

**ADEQUACY OF ACUTE PAIN MANAGEMENT IN ADULT
PATIENTS ADMITTED WITH THERMAL BURNS AT
KENYATTA NATIONAL HOSPITAL**

**DR VIHAR RAJENDRA KOTECHEA M.D (MUHAS)
DEPARTMENT OF SURGERY
UNIVERSITY OF NAIROBI**

**Dissertation Submitted in Part Fulfilment of the Requirements for the
Award of Master of Medicine Degree in General Surgery at The University
of Nairobi.**

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DECLARATION

I hereby certify that this is my original work and has not been presented for a degree in any other university.

Dr. Vihar Rajendra Kotecha

M.D (MUHAS)

Signed.....

Date.....

SUPERVISORS' APPROVAL

This dissertation has been submitted with our approval as the University Supervisors.

Dr Opot Elly Nyaim

MBChB, MMED Surgery (UoN), FCS (ECSA), EMBA (JKUAT)

Lecturer, Department of Surgery University of Nairobi

Sign Date

Dr Nang'ole Ferdinand Wanjala

MBChB, MMED Surgery (UoN), Plastic & Reconstructive Surgery Fellowship University of Cape town, Fellow of European Board of Plastic & Reconstructive surgery (EBOPRAS)

Lecturer, Department of Surgery University of Nairobi

Consultant Plastic & Reconstructive surgeon KNH

Sign Date.....

DEPARTMENTAL APPROVAL

This Dissertation has been presented to the Department of surgery, University of Nairobi school of Medicine, with my approval as the Departmental Chairman.

The Chairman, Department of Surgery,

School of Medicine,

University of Nairobi.

Signature: Date:

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ACKNOWLEDGEMENT

First and foremost, I would like to thank Almighty God for blessing me with a wonderful and supportive family and enriching me with the wisdom to fulfil my dreams.

Special appreciation goes to my supervisors, Drs Nang'ole and Nyaim whose contributions have been invaluable in the completion of this dissertation.

Deep gratitude goes out to my parents, my wife Dr Shahzmah Kotecha and my sister for their unwavering support and encouragement throughout my training.

Last but not least I extend my gratitude to Catholic University of Health and Allied Sciences who sponsored my masters training.

DEDICATION

To my my wife Shahzmah, My parents Rajendra and Nila Kotecha and my sister Nikita Kotecha for their unwavering support through this journey.

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LIST OF ABBREVIATIONS

A & E -	Accidents and Emergency
APRS -	Adjective pain rating scale
BPI -	Brief Pain Inventory
BSPAS -	Burn specific pain anxiety scale
DALY -	Disability adjusted life years
ERRC -	Ethics research review committee
FPRS -	Face pain rating scale
HIV -	Human immunodeficiency virus
IQR -	Interquartile range
KNH -	Kenyatta National Hospital
NRS -	Numeric rating scales
NSAIDs -	Non-steroidal anti-inflammatory drugs
PTSD -	Posttraumatic stress disorder
SD -	Standard deviation
STATA -	Software for statistical analysis
TB -	Tuberculosis
TBSA	Total body surface area
UoN -	University of Nairobi
USA -	United States of America
VAS -	Visual analogue scale
VDS -	Verbal descriptive scale

ABSTRACT

Background:

Worldwide incidence of adult thermal burns is 3-10%. Thermal burns cause significant tissue injury leading to acute pain which if not adequately controlled leads to delayed wound healing, prolonged hospital stay and psychological disturbances like depression and posttraumatic stress disorder. There is paucity of literature concerning burn pain assessment and adequacy of its control in our setup. This study aimed to assess the adequacy of pain control in adult patients with thermal burns admitted to KNH.

Methods:

A descriptive study with a sample size of 138 adult patients admitted to KNH due to thermal burns were recruited for this study. Study duration was six months from February to July 2015. The data collected was demographic data, aetiology of burns, pain scores using Visual Analogue Scale, degree of burn and mode and type of analgesics offered. Data was analysed using STATA v.11.2, frequencies, means, medians were used to describe data. Student's t-test & chi-square were used to test for statistical significance with p-value of ≤ 0.05 showing statistical association.

Results:

Median age of the study population was 28 (IQR 22-38), majority were males 65%. Sixty-five percent sustained moderate to major burns. Etiologies were mainly flame and scald each contributing 35% respectively. Pain assessment was not done in majority at A&E and wards 98% & 95% respectively. The correlation between TBSA and intensity of pain and degree of burn and intensity of pain was not statistically significant. Pain control at KNH was found to be inadequate with only 17% having adequate background control of pain and 7% having adequate procedural pain control. There was judicious use of analgesics at A&E (96%) but this not a common practice during change of dressing (29%). Mostly the mode of offering analgesia was unimodal 77% at A&E and during dressing. The choice of analgesics was opioids in both places.

Conclusion:

Pain assessment is not a common practice at KNH hence its management was very arbitrary. Pain control is inadequate amongst patients with thermal burns at KNH. These findings are

contrary to the recommendation from other burn centres. Judicious use of analgesics is recommended to control procedural pain, but at KNH only 26% of the patients received analgesics during change of dressing yet the VAS scores remained at moderate pain to severe pain despite the use of procedural analgesics.

1.0 CHAPTER ONE: INTRODUCTION AND LITERATURE REVIEW

1.1 INTRODUCTION

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage¹.

Thermal burns leads to significant tissue injury proportional to the body contact time, temperature of the insulting substance, age of the patient and the substance causing the burn for example steam, boiling water, chemicals^{2,3}.

Patients with burn injury undergo a considerable amount of pain. Acute pain in thermal burns results from direct stimulation and injury to nociceptors within the dermis and epidermis. Thermal injury leads to cellular necrosis an inflammation that results in a release of inflammatory mediators, which play a central role in arousing pain. Lastly, the exposed nerve endings are hypersensitive leading to hyperesthesia which is perceived as pain⁴⁻⁶.

Burn injury pain has been broken down into sub facets making its assessment and treatment more convenient. It has been sub stratified into background pain, break through pain and procedural pain^{4,6}.

Pain perception is a subjective feeling and individualization is necessary in its management^{6,7}. It is of utmost importance to assess the level of pain in each patient and gear treatment with the aim of reducing pain to a minimal amount if elimination is not possible^{6,7}.

Different pain assessment methods have been described in various literatures, but a robust tool with vast applicability to any patient is yet to be described^{4,8}.

An assertive approach to pain assessment and management is necessary to increase comfort, cooperation and satisfaction. A multidisciplinary team approach and multimodal pharmacologic pain management should be utilized. From the emergency department analgesics should be administered to maintain adequate serum analgesic levels in order to keep the patient relatively free of pain⁶. This approach contributes to improved patient cooperation and better outcomes such as hastened healing and shorter hospital stays⁹

Although burn injury pain was described as a major clinical problem over two decades ago, it has continued to be reported that burn pain remains undertreated⁶. This is of concern because unrelieved pain is thought to contribute to patient discomfort hence poor cooperation, dissatisfaction, delayed healing, and prolonged hospitalization. Furthermore, poor management of pain can contribute to long-term sensory problems like paraesthesia, chronic pain and debilitating psychological conditions like depression and PTSD^{4,10,11}.

There is lack of data on pain assessment and its appropriate management in burn patients in our setup.

1.2 LITERATURE REVIEW

1.2.1 Epidemiology of Burn injury & Pain control

Burn injuries are a public health problem; globally they are ascribed as the fourth leading cause of injuries requiring medical attention. In 2004, the world wide incidence of burns needing medical attention was eleven million^{12,13}. Five to sixteen burn patients per 100000 seen in emergency departments worldwide require admission¹³. Burn injury accounts for 8% of admissions in the USA^{13,14}. Worldwide, many researchers have described the epidemiology of burn injuries. A study from Indore India documented the prevalence of burns as 13.5%¹⁵. Although many studies from Africa have described the patterns of burn injury, scanty information is available on its prevalence. Data from Ethiopia elucidates the incidence of paediatric burns severe enough to necessitate admission as 80 per 1000 children¹⁶. In Kenya the overall incidence of burns has been described to be 3%¹⁷.

Thermal burns carry the largest bulk as a causal factor for burn injuries having a worldwide incidence of 3-10%^{18,19}. Studies from different countries in Africa demonstrate similar findings. In Zimbabwe, Tanzania and Kenya thermal burns contribute 98%²⁰, 96.5%²¹ and 94-100%^{2,22} as a cause of all burns respectively.

Burn injuries have a significant level of morbidity and mortality¹². In Tanzania and Kenya mortality from burn was reported as 12%²¹ and 5-14%^{2,22} respectively. Pain control presents a challenge from the initial emergency room care through to the rehabilitation phase of burn care. Burn pain is the most difficult form of acute pain to treat from any type of aetiology²³.

1.2.2 Pathophysiology of Pain

Pain perception in the medieval times was considered as a supernatural power to communicate between mankind and divine powers. Biblical times have also mentioned pain as necessary suffering to absolve individuals from sin. It is not until the sixteenth (16th) century that scientific theories were put forward to explain pain²⁴.

Pain in burns is caused by the initial thermal insult to the skin stimulating the nociceptors. Impulse transmission is via A-delta and C-fibres to the dorsal horn of the spinal cord. Conscious perception of pain occurs as a result of impulse transmission to areas collectively known as the pain matrix within the Brain. These areas are yet to be fully defined anatomically, but activity appears centered on cortical areas and the thalamus⁶. Inflammatory response begins within a few minutes and lasts for days. The inflammatory mediators

referred to as the ‘inflammatory soup’ by Richardson continues to stimulate pain fibers throughout this period until regeneration begins or the wound is excised and covered by a dressing or an autograft⁶.

The site of injury remains markedly painful and sensitive to mechanical stimulation and movement. This phenomenon is referred to as primary hyperalgesia. Secondary hyperalgesia is increased sensitivity and pain perception due to mechanical stimulation of nearby undamaged skin^{4,6}. Continuous or repeated painful stimuli will give rise to adaptations throughout the central nervous system whereby pain signals and hence perception become facilitated and amplified to a given stimulus; this is referred to as hyperalgesia. With time, these changes may become irreversible and chronic pain is risked as a result. Adequate background and procedural pain control mitigates tipping the patient over from developing chronic pain⁶.

Individuals have different thresholds for feeling pain. The degree of pain felt is further influenced by the evolving physiological, psychological and environmental changes⁶.

Burns can be classified into superficial, second-degree superficial, second-degree deep and full thickness. Theoretically degree of pain experienced inversely correlates to the depth of burn, but clinically this correlation is not a reliable predictor of the intensity of pain by the victim^{4,6,25}. Pain intensity is worse with injury to upper and mid dermal skin layers as nerve endings are not totally destroyed and constant stimulation results into pain. Patients usually have mixed thickness burns and hence pain sensation cannot be excluded in full thickness burn injury contrary to the theory of no pain in patients with full thickness burn injury. The sensation of pain in these patients is from the surrounding partial thickness burn²⁵. Pain sensation is dynamic and its reduction usually occurs with regeneration of the nerves or coverage of the wound by dressing or skin grafting. Wound infection further propagates and aggravates inflammation hence maintaining the presence of pain for longer periods⁶.

In burns the pain felt can be categorised into nociceptive and neuropathic pain. Nociceptive pain can further be broken down into background, breakthrough and procedural pain.

Background pain is typically the pain a patient experiences while resting or during periods of relative immobility. This is characterized by a continuous pain over a prolonged period of time and is usually of mild to moderate intensity. Such type of pain is qualitatively described as throbbing and burning^{4,6}.

Breakthrough pain is described as short-term pain exacerbation, experienced by a patient who has relatively stable and adequately controlled baseline pain. It is most frequently associated with movement; it has also been described to be of spontaneous onset by some patients. This pain has been attributed to decreased serum levels of analgesics. Qualitatively such pain has been described as excruciating pain^{4,6,26}

Procedural pain is the most intense type of pain felt by patients during procedures such as change of dressing and physiotherapy. More often, such pain lasts for hours even after the procedure has ended. Patients qualitatively describe such pain as sharp, stinging and intense burning. It is the most undertreated amongst burn injury pain^{4,6}.

Neuropathic pain is defined as pain initiated or caused by a primary lesion or dysfunction in the peripheral or central nervous system. This pain occurs in burn patients after the healing of their open wounds. Neuropathic pain is qualitatively described as “pins and needles”, burning, stabbing, shooting, or electric sensation²⁷.

1.2.3 Assessment of Pain

Since pain in burns is an evolving entity, frequent assessment is paramount in guiding the use of right amount of analgesia to attain pain free states. The assessment of pain should include a history and physical examination compounded by objective pain assessment. To objectively assess pain many researchers have described the use of pain assessment tools. These tools are broadly grouped into unidimensional and multidimensional pain assessment tools. The unidimensional tools are verbal descriptive scales (VDS), numeric rating scales (NRS) and visual analogue scales (VAS). The more complex multidimensional tools are McGill Pain Questionnaire, the Brief Pain Inventory (BPI) and the abbreviated Burn Specific Pain Anxiety Scale (BSPAS)^{7,28,29}.

Phase one of a study done in America to assess use of pain assessment tools in burns units found that there was no standard tool utilized amongst burn units, in fact more than one tool was surprisingly used in 60% of the burn units. The most commonly used tools were the Waly and Wong 5 Face pain rating scales (FPRS), VAS 67%³⁰, adjective pain rating scale (APRS) 43%³⁰. Phase 2 of the same study was to identify patient preference of pain reporting tool and patients preference was FPRS 40%, APRS 12.5% and VAS 10%³⁰.

The face pains rating scale has been used mainly for children over three years of age but have been accepted for use for all ages. The FPRS is a 0-5 point rating scale showing faces corresponding to degree of pain³⁰.

VAS is numerical scale ranging 0-10 in which the victim selects a number reflecting to their level of pain, zero being no pain and 10 being the worst pain ever^{5,6,28,30,31}. The use of VAS has been validated as a sensitive tool for assessing pain in burn victims²⁸.

The intensity of pain amongst background, breakthrough and procedural pain needs to be recorded. One study described assessing pain twice daily for three days and this was reported in the nursing notes. Self-pain reporting versus nursing staff pain assessment have shown huge discrepancies and studies report nursing evaluation as underestimating pain³².

1.2.4 Management of pain in burns

Pain control is an intricate part of burns treatment. Adequacy of pain control allows the caregiver a whole lot more cooperation from the patient and enables the patient to feel somewhat comfortable despite the intensity of injury. Effective management of pain requires a dedicated multidisciplinary burn care team. Early determination of goals is necessary with all efforts geared towards attaining them. Definitely pain control is one of the many goals in the holistic management of a burns patient. Despite the improvement in analgesics and pain assessment tools over the last two decades adequate pain treatment still remains a challenge worldwide⁴. Different reasons for this are poor assessment of pain and hence difficulty in instituting the correct amount of analgesia. Furthermore, concerns of respiratory depression and opioid dependence make the caregiver recalculate the risk versus benefit of using such medications. Knowledge and attitude of nurses have also led to deficient management of pain. For example nurses may feel pain is expected in any medical procedure and needs no prioritization, more so pain management is the responsibility of the primary physician³². These reasons have been addressed by authors who suggest that the medical team treating these patients needs to be adequately educated, and a consultant round with pain specialists needs to be carried out at least once a week⁶.

Adequate control of anxiety and pain during the first change of dressing is of paramount importance as it may evoke extreme anxiety and emotional distress, clinical experience suggests that these responses are likely to increase over time with subsequent dressing and

may lead to long-term pain management problems⁴. The reference point for adequate pain control should be no pain at all on the VAS. This may sound unrealistic but aggressive approaches may minimize pain to mild levels with patient satisfaction⁹.

Broadly burn pain management can be grouped into pharmacologic and non-pharmacologic methods. A combination of the two methods has the highest impact on alleviating pain⁵.

1.2.5 Pharmacologic Pain Control

Pharmacologic pain control should start as soon as possible, and continue throughout all phases of treatment. Multimodal pain management has been shown to provide satisfactory pain control amongst these patients. Many drugs have been studied but opioids remain the cornerstone in treating burn pain. Different formulations of have been used and the most effective one is the intravenous route^{4,6}. The intramuscular route is not favourable due to the repeated painful injections and because of the variability of vascular absorption due to unpredictable compartmental fluid shifts and muscle perfusion in particular those patients undergoing acute burn shock resuscitation^{4,6,33}.

A combination of more than one drug offers a steady pain free period with doses within toxicity levels and adverse effects kept to a minimum. Involving the patient where possible using patient controlled analgesia (PCA) should be offered at it boosts patient morale by allowing them to have some control in their management. Different types of burn pain require different treatments^{4,6}.

For Background pain different opioids may be of use with the aim of having a steady state analgesia corresponding to the plasma levels. Continuous infusion of morphine or fentanyl in addition with acetaminophen or paracetamol is a valid option. Long lasting oral opioids are also preferred when feasible; options include sustained release morphine, oxycodone and methadone. Short acting analgesics may also be used at regular intervals to bridge the gap when the long acting ones are at trough plasma levels^{4,6,33}.

For Breakthrough pain prescriptions should indicate use when needed (PRN) allowing the nurse to administer the medication when such pain occurs. It usually occurs at the end of dosing interval when there are sub therapeutic drug plasma levels. Usually adjustments are made in the timing of administering drugs to minimize such pain⁴.

Procedural pain is a short burst of intense pain associated with procedures. High potent opioids with a short duration of action are preferable in controlling this pain. Fentanyl, Alfentanil and Remifentanil are some examples. Use of general anaesthetic agents for conscious sedation offer good analgesia. Ketamine and Propofol are the drugs of choice in this case. Anxiety often sets in after repetition of the same routine of procedures and short acting anxiolytics may be used in conjunction with short acting opioids to obtain maximum cooperation and pain control. The administration of these medications requires trained personnel and resuscitation equipment at an arms stretch. Monitoring of patients is also necessary and pulse oximetry amongst others need to be connected to the patient during procedures^{4,6,33}.

1.2.6 Non-Pharmacologic Pain Control

These are some approaches that prevent or avoid unnecessary elements that would lead to pain. Adequate soaking of wound dressing leads to less pain upon removal. The use of better dressing material such as hydrocolloids have been shown to be effective in slightly lowering pain felt upon removal^{4,33}.

As a team member psychologists and behavioural therapists have a lot to offer to patients during procedures to alleviate pain. Such specialists can offer hypnosis, cognitive behavioural therapies, distraction and operant conditional learning. Hypnosis has been reported to minimize pain in many studies. Simply conversing with the patient during procedures has also been found to be comforting and alleviates anxiety and pain^{4,33}.

In a burns unit, patients may be distracted with simple activities such as watching television, listening to music and by simply talking to them all these have significant impact on reducing background pain³³.

1.2.7 Effects of Poorly Managed Pain

Burn management is not only expensive but also labour intensive requiring a dedicated unit and team. Burn injury has a whole set of complications of which some can be mitigated and some inevitable. Despite significant improvements in pain management, inadequacy of attaining effective analgesia still remains a common problem globally. The effect of this to the victim may be diminished trust in the medical team during the acute phase of their treatment. In the long run psychological disturbances are a common occurrence^{5,6,9}. Many

authors have studied the effects of poorly managed pain worldwide and locally; they describe effects such as delayed healing, psychological disturbances and chronic pain^{2,4,11}.

The stress response to injury peaks usually within hours to seven days, and its return to the basal state is governed by the rate of recovery and healing which the medical team can aid. Presence of pain has been shown to prolong the hyperactive state, which has effects on healing due to the catabolic nature of this response. Mitigation of pain as a factor is within the reach of the medical team by appropriate management of pain^{5,6,9,34}.

Burn injury in itself drives a patient to a state of psychological disharmony and anxiety, which is further aggravated by the surrounding hospital environment, procedures such as dressing and inadequacy of pain control. If left untreated anxiety may intensify into a pathway of fear, sleeplessness and depression that can negatively affect patient cooperation to treatment leading to prolonged hospital stay and deleterious effects on outcome⁹. Within Kenya depression was noted in 85.5% of burn patients and it was statistically associated with prolonged hospital stay¹¹.

The incidence of PTSD was 1%². Long term consequences are chronic pain which is a common problem amongst burn survivors accounting for 52% worldwide⁶.

2.0 CHAPTER TWO: STUDY JUSTIFICATION

Burn injury is a significant public health problem and thermal injury is the commonest type of burn injury accounting for 94-100%^{2,22}.

Thermal burns are associated with significant pain. Not only is the amount of tissue damage caused by burn injury likely to generate unusually high levels of pain but also the nature of standard burn care is likely to worsen whatever pain is present³⁵.

Burn management requires a multidisciplinary team approach. The surgeon may deal with the immediate burn wound coverage but a holistic approach is required.

To overcome deleterious effects of poorly managed pain, offering pre-emptive analgesia is within the control of the burn care team. Early identification and dealing with this factor can relieve the patient from further psychological disharmony such as depression and PTSD which account for a large percentage in these patients¹¹.

In our setup paucity of literature exists as far as pain assessment and adequacy of pain control in burn patients. Lack of guidelines in management of pain further necessitates the need of this study.

3.0 CHAPTER THREE: STUDY OBJECTIVES

3.1 Broad Objective

To assess the adequacy of pain control in patients with thermal burns admitted to KNH

3.2 Specific Objectives

1. To determine pain assessment tools used at KNH
2. To determine the relationship between extent of burn in percentage TBSA and the VAS score
3. To determine the relationship between the degree of burn and the VAS score
4. To determine the mode of analgesia administered to patients with thermal burns admitted to KNH

4.0 CHAPTER FOUR: MATERIAL, METHODS AND DATA MANAGEMENT

4.1 METHODS

4.1.1 Study area

This study was conducted at Kenyatta National Hospital.

Kenyatta National Hospital is the largest referral and teaching hospital in Kenya having a bed capacity of 1800. Specialized burn care is offered at this hospital. The Accidents and Emergency Department (A&E), plastic surgery ward (4D) and burns units were the main study sites for conducting this study.

The KNH burns unit is located on the KNH tower block on first floor opposite the intensive care unit. It has a bed capacity of 20. It handles the most critical burns by admitting patients with standard indications to a burns unit. Such patients are treated and stabilised here before transfer to ward 4D for continuation of care. A multidisciplinary team of surgeons, nurses, occupational therapists, physiotherapists and nutritionists offers services in this unit. The burns unit admits thirty (30) burns patients on an average per month.

4.1.2 Study Population

All adult patients who have sustained thermal burn admitted to burns and plastic surgery unit of KNH.

4.1.3 Study design

This was a descriptive study carried out from February to July 2015.

3.2 SAMPLE SIZE CALCULATION

For a descriptive study

Using the formula:

$$N = \frac{Z^2 P (1-P)}{e^2}$$

Where N = sample size,

Z = Z statistic for a level of confidence,

P = expected prevalence or proportion

e = precision

Assumptions for this study include:

Z value is 1.96 for the level of confidence of 95%

Estimated incidence of adult thermal burns 10%¹⁹

$e = 0.05$

$$n = (1.96^2 * 0.1 * 0.9) / 0.0025 = 138$$

Sample size of 138 was used in this study

4.3 SAMPLING TECHNIQUE

Consecutive sampling of adults admitted with thermal burns that met the inclusion criteria were selected for this study.

4.4 INCLUSION CRITERIA

All patients 13 years and above who sustained thermal burns within twenty-four hours of presentation to the hospital and required admission to KNH.

4.5 EXCLUSION CRITERIA

- Patients that required advanced airway management due to inhalational burns.
- Patients who presented to KNH more than twenty four hours after burn injury
- Patients with any other associated injuries
- Patients who refuse to give consent

4.6 OPERATIONAL DEFINITIONS

Adequacy of pain control in this study was defined by VAS score of less than 3.

Patients thirteen years and above were considered physiologic adults.

4.7 DATA MANAGEMENT

4.7.1 Data collection

Accidents & Emergency department was the primary site of recruiting patients into this study. The researcher and research assistants collected data from consenting/assenting patients on a pretested data sheet.

A qualified nurse from the burns unit and plastic surgery ward was selected as a research assistant. The research assistants were briefed on the study objectives and methodology. The data collection form was explained to them and any doubts cleared prior to starting collection of data.

Pain scores were obtained from patients using the VAS. Three assessments were done in total. The plastic surgery doctor on call and researcher did the first pain assessment upon arrival of patient to the A&E. Subsequent pain assessments were done by the research assistants. A second assessment was done just before the change of dressing and the third assessment was done 10 minutes after the first change of dressing in the patients' respective ward of admission. For those patients whose dressing change was done in theatre pain assessment was done one hour after the procedure. The extent of burn in percentage TBSA, the degree and type of analgesia offered was obtained from the patient's record file.

Data sheets were collected daily by the primary researcher, checks for errors and completeness were done then.

4.7.2 Data Management

The questionnaire was coded in order to facilitate data entry onto an electronic data sheet. Data was entered into a computer using Epidata version 1.4.4.6 by the primary researcher. The statistician did data cleaning and analysis. The researcher safely kept the raw data in a cupboard during the study period. This data was only available to the statistician, the supervisors and the ERRC. The primary researcher will safely keep the raw data for three years after which it will be destroyed.

4.7.3 Data analysis

Analysis was done using Software for statistical analysis STATA version 11.2

Continuous variables were represented using degrees of central tendency such as means and medians with interquartile ranges (IQR).

The scores obtained from visual analogue scale were categorised as:

0 = No pain

1 - 3 = Mild pain

4 - 7 = Moderate Pain

7 - 9 = Severe pain

10 = Worst pain experienced ever

Chi square (X^2) test was used to show association for categorical variables. The student's t-test was used to calculate the differences in means between pain scores taken at different occasions, such as at A&E, before and after change of dressing in the wards. P-value of ≤ 0.05 was used to show statistical significance.

Results of this study were disseminated to the head of department plastic surgery KNH and to the overall head of surgery KNH. Copies have also been availed to the UoN department of surgery and the College of Health Sciences library.

4.8 STUDY LIMITATIONS

Pain is a subjective feeling it may be under reported or over reported by certain participant depending on their native background, cultural belief and gender.

4.9 ETHICAL CONSIDERATIONS

The study commenced after approval from the Department of Surgery UoN and the UoN-KNH ERRC.

Patients or guardians received a briefing on the study title, its objectives and its rationale. There after an informed consent was obtained from the patient or next of kin. An

assent was obtained from patients under eighteen years and consent to participate from their parents/guardians.

In the event where the patient was unable to give informed consent by signing on the consent form due to incapacitating burns to the hands and burn dressing covering the same, consent was obtained from the next of kin.

For patients found to have poorly controlled pain during the study period the primary physician was informed.

Patients were not coerced to participate in this study if they were unwilling. Non-participation did not affect patient care.

Patients' hospital file number was included into the data sheet. This was done so as to allow easy tracing to capture missed information during data collection.

The data sheets were kept safely with the researcher and confidentiality maintained throughout and after the study period. Electronic data file generated was encrypted with a password and only available to the research team. This data was only available to the statistician, the supervisors and the ERRC.

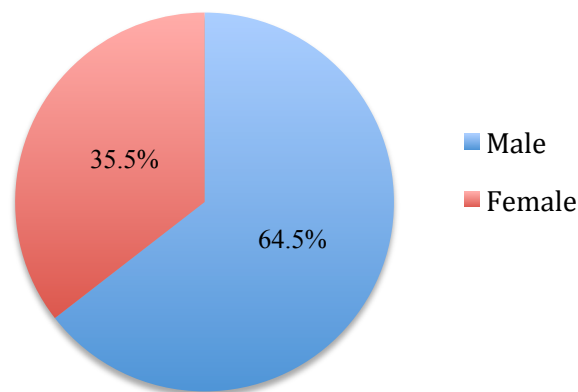
5.0 CHAPTER FIVE: RESULTS

During the study period, a total of 138 patients with thermal burns were enrolled. Majority (45%) of the patients were in the middle age category of 26-35 years, the median age being 28 years (IQR 22-34). During the study period almost three fifths (65%) of the patients admitted with thermal burns were males. The male to female ratio was 1.8:1. The commonest aetiologies of thermal burns recorded from this study were flame burns and scald burns, which constituted just above a third of the patients for each category. Twenty-three percent of the participants sustained burns from hot liquids which were mainly reported as edible substances like hot cooking oil (37.5%), tea (28.1%), porridge (25%), soup (6.3%) and liquid zinc (3.1%). Other causes of burns were flammable substances like kerosene and petrol. Burns unit admissions accounted for just over a third of the admissions (36%) while the majority were admitted to the plastic surgery ward 64%. The results are depicted in Table 1 & Figure 1 below.

Table 1: Age distribution

Age in years	Frequency	Percentage
< 15	8	5.8
16-25	41	29.7
26-35	62	44.9
36-45	19	13.8
46-55	6	4.3
≥ 56	2	1.4
Total	138	100

Figure 1: Gender distribution



From this study, it was noted that majority of patients sustaining burns have no pain assessment done at all. A meagre 2% & 5% of the patients with burns had their pain assessed in the A&E and wards respectively.

In the wards 10% of patients admitted in burns unit had pain assessed while only 2% of those admitted in the plastic surgery ward had their pain assessed.

In the wards and burns unit, the tool utilized for pain assessment was exclusively the FPRS while on the other hand, in the A&E only one patient's pain was assessed using the VAS, the rest were assessed using FPRS. Refer to Table 2 & 3

Table 2: Assessment of pain at different sites of patient contact

Site of pain assessment	Pain assessment		
	Yes	No	Total
A&E	3 (2.2%)	135 (97.8%)	138 (100%)
Plastic surgery ward	2 (2.3%)	86 (97.7%)	88 (100%)
Burns unit	5 (10%)	45 (90%)	50 (100%)

Table 3: Tool utilised for pain assessment

Site of pain assessment	Pain assessment tool		
	FPRS	VAS	Total
A&E	2 (66.6%)	1 (33.3%)	3 (100%)
Plastic surgery ward	2 (100%)	0 (0.0%)	2 (100%)
Burns unit	5 (100%)	0 (0.0%)	5 (100%)

Table 4 shows the correlation between the severity of pain and the extent of burns in TBSA at various points of pain assessment. Immediately upon contact with the participant at A&E, we assessed the extent of burns and categorised is as minor, moderate and major. Similarly, the severity of pain was also categorised into no pain at all, mild pain, moderate pain, severe pain and worst pain ever.

The study shows that there was a similar distribution of participants in terms of extent of burns into the three categories minor burn (34.8%), moderate burn (35.5%) and severe burns (29.7%). The median TBSA was 19.5% (IQR 15 - 27.5%).

This study showed that the plastic surgery ward admitted mostly minor and moderate burns 47% and 42% respectively. The burns unit admitted mostly moderate and major burns 24% and 62% respectively. The minor burns (14%) admitted here were in special areas that needed burns unit admission.

At the A&E VAS scores were moderate 53%, severe pain 45% and 2% with worst pain ever, the mean VAS score was 7 (SD 1.4). Scores for different TBSA categories were also looked at. Majority of patients with severe burns had severe pain at 58.5% while patients with minor burns had mainly moderate pain at 64%. Chi-square was used to assess statistical relationship between severity of burn in TBSA and VAS category, $X^2=13.9$, $p=0.08$ was computed.

Pain assessment in the respective wards was done before change of dressing. Majority of the participants in the plastic surgery wards still had moderate amount of pain accounting for 74% while 21% had mild pain. The mean VAS score in the plastic surgery ward before change of dressing was 5 (SD 1.5).

In the burns unit majority of the participants had moderate pain (88%) while a small number (8%) had mild pain. The mean VAS score in the burns unit was 5 (SD 1.4). Of note was that despite administration of analgesics none of the participant was pain free. Only 21% of patients in burns unit and 8% of patients in plastic surgery wards had pain adequately controlled based on the operational definition of adequacy of pain control in this study. The student's t-test was used to correlate the difference in mean pain scores between A&E and wards (burns unit and plastic surgery ward). The difference in mean VAS score between A&E and the ward was 2.3 ($t=16.8$, $p=0.00$) showing that there was a decrease in pain in the wards.

Furthermore, the participants' mean VAS score was broken down to compare VAS score at A&E and respective ward of admission, where mean difference in VAS score between plastic surgery ward and A&E was 2.13 ($t=13.6$, $p=0.00$) and the mean difference in VAS between burns unit and A&E was 2.58 ($t=10.1$ and $p=0.00$). In both cases there was decreases in the mean pain score in the wards of admission.

This study compared mean differences in VAS scores between the two wards, burns unit and plastic surgery ward before change of dressing using the t-test, the mean difference in VAS between burns unit and plastic surgery wards was 0.4 ($t=1.59$ and $p=0.11$).

The overall mean VAS before change of dressing was compared to a mean VAS score of less or equal to 3 (since this was the operational definition of adequate pain control in this study), the mean score difference was -1.9. Since the mean pain score is negative it means that mean VAS score was higher by 1.9.

See Table 4, Figures 2 and 3.

Table 4: Relationship between VAS and TBSA at wards and A&E

Severity of burns in TBSA	VAS categories				Total
	Mild Pain	Moderate Pain	Severe Pain	Worst pain	
A&E					
Minor burn	0 (0.0%)	31 (64.6%)	17 (35.4%)	0 (0.0%)	48 (100%)
Moderate burn	0 (0.0%)	28 (57.1%)	21 (42.9%)	0 (0.0%)	49 (100%)
Major burns	0 (0.0%)	14 (34.2%)	22 (58.5%)	5 (7.3%)	41 (100%)
Total	0 (0.0%)	73 (52.9%)	62 (44.9%)	3 (2.2%)	138 (100%)
Plastic surgery ward VAS before change of dressing					
Minor burn	10 (24.4%)	22 (70.7%)	2 (4.9%)	0 (0.0%)	41 (100%)
Moderate burn	6 (16.2%)	30 (81.1%)	1 (2.7%)	0 (0.0%)	37 (100%)
Major burns	3 (30.0%)	6 (60.0%)	1 (10.0%)	0 (0.0%)	10 (100%)
Total	19 (21.6%)	65 (73.9%)	4 (4.5%)	0 (0.0%)	88 (100%)
Burns Unit VAS before change of dressing					
Minor burn	1 (14.3%)	6 (85.7%)	0 (0.0%)	0 (0.0%)	7 (100%)
Moderate burn	2 (18.7%)	10 (83.3%)	0 (0.0%)	0 (0.0%)	12 (100%)
Major burns	1 (3.2%)	28 (90.3%)	2 (6.5%)	0 (0.0%)	31 (100%)
Total	4 (8.0%)	44 (88%)	2 (4.0%)	0 (0.0%)	50 (100%)

Figure 2: Comparison of VAS at different areas of contact

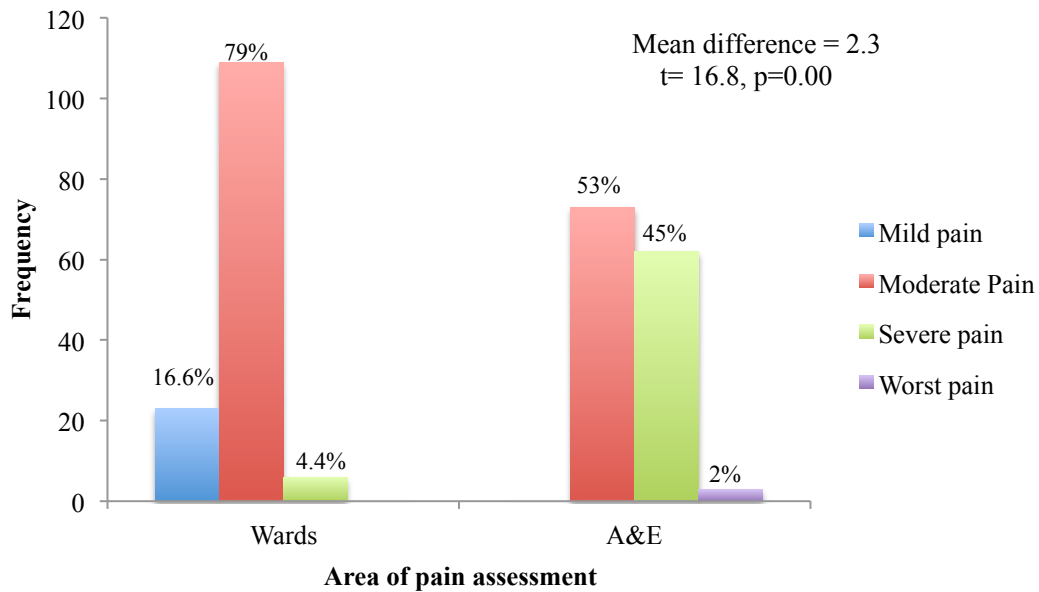
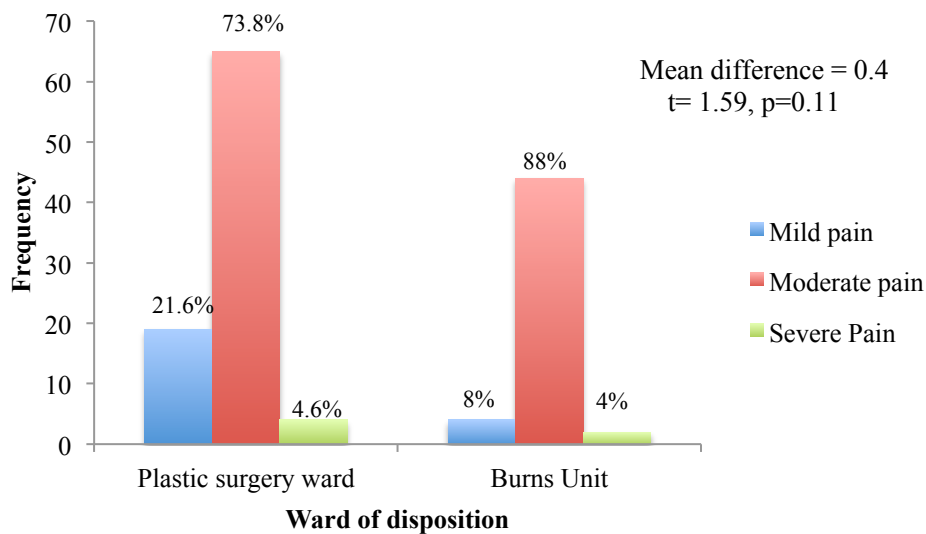


Figure 3: Comparison of VAS between wards of admission



After change of dressing, majority had a VAS score of moderate (67%) & (64%) in the plastic surgery wards and burns unit respectively. The pain was severe in about a quarter and a third of the patients (24%) & (30%) in the wards and burns unit respectively. Only a small percentage of 8% & 6% of the participants had their pain optimally controlled at the two areas namely plastic surgery ward and burns unit.

The students' t-test was used to compare the difference in mean VAS scores after change of dressing between the plastic surgery wards and burns unit the mean difference was 0.58 (t = 0.7, p = 0.076). Refer to table 5.

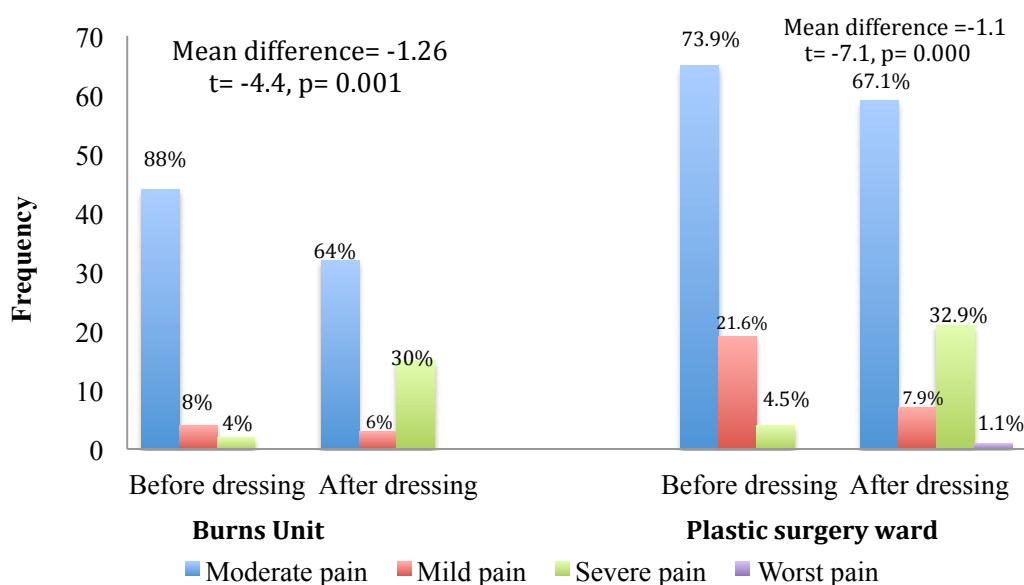
Table 5: Relationship between VAS and TBSA after dressing change in the respective wards

Severity of Burns in TBSA	VAS categories				Total
	Mild Pain	Moderate Pain	Severe Pain	Worst pain	
Plastic surgery ward VAS after change of dressing					
Minor burn	3 (7.3%)	26 (63.4%)	12 (29.3%)	0 (0.0%)	41 (100%)
Moderate burn	2 (5.4%)	27 (73.0%)	8 (21.6%)	0 (0.0%)	37 (100%)
Major burns	2 (20.0%)	6 (60.0%)	1 (10.0%)	1 (10.0%)	10 (100%)
Total	7 (7.9%)	59 (67.1%)	21(23.9%)	1(1.1%)	88 (100%)
Burns Unit VAS after change of dressing					
Minor burn	0 (14.3%)	6 (85.7%)	1(14.3%)	0 (0.0%)	7 (100%)
Moderate burn	0 (0.0%)	9 (75.0%)	3(25.0%)	0 (0.0%)	12 (100%)
Major burns	3 (9.7%)	17 (54.8%)	11(35.5%)	0 (0.0%)	31 (100%)
Total	3 (6.0%)	32 (64.0%)	15 30.0%)	0 (0.0%)	50 (100%)

The students' t-test was used to compare the mean pain score before and after dressing change. In burns unit, the mean difference in VAS was computed to be -1.26 ($t = -4.4, p = 0.0010$). In the plastic surgery ward, mean difference in VAS was -1.1 ($t = -7.1, p = 0.000$). This meant that VAS increased after change of dressing.

Refer to figure 4.

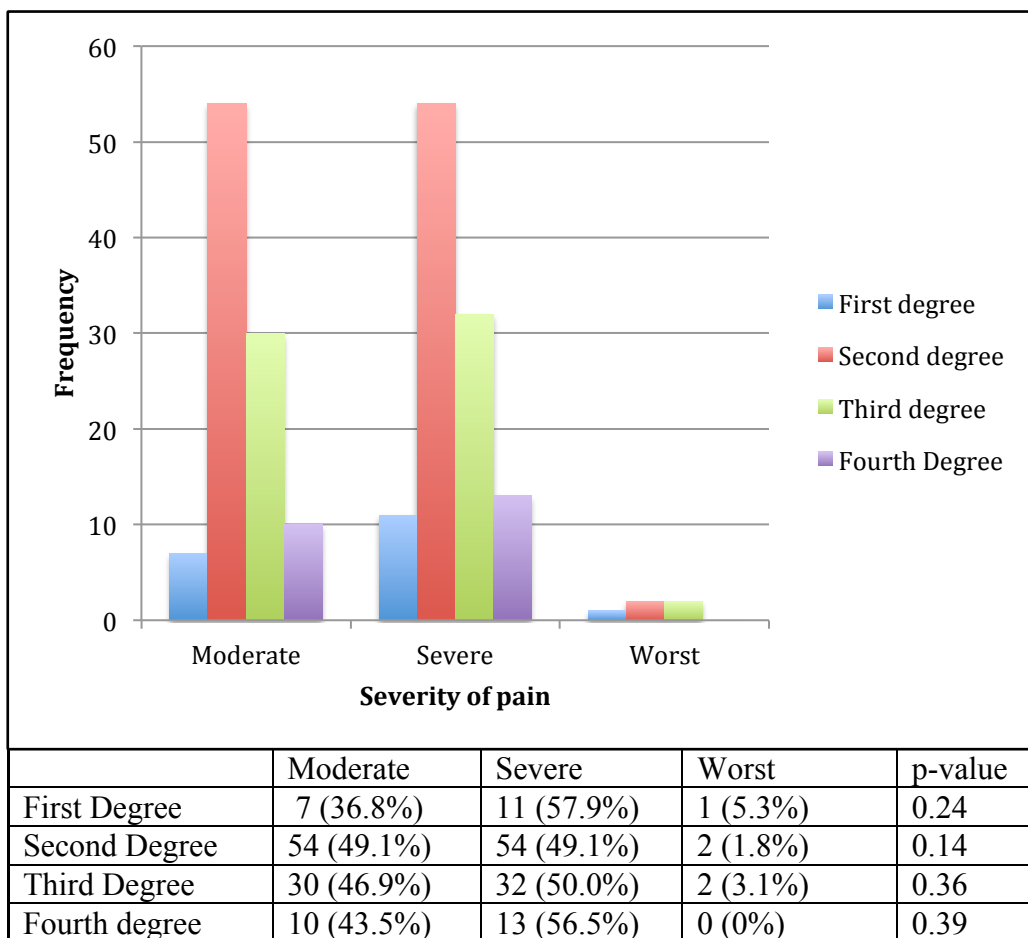
Figure 4: Comparison of VAS before and after change of dressing



Participants with second-degree burns had the most severe pain in comparison to the other degrees of burns. The pain score was ranging between moderate and severe pain in almost all (98.2%) of the patients with second-degree burns. Slightly more than half of the participants with fourth degree burns had severe pain (56.5%). Chi-square test was used to correlate the depth of burn and VAS score.

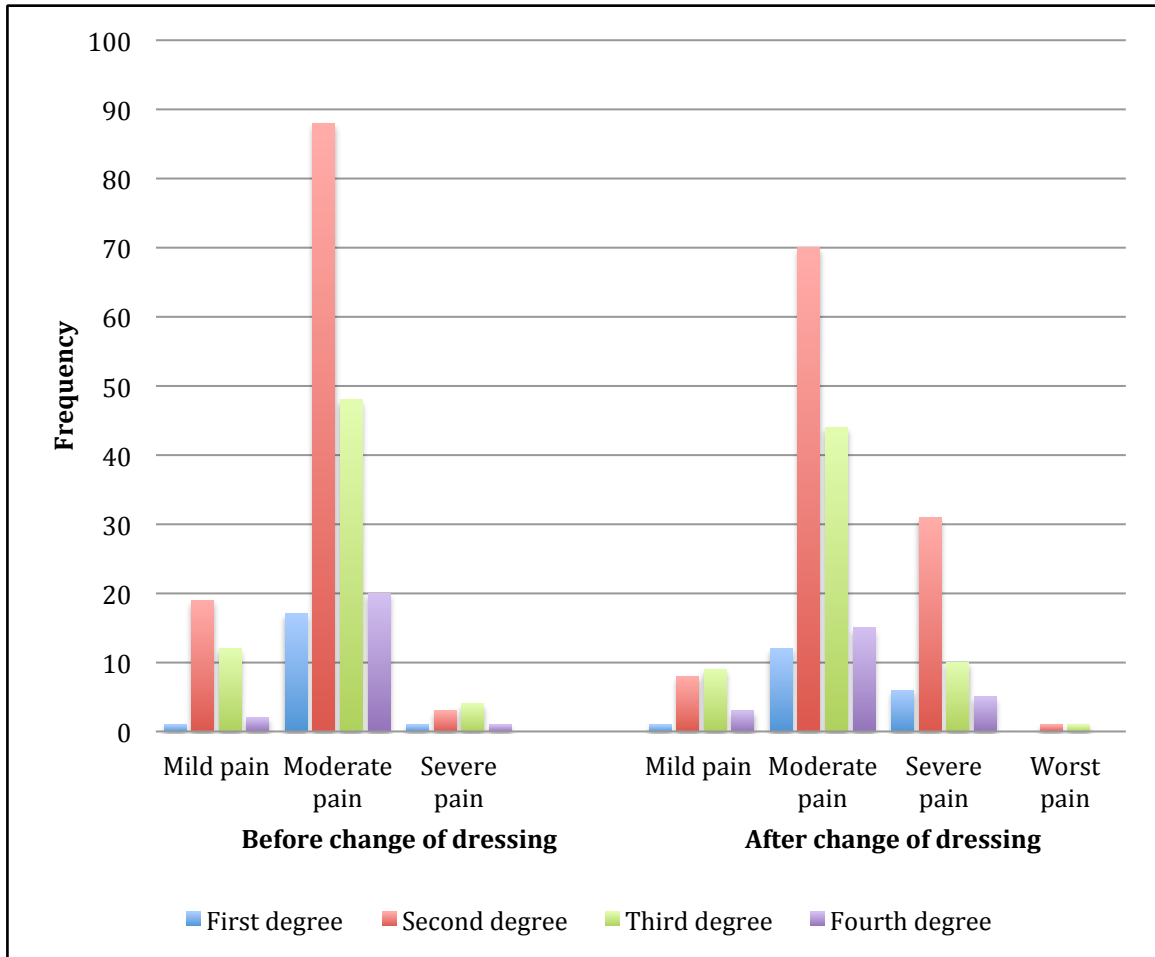
Refer to figure 5.

Figure 5: Relationship between depth of burn and VAS at A&E



Many participants who had mild to moderate pain before change of dressing complained of more pain after dressing hence elevating them into the next pain category. Refer to figure 6.

Figure 6: Comparison of VAS score and depth of burn before and after change of dressing



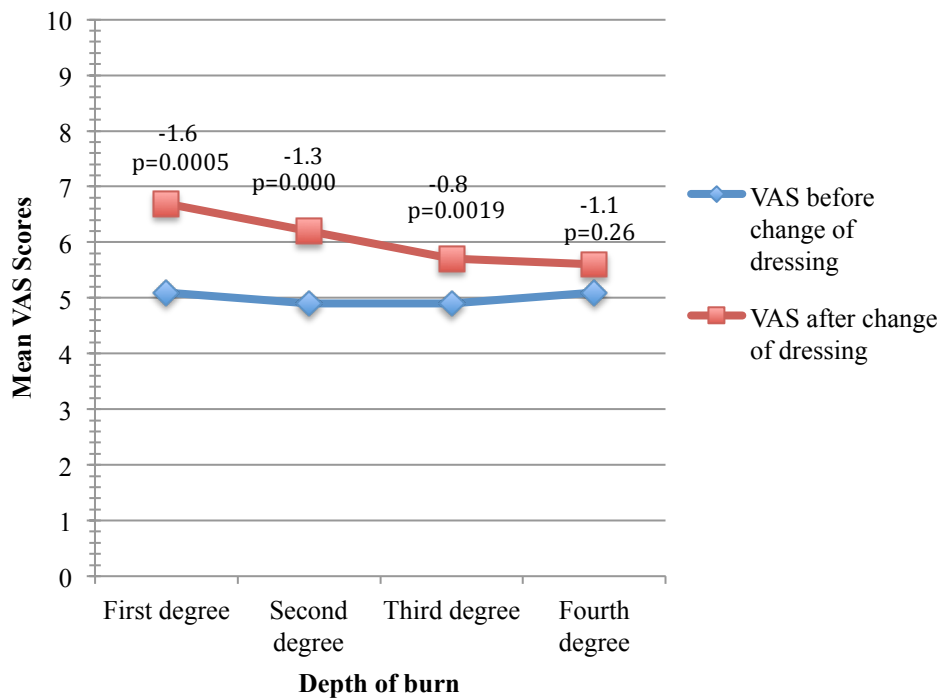
Degree of burn	Pain before dressing			Pain score after dressing			
	Mild pain	Moderate pain	Severe pain	Mild pain	Moderate pain	Severe pain	Worst pain
First degree	1 (5.3%)	17 (89.4%)	1 (5.3%)	1 (5.3%)	12 (63.2%)	6 (31.6%)	0 (0%)
Second degree	19 (17.3%)	88 (80%)	3 (2.3%)	8 (7.3%)	70 (63.6%)	31 (28.2%)	1 (0.9%)
Third degree	12 (18.7%)	48 (75%)	4 (6.3%)	9 (14%)	44 (68.8%)	10 (15.6%)	1 (1.6%)
Fourth degree	2 (8.7%)	20 (87%)	1 (4.3%)	3 (13%)	15 (65.2%)	5 (21.7%)	0 (0%)

The students' t-test was used to correlate the mean VAS scores for each degree of burns to see if there was any statistical significance before and after the dressing. The study shows that there has been an increase in the value of mean VAS after dressing in all patients with

different degrees of burns. This difference in mean VAS was statistically significant in participants with first, second and third degree burns with a p-value of 0.0005, 0.000 & 0.0019 respectively.

Refer to figure 7 below.

Figure 7: Mean differences in VAS score with dressing change



Almost all of the dressing changes at KNH happened in the wards (97%). Dressing change in the operating theatre was done for a small proportion of patients from both the admitting wards (6% and 1% from burns unit and plastic surgery ward respectively). Refer to table 6.

Table 6: Site of change of dressing

Ward of admission	Site of dressing change		Total
	Wards	Operating theatre	
Burns unit	47 (94%)	3 (6.0%)	50 (100%)
Plastic surgery ward	87 (98.9%)	1 (1.1%)	88 (100%)
Total	134 (97.1%)	4 (2.9%)	138 (100%)

In this study, majority (96%) of the participants received analgesics at the A&E. Analgesics were offered after pain assessment, which was done upon arrival. Five (5) patients who didn't receive analgesics had minor and moderate burns three (3) & two (2) patients respectively. The mode of analgesia offered at A&E was mainly unimodal (76%). Refer to table 7 & 8 below.

Table 7: Severity of burns and analgesics offered at A&E

Severity of burns TBSA	Analgesia offered		Total
	Yes	No	
Minor	45 (93.7%)	3 (6.3%)	48 (100%)
Moderate	47 (96%)	2 (4%)	49 (100%)
Major	41 (100%)	0 (0%)	41 (100%)
Total	133 (96.4%)	5 (3.6%)	138 (100%)

Table 8: Mode of analgesia offered at A&E

Mode of analgesia	Frequency	Percentage
Unimodal	102	76.7
Multimodal	31	23.3
Total	133	100

This study shows that slightly more than three quarters of the patients received opioids (77%) alone as the analgesic of choice. The opioid of choice at A&E was morphine (37%). The route of administration of morphine was intravenous in 50% and intramuscular in another 50%. Tramadol was the next most preferred opioid of choice (35%) and the main route of administration was mostly intravenous 92%. Refer to table 9 below.

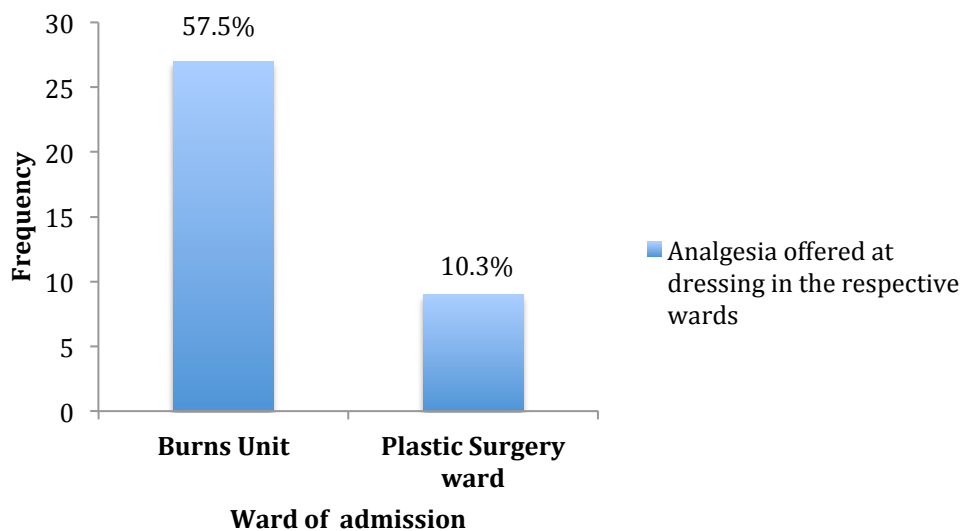
Table 9: Choice of analgesics at A&E

Analgesics of choice	Unimodal	Route of administration	
		IV	IM
Opioids	79 (77.4%)		
Morphine	38 (37.2%)	19 (50%)	19(50%)
Pethidine	5 (4.9%)	2 (40%)	3 (60%)
Tramadol	36 (35.3%)	33 (91.7%)	3 (8.3%)
Diclofenac	9 (8.8%)	n/a	9 (100%)
Paracetamol	14 (13.7%)	10 (71.4)	4 (28.6)
Total	102 (100%)	64 (62.7%)	38 (37.3%)

The study shows that a very small percent of the participants received any analgesia during change of dressing 40 (29%). A total of 36 (90%) received analgesics in the wards while 4 (10%) had their dressing change and analgesics in the operating theatre. Amongst the patients admitted in burns unit 27 (57%) were offered analgesia during change of dressing, while a meagre 9 (10%) of the patients admitted in the plastic surgery ward received any form analgesics during change of first dressing. Four participants had their dressing change done in the operating theatre where they all received analgesics.

The student's t-test was used to look at the mean change in VAS before and after change of dressing amongst those who received any form of analgesia and those who didn't. The differences in mean VAS were -0.5 ($t=-1.3$, $p=0.19$) & -1.4 ($t=-11$, $p= 0.000$) for those who received analgesics and those who didn't respectively. Refer to figure 8 below.

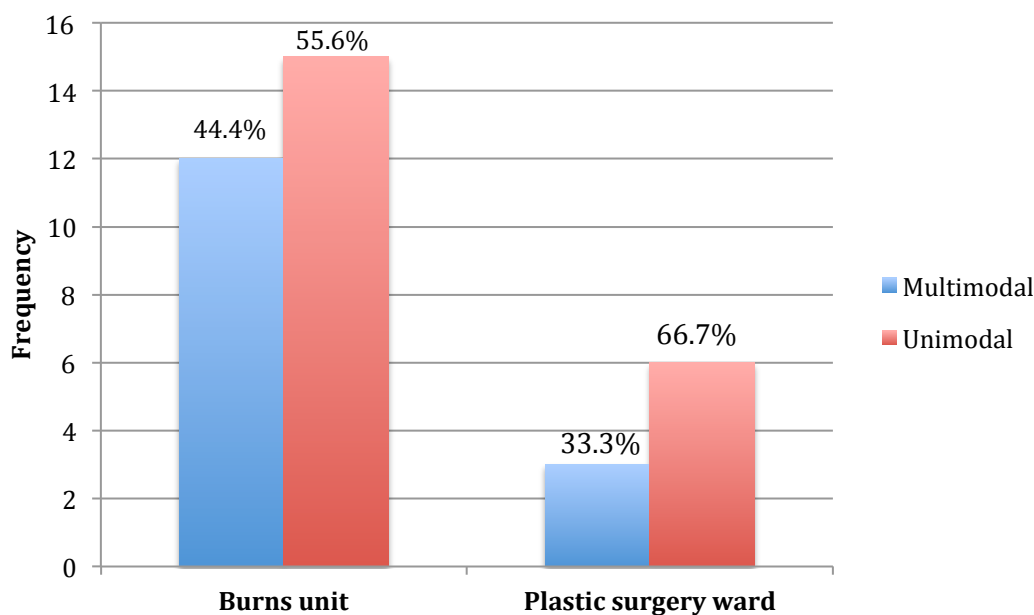
Figure 8: Frequency of analgesia use during change of dressing



Slightly more than half (55%) of those who received analgesics during change of dressing received multimodal analgesia in burns unit. In the plastic surgery ward out of the nine patients who received any sort of analgesics 66% had a single analgesic administered while the remaining had more than one analgesic administered during change of dressing.

Refer to figure 9.

Figure 9: Mode of analgesia offered during change of dressing



Opioids were the most preferred analgesics offered during change of dressing followed by ketamine, paracetamol, NSAIDs, midazolam and lastly propofol. Propofol and fentanyl were exclusively used in patients whose dressing change was done in the operating theatres.

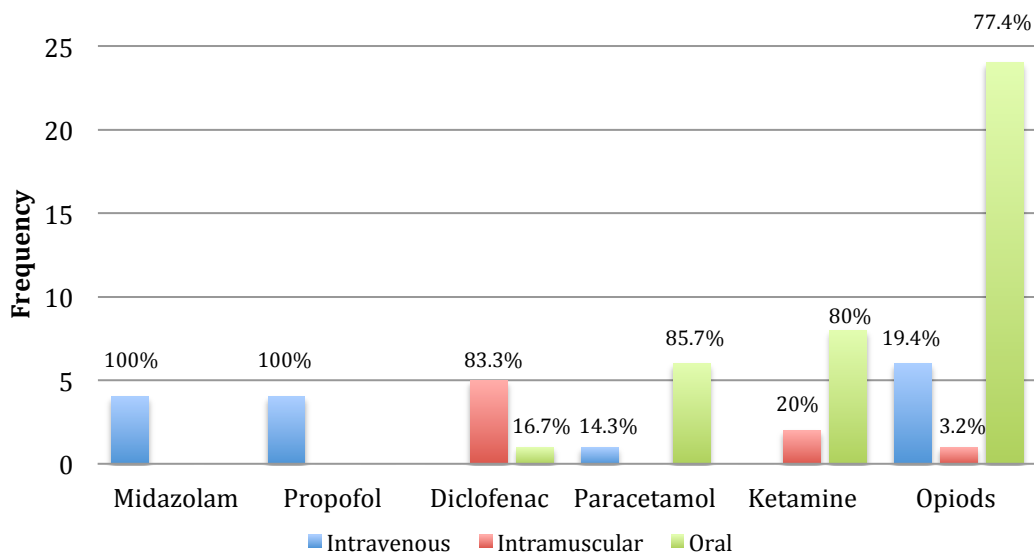
In the wards, morphine was the single and most utilised analgesic used during change of dressing when the mode of analgesia was unimodal (41%). Other medications like ketamine (90%) were also used in conjunction with other medication in the wards. Anxiolytics were used in very few patients and it was midazolam that was the anxiolytic of choice at KNH. Midazolam was used mainly with other medications 100% and not as an isolated drug. See table 10.

Table 10: Choice & mode of analgesia offered during change of dressing

Type of analgesics	Mode of analgesia		Total
	Multimodal	Unimodal	
Opioids	18 (58%)	13 (42%)	31 (100%)
Morphine	17 (58.6%)	12 (41.4%)	29 (100%)
Fentanyl	1 (100%)	0 (0%)	1 (100%)
Tramadol	0 (0%)	1 (100%)	1 (100%)
NSAIDs (Diclofenac)	1 (16.7%)	5 (83.3%)	6 (100%)
Paracetamol	5 (71.4%)	2 (28.6%)	7 (100%)
Ketamine	9 (90%)	1 (10%)	10 (100%)
Midazolam	4 (100%)	0 (0%)	4 (100%)
Others (Propofol)	4 (100%)	0 (0%)	4 (100%)

The routes of offering analgesia in the wards and in theatre were further looked into. From table 10 it is observed that several analgesics were used during change of dressing. From table 10 above, opioids were the most common medication used and the route of opioid administration was mainly oral (77%). From this study ketamine was the next most commonly used medication during dressing at KNH. The route of administration however has been mainly oral (80%). In some patients, diclofenac was used mainly as an intramuscular injection (83.3%). Propofol and midazolam were exclusively used through the intravenous route in conjunction with other medications. See figure 10.

Figure 10: Route of administration of analgesics during change of dressing



6.0 CHAPTER SIX: DISCUSSION

Few studies within the region have been done to address the subject of pain control in patients suffering from burns. No study has looked into the aspect of pain assessment and its control within the African subcontinent. Few studies have described the epidemiology of burns in the East African region. In Kenya the incidence of burns is 3%¹⁷ and 90% of these burns are thermal in etiology^{2,22}. In this study amongst the thermal burns admitted at KNH majority of them were due to open flame and scald each contributing 35.5% of the participants enrolled. These results were in tandem with another study from Eldoret²² while they were contrasted by results from Tanzania where the cause of burns was mostly scald²¹.

In the present study 64.5% of the study population were males with a male to female ratio of 1.8:1. Three studies from Kenya reported similar findings^{22,36,37}. These results generally show that males are the ones mostly affected by burns in Kenya.

The median age of participants in this study was 28 years with an IQR of 22-34 years. These results were similar to a study from Eldoret²² and different from a study done in Kijabe where most of their patients were of the paediatrics age group³⁶. Most of the breadwinners belong to the middle age category and unfortunate happening like scalds and burns by hot liquids would happen at their work place, or while cooking at home.

This study illustrates that there was a similar distribution of participants in terms of extent of burns into the three categories minor burn (34.8%), moderate burn (35.5%) and severe burns (29.7%). The median TBSA was 19.5% (IQR 15 - 27.5%), our patients had slightly higher TBSA when compared to an earlier study from the same institution in 2005 which reported a mean TBSA of 17%³⁷. In the present study 64% of all the patients were admitted to the plastic surgery wards and 36% were admitted in burns unit.

This study looked for assessment of pain amongst patients admitted with thermal burns. Hardly any sort of pain assessment was done in this hospital. In the A&E, plastic surgery ward and burns unit 2.2%, 2.3% & 10% of the participants had their pain assessed respectively. The pain assessment tool used was mainly the FPRS. Only one participant had his pain assessed using VAS at the A&E. These figures are negligible when it comes to pain management since it is known that objective pain assessment is very important to guide the physician in terms of prescribing the correct analgesics to have a pain free state³⁸. In America several burns units utilize pain scales and the preferred scale are FPRS, VAS³⁰ and APRS³⁰.

At KNH pain assessment has been a challenge, since the multidisciplinary aspect of burns management has not taken off as it is in the western world. We have very few pain physicians who serve the whole hospital; hence they are unable to be available daily thereby leading to gaps in pain assessment and pain control as seen in this study. The tools to assess pain like FPRS charts or VAS rulers are lacking thereby making pain assessment difficult. Pain assessment could have been made easier if a copy of these tools were included in the patient's records so that any physician & nurses doing a round could avidly assess and record them in a chart.

VAS was the tool used to objectively assess pain in this study. The study reports pain scores from A&E, plastic surgery wards and burns unit. In the A&E the mean VAS score was 7 while in the wards (plastic surgery and burns unit) mean VAS was 5. VAS score was categorized and majority of the patients had moderate (53%) and severe pain (45%) while 2% has worst pain ever. Scores for different TBSA categories were also looked at. At the A&E majority of patients with major burns had severe pain 58.5% while patients with minor burns had mainly moderate pain 64%. There was a statistically significant correlation between the intensity of burn in TBSA and VAS score $P=0.008$, this meant that participants with burns of higher TBSA reported higher VAS scores.

VAS scores of patients were recorded in the respective wards of admission where we found that there was a decrease in the mean VAS score between A&E and the respective wards. The differences in mean VAS score between A&E and plastic surgery wards and A&E and burns unit was 2.13 ($t=13.6$, $p=0.00$) and 2.58 ($t=10.1$ and $p=0.00$) respectively. Despite the fact that the decrease in pain was statistically significant the overall control of pain in the two places has been inadequate with an overall mean VAS score of five. Very few participants in plastic surgery ward and burns unit actually had their pain adequately controlled before change of dressing 21% & 8% respectively.

The frequency of background pain is very high at KNH with 78% and 92% of the patients having moderate to severe pain in the plastic surgery ward and burns unit respectively. Similar results have been repeatedly reported from other studies despite availability of pain management protocols⁴. The poor control of background pain could be because at KNH; pain assessment is rarely done therefore leading to poor understanding of the initial intensity of pain. This leads to the empiric prescription of analgesics that may actually be an under prescription of these medications. Knowing that burns pathology is dynamic for the first 48-72 hours some patient's pain may be due to progression of burn depth⁴. Such high frequencies of

poorly controlled pain is unacceptable since the detrimental effects of poorly managed pain can be several, from poor patient cooperation, prolonged hospital stay, added morbidity and in the long run development of chronic pain⁶ and psychological disorders like PTSD^{2,4,11}.

This study also looked at depth of burns and its relation to VAS. Burns can be classified into superficial, second-degree superficial, second-degree deep and full thickness. Theoretically degree of pain experienced inversely correlates to the depth of burn, but clinically this correlation is not a reliable predictor of the intensity of pain by the victim^{4,6,25}. The chi square test was used to look for statistical association between depths of burn and pain score at A&E, and there was no statistical association between depth of burn and amount of pain reported. These results further compound to results from previous studies looking at the clinical correlation of depth and intensity of burns. Generally, with any degree of burn it has been noted that VAS scores increased after dressing hence tipping several patients into the next upper category of pain after dressing. Furthermore, the study correlated the differences in mean VAS before and after dressing for each burn depth category, statistical association was noted in participants with first, second and third degree burns only having a p-values of 0.0005, 0.000 & 0.0019 respectively. This increment in pain further shows that procedural pain control at KNH is very poor. This again is very unacceptable and measures to mitigate this need to be set.

In this study we looked at the use of analgesics in patients suffering burns. The mode of analgesia, the preference of analgesics and their route of administration were studied.

At the A&E 96% of the participants had some sort of analgesia offered. The mode of offering analgesia was mainly unimodal 76%. All participants who had major burns received analgesia. The choice of analgesics was mainly opioids 77%, the opioid of choice was morphine 48% and the preferred route of opioid administration was intravenous in 50%. These results differ from other studies, which suggests use of multimodal analgesia^{4,33}. The utility of opioids and route of administration from this study follows recommendations of burn pain management however it should be used in conjunction with other medications^{4,33}.

Most of the dressing change at KNH was done in the wards (97%). Only 40% of the participants received any form of analgesia during change of dressing.

Amongst the patients admitted in burns unit and plastics surgery wards 57% and 10% were offered analgesics during change of dressing respectively. The mode administering analgesics was mainly unimodal in both burns unit and plastic surgery ward 56% & 67% respectively. The choices of analgesics offered during change of dressing in decreasing order were opioids, ketamine, paracetamol and NSAIDS. Propofol and midazolam were offered to patients whose dressing was changed in theatre. The route of administration of most of the medications was oral.

Generally, in the burns unit more patients were offered analgesics during change of dressing, most of the patients received unimodal analgesia (55%). This finding is contrary to recommendations made from other studies, which suggest that multimodal analgesia should be utilized during change of dressing²³. Our findings could be explained by the fact that patients in burns unit have more severe burns; and the hospital also has a small pain management team that occasionally visits to oversee the aspect of pain management in patients admitted here.

In the plastic surgery ward very small proportion of patients received any analgesics during change of dressing (10%). This may be attributed to lack of gadgets like pulse oximeters, lack of expertise and comfort of administering analgesics during change of dressing.

Procedural pain is a sharp burst of pain during procedures that can be alleviated by providing analgesics or sedation⁴. Several studies suggest uses of short acting opioids like fentanyl remifentanyl and use of anxiolytics like midazolam^{4,6,33}. In better centres the dressing change are done under conscious sedation^{4,38}. In our setup despite the low utility of analgesics during change of dressing the choice of analgesic was an opioid it may not be the recommended opioid but still the utility is something to build on. Ketamine has also been used in our hospital but without clear guideline. The route of administration of ketamine in our setup has been oral which reflects to other studies which suggested use of oral ketamine during wound dressing since it has good analgesic and sedating properties^{39,40}. Such practice can be encouraged more frequently in our hospital to alleviate procedural pain.

There was an increment in mean VAS scores in both categories of patients who did and didn't receive procedural analgesia. The increment in VAS amongst those who received analgesia was 0.4 (p= 0.19) while amongst those who didn't receive analgesia was 1.4 (p= 0.000).

Most of the analgesics were offered by the oral route just before or during change of dressing hence time for peak plasma level was not waited for, this may be the reason as to why participants who had received analgesics still had a raise in VAS score. There could also have be a discrepancy in giving the correct dose of analgesics given that nurses would offer the medication and competence and comfort in providing higher doses may be lacking in them.

7.0 CHAPTER SEVEN: CONCLUSION

In conclusion 65% of all the burns patients received KNH had sustained moderate to major burns. Only a minority of the patients had any sort of pain assessment done at A&E (2%) and in the wards (5%). The tools used to assess pain were FPRS (90%) and VAS (10%). Failure to identify the degree of pain leads to inappropriate management of it.

There was clear correlation between severity of burns in TBSA and intensity of pain, but there wasn't any statistical association between depth of burn and intensity of pain in this study.

Overall pain control was poor with very few patients actually having pain adequately controlled. Only 16.7% of all the patients with burns admitted had pain adequately controlled before change of dressing and this figure further dropped to 7% after change of dressing.

Analgesics were offered very sparingly to the patients during change of dressing. A minority (29%) of participants received any form of analgesics during change of dressing. These patients are already traumatised by the primary injury and not mitigating the physical pain during their treatment adds further morbidity.

The mode of offering analgesia has mainly been unimodal at A&E (77%) and in the wards. In the burns unit and plastic surgery wards amongst those who received analgesics during change of dressing 56% & 67% respectively received a single analgesic respectively. The choice of analgesics had been mainly opioids both at A&E (77%) and the wards (77%).

8.0 CHAPTER EIGHT: RECOMMENDATIONS

1. Train primary care givers at KNH in assessing the level of pain amongst patients sustaining burns.
2. The hospital should provide tools to assess pain, a sheet with the VAS or FPRS can be incorporated into the patient's records so that pain scores can be charted often, this would guide the physician to make necessary change in analgesics to alleviate pain.
3. Encourage multidisciplinary management of patient with burns at KNH. Having regular joint rounds with the surgeons, pain specialists, nutritionists, physiotherapists, occupational therapists, psychologists and nurses can lead to this.
4. Look for other methods of pain control apart from pharmacologic and combine all methods to mitigate pain in such patients.
5. Empower nurses in the presence of doctors to offer analgesics safely via the intravenous route during change of dressing. This can be possible by continuous medical education that will assist in removing certain dogmas that may be preventing generous use of analgesics.
6. Development of pain management protocol for different categories of pain with the help of the pain physicians at KNH.
7. Further studies to be done looking at why pain is not assessed at KNH and why analgesics are used sparingly in our setup.

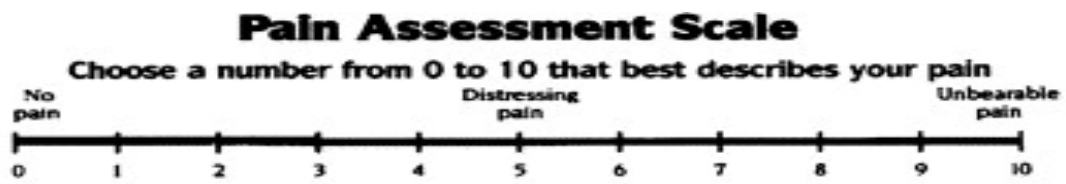
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APPENDICES

APPENDIX I: Visual Analogue Scale



APPENDIX II: Consent Form (English)

ADEQUACY OF ACUTE PAIN MANAGEMENT IN ADULT PATIENTS ADMITTED WITH THERMAL BURNS AT KENYATTA NATIONAL HOSPITAL

This Informed Consent form is for adult thermal burn patients admitted at the Kenyatta National Hospital Burns Unit and Plastic Surgery Ward. This consent will be administered to the patient or their next of kin. We are requesting these patients to participate in this research project whose title is “Adequacy of acute pain management in adult patients admitted with thermal burns at Kenyatta National Hospital”.

Principal investigator: Dr. Vihar Kotecha

Institution: School of Medicine, Department of surgery- University of Nairobi

Supervisors: Dr Opot Elly Nyaim and Dr Nang’ole Ferdinand Wanjala

This informed consent has three parts:

1. Information sheet (to share information about the research with you)
2. Certificate of Consent (for signatures if you agree to take part)
3. Statement by the researcher

You will be given a copy of the full Informed Consent Form.

Part 1: Information sheet

My name is Dr. Vihar Kotecha, a post-graduate student at the University of Nairobi’s School of Medicine. I am carrying out a research on ‘Adequacy of acute pain management in thermal burn patients at Kenyatta National Hospital’. Pain control amongst patients who have sustained thermal burns seems poorly controlled. This leads to dissatisfaction and loss of trust on the treating team. The impacts of poorly controlled pain are significant and simple measures can be used to alleviate them.

Study aims: To check the pain treatment practices and effectiveness of the pain treatment offered in our hospital.

Risks to patient: Your participation is voluntary and refusal to participate in the research or withdrawal from it will not affect treatment you will receive at this hospital. You will face no risk by taking part in this study a simple questionnaire will be administered to you and it will take 10 minutes of your time.

Patient participation: You will not be required to pay any sum of money to participate in the study and you shall not receive any payments as being part of this study.

Benefits of this research: Results from this study will shed light on this subject and further allow us to improve pain treatment in patients sustaining thermal burns.

Confidentiality: All the information that you give us will be used for this research only and will be maintained in full confidentiality. A number will identify the information and only the

researchers can relate the number to patient. The information will not be shared with anyone else unless authorized by the Kenyatta National Hospital/University of Nairobi – Ethics and Research Review Committee (KNH/UoN-ERRC).

Hence I invite you to participate in my study; you are free to agree immediately after receiving this information or later after thinking about it. You will be given the opportunity to ask questions before you decide and you may talk to anyone you are comfortable with about the research before making a decision. After receiving this information concerning the study, please seek for clarification from either my assistant or myself if there are words or details, which you do not understand.

This research has been reviewed and approved by the KNH/UoN-ERRC, which is a committee whose work is to make sure research participants like you are protected from harm.

The contact information is given below if you wish to contact the research team whatever reason.

- Secretary, KNH/UoN-ERRC

P.O. Box 20723 KNH, Nairobi 00202

Tel: 726300-9

Email: uonknh_erc@uonbi.ac.ke

University of Nairobi research supervisors

- Dr. Opot Elly Nyaim

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 19676 KNH, Nairobi 00202

Tel: 0202726300

- Dr. Nang'ole Ferdinand Wanjala

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 19676 KNH, Nairobi 00202

Tel: 0202726300

Principle researcher:

- Dr. Vihar Kotecha

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 19676 KNH, Nairobi 00202

Mobile phone: 0789-797093

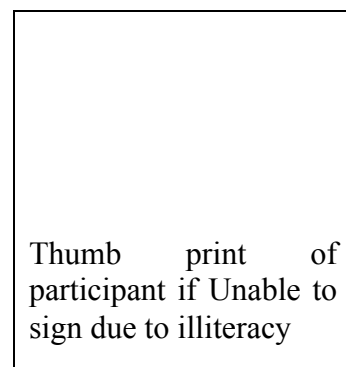
Part 2: Consent certificate by patient

I.....freely give consent of myself or for my proxy Name.....) to take part in the study conducted by Dr. Vihar Kotecha, the nature of which has been explained to me by him/his research assistant. I have been informed and have understood that my participation is entirely voluntary and I understand that I am free to withdraw my consent at any time if I so wish and this will not in any way alter the care being given to me or my proxy.

The results of the study may directly be of benefit to my proxy, other patients, me and most significantly to the Medical professionals to better understand the how pain control can best be achieved in thermal burn patients.

.....
Signature/left thumb print (Participant/Next of kin)

Date



Statement by the witness if participant/ proxy is illiterate

I have witnessed the accurate reading of the consent form to the participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of Witness

Signature of Witness

Date

Part 3: Statement by the researcher

I have accurately read out the information sheet to the participant, and to the best of my ability made sure that the participant understands the following:

- Refusal to participate or withdrawal from the study will not in any way compromise the quality of care and treatment given to the patient.
- All information given will be treated with confidentiality.
- The results of this study might be published to enhance knowledge on pain assessment and adequate pain control amongst thermal burn patients.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant.

Name of researcher taking consent

Signature of researcher taking the consent

Date.....

APPENDIX III: Informed Assent Form 13-17 Years

My name is Dr. Vihar Kotecha, a post-graduate student at the University of Nairobi's School of Medicine. I am carrying out a research to check pain treatment practices and effectiveness of pain treatment in burn patients at KNH. Poorly controlled leads to dissatisfaction and loss of trust on the treating team. The impacts of poorly controlled pain are significant and simple measures can be used to alleviate them.

If you agree, you will be asked to complete a survey. You will be asked how much pain you are having due to the burn and if medicine was given to you during dressing change. Answering these questions will take about 20 minutes. You do not have to put your name on the survey.

You do not have to be in this study. No one will be mad at you if you decide not to do this study. Even if you start, you can stop later if you want. You may ask questions about the study

If you decide to be in the study I will not tell anyone else what you say or do in the study. Even if your parents or teachers ask, I will not tell them about what you say or do in the study.

Hence I invite you to participate in my study; you are free to agree immediately after receiving this information or later after thinking about it. You will be given the opportunity to ask questions before you decide and you may talk to anyone you are comfortable with about the research before making a decision.

Signing here means that you have read this form, or have had it read to you, and that you are willing to be in this study.

Signature of Minor:

Name of Minor:

Name of researcher taking consent

Signature of researcher taking the consent

Date.....

APPENDIX IV: Consent Form (Kiswahili)

Fomu ya ridhaa.

KIWANGO CHA MATIBABU YA UCHUNGU KATIKA WAGONJWA WALIOUNGUA NA MOTO AU VITU VYA MOTO VENYE ASILI YA MAJI KATIKA HOSPITALI YA TAIFA YA KENYATTA.

MTAFITI: Dkt Vihar Kotecha.

KITUO: Shule ya afya, kitengo ya upasuaji. Chuo Kikuu cha Nairobi

Walimu wasimamizi: Dkt Opot Elly Nyaim na Dkt Nan'gole Ferdinand Wanjala

Fomu hii ya idhini ina sehemu tatu

1. Habari itayokusaidia kuamua kushiriki au kukataa kushiriki
2. Fomu ya makubaliano (utakapoweka sahihi ya kukubali ushiriki)
3. Ujumbe kutoka kwa mtafiti

Utapewa nakala ya fomu hii.

1) Sehemu ya kwanza – Maelezo ya kuhusu Daktari mtafiti na utafiti huu.

Mimi ni Dkt Vihar Kotecha, kutoka Chuo kikuu cha Nairobi (University of Nairobi) Kitengo cha Afya Idara ya Upasuaji. Ninatarajia kufanya utafiti huu unaohusu kuangalia ni kwa kiasi gani maumivu yatokanayo na kuungua hutibiwa hapa katika hospital ya Taifa ya Kenyatta.

Ninatarajia kukusanya habari kuhusu maumivu anayopata mgonjwa kwa kuuliza maswali fulani ya afya, na kiwango cha kuhisi maumivu / uchungu ukiwa umelazwa wodini. Katika utafiti huu utatakiwa kutoa taarifa inayokuhusu wewe au inayomhusu ndugu yako. Maumivu yatokanayo na kuungua kwa moto au vitu vya moto vyenye asili ya maji, kama haijatibiwa ipasavyo, huweza kuleta madhara ya kisaikolojia kwa mfano msongo wa mawazo, kutokupona haraka kwa kidonda na kadhalika.

Madhara:

Kwa kushiriki katika utafiti huu, kutakuwa hakuna madhara yoyote utakayopata wewe au ndugu yako. Matibabu yako hayatakuwa tofauti na mgonjwa mwingine yeyote.

Endapo wewe au mgonjwa wako mkikataa kushiriki katika utafiti huu, matibabu yenu hayataathirika kwa uamuzi huo. Kushiriki katika utafiti ni jambo la hiari na hakuna lazima.

Faida:

Kwa kushiriki katika utafiti huu faida kubwa ni kwamba utasaidia madaktari kukuelewa wewe pamoja na matatizo yako kwa kina zaidi na hivyo wataweza kukusaidia vizuri zaidi. Mshiriki huweza kukatisha ushiriki wake muda wowote

Malipo:

Kwa kushiriki katika utafiti huu, hutarajiwi kufanya aina yoyote ya malipo wala hutalipwa chochote.

Usiri:

Taarifa zote zitakazokusanya katika utafiti huu vitashughulikiwa kwa usiri wa hali ya juu na zaidi ya mtafiti na Mkuu wa Kitengo cha utafiti, hakuna atakayekuja kujua tarifa zozote kuhusiana na wewe mgonjwa au ndugu yako.

Unaweza kuuliza maswali yoyote kuhusu utafiti huu na ukiridhika tafadhali jaza fomu ya idhini iliyopo hapa chini. Unaweza pia kuuliza swali yoyote sasa hivi au baadaye kwa kupiga simu kwa mtafiti mkuu ama walimu wasimamizi wa utafiti ukitumia nambari za simu zifuatazo;

- Katibu wa utafiti, Hospitali ya Taifa ya Kenyatta na Chuo kikuu cha Nairobi.
Sanduku la Posta 20723 KNH, Nairobi 00202.
Nambari ya simu 020 726300-9.

Walimu wakuu wa Chuo kikuu cha Nairobi:

- Dkt Opot Elly Nyaim,
Sanduku la Posta 19676 KNH, Nairobi 00202.
Nambari ya simu:0202726300
- Dkt Nan'gole Ferdinand Wanjala
Sanduku la Posta 19676 KNH, Nairobi 00202.
Nambari ya simu: 0202726300

Mtafiti:

Dkt Vihar Kotecha,
Idara ya Upasuaji ya Shule ya Afya – Chuo kikuu cha Nairobi,
Sanduku la Posta 2678 KNH Nairobi 00202.
Nambari ya simu: 0789-797093

(2) Sehemu ya pili – Idhini ya mgonjwa.

Mimi (Jina)..... natoa ihari kwa niaba yangu
ama ya mgonjwa wangu (Jina la
Mgonjwa)..... kushiriki katika
utafiti huu unaofanywa na Daktari Vihar Kotecha kutokana na hali ambayo nimeelezwa na
sio kwa malipo ama shurutisho lolote.
Nimeelewa kwamba ninaweza kujiondoa wakati wowote nitakapotaka na hatua hii
haitahatarisha matibabu nitakayopata ama anayoyapata mgonjwa wangu. Matokeo ya utafiti
yaweza kuwa ya manufaa kwangu ama kwa wagonjwa wengine kwa ujumla na hata
madaktari wenyewe, kwa kuendeleza elimu, na hata kupunguza shida zinazotokea kutotibu
uchungu vizuri.

.....
Sahihi/ama alama ya kidole cha gumba katika sanduku →

Tarehe.....

Jina la shahidi.....

Sahihi.....

Tarehe.....

Kidole Gumba ya
mgonjwa ama Ndugu
Kama huwezi
kuandika

(3) Sehemu ya tatu – Thibitisho kutoka kwa mtafiti

Hii nikuidhinisha ya kwamba nimemueleza msimamizi wa mshiriki(mgonjwa) na mgonjwa mwenyewe kuhusu utafiti huu na pia nimempa nafasi ya kuuliza maswali. Nimemueleza yafuatayo;

Kwamba kushiriki ni kwa hiari yake mwenyewe bila malipo.

Kushiriki hakutasababisha madhara ama kuhatarisha maisha kamwe.

Anaweza kujiondoa kutoka kwa utafiti huu wakati wowote bila kuhatarisha matibabu anayoyapata katika hospital kuu ya Kenyatta.

Habari ambazo atatoa hazitatangazwa hadharani bila ruhusa kutoka kwake (mshiriki) na pia kutoka kwa mdhamini mkuu wa utafiti wa hospital kuu ya Kenyatta na chuo kikuu cha matibabu.

Jina la Mtafiti ama Msaidizi wake

Sahihi.....

Tarehe.....

APPENDIX V: Fomu ya ridhaa kwa wagonjwa wa miaka 13-17

Mimi ni Dkt Vihar Kotecha, kutoka Chuo kikuu cha Nairobi (University of Nairobi) Kitengo cha Afya Idara ya Upasuaji. Ninatarajia kufanya utafiti huu unaohusu kuangalia ni kwa kiasi gani maumivu yatokanayo na kuungua hutibiwa hapa katika hospital ya Taifa ya Kenyatta.

Ninatarajia kukusanya habari kuhusu maumivu anayopata mgonjwa kwa kuuliza maswali fulani ya afya, na kiwango cha kuhisi maumivu / uchungu ukiwa umelazwa wodini. Maumivu yatokanayo na kuungua kwa moto au vitu vya moto vyenye asili ya maji, kama haijatibiwa ipasavyo, huweza kuleta madhara ya kisaikolojia kwa mfano msongo wa mawazo, kutokupona haraka kwa kidonda na kadhalika.

Uki kubali ku shiriki uhitaji ku jaza fomu yenye maswali yanayo husu kiwango cha maumivu unayo sikia kutokana ku ungua. Pia kuna maswali ku husu ku pewa madawa za maumivu wakati una fanyiwa “dressing” ya kidonda. Itakuchuku kama dakika 10 ku jaza fomu hii.

Huta lazimishwa kushiriki katika utafiti huu wala mtu yeyote hata ku shutu kama huja shiriki. Matibabu yako yata endelea kama kawaida hata usipo shiriki. Una weza kujiondoa katika utafiti huu muda yeyote.

Taarifa zote zitakazokusanya katika utafiti huu vitashughulikiwa kwa usiri wa hali ya juu na zaidi ya mtafiti na Mkuu wa Kitengo cha utafiti, hakuna atakayekuja kujua tarifa zozote kuhusiana na wewe.

Ninakukaribisha kushiriki katika utafiti huu.

Ku weka sahihi katika hi fomu ina thibitisha kwamba ume soma fomu hii na ume kubali ku shiriki katika utafiti huu.

Sahihi ama alama ya mgonjwa:

Jina la Mgonjwa:

Sahihi ya anayechukua idhini:

Jina la anayechukua idhini:

APPENDIX VI: Questionnaire

Questionnaire Number: _____

1. SOCIO-DEMOGRAPHIC DATA:

IP NUMBER:	AGE(Yrs)	GENDER	Weight in Kgs
		Male/ Female	

2. BURN INJURY DETAILS:

Time of Injury: (24hr clock)	Date of Injury (dd/mm/yyyy)	Time of Arrival to KNH: (24hr clock)	% TBSA burnt:
_____ hrs	____ / ____ / 20	_____ hrs	_____

3. Causative agent of the Thermal Burn (circle appropriate)

- a. Flame
- b. Scald
- c. Hot liquid (Specify liquid) _____
- d. Others (Please specify) _____

4. Depth of Thermal Burn (Tick as appropriate in the box adjacent)

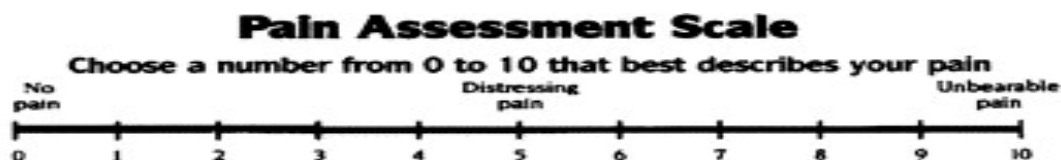
Depth of Thermal burn			
First degree		Third degree	
Second degree superficial		Fourth degree/ full thickness	
Second degree deep		Mixed	

5. Was any pain assessment done in A & E? (Circle appropriate)

- a. Yes b. No (go to qn 7)

6. If yes using which tool? Mention _____

7. Degree of pain at A & E _____



8. Were analgesics offered at A & E?

- a. Yes b. No (go to qn 11)

9. Mode of Analgesics offered at A & E: (Circle appropriate)

- a. Multimodal drugs (go to No 10)
- b. Unimodal (mention drug) _____ (go to qn 11)
- c. Others _____ (go to qn 11)

10. Analgesics prescribed at A & E:

Drug type	Name (Mention)	Dose (Total in 24 Hrs)	Route of Administration			
			IV	IM	PO	All
Opioid						
NSAID						
Paracetamol						
Others						

11. Which ward was the patient admitted in?

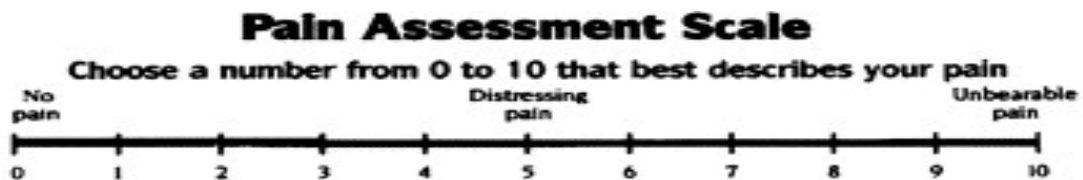
- a. 4D
- b. Burns Unit

12. Was any pain assessment done in the burns unit / ward? (Circle appropriate)

- a. Yes
- b. No (go to qn13)

13. If yes using which tool? Mention _____

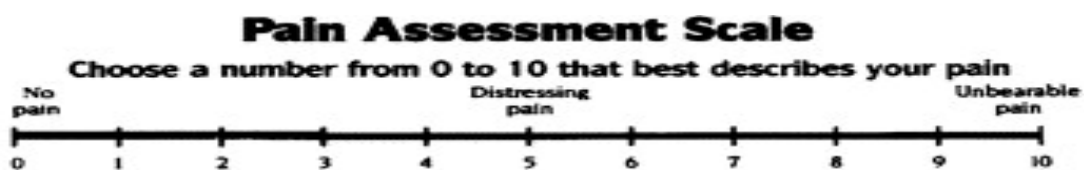
14. Degree of pain before dressing _____



15. Where was the dressing change done?

- a. Wards
- b. Theater

16. Degree of pain after dressing _____



17. Were any analgesics/sedative administered during dressing in the ward?

- a. Yes b. No (End of questionnaire)

18. If yes which drugs?

Drug type	Name (Mention)	Dose (Total in 24 Hrs)	Route of Administration			
			IV	IM	PO	All
Opioid						
NSAID						
Paracetamol						
Ketamine	N/A					
Anxiolytic						
Others						

APPENDIX VII: Ethical Approval



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355



KNH/UON-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/32

2nd February, 2015

Dr. Vihar Kotecha
Dept. of Surgery
School of Medicine
University of Nairobi

Dear Dr. Kotecha

Research Proposal: Adequacy of acute pain management in adult patients admitted with thermal burns at Kenyatta National Hospital (P635/10/2014)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 2nd February 2015 to 2nd February 2016.

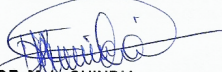
This approval is subject to compliance with the following requirements:

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

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

Protect to discover

Yours sincerely



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

- c.c. The Principal, College of Health Sciences, UoN
 The Deputy Director CS, KNH
 The Assistant Director, Health Information, KNH
 The Chairperson, KNH/UON-ERC
 The Dean, School of Medicine, UoN
 The Chairman, Dept of Surgery, UoN
 Supervisors: Dr. Opot Elly Nyaim, Dr. N.F. Wanjala

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