A STUDY OF ACUTE PAIN AFTER CAESAREAN SECTION - INCIDENCE AND ASSOCIATED FACTORS, AT THE UNIVERSITY TEACHING HOSPITAL, LUSAKA, ZAMBIA

By

DR. ANGEL PHIRI, BSc. HB, MBCHB

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DECLARATION

I, Dr Angel Phiri, hereby declare that this dissertation herein presented for the Degree of Master of Medicine in Anaesthesia and Critical Care has not been previously submitted either in whole or in part for another degree at this or any other university nor being currently submitted for any other degree.

SIGNED

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Dr Angel Phiri

APPROVAL

The dissertation of **Dr Angel Phiri** is approved as fulfilling part of the requirements for the award of the degree of Master of Medicine in Anaesthesia and Critical Care by the University of Zambia.

Examiner 1 _____ Signature _____ Date _____

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ABSTRACT

Background: Some 4,200 caesarean sections were done at the University Teaching Hospital (UTH), Lusaka between September 2015 to September 2016. A 2007 study cited pain was as one of the complications. However, the incidence and possible associated factors to pain after a caesarean section was not evaluated further in that study. The incidence of pain after caesarean section is reported high elsewhere. Caesarean section is an essential life-saving and common surgical procedure. Pain as one of its complication should be well understood to avoid the suffering of patients. There is no data locally on the incidence of acute pain after caesarean section and its associated factors. This study set out to determine the factors associated with acute pain after caesarean section at UTH, Lusaka, Zambia.

Methodology: The study was set out to determine the incidence and associated factors of acute pain after elective caesarean section at UTH, Lusaka, Zambia. It was a prospective, cross-section, observational study involving two hundred and forty-six parturients that had a caesarean section at UTH, Lusaka, Zambia. The study lasted for five months and all women who were undergoing elective caesarean section and gave consent were included. All emergency caesarean sections, patient who was taken to the intensive care unit, high dependence unit, who had altered mental state and those who did not give consent were excluded. Consecutive sampling was used to select participants. Information was obtained at 24-hours post-caesarean on socio-demographic, pregnancy and pain management and pain assessed using the Wong-Baker Score. Data were entered into an excel spreadsheet and then analysed using SPSS version 22.0. Chi-square was used to determine the association of independent factors to the dependent factor (Wong-Baker Score). Multiple logistic regression analysis was used to control for confounders and determine factors associated with acute pain 24-hours after caesarean section.

Results: The age range of the 246 participants was from 16 years to 45 years. Eighty-four participants had no pain (34.1%), 71 (28.9%) had mild pain, 63 (25.6%) had moderate pain and 28 (11.3%) had severe pain. On bivariate analysis, administration of pethidine, paracetamol and diclofenac was associated with low pain scores. The grade of the surgeon, age of the participant, previous surgery, previous caesarean section, history of dysmenorrhea, joint pains, headache, backache, bilateral tubal ligation, level of education, the expectation of pain, anxiety or depression were not associated with acute pain. On multivariate analysis, only a history of the previous caesarean was associated with moderate-severe pain: OR 0.47 (95%CI 0.26-0.84, p=0.0101).

Conclusion: The incidence of acute pain at UTH, Lusaka, was significant - over one-third (36.9%) complained of moderate to severe pain at 24-hours based on the Wong-Baker Score. A history of previous caesarean section was the only factor that was associated with moderate to severe pain. However, the odds ratio <1 implied those with a previous caesarean had less association with moderate to severe pain. More research is needed to optimize pain relief after caesarean section.

Keywords: Caesarean section, Pain scores, Wong-Baker Score
Word Count: 486

DEDICATION

This dissertation is dedicated to my children; Racheal, Martha, Shadreck and Angel Phiri.

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ABBREVIATIONS

CI Confidence Interval

GRS Graphic Rating Scale

IASP International Association for the Study of Pain

NRS Numeric Rating Scale

ORIF Open Reduction and Internal Fixation

PCA Patient-controlled Analgesia

PTSD Post Traumatic Stress Disorder

UTH University Teaching Hospital

VAS Visual Analog Scale

VRS Verbal Rating Scale

WHO World Health Organisation

CHAPTER ONE: INTRODUCTION

1 Introduction

1.1 General information on post caesarean pain

Pain is an unpleasant sensory and emotional experience associated with potential or actual tissue damage (IASP, 1997). When questioning women's fears and expectations from the caesarean section, pain during and after the caesarean section were their greatest concern. Pain is associated with negative short and long-term effects on the mother and the newborn. The response to pain by the body and its effects manifests in many-body systems. Information on the incidence and contributing factors to acute pain after caesarean section in low resource settings such as at the University Teaching Hospital (UTH) is lacking. This study endeavoured to explore this aspect.

1.2 What is already known with regards to acute pain after caesarean section globally?

Many women undergo caesarean delivery without problems; however, some experience significant pain after caesarean section. There are a variety of factors that have been associated with pain after caesarean section. These include but not limited to culture, psychosocial, ethnicity, educational background and previous experience. In Malaysia, all university and major public hospitals have acute pain teams, and regular pain assessment is encouraged by the promotion of the concept that pain is the “5th vital sign.” Despite these initiatives, acute pain services can reach only about 30% of patients due to constraints of personnel and equipment.

1.3 What is already known with regards to acute pain after caesarean section regionally?

In 2016, a South African study revealed that the anatomical sites of surgery with the highest incidence of moderate or severe pain were lower limb and abdomen. Caesarean section was the procedure with the highest incidence of inadequate analgesia, followed by open reduction and internal fixation (ORIF) of the lower limb, sloughectomy and laparotomy. Obstetric patients reported the highest incidence of moderate or severe pain immediately after surgery (39%) followed by trauma surgery (23%) and burns (21%). Caesarean section patients could have had more pain because they were young females and surgery was done under spinal anaesthesia with inadequate systemic analgesia. Even though one can only speculate as to the cause, it remains useful to know that there is a problem in this population that needs to be addressed or investigated urgently (Murray and Retief, 2016).

1.4 What is already known with regards to acute pain after caesarean section at UTH?

A large number of caesarean sections are done at the university teaching hospital. Pain is a known complication that results from a caesarean section. The incidence of acute pain after caesarean section and the factors associated with it at the UTH is unknown. This study endeavoured to explore these aspects of pain after caesarean section.

1.5 What the study aims to achieve

The study aims to establish the incidence of acute pain and the associated factors of moderate to severe pain after caesarean section. The study wants to evaluate the extent of utilization of available simple analgesics at the UTH.

1.6 Overview of research and research gaps, contribution to policy and practice

Peri-operative pain management for caesarean section is centred on the concept of multimodal analgesia. Multi-modal analgesia is practised at the UTH; however, nothing is currently being documented about the incidence, severity or associated factors for pain following caesarean section at UTH.

1.7 Overall purpose of the research and area/site where the research will be conducted

Knowing the incidence and associated factors of acute pain following caesarean section at UTH, Lusaka, will help to guide the improvement of pain management and it will help the clinicians to identify those at high risk.

2 Statement of the problem

2.1 The background of the problem.

Caesarean section is a common procedure worldwide and has been named as one of the essential surgical procedures by the WHO. At UTH alone, 4206 caesarean sections were carried out, over one year, between September 2015 and September 2016. This data was obtained from the register of caesarean sections held at UTH. Unsurprisingly, the incidence of pain following caesarean section is high (Murray and Retief, 2015). Given the high number of caesarean sections performed here at the UTH, identification and management of postoperative pain will be essential to improving our patient's experience, and in the prevention of many complications associated with untreated pain, such as the stress response which manifests itself in several physiological systems, and these complications can threaten a patient's health. At UTH the incidence of pain following caesarean section is unknown.

Apart from the direct stimulation of an extensive surgical incision, all the factors contributing to pain following caesarean section have not been fully established.

2.2 Importance and relevance of the research

Recognising specific associated factors to pain following caesarean section will help to target therapy in those patients at high risk. Understanding the incidence of acute pain following caesarean section at UTH will help in planning resource allocation. Using acute pain following caesarean section as a model, may help to better understand other cases of post-operative pain at UTH which may help improve postoperative pain management.

3 Study justification

3.1 Contribution of the study to science or body of knowledge

If preoperative factors which reliably predict patients at risk of developing severe postoperative pain can be identified, there will be a significant improvement in postoperative pain management, by creating individualised, rather than standardised treatment plans and intervening early to improve patients' postoperative care (Carvalho, 2012). Pain after caesarean section is an excellent model to study post-operative pain because the procedure is performed on otherwise young and healthy women with no or few co-morbidities (Landau, 2010). It will improve communication between all members of the medical team who take part in patients care.

3.2 Changes to be made by the study.

Awareness of specific factors that are associated with moderate to severe pain after caesarean section will help the medical team to plan analgesia management of the at-risk patients before their surgery. Patients deemed to be at high risk of developing severe postoperative pain will be prophylactically given adequate doses of all the available analgesics such a combination of paracetamol, NSAIDs and opioids. It is hoped that by targeting this group of at-risk patients will help in prevention or minimising complications like deep vein thrombosis, hypostatic pneumonia, and poor wound healing and prolonged hospital stay.

3.3 Evidence supporting the justification

Caesarean section is a common essential major operation in Sub-Saharan Africa (Size et al, 2007). 4206 Caesarean sections were done at the UTH from 21 September 2015 to 21 September 2016. The incidence of pain after caesarean section is high (Murray and Retief 2016). However, to date, this has only been reported elsewhere. At UTH, the incidence of pain after caesarean section is unknown and the factors contributing to this pain have not

been established. Given the high number of caesarean sections performed at the UTH, identification and management of acute postoperative pain is essential in the prevention of many complications that result thereof.

4 Research question

What are the factors that predict moderate to severe acute pain after caesarean section?

5 Objectives

5.1 General objectives

To evaluate the associated factors to acute pain after caesarean section at University Teaching Hospital, Lusaka, Zambia.

5.2 Specific objectives

1. To determine the incidence of pain after caesarean section through the use of pain scores.
2. Determine factors associated with acute pain after caesarean section.
3. Determine if paracetamol, diclofenac and pethidine are utilised adequately in the treatment of acute pain after caesarean section.

6. The organisation of the Dissertation

This dissertation is organised into eight chapters besides the references and appendices.

1. Chapter One gives a brief introduction and looks at general information on post caesarean pain. It outlines the statement of the problem, the background of the problem and the importance and relevance of the research and study justification. It provides evidence supporting the justification, looks at the research question as well as the general and specific objectives.
2. Chapter Two reviews the literature regarding postoperative pain after caesarean section, methods of pain assessment and reviews the literature regarding factors associated with post-operative pain worldwide, regionally and locally.
3. Chapter Three deals with the methodology used in this particular study and include study design, study site, population, research materials, the target and study participants. It also lists the eligibility criteria, that is inclusion and exclusion criteria. It also includes the sampling methods and sample size, data collection plan and tools. Data management and storage and analysis plan are also outlined. Ethical considerations are also discussed in this chapter and the limitations and strengths of the study.

4. Chapter Four presents the results and include details of participants, pain medication administered, the Wong-Baker pain score, distribution and analysis of participants characteristics by Wong-Baker score by different levels of pain. It also looks at bivariate analysis characteristics associated with Wong-Baker pain score and finally multivariate analysis.
5. Chapter five discusses the results within the context of what is published and also explains the significance of the results.
6. Chapter Six deals with the conclusion and the recommendations.
7. At the end are the references and appendices

CHAPTER TWO: LITERATURE REVIEW

Peri-operative pain is the most common concern for patients undergoing surgery, and many patients experience unpleasant side effects related to pain medications (Landau, 2010). Pain remains a significant problem following surgical operations in sub-Saharan Africa (Kolawole and Fawole 2003). Caesarean section is one of the most painful surgical procedures necessitating the attention of the whole medical team (Marcus, 2012). The under-treatment of acute post-operative pain can have many adverse effects, including increased recovery time and prolonged hospital stay (Scholten et al, 2015). Pain is a core component of the stress response to injury and therefore needs to be managed appropriately to optimise patient recovery (Mathews, 2010). The stress response manifests itself in several physiological systems and can give rise to complications that threaten the patient's health (Mowat and Johnson, 2013). Stimulation of the sympathetic nervous system increases cardiovascular parameters such as heart rate, blood pressure and systemic vascular resistance. This greater workload increases myocardial oxygen demand and can provoke myocardial ischaemia or infarction if such demand exceeds oxygen delivery. Patients with coronary artery disease are at greater risk of such a complication. Other complications of undertreated post-operative pain are thromboembolism such as deep vein thrombosis and pulmonary embolism. This is due to reduced mobility, increased coagulation, a state of being both postpartum and post major abdominal surgery (Mowat and Johnson, 2013). Severe pain in the upper abdomen or chest can impair respiratory function and compromise the patient's ability to clear sputum and secretions leading to hospital-acquired pneumonia, atelectasis and hypoxaemia. Pain may have psychological sequelae, such as depression and post-traumatic stress disorder (PTSD). Women with severe pain on the day after caesarean delivery have a two and a half to three-fold increased risk of postpartum depression and persistent pain eight weeks later compared with those with mild pain. This persistent pain and depression may affect the cognitive development of infants and induce negative behaviour.

Changes in regional blood flow may decrease supply to the skin which may impair wound healing (Mowat and Johnson, 2013). Increased levels of catabolic hormones lead to increased protein breakdown and hyperglycaemia and may compromise both wound healing and immune function (Mowat and Johnson, 2013). This puts patients at risk of surgical site wound infection.

Caesarean section commonly induces moderate to severe pain for 48 hours (Ismail, 2012, Landau 2010). Is the prediction of who is at risk for developing significant postoperative pain before women undergoing surgery possible? Is its prevention or minimizing its negative consequences possible? These are the fundamental questions that a team from the University of Washington, Stanford University, the Catholic University in Brussels, Belgium, Santa Joana Women's Hospital in São Paulo, Brazil, and Rambam Medical Center in Israel, is currently evaluating in international research collaboration. The ultimate goal of this project is to provide optimal pain relief during and after caesarean section by offering individualized anaesthetics care to women who appear to be more 'susceptible' to pain after surgery. The ability to preoperatively identify patients at risk of developing severe postoperative pain, and higher analgesic dose requirement will be beneficial, potentially facilitating the use of individualized or stratified analgesic treatment plans. Patients deemed to be at high risk of developing severe postoperative pain, for example, will receive more attention concerning the analgesic plan.

Psychological predictors of surgical pain and analgesic requirements are incompletely understood. Several psychological characteristics such as anxiety, pain catastrophizing, and fear of pain have been shown to significantly correlate with postoperative pain (Carvalho et al, 2016). Evaluating these psychological characteristics, however, requires time-consuming questionnaires and additional trained personnel making them impractical for routine clinical use. A robust, quick to perform, point-of-care set of questions that accurately predict postoperative pain may improve pain management after caesarean section (Carvalho et al, 2016). In a study at a referral hospital in Western Cape, South Africa, young age, female gender and emergency surgery were some of the factors associated with high pain scores (Murray and Retief, 2016). Although this is an African country, the demographics of the Western Cape and the Zambian population are likely to be different in some ways.

Factors that prevent adequate pain control in developing countries have been explored and are reported to be; lack of awareness of the problem, fear of administering opioids (opiophobia), restrictive registration, fewer resources namely staff and drugs, and the low priority afforded to pain management (Carvalho, 2012, Murray and Retief, 2015). Studies have found that two of the chief barriers for health care professionals in the management of pain are; poor assessment of pain and lack of knowledge about pain (Fink, 2000). Other factors are underassessment and under treatment (Vijayan, 2011). Two recent reports, one a

multicenter study from France, showed that acute postoperative pain was not adequately treated, finding that pain intensity was not sufficiently reassessed, analgesics were underutilized, and delays in treatment were common (Vijayan, 2011). In an often overstretched and low resource healthcare system setting like ours, management of acute or chronic pain is given a low priority

Pain is an individual and multi-factorial experience influenced by culture, previous pain events, beliefs, moods, and individual coping mechanisms. These factors may impact the response to both pain and its treatment, and so should be considered when assessing and managing acute pain (Mowat and Johnson, 2013).

Tan et al (2008) studied ethnic differences in the perception of pain in a large series of 1034 mothers, from different ethnic backgrounds, which had a lower caesarian section under spinal anaesthesia in Singapore. There are three distinct ethnic groups in Singapore namely Chinese, Malay, and Indian. After surgery, all patients were given morphine infusion via PCA and were asked to rate their pain intensity scores at regular intervals. Data on pain scores and morphine consumption were collected every four hours. There were statistically significant ethnic group differences in pain scores and morphine usage, with Indians having the highest mean pain score and using the highest amount of morphine, even after adjustment for age, weight, and duration of surgery. This study shows that without awareness of ethnic differences, management of acute pain may be suboptimal in certain groups. Whether these differences are genetic or sociocultural needs to be explored further, but they certainly add another barrier to optimal pain control (Vijayan, 2011). This variation in pain perception between individuals is a factor that needs to be considered as one manages pain in patients that might have undergone a similar procedure.

This study expects previous painful surgeries, regular pain problems like back pain, dysmenorrhea, headache, joint pains, fear or worries of, or expectation of pain during and after surgery to be the factors that will be associated with moderate to severe acute pain after caesarean section. Others are anxiety and depression before surgery.

Management of postoperative pain is critical in mothers following caesarean delivery as adequate pain relief is required for mothers to quickly regain mobility and begin to care for the new-born (Ismail, 2012, Kwok et al, 2014). Pain relief following caesarean section is centred on the concept of multimodal analgesia (Ismail, 2012). Multimodal analgesia utilises

analgesics acting on different aspects of the pain pathway (Kwok et al, 2014). This includes a combination of oral and intravenous analgesics, atypical analgesics, such as anti-psychotics and alpha-blockers, nerve blocks and wound infiltration (Ismail, 2012). Comprehensive data about the incidence and management of postoperative pain are lacking in the developing world (Size et al, 2007). Multi-modal analgesia is being practised at the UTH. However, neither the incidence nor severities of the pain following caesarean section are being recorded. Without this data, it is difficult to report on the impact of multi-modal analgesia after caesarean section at UTH.

CHAPTER THREE: METHODOLOGY

3.1 Study design

Prospective cross-sectional observational study

3.2 Study site, population and research materials

The study was carried out at the UTH, Lusaka, Zambia from December 2017 to March 2018 and patients who underwent caesarean section during this time, and met inclusion criteria, were recruited for the study.

3.3 Target and Study Participants

3.3.1 The target population was all parturients who underwent elective caesarean section under spinal anaesthesia at UTH, Lusaka, Zambia.

3.3.2 The Study Population included those that met the eligibility criteria.

3.4 Eligibility Criteria

3.4.1 Inclusion criteria

1. All parturients who underwent elective caesarean section
2. Caesarean section under spinal anaesthesia
3. Gave written consent to participate
4. Any age

3.4.2 Exclusion criteria

1. Patients with altered mental status.
2. Patients who underwent operations other than caesarean sections e.g. hysterectomy
3. Emergency caesarean section.
4. Patient who underwent a caesarean section under general anaesthesia.
5. Failed spinal and subsequent conversion to general anaesthesia.
5. No consent provided
6. Patients who were taken to the Intensive Care Unit/High Dependency Unit

3.5 Sampling methods and sample size

Convenience sampling was done. Every other patient was recruited to the study.

The sample size was calculated based on prevalence formula as follows:

$N=Z^2 \times P\ (1-P)/E^2$

Where

N = sample required

Z=Z statistic = 1.96 (95% CI)

P = expected prevalence (20% at Western Cape, a similar study)

E = confidence interval 0.05

$N=Z^2 \times P\ (1-P)/E^2 = [(1.96x1.96)\ x0.2\ (1-0.2)]/\ (0.05x0.05) = 245.8624 = 246$

Sample size calculated at 246

3.6 Procedures, data collection plan and tools

Participants were recruited from their various wards a day or hours before their surgery. A Participant Information Sheet (in English and Nyanja) (Appendix A and B respectively) was used to provide information to potential participants. Those that agreed to take part gave written consent (Appendix C and D for English and Nyanja respectively). A data collection questionnaire (Appendix E) was used to collect participant sociodemographic, potential factors related to pain and pain relief (e.g., type of analgesia given, times). The researcher filled in the questionnaire at the bedside of the participant. For participants that were not able to understand English, the questionnaire and the consent form were translated into the local language most spoken in Lusaka Zambia. Participants were followed up at 24 hours after caesarean section. Assessment of pain was carried out at 24 hours after caesarean section using the Wong-Baker faces scale (Appendix F).

This pain assessment tool (Wong-Baker faces scale) was simple to administer and appropriate in a population like ours where literacy levels are low. There are various pain assessment tools. These include the visual analogue scale (VAS), the graphic rating scale (GRS), the numerical rating scale (NRS), and the verbal rating scale (VRS). Studies comparing these scales have found similar accuracy and validity among scales. However, the Numerical Rating Scale (NRS) has been found to have the highest sensitivity combined with the simplicity of administration. The faces pain scale, which was used in this study, was developed for use in paediatric populations, but now has been validated in all age ranges, and was particularly helpful in participants who are illiterate or have language difficulties (Huang et al, 2012). The faces pain scale was validated for use in the Zambian population, in a study done at UTH in women who underwent manual vacuum aspiration (Mumphansha 2016). Pain

studies relied on participant report and this study was interested in finding out how many people had moderate to severe pain after caesarean section and it was considered that this pain assessment tool could identify these participants. Since this was an observational cross-section study the researcher recorded what and how much analgesia was given in the first 24 hours period after the procedure of caesarean section. The time when the last doses of analgesics were given was noted just before the assessment of pain scores.

3.7 Data management and storage

Participants were only identified by coded numbers. The data was then entered into, and stored on, an Excel spreadsheet. Double-entry ensured that the correct data was entered. Data was stored on a secure computer which required a password to access. This password was only known by the researcher.

3.8 Data analysis plan

The data was exported to SPSS Version 22 (IBM Armonk, US) to analyse the data. All statistical tests were at 5% significance level. The Pearson's chi-squared test was used for comparison of proportions between groups. Fisher's exact test was used when one or more of the cells had an expected frequency of five or less. Some variable categories with less frequency were collapsed together accordingly. Hence the Pearson's chi-squared test was used to evaluate the association between the dependent variable (levels of pain) and the independent variables which were age, grade surgeon, education, headache, joint pain, previous caesarean, previous surgery and different analgesics. Further, binary logistic regression was used to assess whether the independent variables could predict moderate to severe pain based on the Wong Pain Score (dichotomised as mild or moderate to severe pain).

Multivariate regression analysis was used to model the relationship between study variables and Wong Pain Score. Adjusted odds ratios and 95% confidence intervals were calculated after controlling for confounders. The backward elimination method was used and selection for entry into the logistic regression model was considered at level $p<0.20$ or known clinical significance.

3.9 Ethical considerations

Ethical approval was obtained from the University of Zambia Biomedical Research Ethics Committee (UNZABREC) (Appendix G). Permission from the Senior Medical Superintendent was sought to use the hospital for this study. The purpose of the study was fully explained to all participants, and written informed consent was obtained from each

participant in the presence of a witness. Participant confidentiality was maintained. Coded numbers identified all data entry forms and enabled anonymity. Participants were assured that their participation in the study was purely voluntary, and their refusal to participate did not affect the care that they received. Participants were informed that they were free to withdraw consent at any point, without being required to provide a reason. Only those participants who understood and consented to take part in the study, either by appending their signature or right thumbprint, were recruited. For participants who were under the age of 18 years, assent to participate was sought from their next of kin. When a participant was found in severe pain, bleeding or septic, the researcher informed the nurses and advised to contact the supervising doctors for immediate action. If that did not occur, the researcher approached the doctors on call so that the participant would be attended to as soon as possible. Participants or they're next of kin, were not coerced into giving consent, nor were they offered incentives, for example, money, to participate in this study. Participants that were confused and drowsy were not recruited as this was one of the exclusion criteria. Patients whose general condition was not stable like haemodynamic instability, respiratory compromise were not recruited; the priority was to inform the medical team in charge of that patient or the doctors on call in labour ward or gynaecological emergency room for action.

All participants' records were protected, and kept confidential, throughout this study, as stipulated in the Health Professions Act No. 24, 2009. Information obtained was used only for research purposes and only the lead researcher and the supervisors had to access. However, any information pertinent to the patient's wellbeing was communicated in confidence to the attending medical team. The information obtained from this study did not only add to the body of knowledge but also would be beneficial to future patients undergoing caesarean section at UTH.

CHAPTER FOUR: RESULTS

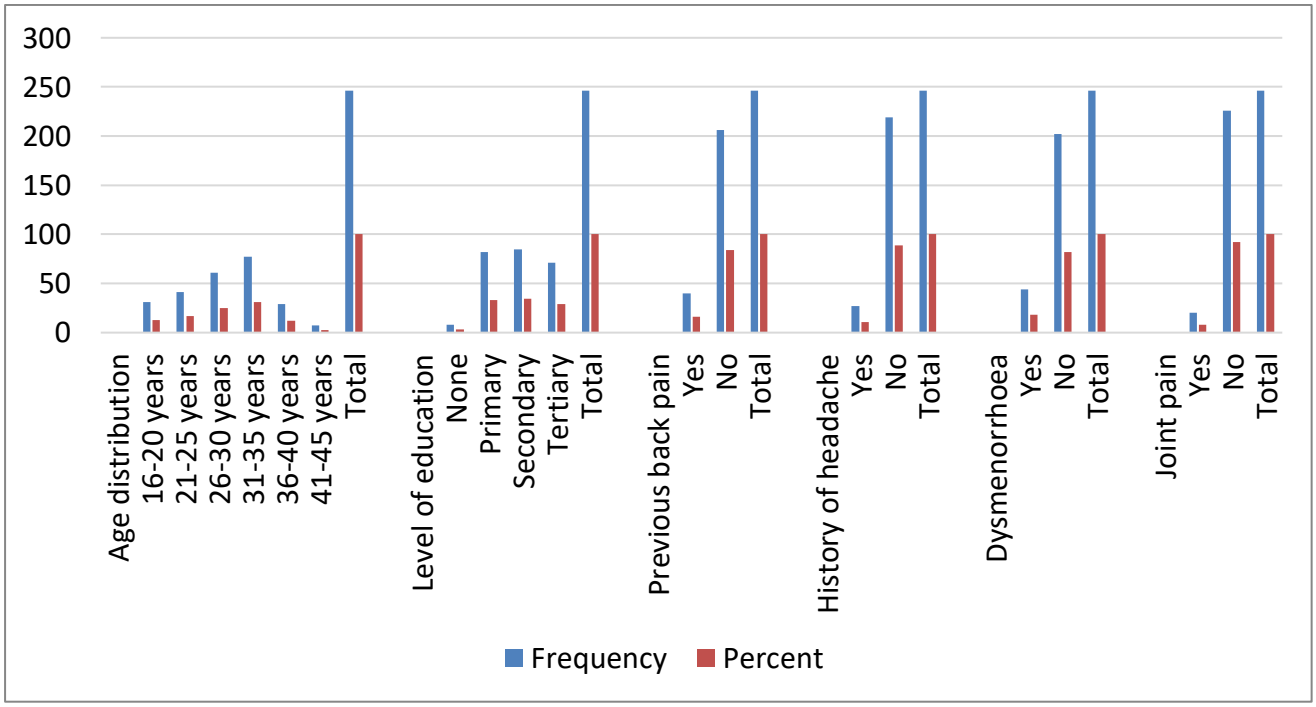
4.1 Details of participants

Figure 1 shows the summary of distribution and percentages of the patients' age, education level, different pain syndromes, psychological factors, previous surgery, previous caesarean section, whether had a bilateral tubal ligation and grade of the senior-most surgeon that did the caesarean section.

Most participants were in the 31-35 years age category (31.3%) and the second-largest group were those between 26-30 years old (24.8%). There were 7 patients (2.8%) that were between 41-45 years of age and also 31 (12.6%) that were between 16-20 years of age. Few had no education, 8(3.3%) and the others were spread out between primary (33.3%), secondary (34.6%) and tertiary education (28.9%).

The majority had no history of previous back pain (83.7%), headache (89%), dysmenorrhoea (82.1%) or joint pain (91.9%).

Figure 1a: Distribution of study participants

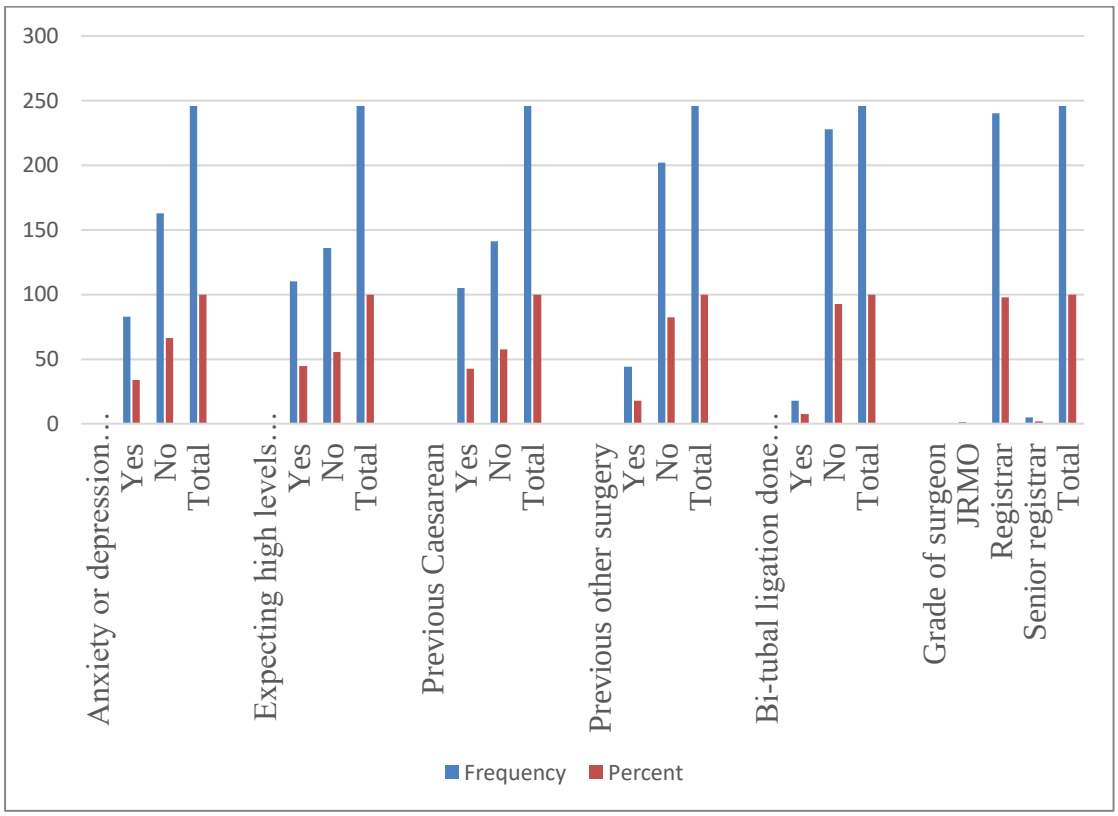


However, about a third expressed Anxiety or depression before surgery (33.7%) and about a half (44.7%) were expecting high levels of pain**.**

Almost half of the participants had a previous caesarean (44.2%) and 17.9% had other previous surgery. A small percentage (7.3%) had a bilateral tubal ligation after the caesarean section was completed.

The vast majority of caesarean sections (97.6%) were performed by a Registrar surgeon and the others by a junior resident medical officer (0.4%) or Senior Registrar (2.0%).

Figure 1b: Distribution of study participants



4.2 Type and quantity of pain medication administered within 24-hours

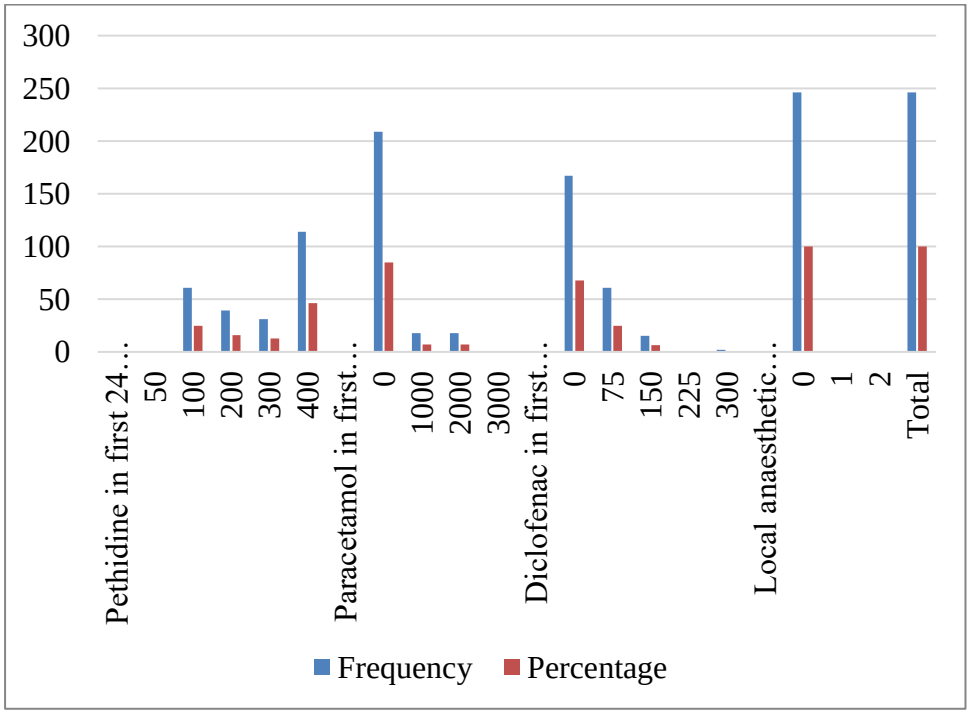
Figure 2 shows the distribution of analgesics doses, their frequency and percentages and local anaesthetic. One participant (0.4%) received 50mg of pethidine in 24 hours; 61 participants (24.8%) received 100mg of pethidine in 24 hours; 39 participants (15.9%) had received 200mg of pethidine in 24 hours. A further 31 participants (12.6%) had received 300mg of pethidine in 24 hours. The rest (114) of the participants (46.3%) had received 400mg of pethidine in 24 hours.

Two hundred and nine participants (85.0%) had received no paracetamol in last 24 hours post caesarean section; 18 participants (7.3%) had received 1000mg; 18 participants (7.3%) had received 2000mg of paracetamol. One participant (0.4%) had received 3000mg of paracetamol in 24 hours.

One hundred and sixty-seven participants (67.9%) had not received any diclofenac in 24 hours post caesarean. Another 61 participants (24.8%) had 75mg of diclofenac, 15 participants (6.1%) had received 150mg, one participant (0.4%) had received 225mg. Two participants (0.8%) had received 300mg of diclofenac in 24 hours.

No participant received local anaesthetic infiltration to the wound.

Figure 2: Distribution of pain medication

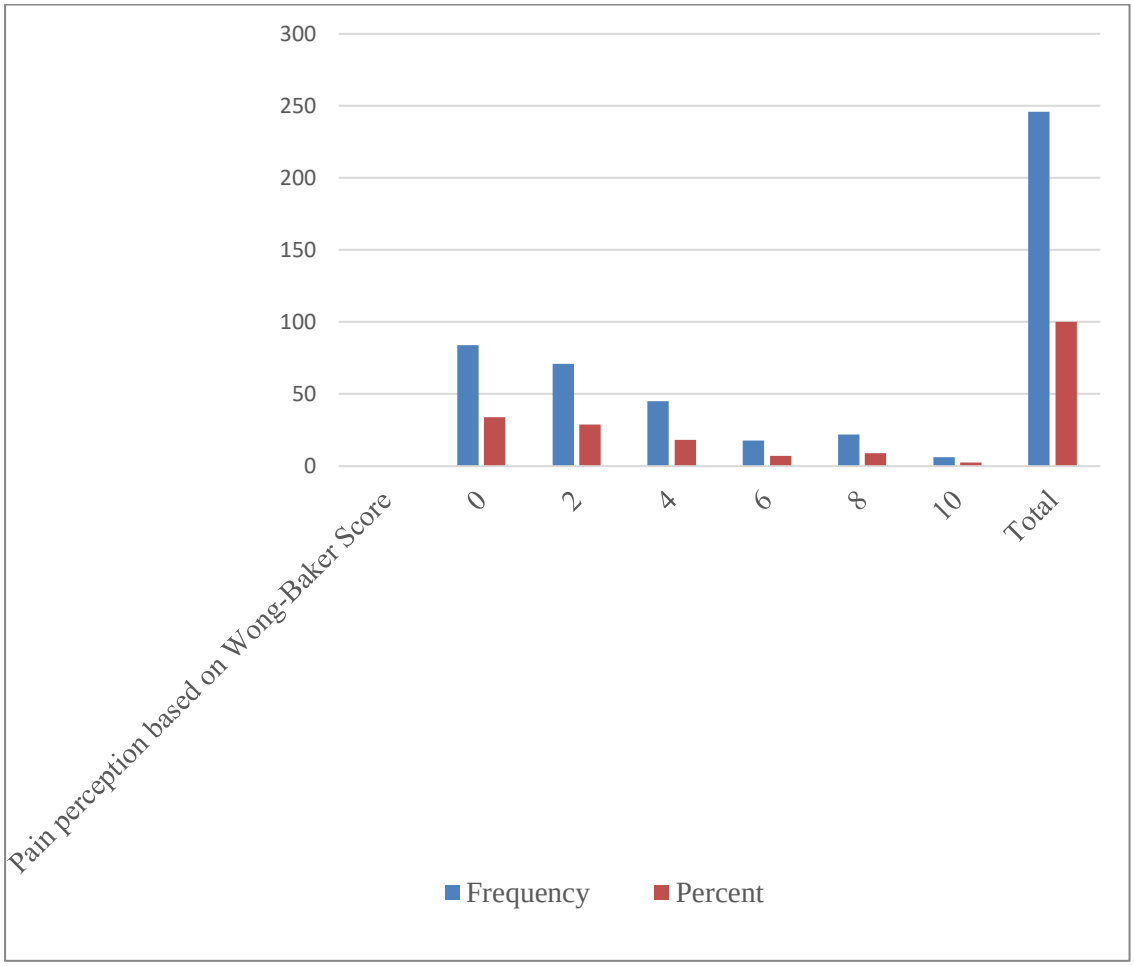


4.3 Distribution of Wong-Baker pain scores

Figure 3 summarises the distribution of pain based on the Wong-Baker score. Almost two-thirds of the 246 participants, (n=155, 63%) had a pain score of zero or 2. Of these, 84 participants (34.1%) had a pain score of zero while 71 (28.9%) had a pain score of 2.

There were 45 participants (18.3%) that had a pain score of 4. A further 18 participants (7.3%) had a pain score of 6. Twenty-two (22) participants (8.9%) had a pain score of 8. Finally, six participants (2.4%) had a maximum Wong-Baker pain score of 10.

Figure 3: Distribution of the Wong-Baker Score



4.4 Distribution and analysis of participant characteristics by Wong-Baker Score

Table 1 summarises the different factors (age, education, medical history) and their association with different levels of pain (Wong-Baker Scores). There was a significant association between the previous history of dysmenorrhea and Wong-Baker Scores ($p=0.006$).

Table 1: Association of age, education and history with different levels of pain

	Wong-Baker (level of pain)								
Characteristic (factor)	**No hurt (Score0) n (%)**	**Hurts little bit (2) n (%)**	**Hurts little more (4) n (%)**	**Hurts even more (6) n (%)**	**Hurts whole lot (8) n (%)**	**Hurts worst (10) n (%)**	**Total N (%)**	**Chi-square value**	**P-value**
Age group (yrs)									
16-20	7(22.6)	11(35.5)	10(32.3)	1(3.2)	2(6.5)	0(0.0)	31(100.0)		
21-25	13(31.7)	12(29.3)	7(17.1)	2(4.9)	5(12.2)	2(4.9)	41(100.0)		
26-30	21(34.4)	17(29.9)	11(18.0)	7(11.5)	3(4.9)	2(3.3)	61(100.0)	19.972	0.748
31-35	28(36.4)	18(23.4)	13(16.9)	7(9.1)	9(11.7)	2(2.6)	77(100.0)		
36-40	12(41.4)	11(37.9)	3(10.3)	0(0.0)	3(10.3)	0(0.0)	29(100.0)		
41-45	3(42.9)	2(28.6)	1(14.3)	1(14.3)	0(0.0)	0(0.0)	7(100.0)		
Education									
None	2(25.0)	1(12.5)	3(37.5)	0(0.0)	2(25.0)	0(0.0)	8(100.0)	18.215	0.252
Primary	25(30.5)	29(35.4)	12(14.6)	8(9.8)	7(8.5)	1(1.2)	82(100.0)		
Secondary	29(34.1)	25(29.4)	16(18.8)	2(2.4)	9(10.6)	4(4.7)	85(100.0)		
Tertiary	28(39.4)	16(22.5)	14(19.7)	8(11.3)	4(5.6)	1(1.4)	71(100.0)		
Grade Surgeon									
JRMO	1(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(100.0)		
Registrar	81(33.8)	70(29.2)	44(18.3)	18(7.5)	21(8.8)	6(2.5)	240(100.0)	3.338	0.972
Senior Registrar	2(40.0)	1(20.0)	1(20.0)	0(0.0)	1(20.0)	0(0.0)	5(100.0)		
Back pain									
Yes	15(37.5)	8(20.0)	7(17.5)	3(7.5)	4(10.0)	3(7.5)	40(100.0)	6.552	0.256
No	69(33.5)	63(30.6)	38(18.4)	15(7.3)	18(8.7)	3(1.5)	206(100.0)		
Headache									
Yes	12(44.4)	5(18.5)	5(18.5)	4(14.8)	1(3.7)	0(0.0)	27(100.0)	6.068	0.300
No	72(32.9)	66(30.1)	40(18.3)	14(6.3)	21(9.6)	6(2.7)	219(100.0)		
Dysmenorrhea									
Yes	13(29.5)	14(31.8)	6(13.6)	6(13.6)	1(2.3)	4(9.1)	44(100.0)	16.441	0.006
No	71(35.1)	57(28.2)	39(19.3)	12(5.9)	21(10.4)	2(1.0)	202(100.0)		
Joint pain									
Yes	10(50.0)	4(20.0)	1(5.0)	4(20.0)	1(5.0)	0(0.0)	20(100.0)	9.993	0.075
No	74(32.7)	67(29.6)	44(19.5)	14(6.2)	21(9.3)	6(2.7)	226(100.0)		
Anxiety Depression									
Yes	37(44.6)	16(19.3)	15(18.1)	8(9.6)	5(6.0)	2(2.4)	83(100.00	10.099	0.072
No	47(28.8)	55(33.7)	30(18.4)	10(6.1)	17(10.4)	4(2.5)	163(100.0)		
Expecting or worried about high levels of pain	45(40.9)	28(25.5)	18(16.4)	9(8.2)	9(8.2)	1(0.9)	110(100.0)	6.112	0.295
Yes	39(28.7)	43(31.6)	27(19.9)	9(6.6)	13(9.6)	5(3.7)	136(100.0)		
No									
Previous Surgery									
Yes	14(31.8)	15(34.1)	7(15.9)	5(11.4)	2(4.5)	1(2.3)	44(100.0)	3.123	0.681
No	70(34.7)	56(27.7)	38(18.8)	13(6.4)	20(9.9)	5(2.5)	202(100.0)		
Previous Caesarean									
Yes	40(38.5)	34(32.7)	15(14.4)	5(4.8)	6(5.8)	4(3.8)	104(100.0)	8.416	0.135
No	44(31.0)	37(26.1)	30(21.1)	13(9.2)	16(11.3)	2(1.4)	142(100.0)		
Bilateral tubal ligation									
Yes	11(61.1)	3(16.7)	2(11.1)	1(5.6)	1(5.6)	0(0.0)	18(100.0)	6.489	0.262
No	73(32.0)	68(29.8)	43(18.9)	17(7.5)	21(9.2)	6(2.6)	228(100.0)		

4.5 Association of analgesic drug and quantity with different levels of pain

Table 2 shows the distribution of different analgesics and their association with different levels of pain (Wong-Baker Score). The amount of analgesia ever given for pethidine, paracetamol, and diclofenac all showed a significant, p-value 0.001, 0.014 and 0.014 respectively.

There was no association between pethidine use within the last four hours and the Wong-Baker Scores (p=0.260) (Table 5). This could not be tested for diclofenac as there were too many missing data.

Table 2: Association of analgesic drug and quantity with different levels of pain

	Wong-Baker (level of pain)								
Characteristic (factor)	**No hurt (0) n (%)**	**Hurts little bit (2) n (%)**	**Hurts little more (4) n (%)**	**Hurts even more (6) n (%)**	**Hurts whole lot (8) n (%)**	**Hurts worst (10) n (%)**	**Total N (%)**	**Chi-square value**	**P-value**
Pethidine (mg) (ever given)									
50.0	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	0(0.0)	1(100.0)	47.377	**0.001**
100.0	26(42.6)	8(13.1)	8(13.1)	4(6.6)	12(19.7)	3(4.9)	61(100.0)		
200.0	13(33.3)	16(41.0)	5(12.8)	4(10.3)	1(2.6)	0(0.0)	39(100.0)		
300.0	10(32.3)	4(12.9)	8(25.8)	1(3.2)	6(19.4)	2(6.5)	31(100.0)		
400.0	35(30.7)	43(37.7)	23(20.2)	9(7.9)	3(2.6)	1(0.9)	114(100.0)		
Paracetamol (mg)	72(34.4)	65(31.1)	35(16.7)	13(6.2)	20(9.6)	4(1.9)	209(100.0)	29.430	**0.014**
0.0	7(38.9)	2(11.1)	7(38.9)	0(0.0)	1(5.6)	1(5.6)	18(100.0)		
1000.0	5(27.8)	4(22.2)	3(16.7)	4(22.2)	1(5.6)	1(5.6)	18(100.0)		
2000.0	0(0.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	1(100.0)		
3000.0									
Diclofenac (mg) (ever given)									
0.0	52(31.1)	49(29.3)	33(19.8)	9(5.4)	18(10.8)	6(3.6)	167(100.0)	36.271	**0.014**
75.0	24(39.3)	17(27.9)	12(19.7)	5(8.2)	3(4.9)	0(0.0)	61(100.0)		
150.0	8(53.3)	5(33.3)	0(0.0)	2(13.3)	0(0.0)	0(0.0)	15(100.0)		
225.0	0(0.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	1(100.0)		
300.0	0(0.0)	0(0.0)	0(0.0)	1(50.0)	1(50.0)	0(0.0)	2(100.0)		
Pethidine is given within last 4-hours of follow-up									
No	41	29	17	4	11	3	105	Fischer exact	0.260
Yes	43	42	28	14	11	3	145		
Total	84	71	45	18	22	6	**246**		
Diclofenac gave within last 4-hours of follow-up									
No								n/a	n/a
Yes									
Missing							**171**		
Total	Too many missing	Too many missing	Too many missing	Too many missing	Too many missing	Too many missing	**246**		

4.5 Bivariate analysis characteristics associated with Wong-Baker pain score

Tables 3, 4 and 5 summarises the bivariate analysis in preparation for the multivariate regression. Stratification (in columns) was by Wong-Baker score 4-10 (moderate to severe pain) and Wong-Baker Score 0-2 (none or mild). This was to show what variable/factor was associated with moderate to severe pain (Wong-Baker Score 4-10). The characteristic variable in the first column was hypothesised to be associated with moderate-severe pain.

4.5.1 Association of Age and Education with Wong-Baker Score

A non-parametric test of association was done of the different age categories stratified by the two Wong-Baker scorings. This showed that the different age categories were not associated with the Wong-Baker Score ($p=0.501$). Specifically, when the age variable was dichotomised in two, (less than 20 or more than 20 years) (see the as 2 x 2 contingency in table 6) the odds of those less than 20-years of age reporting moderate to severe pain was 1.27 but the 95% confidence interval of 0.58 to 2.73 showed this was not significant.

The level of education, dichotomised in the following two groups:

1. none and primary level, or
2. secondary and tertiary level

Level of education did not show any association with the Wong-Baker Score.

As was previously shown in Table 1, out of the 246 caesarean sections, only one had been done by a JRMO and only 5 by Senior Registrars. This variable was therefore removed from the bivariate analysis.

Hence Table 6 shows that neither age nor education background influenced pain scores on bivariate analysis.

Table 3: Bivariate analysis of participant age and education level versus Wong-Baker Score

Characteristic (factor)	Wong-Baker score 4-10 (N=91)	Wong-Baker score 0-2 (N=155)	Total N (%) (N=246)	Chi-square (Unadjusted Odds Ratio with 95% confidence interval)	P-value (two-sided)
Age group (years)					
16-20	13	18	31	N/A.	0.501
21-25	16	25	41		
26-30	23	38	61	Fisher-Freeman-Halton exact	
31-35	31	46	77		
36-40	6	23	29		
41-45	2	5	7		
Age group (years)					
16-20	13	18	31	1.27 0.58 to 2.73	0.545
21-45	78	137	215		
Education (None + Primary)	33	57	90	0.83 0.49 to 1.42	0.5067
(Secondary + Tertiary)	68	98	166		

4.5.2 Association of medical history with Wong-Baker Score

Table 4 shows the various aspects of medical and surgical history and their association with the pain scores on the Wong-Baker Score on bivariate analysis. The only previous caesarean section had a significant association with the Wong-Baker Score. (Unadjusted Odds ration of 0.54 with a 95% confidence interval of 0.31 to 0.92). This implied that those with previous caesarean section had lower Wong-Baker Scores.

4.5.3 Association of analgesic drug and quantity with Wong-Baker Score

Table 5 summarises the association of use within the past 24-hours, within the past four hours and the last two hours of the different analgesics with the Wong-Baker Score. None of the analgesics ever within the 24-hours, nor their use in the previous four hours or two hours had a significant association with Wong-Baker Score on bivariate analysis. Also, there was no association between those that had ever had pethidine and diclofenac (though at different times) and Wong-Baker Score.

Table 4: Association of medical history with Wong-Baker Score

Characteristic (factor)	Wong-Baker score 4-10 (N=91)	Wong-Baker score 0-2 (N=155)	Total N (%) (N=246)	Unadjusted Odds Ratio	P-value (two-sided)
Back pain Yes No	 17 74	 23 132	 40 206	1.32 0.65 to 2.63	0.4355
Headache Yes No	 10 81	 17 138	 27 219	1.002 0.42 to 2.29	0.9851
Dysmenorrhea Yes No	 17 74	 27 128	 44 202	1.09 0.55to 2.13	0.7994
Joint pain Yes No	 6 124	 14 141	 20 226	0.49 0.17 to 1.29	0.1537
Anxiety Depression Yes No	 30 61	 53 102	 83 163	0.95 0.54 to 1.64	0.8488
Expecting or worried about high levels of pain Yes No	 37 54	 73 82	 110 136	0.77 0.45 to 1.30	0.3312
Previous Surgery Yes No	 15 76	 29 126	 44 202	0.86 0.42 to 1.70	0.6706
Previous Caesarean Yes No	 30 61	 74 81	 104 142	0.54 0.31 to 0.92	0.024
Bilateral tubal ligation Yes No	 4 87	 14 141	 18 228	0.46 0.11 to 1.541	0.2125

Table 5: Association of analgesic drug and quantity with Wong-Baker Score

Characteristic (factor)	Wong-Baker score 4-10 (N=91)	Wong-Baker score 0-2 (N=155)	Total N (%) (N=246)	Unadjusted Odds Ratio	P-value (two-sided)
Pethidine (mg) (ever given)					
50-200	38	63	101	1.05	
300-400	53	92	145	0.62 to 1.77	0.8637
Paracetamol (mg)					
0-1000	81	146	227	1.38	
2000-3000	10	9	19	0.51 to 3.68	0.5252
Diclofenac (mg) (ever given)					
0.0-75	86	142	228	1.57	
75.0-300	5	13	18	0.55 to 5.06	0.4192
Pethidine + diclofenac					
Yes	25	54	79	0.71	
No	66	101	167	0.40 to 1.25	0.2361
Pethidine is given within last 4-hours of follow-up					
Yes <4hrs	35	70	105	0.76	
No >4hrs	56	85	141	0.45 to 1.29	0.3093
Pethidine is given within last 2-hours of follow-up					
Yes <2hrs	11	30	41	0.57	
No >2hrs	80	125	205	0.27 to 1.21	0.1421
Diclofenac gave within last 4-hours of follow-up					
Yes	-	-	-		
No	-	-	-		
Missing	Too many missing	Too many missing	**171**		
Total			**246**	**n/a**	**n/a**

4.6 Multivariate analysis

Based on the earlier bivariate analysis, the following variables were considered clinically important as determinants of pain to be considered in the multivariate logistic regression: age, history of back pain, headaches, dysmenorrhea, joint pain, expecting or worried of high levels of pain, previous caesarean, anxiety/depression, time from the previous dose of pethidine.

Table 6 highlights the initial multivariate logistic regression model with all nine factors controlled for potential confounders and presumed to be associated with moderate to severe pain. A history of the previous caesarean was associated with fewer odds of moderate to severe pain (Adjusted odds ratio 0.53, 95% CI 0.29 to 0.98, p=0.042).

Table 6: Initial multivariate model of factors associated with moderate to severe pain (Wong-Baker Score 4-10)

Parameter	**Adjusted Odds Ratio**	**95% Confidence Interval**	**P-value**
(intercept)	n/a		P = 0.4006
Age	0.97	(0.93 to 1.02)	P = 0.2124
History of Back Pain	1.29	(0.62 to 2.69)	P = 0.4975
History of Headache	1.25	(0.51 to 3.08)	P = 0.6277
History of Dysmenorrhoea	1.04	(0.51 to 2.11)	P = 0.918
History of Joint Pain	0.72	(0.25 to 2.05)	P = 0.5352
Anxiety/Depression	1.16	(0.58 to 2.33)	P = 0.6697
Expecting or worried of high levels of pain	0.52	(0.25 to 1.06)	P = 0.0701
Previous Caesarean	0.53	(0.29 to 0.98)	P = 0.042

hours from last pethidine >4hrs	1.19	(0.69 to 2.07)	P = 0.5343

Backward elimination was used to systematically eliminate successive factors that did not contribute to the model. The following factors were eliminated sequentially and the subsequent models are listed in Appendix H:

1. Dysmenorrhea
2. Eliminating Headache
3. Eliminating Anxiety/Depression
4. Eliminating Joint pain
5. Eliminating Pethidine >4hrs ago
6. Eliminating Backpain
7. Eliminating Age

A history of a previous caesarean and expectation or worry about high levels of pain remained in the final model (Table 10).

As summarised in Table 7, based on the multivariate logistic regression model (taking potential confounders into account), the odds of previous caesarean section predictive of moderate to severe pain was 0.47 (95% confidence interval of 0.26 to 0.84). Also, the odds of expectation or worry of high levels of pain was 0.59 (95% confidence interval of 0.33 to 1.05) though not statistically significant (P=0.069).

Table 7: Final multivariate regression model of factors associated with moderate to severe pain

Parameter	**Adjusted Odds Ratio**	**(95% Conf. Int.)**	**P-value**
Previous Caesarean	0.47	0.26 to 0.84	P = 0.0101
Expecting or worried of high levels of pain;	0.59	0.33 to 1.04	P = 0.069

If the converse was stated and summarised in Table 8; based on the multivariate logistic regression model (taking potential confounders into account), the odds of a previous caesarean section associated mild pain was 2.13 (95% confidence interval of 1.20 to 3.82). Those with a previous caesarean had higher odds to be associated with less pain perception on Wong-Baker Score.

Also, the odds of expectation or worry of high levels of pain was 1.70 (95% confidence interval of (0.96 to 3.01) though not statistically significant (P=0.069). Meaning those with high expectation of pain were 70 per cent more likely to report less pain perception on Wong-Baker Score.

Table 8: Final multivariate regression model of factors associated with mild pain (outcome inverted)

Parameter	**Adjusted Odds Ratio**	**(95% Conf. Int.)**	**P-value**
Previous Caesarean	2.13	(1.20 to 3.82)	P = 0.0101
Expecting or worried of high levels of pain;	1.70	(0.96 to 3.01)	P = 0.069

CHAPTER FIVE: DISCUSSION

This study looked at acute pain after caesarean section in 246 parturients who had undergone elective caesarean section under spinal anaesthesia. The age range of the study population was 16 to 45 years and is a reflection of the population undergoing caesarean section. The majority of participants were aged between 31 to 35 years which again reflects that most women in this group studied had a caesarean not in the early or later part of the reproductive age range (15-49).

Pain scores were assessed at 24 hours using the Wong-Baker score. Interestingly, it was found that 84 participants (34.1%) reported no pain (at 24-hours) while 162 participants (65.9%) experienced the pain of varying intensity. Of the ones with pain reported, 71 participants (28.9%) experienced mild pain, 63 participants (25.6%) had experienced moderate pain and 28 participants (11.4%) experienced severe pain. What led to some reporting no pain or mild pain is worth exploring. Similarly, what factors led to those reporting moderate to severe pain is worth noting. Apart from type and frequency of analgesia, there are other factors, particularly previous caesarean and expectation and worry about the pain which were highlighted to have an influence on pain scores.

Cumulatively, 91participants (37%) had moderate to severe pain. In Zambia, this is the first study on the incidence of pain after caesarean section. The findings are far lower compared with a study done by Murray and Retief (2016), at Western Cape, South Africa, at Stellenbosch University, Tygerberg hospital where the incidence was found to be 87% maximum pain in the first 24 hours and 38% at the time of the survey. This may be due to the differences in the socio-demographic characteristics of women in Lusaka, Zambia and the Western Cape and also the differences in sample size and also the differences in pain assessment tools used. In this study, the Wong-Baker scale was used unlike the visual analogue scale used by Murray and Retief. Since a patient had to recall their pain experienced in the last 24 hours some may have forgotten their pain experience because of the passage of time.

The incidence of moderate/severe pain tallies well with the results of a meta-analysis study done by Dolin et al (2002) in the UK, which was looking at the effectiveness of acute postoperative pain management. They searched for evidence from published data whose aim was to look at the incidence of moderate-severe and severe pain after major surgery and they

found an incidence of 35.8% (31-40.2%) which compares well with 37% found in this study. However, it should be noted that this study just looked at the caesarean section and not all major surgeries in contrast to the meta-analysis done by Dolin et al (2002). The incidence of severe pain in my study was found to be 11.4% and it compares well with the study done by Dolin et al 2002 who found an incidence of 10.4% (8-12.8%).

In this study, age was not associated with high pain scores in the final multivariate model. This finding tallies well with a study done by Borges et al (2016) in a study of 1062 patients who were submitted to the caesarean section where there was no significant association of age of patient and moderate to severe pain, but in a study done in South Africa by Murray and Retief in 2016 demonstrated that young age was associated with moderate to severe acute pain after caesarean section.

The study looked at the contributing factors to acute pain after caesarean section at UTH. A study which was carried out by Mukeshimana in 2007 at UTH looked at the complication of caesarean section and identified postoperative pain as one of the complications of the procedure. However, this study did not elaborate further in terms of incidence or the risk factors which were associated with the post caesarean pain. Dysmenorrhea was not found to be associated with acute post caesarean pain (p =0.918) on multivariate analysis.

The other factors which were identified to influence pain scores were analgesics. Pethidine was found to have a strong influence on the pain scores(p =0.001) as shown in table 2. However, in the bivariate analysis, the dose given was categorised in two: Pethidine ever-given of 50-200mg and 300-400mg, against an outcome of high or low Wong-Baker scores (4-10 and 0-2 respectively). Similarly, bivariate analysis was done with whether pethidine was given in the last four hours before scoring or not. In neither case was there a significant association with the Wong-Baker scores. A consideration is that a shorter duration could have been explored (e.g. hours). The total dose of diclofenac given was not associated with the Wong-Baker scores. There were too many missing data to consider the last dose of diclofenac and the association with the Wong-Baker scores

In UTH it is a common practice among obstetricians and surgeons after doing a major procedure such as caesarean section or laparotomy respectively to prescribe pethidine as the mainstay of analgesia in the first 24 hours after the operation. This finding is consistent with the literature. In a study done in Tanzania by Masingati and Chilonga in 2014 where they

looked at postoperative pain management outcomes among adults treated at a tertiary hospital in Moshi, they observed that most patients received pethidine in the first 48 hours postoperatively. The second most given drug was diclofenac, then tramadol and the least given was paracetamol. The other practice worthy mentioning in our institution UTH, is the deliberate non-administration of paracetamol and diclofenac as observed, despite that these analgesics may have been prescribed and written on the drug chart of the patients. Nurses only administered pethidine in the first 24 hours and ignored paracetamol and diclofenac until when the four doses of pethidine were completed in most instances. It takes about 24 hours for the four doses of pethidine to be given. The practice of monotherapy analgesia could explain the lack of understanding of the concept of multimodal analgesia or it could explain the non-availability of some simple analgesics on the postnatal wards were the patients are nursed. It could also explain some fears among nurses to giving more than one type of analgesia. Pethidine is thought to be the most powerful among the three simple analgesics available. Therefore nurses may think once someone is on pethidine they don't need other analgesics. Further, pethidine being an opioid formed a backbone of the treatment of moderate to severe pain and this tallies well as observed by Mowat and Johnson (2013). The standard of care for post perioperative analgesia is a multi-modal approach, but the erratic nature of implementation of this guideline as illustrated above may explain the variability in levels of association between pethidine ($p=0.001$) compared to paracetamol ($p = 0.014$) and diclofenac ($p= 0.014$) on bivariate analysis. In any case, none of these reached significances in multivariate analysis.

Eight participants (3.3%) had no formal education while 82 participants (33.3%) had attained primary education and 85 participants (34.6%) had attained secondary education and 71 participants (28.9%) had attained tertiary education. In this study, the educational background did not influence the pain scores($p= 0.295$). My findings do not tally with other studies like a study done by Lanitis et al (2015) at Red Cross Athens General Hospital in Greece, involving 400 general surgery patients, found that the educational status may be a significant predictor of postoperative pain due to various reasons, including poor understanding of preoperative information. Because of poor understanding, it can lead to anxiety and depression and suboptimal request and use of analgesia. In our environment like UTH patients may feel shy to request for analgesia especially if they are less educated fearing to provoke the nurses on duty if they do so. Therefore there is a need to educate our patients not to hide pain because

doing so is in nobody interest. Relief from pain is part of the basic Human right to health (Size et al, 2007).

In two hundred and forty (97.6%) patients the surgeon was a Registrar while in five (2.0%) participants a Senior Registrar was the surgeon and only one (1) participant was operated on by a Junior Resident Medical Officer. Hence in this study, there was not sufficient distribution of grades of the surgeon to analyse the association with the Wong-Baker Scores. Macrae (2008) reviewed the literature and reported on two conflicting findings on the experience of the surgeon and the risk of chronic post-surgical pain. In one study done Tasmuth et al (1999) studied chronic pain after breast cancer and found that participants who had their surgery in low volume, less experienced units suffered more chronic post-surgical pain than patients from high volume, specialist units. On the other hand, Macrae reported another study done by Courtney and colleagues (2002) that showed no correlation between the grade of the surgeon and severe pain after hernia repair. In UTH most of the operations are done by registrars hence they are the target in pain management education. If registrars are equipped with knowledge about pain assessment and management the incidence of pain in UTH will probably reduce.

Forty (40) participants had backache problem. In my study pre-existing backache was not associated with high pain scores despite those participants with pre-existing pain problems may have central sensitization. Twenty-seven (27) participants (11.0%) had headache problem. Migraine or chronic headaches were not associated with high pain scores. Twenty (20) participants (8.1%) had joint pains problem. Preexisting arthritis did not influence pain scores in this study. However one needs to understand the relationship between preexisting pain syndromes and central sensitization as it may explain the low threshold for pain in some patients.

Eighty-three (83) participants (33.7%) had anxiety or depression. In my study anxiety or depression was not associated with high pain scores, this is in contrast with existing literature which highlighted anxiety or depression to be associated with high pain scores. In a study of 1122 women by Borges et al (2016) on the predictors for moderate to severe acute postoperative pain after caesarean section, they demonstrated that patients who presented preoperatively with anxiety had increased risk of reporting postoperative pain as moderate to severe.

One hundred and ten (110) participants (44.7%) were expecting high levels of pain. In this study expectation of high levels of pain was not associated with high pain scores. This is contrary to what is found in the literature. In a cohort study done in Finland by Sipila et al (2017) at Helsinki University hospital on patients who were undergoing mastectomy for breast cancer, one group of 563 were expecting pain after surgery and the other group of 433 were not. It was found out that the group that was expecting pain after surgery had high pain scores ($p< 0.001$) compared to those who were not expecting pain. The difference between my study is that my participants were not cancer patients and the surgical procedure was different. Usually, cancer patients have a lot of Psychological issues compared to non-cancer patients. However, the issue which was investigated was the same that is the expectation of pain after a surgical procedure.

Forty-four (44) participants (17.9%) had previous surgery and one hundred and four (104) participants (42.3%) had a history of previous caesarean section. In this study, both histories of previous caesarean section ($p = 0.135$) and previous surgery ($p = 0.681$) were not associated with high pain scores. However, in multi logistic regression analysis, the previous caesarean section was found to be a predictor of moderate to severe pain. Because the odds ratio was less than one it means that those who had a previous caesarean section would be less prone to experiencing moderate to severe pain after a caesarean section. However, a randomised controlled trial should be done to ascertain this association. Eighteen (18) participants (7.3%) had a bilateral tubal ligation. In this study, bilateral tubal ligation was not associated with high pain scores ($p= 0.262$). This is in agreement with the data existing in the literature. In a study done by Borges et al (2016) on 1062 women submitted to caesarean section, bilateral tubal ligation was not associated with moderate to severe acute pain ($p=0.262$).

Patients in this study received different total doses of pethidine, diclofenac and paracetamol over the 24-hours. None of the participants received local anaesthetic infiltration to the wound. However, none of these, not even a combination of pethidine and diclofenac (over 24-hours), not even when the pethidine was given within 2-hours or within 4-hours impacted the Wong-Baker Score.

The multivariate logistic regression result performed to ascertain the effects of various factors shown on bivariate analysis to be significant on moderate to severe pain resulted in only one factor to be associated with a high Wong-Baker Score - previous caesarean section (Odds

ratio 0.47, 95% CI 0.26 to 0.84, p = 0.0101) (Table 8). It is noteworthy that a history of expecting or worried of high levels of pain was similarly likely to have fewer odds of severe pain (Odds ratio 0.59, 95% CI 0.33 to 1.05, p = 0.069). The reasons for this are unclear and need further exploring.

3.10 Study Limitations

This study did not look at all possible factors that may have contributed to acute pain after caesarean section.such as nurse to patient ratio, lack of supply of pain-relieving drugs and lack of awareness of a multimodal approach to pain management among the obstetricians and midwives. Reasons as to why midwives were not giving paracetamol, diclofenac and pethidine together in most patients were not established. Only elective caesarean section patients were included in this study, this led to many patients who had an emergency caesarean section left out. Patients who had general anaesthesia for their operation were not considered. Participants were only followed up once after the operation, that is at 24 hours. The pain scored was the maximum pain in the last 24 hours after the caesarean section procedure, which required the participant to recall their pain experience in the last 24 hours, this may affect pain scores as some may have forgotten their pain experience. The pain scores were assessed without controlling when and how much analgesics were given. Though appropriate for the Zambian population, the tool for scoring pain was not the most sensitive.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study has shown an overall incidence of acute pain 24 hours after caesarean of 65.9% among parturients. Multimodal analgesia is not well adhered to at the UTH as most patients did not receive diclofenac and paracetamol alongside pethidine in the first 24 hours after caesarean section. This study showed that most of our patients are on monoanalgesic treatment plan namely pethidine in the first 24 hours postoperatively. Despite paracetamol and diclofenac being on the treatment chart, the nurses did not administer these two analgesics reason for this need further evaluation. The administration of analgesics was protective against acute pain after caesarean section. However, considering confounding, only previous caesarean section and to some extent, high expectation of pain was associated with pain perceived on the Wong-Baker Score – and even that associated with less pain.

Recommendations

There is a need to look for other contributing factors to acute pain after caesarean section. In particular, what it is about a history of the previous caesarean that may predispose to lower pain scores. Similarly, to understand the effects of anxiety and worry about pain. Multimodal analgesics are warranted as a pharmaceutical approach to pain management. The use of simple and cheap analgesics such as paracetamol and diclofenac in the treatment of postoperative pain should be encouraged. Sensitisation of the midwives and nurses working on the postnatal ward on the importance of a multimodal approach to managing acute postoperative pain should be done. Those patients that might have their operation under general anaesthesia will benefit from infiltration of the wound with a local anaesthetic. All anaesthetist, obstetricians and midwives must know how to assess pain objectively for the better management of patients after caesarean section. There is a need to establish an acute pain service team which will look into postoperative patients in the UTH. Pain should be charted just like any other vital sing and be acted upon accordingly.

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APPENDICES

Appendix A: Participant information sheet

UNZABREC Reference Number: **FWA00000338**

IRB00001131 of IORG0000774

Title of study

STUDY OF ACUTE PAIN AFTER CAESAREAN SECTION, INCIDENCE AND ASSOCIATED FACTORS AT UTH, LUSAKA, ZAMBIA.

Introduction

My name is Dr Angel Phiri, a student in the School of Medicine at the University of Zambia pursuing a degree of Master of Medicine in Anaesthesiology and Intensive Care. I am kindly requesting your participation in the above-mentioned study. Completing a research study is one of the requirements for the award of this masters' degree. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. If you agree to take part in this study, you will be asked to sign a consent form in the presence of a witness.

What is the purpose of the study?

Understanding the incidence of post-caesarean pain and associated risk factors is needed to better manage pain, and therefore reduce the risk of many postoperative complications including poor mobility, delayed discharge home, hospital-acquired pneumonia and venous thromboembolism. Additionally, understanding the incidence and associated factors of post-caesarean section pain in UTH will help in planning resource allocation, identifying methods to improve standards and enable targeted therapy with recognition of those at highest risk. Through the use of acute pain after caesarean as a model, other post-operative pain cases at UTH may be understood.

Why have I been invited to take part?

All pregnant patients undergoing elective or emergency caesarean section are invited to participate.

Do I have to take part?

Participation in the study is purely voluntary.

What will happen to me if I take part?

If you decide to take part you will be given this information sheet to keep and will be asked to sign a consent form. You will then be provided with a questionnaire to complete. You are free to skip any questions below that you deem personal or otherwise. Even if you have decided to take part, you are still free to stop your participation at any time and to have research data/information relating to you withdrawn without giving any reason. You are also free to decline participation without any negative impact on yourself.

What are the possible benefits and risks of taking part?

The main benefit is that by understanding the incidence of post-cesarean section pain and key factors, pain management may be improved. As many women have multiple caesarean sections in their lifetime, these research findings will also benefit them if they present for future surgery. This is an observational study and care will not be influenced during the research; therefore, this is considered to be a low-risk study to participants. There are no foreseeable risks in participating in the study.

Will my taking part be kept confidential?

Your responses in the questionnaire are regarded as strictly confidential and will be held securely. Participants' confidentiality will be maintained by the use of coded numbers to identify all data entry forms and this will enable anonymity. All data for analysis will be anonymised. When reporting on the research findings, there will be no tracing back the code number to maintain the anonymity of any participant. At all times there will be no possibility of any participant as individuals being linked with the data. The Zambian Data legislation will apply to all information gathered within the interviews and held on password-locked computer files. No data will be accessed by anyone other than the researchers.

How is the project being funded?

The project is being funded by Dr Angel Phiri the lead principal researcher.

What will happen to the results of the study?

A summary of the main findings will be produced, which will be compiled as a report to be submitted to The University of Zambia. Findings may also be disseminated through publication and conferences to inform others of the impact of this work.

Who should I contact for further information?

If you have any questions or require more information about this study, please contact the researchers using the following contact details:

Dr Angel Phiri, Lead Principal Investigator
Department of Anaesthesia, UTH, Lusaka, Zambia
nyonganiphiri@yahoo.co.uk
0977349873

What if I have further questions, or if something goes wrong?

If this study has harmed you in any way or if you wish to make a complaint about the conduct of the study you can contact the Chairperson of the Ethics Committee:

The Chairperson
University of Zambia Biomedical Research Ethics Committee
University of Zambia, Ridgeway Campus, PO BOX 50110, Lusaka, Zambia
unzarec@zamtel.zm
260-1-256067

Thank you for reading this information sheet and for considering taking part in this research.

Appendix B: Information sheet Nyanja version

Mutu wakafukufuku

KUFUFUDZA PA ZOWAWA PAMBUYO PA OPALESHONI YA SIZA PA UTH, LUSAKA, ZAMBIA.

Mau oyamba

Dzinalanga ndine Dotolo Angel Phiri, mwana wasukulu pasukulu ya usinganga pa University of Zambia. Palipano, ndili kuonjezera pa maphunziro ausinganga mu zamankwala ogonetsa kufyeta ndizotsamalira odwaritsa. Chonde ndikupemphani kuti mutengemo mbali mukafukufuku. Kutsiridza kafukufuku ndichinthu chimodzi chofunika kuti muthu apatsidwe setifiketi yamastala digiri. Mungatengemo mbali mukafukufuku pokhapo ngati mufuna. Ngati mwasankhapo kusatengamo mbali sibvuto iyayi , ndiponso kulimbe choipa chomwe chizamuchitikira munjira iliyonse.

Poyamba mukalibe kupanga chosanka mvetsetsani cholinga chakafukufuku uyu, ndiponsochomwe kutengamo mbali kwanu chidzatanthaudza. Ngati mwasankhapo kutengamo mbali, mudzapemphedwa kusaina fomu yakuti mwabvomeredza kutengamo mbali pamatso pa mboni.

Cholinga chakafukufuku uyu

Kufuna kudziwa unyinji wa anthu omwe amamvera kuwawa pambuyo pokhala ndi opaleshoni yasiza, ndiponso kufuna kudziwa nizinthu zotani zomwe zimaonjezera kuwawako . Ichichidzathandidza kusamalira anthu omvera kuwawako, ndiponso kuchingilidza zoipa zotuluka po padzowawazo; kusayenda, kuchedwa kutuluka mu chipatala, kalatso, ndiponso kukosa kwa gazi mulandu wotsayenda.

Kudziwa unyinji wa anthu omwe amamvera kuwawa ndikudziwa dzinthu zomwe dzimawonjezera kuwawako, zizathandiza kudziwa komwe zinthu zosewenzetsa mu chipatala dzifunikakupita kwambiri; mankhwala, manasi ndi adotolo. Chidzathandizanso kupeza njira yabwino yopititsa patsogolo kasamalilidwe ka odwala, ndiponso kudziwanso zinthu zomwe zimalengetsa anthu okhala nimaopaleshoni ena ache mu UTH kuti adzimvera kuwawa.

Nchifukwa nchiyani mwapemphedwa kutengamo mbali?

Onse azimai apathupi omwe alupita kuopaleshoni yasiza yokodzetseredwa afunitsidwa kutengamo mbali.

Kodi ndigatengemo mbali?

Kutengamo mbali mukafukufuku uyu chidalira pa chosakhapo chanu.

Nchiyani chomwe chidzachitika kuli ine ngati natengamo mbali?

Ngati mwasankhapo kutengamo mbali mudzapatsidwa pepala iyi yofotokodza kuti musunge ndiponso mudzapemphedwa kusaina pepala latukuti mwabvomeredza, pambuyo pache mudzayankha mafunso yowerengendwa kuchoka pa pepala yamafunso. Muli aufulu kusayankhafunso yomwe muganidza simufuna kuyankha.

Olo kuti mwasankhapo kutengamo mbali, muli aufulu kuleka ndikutulukamo mukafukufuku uyu pa nthawi iliyonse popanda imwe kulongotsola zachifukwa nchiani mulutuluka.

Muli aufulu kukana kutengamo mbali popanda choipa chilichonse chingachitike .

Phindu ndizoipa zingatulukemo ngati mwatengamo mbali

Mwa kudziwa unyinji wa anthu omvera zowawa ndiponso ndizinthu zomwe zimawonjezerakuwawako pambuyo pa opalesheni yasiza, katsamaliridwe ka anthu omvera dzowawazo kakhodza kuwamilako. Chifukwa adzimai ambiri pa umoyo wawo amakhala ndi ma opalesheni asiza opotsa imodzi, zotuluka mukafukufuku uyu zikhodza kuwapindulila kutsogolo ngati achitidwatso opaleshoni yasiza.

Kafukufuku uyu ndiwoyangana chabe, Kasamalilidwe ka odwala sikadzasinthidwa, mwaicho, palibe zoipa zomwe zinga kuchitikileni chifukwa cha kafukufuku uyu.

Kodi kutengamo mbali kwanga kudzakhala chinsinsi ?

Kuyankha kwanu kwa mafunso nichisinsi, ndiponso kuzasungidwa mwa chisinsi. Chisinsi cha otengamo mbali chizatetezedwa mopitira mwa kusewenzetsa manambala m’malo mwa maina. Nthawi zones sikotheka kudziwa maina anu kupitira mwamanambala aya. Kulibe amene azakhala ndimpata kuona za mukafukufuku uyu kuchosapo chabe amene ali kuchita kafukufuku uyu.

Ndani alipira za mukafukufuku uyu?

Dotolo Angel Phiri wosogolela kafukufuku uyu ndiye amene alipira zofunikira mukafukufuku uyu.

Nchiyani chidzachitika kuzotulukamo mukafukufuku uyu?

Lipoti lazachidule chazotulukamo mukafukufuku uyu azalembedwa. Lipoti ili lizaperekedwa ku sukulu ya University of Zambia. Zotulukamo kuti zakambidwa mu ma seminara, ndiponsokulembendwa muzofalitsidwa.

Kodi ndani ndingafunse ngati ndili ndifunso?

Ngati muli ndifunso iliyonse olo mukufuna dongotsolo pali kafukufuku uyu, mungatilembele pa adilesi iyi:

Dr Angel Phiri lead principal investigator

Department of anaesthesia, UTH, Lusaka, Zambia

P/Bag RW1X

Lusaka

nyonganiphiri@yahoo.co.uk

0977349873

Ngati ndili ndimafunso olo zina zoipa zinkachitika

Ngati zoipa zochokera mukafukufuku uyu zinkachitika olo mufuna kudandaula pa machitidwe aka fukufuku uyu, mungalembele;

The Chairperson

University of Zambia Biomedical Research Ethics Committee

University of Zambia, Ridgeway Campus, PO BOX 50110, Lusaka, Zambia

unzarec@zamtel.zm

260-1-256067

Dzikomo potenga nthawi yanu kuwerenga dongotsolo ndiponso ponganizira zotengamo mbali mukafukufuku uyu.

Appendix C: Consent

Consent

I, _____ hereby confirm that the nature of this clinical study has been sufficiently explained to me. I am aware that my details including my HIV status will be kept confidential and I understand that I may voluntarily, at any point, withdraw my participation without suffering any consequences. I have been given sufficient time to ask questions and seek clarifications, and of my own volition do hereby declare my participation in this research.

I have received a signed copy of this agreement

_____ _____ _____

Name of Participant (Print) Participant Signature or thumbprint Date

_____ _____ _____

Witness (Print Name) Witness Signature Date

Appendix D: Nyanja version of the consent form

Ine, _____ nditsimikiza kuti dongotsolo la kafukufuku uyu wapatsidwa kuli ine. Ndidziwa kuti dzina langa ndiponso ngati ndili ndimatenda a HIV zonsedzi dzidzatsungindwa mwachinsinsi, ndamvetsetsa kuti ndingatuluke mukafukufuku uyu panthawi ili yonse kopanda choiopa chilichonse chingatulukemo. Ndapatsidwa nthawi yokwanira kufunsa mafunso pa zomwe sinamvetsetse, ndiponso ndi chosankha change kuti ndi tengemo mbali mukafukufuku uyu.

Ndalandira fomu yosayinindwa zachipanganoichi.

_____ _____ _____

Dzina otengamo mbali Siginecha olochikumo Deti

_____ _____ _____

Mboni (Dzina) Mboni Siginecha Deti

Appendix E: Data Collection Tools

Data collection sheet

Participant ID number

1. Age (years)

2. Grade of surgeon: JRMO=1, Registrar=2, Senior Registrar=3, Consultant=4

3. Regular pain problems – back pain: Yes = 1, No = 2, headache: Yes = 1, No = 2, dysmenorrhea: Yes = 1, No = 2, joint pains: Yes = 1, No = 2.

4. Anxiety or depression before surgery: Yes = 1, No = 2

5. Expecting or worried about, high levels of pain: Yes = 1, No = 2

6. Previous surgery: Yes =1, No = 2; was it painful? Yes =1, No = 2

7. Previous caesarean section: Yes = 1, No = 2; was it painful? Yes = 1, No = 2

8. Education level: (Tick appropriately)

None=1
Primary=2
Secondary=3
Tertiary =4

9. Additional procedure-BTL: (Yes=1, No=2)

10. Pethidine in first 24 hours mg

11. Paracetamol in the first 24 hours mg

12. Diclofenac in the first 24 hours mg

13. Local anaesthetics infiltrated to the wound site: Yes =1, No=2

14. At what time was pethidine last given? hrs .

15. At what time was diclofenac last given? hrs

16. At what time was Paracetamol last given? hrs.

17. Time at follow up hrs

18. Time caesarean section finished hrs

Appendix F: Wong-Baker Faces Pain Rating Scale - Pain Assessment Tool

Sichibaba chibaba chibaba chibaba chibaba chibaba

Pangono mochilapo mochilapo chonse koposa

Chabe pangono maningi

Appendix G: Permission from Head of Clinical Care and Ethics Approvals

School of Medicine
Ridgeway Campus
Lusaka
27th April 2017.

Head Clinical Care
University Teaching Hospital

Dear Sir,

RE: **APPLICATION FOR A RESEARCH INSTITUTIONAL CONSENT**

My name is Dr Angel Phiri, am a third year MMED student pursuing a Master of Medicine in Anaesthesia and Critical care.

I am hereby seeking for an institutional consent to conduct a research titled: **INCIDENCE AND SEVERITY OF PAIN AFTER CAESAREAN SECTION, AND ASSOCIATED CONTRIBUTING FACTORS AT UTH, LUSAKA, ZAMBIA.**

The study will involve following up of patients in B-wards in the Mother and New born Hospital after they have had a caesarean section , and a review of patient records and assessment of pain at 24 hours post-operatively.

Attached is a copy of the research proposal.

permission granted

REPUBLIC OF ZAMBIA
HEAD CLINICAL CARE
UNIVERSITY TEACHING HOSPITAL
LUSAKA
28 APR 2017

Sincerely

Dr Angel Phiri
Registrar Anaesthesia and Critical Care
Mobile number +260-977349873

Appendix H: Permission from Head of Clinical Care and Ethics Approvals

THE UNIVERSITY OF ZAMBIA

BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753
E-mail: unzarec@unza.zm
Assurance No. FWA00000338
IRB00001131 of IORG0000774

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

1st November, 2017.

Your Ref: 009-08-17.

Dr. Angel Phiri,
School of Medicine,
C/o Assistant Dean Postgraduate,
P.O Box 50110,
Lusaka.

Dear Dr. Phiri,

RE: RESUBMITTED RESEARCH PROPOSAL: "STUDY OF ACUTE PAIN AFTER CAESAREAN SECTION AT UTH, LUSAKA, ZAMBIA" (REF. 009-08-17)

The above-mentioned research proposal was presented to the Biomedical Research Ethics Committee meeting on 23rd October, 2017. The proposal is approved.

CONDITIONS:

- This approval is based strictly on your submitted proposal. Should there be need for you to modify or change the study design or methodology, you will need to seek clearance from the Research Ethics Committee.
- If you have need for further clarification please consult this office. Please note that it is mandatory that you submit a detailed progress report of your study to this Committee every six months and a final copy of your report at the end of the study.
- Any serious adverse events must be reported at once to this Committee.
- Please note that when your approval expires you may need to request for renewal. The request should be accompanied by a Progress Report (Progress Report Forms can be obtained from the Secretariat).
- Where appropriate, apply to National Health Research Authority for storage of samples before you embark on the study.
- **Ensure that a final copy of the results is submitted to this Committee.**

Yours sincerely,

Dr. S.H Nzala
VICE-CHAIRPERSON

Date of approval: 1st November, 2017. **Date of expiry**: 31st October, 2018.

Appendix I: Backward Elimination Models

1. Eliminating dysmenorrhea

Parameter	Odds Ratio	(95% Confidence Interval)	Z Value	P (>|Z|)
(intercept)	n/a		0.861239	P = 0.3891
Age	0.972987	(0.932281 to 1.01547)	-1.255923	P = 0.2091
BackPain 1=yes	1.292791	(0.621311 to 2.689969)	0.686922	P = 0.4921
HeadAche 1=yes	1.252926	(0.509357 to 3.08197)	0.490992	P = 0.6234
JointPain 1=yes	0.720802	(0.253197 to 2.051982)	-0.61334	P = 0.5397
AnxDepression 1=yes	1.163044	(0.581313 to 2.326924)	0.426865	P = 0.6695
Expecting or worried of high levels of pain; 1=yes	0.518242	(0.254244 to 1.056367)	-1.809046	P = 0.0704
PrevCaes 1=yes	0.531819	(0.290492 to 0.973627)	-2.046588	P = 0.0407
hours from pethidine >4hrs=1; <4=0	1.191434	(0.685349 to 2.07123)	0.620819	P = 0.5347

2. Eliminating headache

Parameter	Odds Ratio	(95% Confidence Interval)	Z Value	P (>|Z|)
(intercept)	n/a		0.833019	P = 0.4048
Age	0.973847	(0.933297 to 1.016159)	-1.221244	P = 0.222
BackPain 1=yes	1.321003	(0.637934 to 2.735468)	0.749592	P = 0.4535

JointPain 1=yes	0.758699	(0.272334	to	-0.52826	P = 0.5973
		2.113674)			
AnxDepression 1=yes	1.163691	(0.581413	to	0.428201	P = 0.6685
		2.329112)			
Expecting or worried of high levels of pain; 1=yes	0.534446	(0.265219	to	-1.752545	P = 0.0797
		1.076969)			
PrevCaes 1=yes	0.534179	(0.291934	to	-2.033982	P = 0.042
		0.977441)			
hours from pethidine >4hrs=1; <4=0	1.186947	(0.683124	to	0.608018	P = 0.5432
		2.062354)			

3. Eliminating Anxiety/Depression

Parameter	**Odds Ratio**	**(95% Confidence Interval)**		**Z Value**	**P (>|Z|)**
(intercept)	n/a			0.811184	P = 0.4173
Age	0.974668	(0.934283	to	-1.18839	P = 0.2347
		1.016798)			
BackPain 1=yes	1.334999	(0.646243	to	0.780545	P = 0.4351
		2.757819)			
JointPain 1=yes	0.769325	(0.276852	to	-0.50290	P = 0.615
		2.137829)			
Expecting or worried of high levels of pain; 1=yes	0.580127	(0.322037	to	-1.81320	P = 0.0698
		1.045057)			
PrevCaes 1=yes	0.532467	(0.291099	to	-2.04557	P = 0.0408
		0.973967)			
hours from pethidine >4hrs=1; <4=0	1.198502	(0.691005	to	0.644467	P = 0.5193
		2.078723)			

4. **Eliminating joint pain**

Parameter	Odds Ratio	(95% Confidence Interval)	Z Value	P (>|Z|)
(intercept)	n/a		0.808199	P = 0.419
Age	0.974709	(0.934364 to 1.016797)	-1.18766	P = 0.235
BackPain 1=yes	1.317798	(0.639868 to 2.713982)	0.748663	P = 0.4541
Expecting or worried of high levels of pain; 1=yes	0.568896	(0.317288 to 1.020028)	-1.8934	P = 0.0583
PrevCaes 1=yes	0.52698	(0.288496 to 0.962609)	-2.08393	P = 0.0372
hours from pethidine >4hrs=1; <4=0	1.19055	(0.687045 to 2.063052)	0.621801	P = 0.5341

5. **Eliminating Pethidine >4hrs ago**

Parameter	Odds Ratio	(95% Confidence Interval)	Z Value	P (>|Z|)
(intercept)	n/a		1.09612	P = 0.273
Age	0.973845	(0.933694 to 1.015722)	-1.23376	P = 0.2173
BackPain 1=yes	1.27565	(0.624809 to 2.604449)	0.668518	P = 0.5038
Expecting or worried of high levels of pain; 1=yes	0.558266	(0.312544 to 0.997175)	-1.96952	P = 0.0489
PrevCaes 1=yes	0.514557	(0.283134 to 0.935138)	-2.17998	P = 0.0293

6. **Eliminating back pain**

Parameter	Odds Ratio	(95% Confidence Interval)	Z Value	P (>|Z|)

(intercept)	n/a			1.143327	P = 0.2529
Age	0.974305	(0.934192	to	-1.21356	P = 0.2249
		1.016139)			
Expecting or worried of high levels of pain; 1=yes	0.568487	(0.319344	to	-1.91941	P = 0.0549
		1.012003)			
PrevCaes 1=yes	0.502749	(0.277765	to	-2.27162	P = 0.0231
		0.909967)			