usually 9cm long.
- **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.

CHAPTER ONE

1.0 INTRODUCTION

1.1 General overview of spinal anaesthesia and caesarean section

Globally, there is an increasing caesarean section rate, and spinal anaesthesia is the anaesthetic of choice for this operative procedure. In Tanzania, the rate of caesarian delivery has increased from 29.9% in 2005 to 35.5% in 2010with spinal anaesthesia being the most common method of anaesthesia in the district and regional hospitals in the country (1). The worldwide trend towards spinal anaesthesia for cesarean section is also on increase due to the superior safety profile over general anaesthesia (2) (3). Most common indications for cesarean delivery being arrest dilatation, non-reassuring fetal status, cephalopelvic disproportion, malpresentation, prematurity, prior caesarian delivery, and prior uterine surgery involving the corpus (4).

The urgency of the procedure, the condition of the mother and fetus and the mothers wish are known reasons guiding the choice of anaesthesia method used, whether spinal or GA (5).

Previous studies have shown the safety of Spinal anaesthesia over general anaesthesia (5). This method is the main anaesthetic method used at MNH, where a parturient undergoing caesarean section is given spinal anaesthesia using size 25-gauge quincke spinal needle and 10mg of 0.5% hyperbaric bupivacaine.

A 2001 survey of obstetric anaesthesia practices in the United States revealed that most patients undergoing cesarean delivery do so under spinal or epidural anaesthesia. The advantages of Spinal anaesthesia include, avoidance of the necessity of airway manipulation, lessen the risk of gastric aspiration, avoid the use of depressant anaesthetic drugs, allow the mother to remain awake during delivery, associated with less operative blood loss, have excellent postoperative analgesia. Also compared to general anaesthesia, there is less immediate neonatal depression after neuraxial compared with general anaesthesia (5) (6).

In spinal anaesthesia, a spinal anaesthetic agent is injected into the subarachnoid space where it bathes the nerve roots. The anaesthetic agent is diluted within the cerebrospinal fluid and after that diffused in the nervous tissues where it attaches to the neural receptors. The blockage of transmission in the nerve roots interrupts somatic, visceral, autonomic, and motor outflow (7). The resulting interruption produces different levels of blockage with a loss of sensation to the temperature that is two segmental dermatomes higher than pain and light touch which in turn are usually two segmental dermatomes higher than the loss of motor function. (7)

Landmarks for spinal anaesthesia

To prevent needle trauma to the spinal cord, the spinal needle is inserted below the second lumbar vertebra in adults. A lumbar puncture is then performed using the spinous processes of the lumbar vertebra at the intercristal plane, (a horizontal line joining the highest points of the iliac crests).

Assessment of spinal anaesthesia level

Following the administration of the spinal anaesthetic agent, it is important to assess whether a satisfactory level of the block has been achieved as this is essential before proceeding with the caesarean section. (8). The modalities available for such an assessment include the loss of sensation to cold when ice is applied, to touch or a sharp pinprick. (9).

Each modality of assessment provides different heights of the anaesthetic block, which may then be sufficient for a caesarean section to be performed.

Ousley et al reported that the loss of sensation to touch at T10 (umbilicus), a loss of sensation to pinprick at the level of T5 and loss of sensation to a cold modality at T3 level was adequate for caesarean section. (10)

Relevant anatomy

In order to perform effective spinal anaesthesia, it is imperative that anaesthetists have a thorough knowledge of the anatomy of the spine, including musculature and innervations of the structures(11) likewise a surgeon cut through the following structures during caesarean section: skin of lower abdomen which is innervated by T12 dermatomes; the peritoneum

which is innervated as high as T4 dermatomes. A pain-free caesarean section requires denervation of peritoneum which corresponds to T4 dermatomes; the uterus which is innervated by T12. (12). Thus for successful spinal anaesthesia, the segmental dermatome block must extend up to T4.

The vertebral canal

The vertebral canal contains the spinal cord and its coverings. The meninges of the vertebral canal divide the vertebral canal into the epidural and subarachnoid spaces that contain the cerebrospinal fluid. The spinal cord and its roots are protected within the bony vertebral canal. The vertebral column of an adult consists of thirty-three vertebrae arranged in five regions, viz. seven cervical, twelve thoracic, five lumbar, five sacral and four coccygeal. (12).

Each lumbar vertebra has a large vertebral body and sturdy lamina to withstand the weight it bears.

A vertebral canal is boarded anteriorly by the vertebral body, laterally by the pedicles and transverse processes and posteriorly by the lamina and spinous processes. (7). The bones of the vertebral column are arranged to form cervical, thorax, lumbar and sacral curves in the adult spine. The articulation between two adjacent vertebrae allows for significant flexion thus enabling the introduction of the spinal needle via the interlaminar space. (12).

The five lumbar vertebrae are arranged in a column and are separated by fibro-cartilaginous inter-vertebral discs. Spinal malformations or abnormalities such as kyphosis or scoliosis have an impact on the provision of spinal anaesthesia as reported by Fettes P et al since they may affect the distribution of anaesthetic agent within the subarachnoid space. (13). Conversely, studies among patients with scoliosis have shown that regional anaesthesia could be administered safely. (14).

Since abnormalities of the spine result in the challenging identification of landmarks for a lumbar puncture, they were found to be a predictor of technical difficulty in spinal anaesthesia (14). The use of pre-procedural ultrasound was shown to increase the success rate of spinal anaesthesia in patients with challenging spinal anatomy. (14). However, one study reported that the success rate of spinal anaesthesia by experienced anaesthetists was not influenced by the use of ultrasound among parturients with easily palpable spines. (15).

To conduct successful spinal anaesthesia, the local anaesthetic agent must be deposited into the subarachnoid space. This space contains cerebrospinal fluid, the spinal nerve roots, radicular, segmental medullary, spinal arteries, veins and arachnoid trabeculae. (12).

The effectiveness of the spinal anaesthetic agent is affected by the relative density and volume of the CSF. (16). Large volumes of CSF in the lumbosacral region may lead to over-dilution of the local anaesthetic and subsequently cause the failure of the spinal block. (17).

To access the subarachnoid space, a spinal needle passes through the following layers Skin, Subcutaneous tissue, Supraspinous ligaments
Interspinous ligaments, Ligamentum flavum, Epidural space, Dura and arachnoid mater. The depth from the skin to the subarachnoid space is influenced by gender, obesity, pregnancy and ethnicity. There was a statistically significant correlation between SSD and BMI among 332 Indian parturient. (18).
With the increasing epidemic of obesity among Tanzanian women, it is imperative for an anaesthetist performing spinal anaesthesia to have knowledge of the SSD of their patients as these guides the placement of the spinal needle. Ultrasonography improves the localization of the subarachnoid space, thereby improving the success rate of spinal blocks in obese patients. (19) (20).

The effect of pregnancy on the anatomy of the spine

During the later stage of gestation, the size and weight of uterus progressively displace the body's centre of gravity and lumbar lordosis occurs as a compensatory mechanism. (21). This anatomical change may contribute to the misidentification of landmarks during a lumbar

puncture procedure, thus increasing the risk of neurological injury. The compression of the inferior vena cava by the uterus in the third trimester also causes engorgement of the epidural blood vessels leading to a reduction in the volume of the lumbosacral subarachnoid space. A study done by Cronje recommended that a smaller amount of anaesthetic agent be used for spinal anaesthesia in pregnant women as the epidural and subarachnoid space is reduced. A low dose of 0.5% heavy bupivacaine (1.8 – 2.0mL) combined with fentanyl has produced effective spinal anaesthesia with fewer hypotensive side effects as compared with a high dose of heavy bupivacaine alone (22).

Equipment requirement

Spinal needles, Spinal needles are available in different sizes (from 16 to 30 gauge), lengths, and bevel and tip designs (7). The shape of the tip of a spinal needle is either a pencil or cutting point. Studies have reported a greater incidence of post-dural puncture headaches when a larger cutting point spinal needle is used. (23).

1.2 Literature Review

General or regional anaesthesia is necessary to perform caesarean sections on a pregnant woman.

Internationally, there has been an increasing trend towards the preferential use of regional anaesthesia for caesarean section due to higher safety levels when compared to general anaesthesia (24) (25).

In an audit conducted in England shows that over 90% of caesarean sections performed were done using regional anaesthesia (26).

A study done in Nigeria reported that 78.1% of the caesarean sections are conducted using spinal anaesthesia (2).

In Tanzania, the proportion of caesarean sections performed under spinal anaesthesia varies across the different levels of health facilities. Evidence reveals that a large proportion of caesarean sections are performed under spinal anaesthesia in the public health facilities (1). The techniques employed to administer regional anaesthesia include (i) spinal anaesthesia (ii) epidural anaesthesia,(iii) combined spinal-epidural anaesthesia and (iv) continuous spinal anaesthesia.

There are no published studies concerning the incidence or predictors of failed spinal anaesthesia for caesarean section in Tanzania. Various incidences of failed spinal differ from hospital to hospital as well as over a period at the same centre.

The incidence of failed spinal anaesthesia ranges between 2.7%-11.7% in recent studies (3) (5). The lowest incidences are reported in developed countries, which may reflect refinements in modern anaesthesia and adequate well-trained anaesthesia providers.

Failed spinal anaesthesia is a multifactor event. It can occur preoperatively or intraoperatively, a study by Alab showed that the majority of failed spinal anaesthesia occurred intraoperatively (5). A higher rate of 11.6% was reported in the USA and was attributed to the low level of experience of the anaesthesia provider. (2)

Another study done in Nepal reported a failure rate of 6% and the level of experience of anaesthesia provider and position were among contributing factors. (12)

In South Africa, a relatively high rate of 11.7% was reported among parturients undergoing caesarean section which was attributed to the low level of experience of the provider of the anaesthesia, multiple skin attempts and level of block achieved. (5). Similarly, a study done in Nigeria reported a failure rate of 6% which was attributed to obesity and inadequate experience of anaesthesia providers (4).

An acceptable failure rate of spinal anaesthesia could be achieved if the provider is aware of all the possible technical errors of the procedure that may lead to failure of spinal block (27). Studies have reported that competency could be achieved by a trainee after 36 – 112 attempts of spinal anaesthesia. The competence achieved by the trainee was also found to be influenced by formal and structured training, trainer-trainee interaction, stressors and visualization of the procedure (26)

Identifying the anatomical landmarks for spinal anaesthesia is influenced by factors such as pregnancy, height, obesity, anatomical abnormality and posture (28). Studies reported that knowledge of the anatomical landmarks is an independent predictor of a successful spinal block. Poorly identifiable landmarks may result in multiple skin puncture attempts, thus increasing the chance of failed spinal anaesthesia. Several studies reported on problems experienced when performing spinal anaesthesia in obese patients. A study conducted in the United States of America confirmed that patients with a BMI greater than 25kg/m2 had higher rates of failed blocks compared to those with lower BMIs .(14,29)

The loss of bupivacaine, the anaesthetic agent, may arise because of: (i) The spinal needle being partly inside or partly outside the subdural space, Leakage of anaesthetic between the syringe the spinal needle, Displacement of the spinal needle from subarachnoid during the procedure (13).The loss to cerebrospinal fluid (CSF) containing an extradural cyst. (30). Yamak et al reported that a case of failed spinal anaesthesia was due to spinal arachnoid cyst (31)

The efficacy of bupivacaine, an anaesthetic drug used for spinal anaesthesia may be affected by an inadequate dosage and prolonged exposure to light. ((32)

Studies have shown a higher incidence of failed spinal anaesthesia among patients with a history of addiction to Marijuana, Tramadol and Clonazepam (33). There is a correlation between an old scorpion bite and the development of resistance to local anaesthetics used for a spinal block (34).

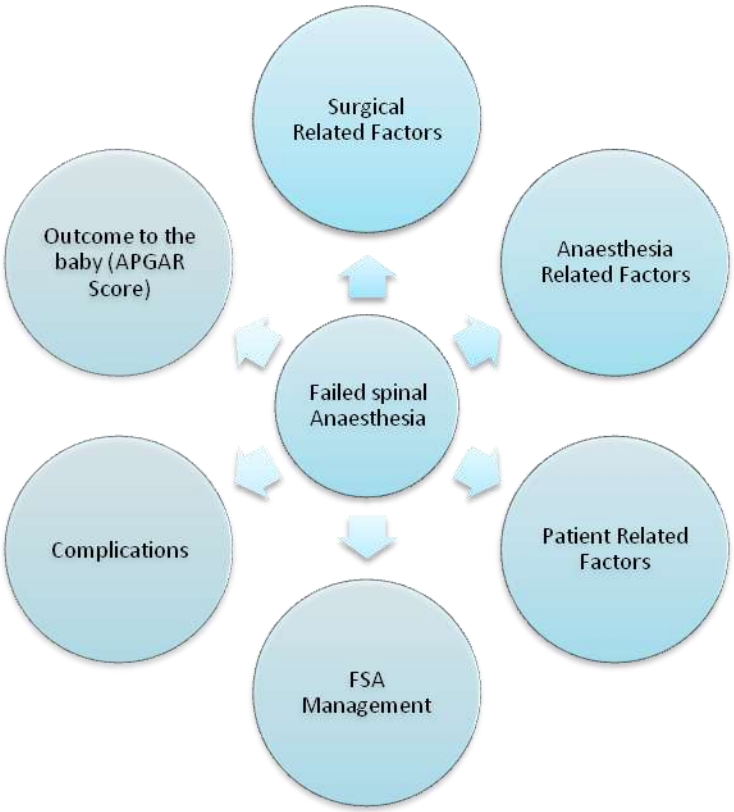
Spinal anaesthesia, although a relatively safe procedure, has several complications, the majority of studies have reported the following complications, hypotension, vomiting, hematoma, cardiac arrest, shivering and headache. (29). Hypotension is by far the most frequent complication following spinal anaesthesia. (5)

1.3 Statement of the Problem

Muhimbili National Hospital offers obstetric anaesthesia to parturients who require caesarean sections. The Royal College of Anaesthetists of United Kingdom recommends an acceptable failure rate of less than 1% for elective and less than 3% for emergency caesarean section. (2).However, the prevalence and contributing factors for the occurrence of failed spinal anaesthesia are not much studied in this setting and Tanzania in general.

The lack of guideline on the acceptable failure rate of spinal anaesthesia in Tanzania means that local benchmarks do not exist for anaesthetists providing spinal anaesthesia. Thus the information on the prevalence and factors associated with failed spinal anaesthesia will be useful in prioritizing training needs of doctors toward improving the clinical outcomes from caesarean sections in the hospital. In general, there are a limited number of anaesthesiologists to the population ratio. Most of the anaesthesia care is provided by nurse anaesthetists. To the level of our knowledge, no study has reported if there is any difference in terms of failed spinal anaesthesia to whether the anaesthesia care provider was a nurse anaesthetist or an anesthesiologist.

1.4 Conceptual Framework



Key: ⟶ influences

The narration of conceptual framework:

This study intends to study the prevalence and the associated factors of failed spinal anaesthesia in pregnant women undergoing cesarean section at MNH. Independent variables which can influence the occurrence of failed spinal anaesthesia comprise patients related factors, anaesthesia related factors and surgical factors. Patient-related variables which will be studied include age, BMI, past obstetric history and previous spinal anaesthesia.

Anaesthesia related factors will include: the number of skin puncture attempted, size of the spinal needle, presence of free flow CSF, and characteristics of the CSF and experience of the anaesthesia provider.

Surgical related factors will include the duration of the procedure done, the presence of any surgical complications like haemorrhage.

These factors can contribute to failed spinal anaesthesia alone or in combination. Management of failed spinal anaesthesia can result either in conversion to general anaesthesia or supplementation with intravenous analgesia and complications such as difficult airway or low APGAR score can happen.

1.5 Rationale

A study of prevalence and factors associated with failed spinal anaesthesia for pregnant women undergoing cesarean section has not been done at MNH; the results of this study will be the database for other future studies and to inform the management for possible changes.

MNH is a national hospital with both anaesthetists and anesthesiologist, so it can give a clear picture of the best care in terms of anaesthesia for obstetrics in Tanzania. This may help in the formation of guidelines.

This study will help obstetricians and anaesthetic providers to take more attention to the identified contributing factors for failed spinal anaesthesia and get prepared for better maternal and child outcomes.

It is important to know the rate of failed spinal anaesthesia and associated factors because it will help for the future intervention in improving anaesthetic care for cesarean section, the formation of an algorithm to follow in failed spinal anaesthesia encounter.

This study is also done as partial fulfillment of the requirements for the degree of masters of medicine in Anaesthesiology of MUHAS.

1.6 Research Questions

1. What is the prevalence of failed spinal anaesthesia among pregnant women undergoing cesarean section at MNH?
2. What are the factors associated with failed spinal anaesthesia among pregnant women at MNH?
3. What are the complications associated with failed spinal anaesthesia among pregnant women undergoing cesarean section at MNH?

1.7 Objectives

1.7.1 Broad Objective

To determine the prevalence and factors associated with failed spinal anaesthesia among pregnant women undergoing cesarean section at MNH, between October 2018 and March 2019

1.7.2 Specific Objectives

1. To determine the prevalence of failed spinal anaesthesia among pregnant women undergoing caesarean section at MNH, between October 2018 and March 2019.
2. To determine factors associated with failed spinal anaesthesia among pregnant women undergoing caesarean at MNH, between October 2018 and March 2019.

CHAPTER TWO

2.0 MATERIALS AND METHODS

2.1 Study Design

This was a descriptive cross-sectional study, using a quantitative approach.

2.2. Study Area

This study was conducted in Obstetric theatre of Muhimbili National Hospital (MNH). MNH is located in Ilala District, Dar- es- Salaam city of the United Republic of Tanzania. This is a specialized University Teaching Hospital which provides global health cares for whole Tanzania and other countries in Africa. It is a busy hospital with a capacity of 2000 beds and a workforce of 2500employees(35). The main theatre utilizes 53 anaesthesia providers, among them 5 anaesthesiologists. Currently, it has two separate working obstetric theatres, operating 24 hours with at least three nurse anaesthetists per each theatre and one Anaesthesiologist.

2.3. Study population and subject

All pregnant mothers scheduled for elective or emergency cesarean section under spinal anaesthesia from October 2018 to March 2019.

2.3.1 Inclusion criteria

This study included all pregnant women scheduled for elective or emergency cesarean section with no contraindication to spinal anaesthesia and had already consented to the cesarean section at obstetrics theatre MNH.

2.3.2 Exclusion criteria

Pregnant mothers planned for cesarean section under general anaesthesia were excluded. Pregnant mothers who did not consent were also excluded from our study.

2.4. Variable of interest study subject

Considering the exclusion criteria, the following data were collected for patients who met the inclusion criteria:

2.4.1 Independent Variables

- ✓ Demographics: age, weight in kilogram, height in meters, the weight and height contributed in the calculation of the BMI.
- ✓ Clinical variables: high BMI and obesity, medical conditions, pregnancy status, indications of cesarean section (elective or emergency), number of previous cesarean sections.
- ✓ Anaesthetic variables: patient positioning during performing spinal anaesthesia, intervertebral space used, type of bupivacaine, level of block achieved, need for conversion to GA, need for supplemental intravenous analgesia, duration of surgery, surgical complications, APGAR score of the baby, qualification and experience of the anaesthesia provider.
- ✓ Others variables of interest were the result of failed spinal anaesthesia and its complications such as difficult intubation and low APGAR score.

2.4.2 Dependent Variable

Failed spinal anaesthesia was the dependent variable.

2.5. Sample Size

Using the formula below, the sample size of this study was estimated by taking into account the proportion of failed spinal anaesthesia among pregnant mothers undergoing caesarean section which is estimated to be 11.7 %(5)

$$N = \frac{Z^2 p (1-p)}{E^2}$$

Whereby,

N= minimum sample size

Z = standard normal deviation which is 1.96 for 95% confidence level

P = the proportion of failed spinal anaesthesia among pregnant mothers undergoing cesarean section (which is 11.7%)(5)

E = the margin of error (which is 0.05)

N = 150, hence the estimated sample size for this study was 150.

Adjusted sample size = N+10% of estimated sample size was165 patients.

2.6. Recruitment and training of research assistants

One nurse anaesthetist was recruited as a research assistant; he was trained for one day before the data collection period. He was trained in the study and familiarize him/her with the research questionnaire, and collection data tool in receiving and operating rooms. Research ethics and work schedule and logistics were part of the training. During data collection, feedback meetings between the principal investigator and research assistant were conducted on the same day after data collection.

2.7. Patient Recruitment and Data Collection

The principal investigator and the trained research assistant enrolled pregnant mothers scheduled for cesarean section under spinal anaesthesia at obstetrics theatre at MNH. They were observing the technique and completed a research questionnaire and until the minimum sample was achieved.

Standardized Data Collection Tool

For each eligible and consenting pregnant woman, a research questionnaire was completed by the principal investigator or trained research assistant, documenting demographic information, clinical information, and the details of the spinal anaesthesia as per the data collection tool.

2.8. Measurements

The weight of the patient was measured using the same calibrated electronic weight scale in a kilogram. The height was measured by tape measure in centimetre. Time was determined by the same monitoring machine in the operating theatre. BMI for age was calculated by a standard metric calculator on the CDC website for pregnant women child and teen (http://apps.nccd.cdc.gov/dnpabmi/Calculator).

2.9. Data Analysis

Data indicating patient's demographics, clinical status, anaesthetic factors, surgical factors and FSA management's outcomes were entered in the computer using Statistical Package for Social Scientists (SPSS) computer program version 20and frequency distribution was used to determine the proportion. continuous variables such as age and BMI were presented as mean and standard deviation the categorical variables such as clinical status, precipitating causes, FSA anaesthetic factors, surgical factors and management's outcomes were presented as a percentage. Data were subjected to cross-tabulations to assist in drawing correlates and inferences on the variables.FSA prevalence and factors were presented as a percentage. Association between patients' factors (BMI, Previous anaesthesia, the experience of the anaesthetic provider, multiple attempts, with FSA was tested via Chi-square test and Fisher's exact test for categorical variables and t-test for continuous variables. A 95% Confidence Interval and p-value of <0.05 was used for statistical significance. After data analysis, the result was interpreted and discussed.

2.10. Ethical Considerations and Ethical Clearance

Ethical approval was sought from the Senate Research and Publication Committee of MUHAS. Permission to conduct the study was sought from respective authorities at Muhimbili National Hospital. As this study concerned pregnant women scheduled for caesarean section under spinal anaesthesia at MNH were enrolled and that agreed informed consent was obtained.

All collected data were treated and stored confidentially and safely in secured computers. Pregnant women were told that Refusal to participate or withdrawal from the study will not involve penalty or loss of the patient right to the planned treatment.

CHAPTER THREE

3.0 STUDY RESULTS AND ANALYSIS

3.1 Demographic characteristics

We recruited a total of 165 pregnant women with a mean age of 29.6 (ranging from 16 to 45) years old and an SD of 5.51. The majority had age above 25 years old. The body mass index (BMI) was of 28.8±4.0, where 1 (0.6%) was underweight, 23 (13.9%) had normal weight, 97 (58.8%) were overweight and 44 (26.7%) were obese. Their mean height was 1.60 (ranging from 1.30-1.72) meters with a standard deviation of 0.68 (1.6±0.68). Majority, 152 (92.1%) had height above 150cm while 13 (7.9%) had height below 150cm.

Table 1: The socio-demographic characteristics of the study population

Variable		**n**	**%**
Age group	Below 25	34	20.6
	25 and above	131	79.4
BMI	Underweight	1	0.6
	Normal weight	23	13.9
	Overweight	97	58.8
	Obese	44	26.7
Height	< 150 cm	13	7.9
	≥ 150 cm	152	92.1

Among the 165 parturient who underwent caesarean section majority of them had emergency caesarean section 130(78.8%) and the rest were elective caesarean section 35(21.2%)

3.2 Prevalence of failed spinal anaesthesia

Table 2 below summarizes the prevalence and factors associated with failed spinal anaesthesia in the study population. Failed spinal Anaesthesia was observed in 30 of 165 parturients, which represents a failed spinal prevalence of 18.2%.

Majority of the failed spinal occurred intraoperatively, means after the start of caesarean section and the prevalence was high to parturients who had emergency caesarean section 25(19.2%)

3.3 Factors associated with Failed Spinal anaesthesia

We studied previous spinal anaesthesia, the rank of training of anaesthesia provider, technique related, the number of skin attempts puncture, block-level body mass index, free flow of CSF, position and working experience as factors associated with failed spinal.

The prevalence of failed spinal was high in parturients with history of previous spinal anaesthesia(22.9%).it was found that there was no significant association between previous spinal anaesthesia and failed spinal anaesthesia as the p-value was greater than 0.05.

The number of parturients anaesthetized by each qualification level during anaesthesia was, nurse anaesthetists 84(51%), certificate student 47(29%), residents in anaesthesia 23(14%), registrars 7(4%) and Anaesthesiologist 4(2%). The majority of the parturients were anaesthetized by nurse anaesthetist and only 2% by Anaesthesiologists. The prevalence of failed spinal was higher in resident anaesthesia group 34.8% and student certificate 19.1%. The lowest prevalence (0%) of failed spinal was observed in the anesthesiologist group. Nevertheless, the association between the prevalence of failed spinal anaesthesia and qualification of anaesthesia provider were not statistically significant (p=0.63).

The prevalence of failed spinal anaesthesia was high in parturients who had emergency caesarean section 19.2% versus the elective caesarean section, this difference was not statistically significant (p=0.501).

Multiple skin punctures were observed in approximately 53% of the parturients. A higher failure rate of 60%was observed among those with three skin punctures and 14.8%in patients with two skin punctures compared to a low failure rate of 10.7% among parturients with a single puncture. The number of skin puncture attempts was significantly associated with failed spinal anaesthesia with a p-value of < 0.001.

Among the parturients who had failed spinal anaesthesia, 21(70%) had block-level T6-T7,6(20%) had a block level of T4-T5 and 3(10%) had a block level of T8-T10. The prevalence of failed spinal anaesthesia was high with level T6-T7 (33.9%).T4 level had the lowest prevalence (0%). The level of the block was a significant predictor of failed spinal anaesthesia (p-value<0.001).

The prevalence of failed spinal anaesthesia was high in parturients with obesity (20.5%), although the majority of the parturients with failed spinal were overweight. There was no statistically significant association between BMI and the prevalence of failed spinal anaesthesia (,p-value=0.938).

With regarding the working experience of the anaesthesia provider it was found that the high failure rate was observed with the providers less than 2years experience, with the lowest being with the provider with more than 6years work experience, although these findings were not statistically significant(p-value=0.705).

Table 2: Factors associated with failed spinal anaesthesia

factor		Failed spinal	Successful spinal	X^2	p-value
Previous spinal anaesthesia	Yes	22 (22.9%)	74 (77.1%)	3.46	0.63
	No	8 (11.6%)	61 (88.4%)		
Rank of training	Certificate student	9 (19.1%)	38 (80.9%)	7.148	0.128
	Registrar	0	7 (100%)		
	Resident	8 (34.8%)	15 (65.2%)		
	Nurse anaesthesist	13 (15.5%)	71 (84.5%)		
	Anaesthesiologist	0	4		
Technique related	Elective	5 (14.3%)	30 (85.7%)	0.453	0.501
	Emergence	25 (19.2%)	105 (80.8%)		
Number of attempts	Once	9 (10.7%)	75 (89.3%)	27.142	<0.001*
	Twice	9 (14.8%)	52 (85.2%)		
	Thrice	12 (60%)	8 (40%)		
Block-level	>T4	0	1 (100%)	19.969	<0.001*
	T8 – T10	3 (27.3%)	8 (72.7%)		
	T6 – T7	21 (33.9%)	41 (66.1%)		
	T4 – T5	6 (6.6%)	85 (93.4%)		
Body Mass Index	Underweight	0	1 (100%)	0.413	0.938
	Normal weight	4 (17.4%)	19 (82.7%)		
	Overweight	17 (17.5%)	80 (82.5%)		
	Obese	9 (20.5%)	35 (79.5%)		
Working experience	1 – 6 Months	10 (19.2%)	42 (80.8%)	1.403	0.705
	1 – 2 years	11 (22.4%)	38 (77.6%)		
	3 – 5 years	8 (14.3%)	48 (85.7%)		
	> 6 years	1 (12.5%)	7 (87.5%)		

3.4 Complications of spinal anaesthesia

Table 3 below shows complications of spinal anaesthesia in general. Hypotension was the most common complication that was observed in 51(30.9%) parturients followed shivering 16(9.7%), vomiting 6(3.6%) and high spinal 3(1.8%). Management of these complications included fluids, ephedrine and oxygen.

Table 3: Complications Associated with spinal anaesthesia for caesarean section

Complication		Failed spinal	Successful spinal	X^2	p-value
hypotension	Yes	2(3.9%)	49(96.1%)		0.001
	No	28(24.6%)	86(75.4%)		
Vomiting	Yes	0(0.0%)	6(100.0%)	1.384	0.239
	No	30(18.2%)	129(81.1%)		
High spinal	Yes	0(0.0%)	3(100.0%)		0.945
	No	30(18.5%)	132(81.5%)		
Shivering	Yes	0(0.0%)	16(100.0%)	2.700	0.100
	No	30(20.1%)	119(79.9%)		

(Fisher exact test used)

3.5 Outcome of the baby (APGAR SCORE) to failed spinal

Table 4 below shows that among the parturients with failed spinal anaesthesia only one had a baby who scored critically low, and 3 had scored below normal and 26 had normal APGAR score. There was no statistically significant association between the outcome of the baby and failed spinal anaesthesia (p-value=0.235).

Table 4: Outcome of the baby to failed spinal anaesthesia

The outcome of the baby		Failed spinal	Successful spinal	X^2	p-value
APGAR score	Critically Low	1 (50%)	1 (50%)	2.899	0.235
	Below Normal	3 (37.5%)	5 (62.5%)		
	Normal	26 (16.8%)	129 (83.2%)		

CHAPTER FOUR

4.0 DISCUSSION

4.1 Prevalence of failed spinal anaesthesia

The prevalence of failed spinal anaesthesia in this study was 18.2%. The failure rate of the spinal block was 19.2% and 14.3% for emergency and elective caesarean section respectively. The prevalence of failed spinal anaesthesia for pregnant women undergoing caesarean section at Muhimbili National Hospital (MNH) was higher than what has been reported from hospitals of high-income countries. Failed spinal anaesthesia was higher than what was observed in studies done in the UK and the USA(3). However, failed spinal anaesthesia at MNH had lied in a historically high range of FSA as found in other studies((2,5)

The rate of failed spinal anaesthesia in this study is high when compared to the standard set proposed by Royal College of Anaesthetists, which recommends a failure rate of less than 1% for elective and less than 3% for emergency caesarean section(36)

Majority of the failed spinal anaesthesia occurred intraoperatively. This result was similar to the findings of Alab et al. Hyperbaric bupivacaine was used as a sole local anaesthetic agent unlike in other studies where the use of opiates in combination with bupivacaine was associated with fewer cases of failed spinal anaesthesia((3,5)

Routine use of narcotic adjuncts has not been achieved in our practice due to challenge with the supply of preservative-free narcotic commonly seen in many poor resourced countries including ours.

Currently, there is no acceptable National standard for the rate of failed spinal anaesthesia in Tanzania.

4.2 Factors Associated with Failed Spinal Anaesthesia

The study identified multiple associated factors to failed spinal anaesthesia for the caesarean section including overall obesity, previous spinal anaesthesia, a block between T8 T10, T6 T7 and three or more attempts at the skin puncture. These were recognized as the most and independent significant predictors of Failed Spinal Anaesthesia.

In this study, we found that the level of a block of spinal anaesthesia and multiple skin attempts at the puncture site was statistically significantly associated with failed spinal anaesthesia.

Patients who achieved a spinal block height of T8-T10 had 27.3% failure rate while 33.9% and 6.6% failure rates were seen at block T6-T7 and T4-T5 respectively, A block-level of T4 was adequate for caesarean section. These findings were similar to the study that was done in South Africa by Alab et al, that reported a block level to be a significant predictor of failed spinal anaesthesia(5)(5) (5).

Multiple skin puncture was observed in approximately 53% of the women. Prevalence of failed spinal anaesthesia was higher in those who had three skin punctures (60%) compared to those who had a single puncture (10.7%). Difficult in locating the landmarks usually resulted in multiple skin punctures which may lead to complications(37).Rhee at al reported that patients who received more than three punctures attempts were identified to a more higher level of dissatisfaction of spinal anaesthesia.

Majority of parturient were overweight, although the prevalence of failed block was high in the obese group (20.2%) it was not statistically significant, these findings were similar to study done by Schilzeck and Horikawa that reported no difficulty in performing spinal anaesthesia on obese patients, contrary to study that was done in South Africa that reported obesity as significant predictor of FSA. Also, a study done by Bamobade et al reported that an obscured landmark in obese parturients makes the identification of the landmark for spinal anaesthesia difficult to locate(38,39).

The study explored the competence of the anaesthesia providers by evaluating their rank and duration of working in anaesthesia at MNH. The higher failure rate of spinal anaesthesia was observed with those who had worked for less than two years, and majority of parturients were anaesthetized by nurse anaesthetists who most of them had experience of working in anaesthesia for 3 to 5years.when compared these factors were not statistically significant associated with failed spinal anaesthesia, these findings were similar to study done by Alab et al that reported experience as an insignificant factor for FSA.(5)

4.3 Complications, outcome of the baby in terms of APGAR Score

Complications of spinal anaesthesia in this study included hypotension(30.9%), vomiting (3.6%), high spinal(1.8%) and shivering(9.7%).Hypotension was the most significant complication of spinal anaesthesia in this study. This finding is similar to the study done in South Africa (5). Hypotension was treated with intravenous normal saline or lactated ringer solution and where necessary ephedrine was given.

Among the parturients with FSA, one had a baby with critically low APGAR Score and three had babies with below normal APGAR Score, but statically this was not significant, so FSA can not be concluded as the cause of low APGAR Score. This finding is similar to the study that was done by Adenekan in Nigeria that reported low APGAR Score was not associated with failed spinal anaesthesia(2).

4.4 Study limitations

The study did not indicate the cutoff point between partial or complete block failure. All the women who experience pain before, during caesarean section were regarded as had failed SA.

Anaesthetic management of the patients was not standardized, different doses of bupivacaine were used as decided by attending anaesthetists.

Other factors could have predicted failed spinal anaesthesia but were not studied like smoking, alcohol intake and level of education of the parturients.

Duration of the study was short, and the number of parturients recruited was few to conclude the higher prevalence of failed spinal anaesthesia.

This cross-sectional study cannot establish the real cause of failed spinal anaesthesia.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The prevalence of failed spinal anaesthesia for pregnant women who underwent a caesarean section at MNH was high (18.2%). The majority of failed spinal anaesthesia was partial and occurred intraoperatively. Prevalence of failed spinal anaesthesia was associated with the experience of the anaesthesia provider, multiple skin puncture attempts and the level of block height. Majority of the parturients were given spinal anaesthesia by Nurse Anaesthetists. Age, previous anaesthesia, obesity, level of education of anaesthesia provider, spinal needle, and position did not show a significant association with failed spinal anaesthesia prevalence at MNH. The complications of spinal anaesthesia seen in this study were hypotension, pain, shivering, and higher spinal. In general failed spinal anaesthesia was managed depending on the block, patients need and the perception of anaesthesia provider at that particular time.

5.2 Recommendations

This was a single centred study with a small sample size of 165 parturients, further studies should be done in other centres so that these results can be concluded.

To develop standardized protocols for management of failed spinal anaesthesia that should be followed by anaesthesia provider whenever they have such cases.

To educate the anaesthesia provider especially the nurse anaesthetics and student who most of the time are the one giving anaesthesia, the importance of knowing the adequate block level, and assessment, so they can be prepared when the block level is inadequate.

The anaesthesia provider should brief the parturients in the spinal anaesthesia and how they are going to feel during the procedure

Presence of the most experienced and trained anaesthesia provider to supervise the juniors and student when performing spinal anaesthesia.

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APPENDICES

Appendix I: Questionnaire

PREVALENCE AND FACTORS ASSOCIATED WITH FAILED SPINAL ANAESTHESIA FOR CAESAREAN SECTIONS AT MUHIMBILI NATIONAL HOSPITAL FROM JULY TO DECEMBER 2018.

I. Pre-operative Assessment
   - i. Age
   - ii. Weight
   - iii. Height
   - iv. Pregnancy status
     1. Prime gravid
     2. Multigravid
   - v. MUAC
   - vi. Surgery
     1. Elective
     2. Emergency
   - vii. Number of previous C-sections: _____
   - viii. ASA status:_____
   - ix. Patient position during performing spinal anesthesia
     1. Sitting position
     2. Lateral position
   - x. Intervertebral space used
     1. L2/3
     2. L3/4
     3. L4/5
   - xi. Type of Bupivicaine used
     1. Heavy (volume and %):_____
     2. Plain (volume and %):_____

xii. Level of the block:_____

xiii. Was Spinal Anesthesia successful

1. Yes

2. No

II. Intraoperative Assessment

i. Need for supplemental Intravenous analgesia

1. Yes

2. No (go to v)

ii. Type of supplemental analgesia used:_____

iii. Duration of surgery:_____

iv. Was Anesthesia successful

1. Yes

2. No

v. Surgical complications

vi. Apgar score of the baby

vii. Experience of obstetric provider (in years):_____

viii. Qualification and Experience of anesthesia provider (in years):_____

Appendix II: Data Collection tool

A. Patient-related factors ;

a. Height (meters)……
b. weigh t(kilograms)……..
c. BMI. (Kg/m2)……..
d. Age (years)……..
e. Patients position
   Setting =1
   Lateraldecubitus=2
f. Previous spinal anaesthesia
   Yes =1
   No=2…….

B. Providers related factors

a. Rank :

- Student for certificate 1……..
- Registrar 2……..
- Resident 3……..
- Nurse anaesthetist4……
- Anaesthesiologist 5……
- Others 6……..

b.Duration of working in anaesthesia at MNH

- 1-6months=1……..
- 1-2yrs=2…….
- 3-5yrs=3…….
- >6yrs=4……

c. Frequency of administering spinal anaesthesia

- 1-2times/ month=1……..
- 3-4times/month=2…….
- Once in 6 month=3……

d. Techniques related.

- Indication for the caesarean section
- Elective CS=2……
- Emergence CS=1…….

Pre anaesthetic assessment on the ward

Yes, =2…….

No =1……

Spinal needle type and gauge

22G=1……..

25G=2…….

27G=3……

Number of skin puncture attempts

Once =3……

2=2……..

3=1……

Confirmations of dura puncture

Presence of free flow CSF=2……..

Absence of free flow CSF=1……..

Characteristics of the CSF ;

Bloody=1……

Non-bloody=2……

Dose of bupivacaine

1.8mls=3/2mls=2/3mls=1

……..

Block levels

T4-T5=4/T6-T7=3/T8-T10=2/ >T4=1

……

The outcome of the spinal anaesthesia

Failed spinal anaesthesia=1/succesful spinal anaesthesia=2

……

Complications :

Pain duringoperationYes=1/No=2

…….

Hypotension>=20% decrease in systolic BP Yes=1/No=2

……

Vomiting; Yes=1/No=2

……

High spinal; Yes=1/No=2

……..

Headache; Yes=1/No=2

……..

Shivering; Yes=1/No=2

…….

Death,Yes=1/No=2

……

Medications used in the management of complications.

Fluid and oxygenYes=2/No=1

……..

Atropine,Yes=1,No=2

…….

Ephedrine,Yes=1,No=2

…….

Ketamine,Yes=1,No=2

……

Appendix III: Consent Form (English Version)

CONSENT TO PARTICIPATE IN A RESEARCH STUDY TO ASSESS THE PREVALENCE AND FACTORS ASSOCIATED WITH FAILED SPINAL ANAESTHESIA AMONG PREGNANTS WOMEN UNDERGOING CAESAREAN SECTION AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM, TANZANIA from April 2018 to December 2018.

Greetings!

My name is Advesta Kilawe, student of Muhimbili University of Health and Allied Sciences. I am conducting a research study on the prevalence and factors associated with failed spinal anaesthesia among pregnant women undergoing caesarean section at Muhimbili National Hospital, Dar es Salam Tanzania;

From April 2018 to January 2018.

Purpose of the Study

This study has three purposes. The first purpose is to assess the prevalence of failed spinal anaesthesia among pregnant women undergoing caesarean section at Muhimbili National Hospital, Dar es Salam Tanzania.

The second is to determine the factors associated with failed spinal anaesthesia among pregnant women undergoing caesarean section at Muhimbili National Hospital, Dar es Salam Tanzania. The third purpose is to assess the outcome of failed spinal anaesthesia among pregnant women undergoing caesarean section at Muhimbili National Hospital, Dar es Salam Tanzania.

Participation

If you agree to take part in the study, you will be required to respond to some questions.

Confidentiality

All information that will be collected from you will be treated confidential and will not be used for any other purpose other than this study.

Risks

We ensure you that no harm will happen to you because of joining in this study. Will not use any invasive device and we will not interfere in planned management by your physicians or surgeons.

Rights to withdraw and alternatives

Taking part in this study is entirely your choice. If you choose not to participate in the Study or if you decide to stop participating in the study you will continue to be treated normally. You can stop participating in this study at any time, even if you have already given your consent and if for any reason you would wish to come back into the study after withdrawal, we will be ready to accept you to continue with the study. Refusal to participate or withdrawal from the study will not involve penalty or loss of any benefits to which you are otherwise entitled.

Benefits

Firstly participating in this study you will contribute to estimate the prevalence of failed spinal anaesthesia in pregnant women undergoing caesarean section at Muhimbili National Hospital, Dar es Salam Tanzania. Secondly, It will contribute to the knowledge of the factors associated with failed spinal anaesthesia in pregnant women undergoing caesarean section at Muhimbili National Hospital, Dar es Salam Tanzania. This knowledge is important in management strategies in case of failed spinal anaesthesia.

Who to contact

If you ever have questions about this study, you should contact the following:

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Dr R Boniface (Principal Study Supervisor)

MUHIMBILI ORTHOPAEDIC INSTITUTE (MOI),
P.O. Box 650.., Dar es Salaam.
Mobile: +255754270840

Also, if you will have questions about your rights as a participant, you may call DR Joyce Masalu, the Director of Research and Publications.
P.O. Box 65001, Dar es Salaam. Tel: 2150302-6.

Signature
Do you agree to participate? *Write the word 'Yes' if you agree*……..
I, _____ have read the contents in this form.
My questions have been answered. I agree to participate in this study.
Signature of participant _____

Signature of investigator _____

Date of signed consent _____

Appendix IV: Fomu Ya Ridhaa Kwa Kiswahili

Ridhaa ya kushiriki katika utafiti huu

Salaam!

Mimi ninaitwa Dr. Advesta Kilawe, mwanafunzi wa Chuo Kikuu cha Afya na Sayansi Shirikishi cha Muhimbili. Nafanya utafiti wa kujua idadi ya wamama wajawazito wanaoshindwa kupata dawa ya usingizi ya kutosha kwa kuchomwa sindano ya uti wa mgongo katika Hospitali yaTaifa Muhimbili.

Madhumuni ya Utafiti

Utafiti huu unamadhumuni matatu. Ya kwanza nikujua idadi ya wamama wajawazito wanaoshindwa kupata dawa ya usingizi kupitia sindano ya uti wa mgongo katika Hospital iya Taifa Muhimbili. Pili, nikujua mambo yanayopelekea kushindwa kutoa dawa ya usingizi kwa sindano ya uti wa mgonngo kwa wamama wanaojifungua kwa upasuaji katika Hospitali ya Taifa Muhimbili. Tatu ni kujua matokeo ya kushindwa kwa kutoa sindano ya usingizi ya uti wa mgongo kwa wamama wanao fanyiwa upasuaji wa kutoa mtoto katika Hospitali ya Taifa Muhimbili.

Ushiriki

Ushiriki katika utafiti huu ni wa hiari na endapo utakubali kushiriki, utatakiwa kujibu maswali kadhaa.

Siri

Taarifa zote zitakazokusanywa katika utafiti huu zitawekwa kwa usiri mkubwa na mtafiti, pamoja na kamati ya utafititu wataku wana taarifa kuhusiana na utafiti huu.

Madhara

Hatutarajii kuwepo kwa madhara yoyote kwa kujiunga katika utafiti huu.Hatutamia kifaa chenye madhara na hatutaingilia kati ya matibabu yaliyopangwa.

Haki ya kutokushiriki au kukatisha ushiriki wako

Kushiriki katika utafiti huu ni wa hiari. Endapo ukikataa kushiriki kutakuwa hakuna mabadiliko katika matibabu yako na utaendelea kupewa matibabu stahiki.

Ukikubali kushiriki na ukiamua kukatisha ushiriki wako, pia kutakuwa hakuna athari kwa matibabu yako.

Faida

Kwa kushiriki katika utafiti huu, kwanza utakuwa umechangia sisi kupata makisio ya idadi ya dawa za usingizi kupitia sindano ya mgongoni kwa wamaama wanaojifungua kwa upasuaji zilizoshindikana katika Hospitali yaTaifa Muhimbili. Pili, utachangia sisi kujua mambo yanayopelekea kushindwa kutoa dawa ya usingizi kwa njia ya sindano ya mgongoni kwa wamama wanaojifungua kwa njia ya upasuaji katika Hospitali ya Taifa Muhimbili. Elimu hii ni muhimu sana katika kuweka mikakati ya kuzuia matukio na matatizo yanayoweza kutokea baada ya kushindwa kutoa dawa ya usingizi kwa njia ya sindano ya mgongoni kwa wamama wanaojifungua kwa njia ya upasuaji katika Hospitali ya Taifa Muhimbili.

Kama una maswali ya ziada unaweza kuwasiliana na hawa wafuatao:

1. Mtafiti Mkuu,
   Dk. Advesta Kilawe,
   Idara ya Utoaji wa dawa za Usingizi (Anaesthesiology),
   Dar es Salaam.
   Simu: +255653680903

2. Dk. Edwin Lugazia
   Idara ya Utoaji wa dawa za Usingizi,
   MUHAS P. O. Box 65001
   Dar es Salaam
   Tel: +255 713283900

3. Dk. Joyce Masalu
   Mkurugenzi wa Utafiti na Uchapishaji
   MUHAS, P.O. Box 65001,
   Dar es salaam
   Simu: 2150302-6

Kuweka sahihi ya makubaliano:

Mimi, _____, nimesoma/nimesomewa maelezo yote yaliyomo kwenye fomu hii na nimeelewa. Maswali yangu yamejibiwa na niko tayari kushiriki.

Kama unakubali kushiriki andika neno “Ndio” katika nafasi hapa chini_____

Sahihi ya mshiriki _____ Sahihi ya Mtafiti _____

Tarehe _____

Appendix V: Introduction Letter

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

P.O. Box 65001
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TANZANIA
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Tel G/Line: +255-22-2150302/6 Ext. 1015
Direct Line: +255-22-2151378
Telefax: +255-22-2150465
E-mail: dpgs@muhas.ac.tz

Ref. No. HD/MUH/T.30/2016

12th June, 2018

Executive Director
Muhimbili National Hospital
P.O. Box 65000
DAR ES SALAAM.

Re: INTRODUCTION LETTER

The bearer of this letter Dr. Advesta Kilawe is a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MMed.Anaesthesiology.

As part of her studies she intends to do a study titled: "***Prevalene and factors assocaited with failed spinal Anaesthesia for caesarea section at Muhimbili National Hospital***".

The research has been approved by the Chairman of University Senate.

Kindly provide her the necessary assistance to facilitate the conduct of her research.

We thank you for your cooperation.

Ms. L.C. Kapama
For: DIRECTOR, POSTGRADUATE STUDIES

cc: Dean, School of Medicine
cc: Dr. Advesta Kilawe

Appendix VI: Approval for Ethical clearance

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

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Telefax: +255-22-2150465
E-mail: dpgs@muhas.ac.tz

Ref. No. DA.287/298/01.A/

12th June, 2018

Dr. Advesta Kilawe
MMed. Anaesthesiology
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED: "PREVALENE AND FACTORS ASSOCIATED WITH FAILED SPINAL ANAESTHESIA FOR CAESAREAN SECTION AT MUHIMBILI NATIONAL HOSPITAL"

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from 11th June, 2018 to 10th June, 2019. In case you do not complete data analysis and dissertation report writing by 10th June, 2019, you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. Emmanuel Balandya
ACTING: DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Medicine