

**PAIN MANAGEMENT PRACTICES DURING WOUND CARE IN
PATIENTS WITH MODERATE TO MAJOR BURN INJURIES,
KENYATTA NATIONAL HOSPITAL, KENYA**

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Declaration

I, Moses Kiplagat declare that this is my original work and has not been submitted for any degree in any university for similar purposes.

Signature.....

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Dedication

I dedicate this work to my wife Everlyn Rotich and my children Oscar, Anita and Darlene for their moral support throughout the project.

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LIST OF ABBREVIATIONS

BPM: Beats Per Minute

BSA: Body Surface Area

IBM: International Business Machine

IV: Intravenous

KNH: Kenyatta National Hospital

MMHg: Millimeter of Mercury

SPSS: Statistical package for Social Scientists

TBSA: Total Body Surface Area

TM : Trade Mark

U o N: University of Nairobi

VIHA: Vancouver Island Health Authority

WHO: World Health Organization

OPERATIONAL DEFINITIONS

Adult: A person who has attained age of 18 years.

Adjuvant drug: Are those drugs used alongside analgesics in management of pain which themselves are not analgesics though they modify the perception of pain e.g. hypnotics.

Analgesia drug: Drugs that relieve pain due to multiple causes, for example paracetamol or morphine

Analgesics: Are narcotics acting in central nervous system and cause drowsiness e.g. opioids or non narcotic acting peripherally e.g. diclofenac.

Child: A person who is below 18 years of age.

Clinician: A healthcare practitioner that works as primary care giver of a patient in the hospital. They include Doctors (consultant physicians and Registrars), Registered nurses and physiotherapists.

Major Burn injury: Second degree burns exceeding 25% TBSA in adults or 20% in children

Moderate burn injury: Defined as partial thickness burns between 15-25% in ages between 10-50 years, partial thickness burns between 10-20% in ages below 10 years or above 50 years and full thickness burns between 2-10%.

NSAIDs: Non Steroidal Anti-inflammatory drugs

Pain: Unpleasant sensation often caused by intense or damaging stimuli.

Pain management: Pharmacological and non pharmacological pain intervention during burn wound care procedures.

Wound care: Cleaning, dressing, physiotherapy or debridement done on burn injury site.

ABSTRACT

Introduction: Daily burn wound care procedures lead to trauma and excruciating pain and this is associated with longer bed occupancy and poor outcomes. Because of different components of pain and ever changing pattern overtime, it has become difficult to control and manage procedural burn pain. The objective of the study was to determine pain management practices during wound care procedures in patients with moderate to major burn injuries in Burns Unit and ward, Kenyatta National Hospital, Kenya.

Methods: The study was a cross sectional study carried out at Kenyatta National Hospital. Eighty (80) patients who met inclusion criteria were recruited into the study over a three weeks period between June and July 2013. Data was collected using structured questionnaire consisting of two parts: Patient data (demographic and pain scales) and clinician management of pain. The analysis was done using Statistical Package for Social Scientists (SPSS) version 18 and presented using charts and tables.

Results: Children below 18 years of age were the majority 52%, (n=41). Mean Total Burn Surface Area (TBSA) was 24.5%. There was a higher risk of sustaining burn injuries in informal settlements in Nairobi 53.2% (n=25) compared to formal and semi formal settlements 46.8% (n=22). Kerosene stove was the main source of fire at 40% (n=32). Patients reported significant increase of pain during wound care procedures with mean pain score 8.5 SD 1.4, P=0.001 in both numerical and behavioral pain scales. Patients who were only on paracetamol analgesic reported more pain during wound care procedures (mean change 5.66) compared to morphine (mean change 4.37, P=0.033). Patients who received non pharmacological pain management practices

in addition to pharmacological pain management reported less pain than those who did not benefit from them, $P=0.004$.

Conclusion: The study found that majority of patients admitted in burns unit and ward were children aged between 2-10 years and a significant proportion was from urban (informal inhabitants). Clinicians pain management practices during wound care procedures involved pharmacological as well as non pharmacological pain management, however their pain dissipation was inadequate. Public health interventional strategies need to be instituted to prevent and protect children and informal inhabitants to mitigate the dangers of fire. Innovative pain management practices combining both pharmacological and non pharmacological therapies need to be implemented and / or researched on.

CHAPTER 1: INTRODUCTION

1.1: BACKGROUND

Burns are the most intense painful injuries. All patients will experience pain regardless of the cause, size or depth of burn with 1st and 2nd degrees being the most painful. Advances over the years including analgesics, sedatives and topical wound therapies have resulted in more patients surviving burn injuries. Yet despite these developments, there is great variability in pain management (Stoddard et al, 2002).

Providing adequate analgesia to a burn patient is a challenge to clinicians. Because of different component and ever changing pattern overtime, it has become difficult to control. Wound care procedures significantly leads to trauma and excruciating pain in burnt patients and Intensity of pain experienced during therapeutic procedures may also increase rather than decrease overtime. Indeed, it has also been shown that children are much less likely than adults to receive sufficient analgesic during procedural wound care despite the fact that burn pain is as painful in a child as an adult. Burn invokes a lot of pain in most circumstances and has not been adequately controlled leading to psychological sequel and poor wound healing (Chamblis and Anand, 1997).

Procedural burn pain control needs to be under constant revision and improvement using creative ideas and approaches (Hyeong et al 2012). Moreover, pain management during wound care procedures is a critical part of treatment in acute burn injuries. There are limited studies conducted on burn pain in this region and this study will add value in existing burn pain management protocols in our hospitals and sub-saharan Africa as a whole.

1.2 PROBLEM STATEMENT

Burn injuries are classified as one of the most devastating of all injuries and a major global public health crisis. Approximately 90% of burns occur in low to middle income countries, regions that generally lack the necessary infrastructure to reduce incidence and severity of burns (Peck et al 2008). Most clinicians prescribe opioids sparingly in practice due to fear of tolerance and addiction hence most patients may not get quality analgesia.

Most wound care procedures for example cleaning, dressing and physiotherapy are very painful hence long term prolonged pain may increase risk of developing anxiety and minimizes patient's participation in burn rehabilitation hence increasing hospital stay and morbidity (Peck et al, 2008).

There are limited studies conducted in Africa and especially in Kenya on pain management during wound care procedures. Numerous studies have been done in developed countries but none have been replicated in Kenya considering racial and cultural differences between races. There exists disparities on procedural pain management and this study would wish to establish current situation and come up with baseline findings likely to open research and evidence based practice.

1.3 RESEARCH QUESTIONS

1. What are characteristics of patients admitted with moderate to severe burn injuries?
2. What are clinician practices for managing procedural pain in patients with moderate to major burn injuries?

3. How effective is procedural pain management practices during wound care procedures using numerical and behavioral pain scales?

1.4 BROAD OBJECTIVES

To determine pain management practices during wound care procedures in patients with moderate to major burn injuries in Burns ward and Unit, KNH, Kenya.

1.5 SPECIFIC OBJECTIVES

1. To establish characteristics of patients admitted with moderate to severe burn injuries
2. To establish clinician practices for managing procedural pain in patients with moderate to major burn injuries.
3. To determine the effectiveness of procedural pain management practices on patients with moderate to major burn injuries.

1.6 Hypothesis

Adequately managed procedural pain among burn injury patients results to positive outcomes

1.7 Justification of the study

The findings of this study may contribute to development of policies on procedural burn pain management and may have implications for further research and innovative strategies for the management of burn pain during wound care procedures in enhancing quality of life for patients with burns.

1.8. Theoretical framework: Ida Jean Orlando's Deliberative nursing process

Ida J. Orlando was one of the first nursing theorists to write about the nursing process based on her own research. Her Deliberative Nursing Process Theory focuses on the interaction between the nurse and patient, perception validation, and the use of the nursing process to produce positive outcomes or patient improvement (Faust, 2002).

In burn procedural pain, the presenting behavior of the patient, regardless of the form in which it appears, may represent a plea for help. When a patient experiences a need that he cannot resolve, a sense of helplessness occurs. The patient's behavior reflects this distress. The patient's pain stimulates a nurse reaction which marks the beginning of the nursing process and investigates to resolve the problem and later evaluates pain perception through a close dynamic nurse-patient relationship.

1.9 Conceptual framework

Clinician practices in procedural pain management include assessment of pain using numerical pain rating scale to determine effectiveness of pharmacological and non pharmacological intervention. Thus clinician practices forms dependent variables in this study.

Clinician experience and knowledge on procedural burn pain management including hospital policies on burn pain management forms independent variables.

Confounding variables in this study that directly affect relationship between dependent and independent variables include age, severity of burn injury and type of wound care procedure done to the patient. The outcome is effective procedural pain management which improves quality of care as detailed in schema below:

Confounding variables

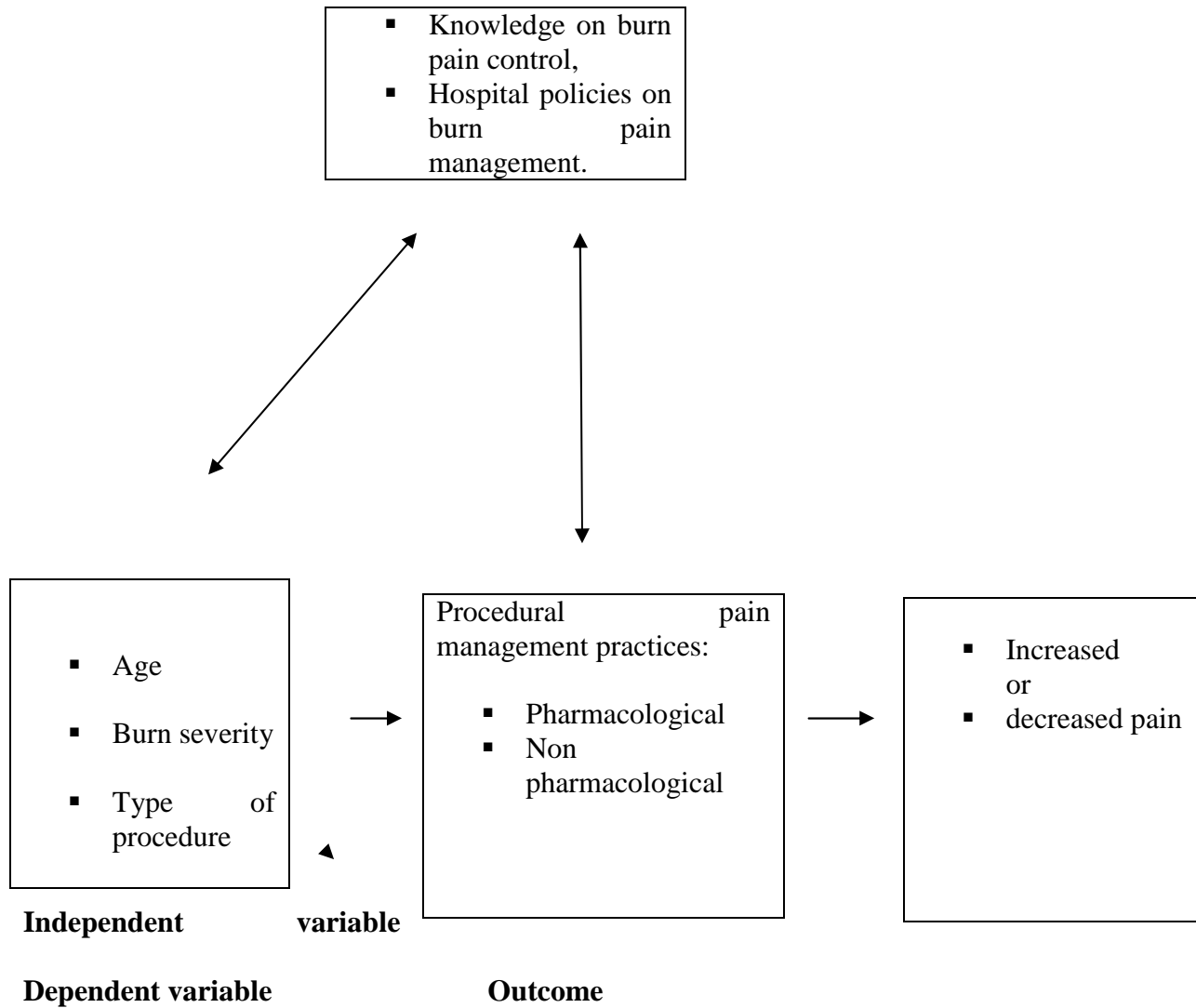


Figure 1. Conceptual framework

CHAPTER 2: LITERATURE REVIEW

2.1 Burn definition and pathophysiology

Burns are injuries to tissues caused by heat, friction, electricity, radiation, or chemicals (Hendon 2007). Burn result in a local inflammatory response and a systemic inflammatory response if it is major. Following major burns, there is an increase in heart rate due to release of catecholamines and hypovolemia due to shift of fluid volume in body's compartments. Cardiac output may decrease initially but returns to normal if there is adequate fluid resuscitation (Ashley 2011).

2.2 Epidemiology of Burns

Although epidemiology of burns in Kenya is scarce, about 90% of burns occur in the developing world and 70% of these are in children. In a study conducted at AIC Kijabe Hospital (Dale et al, 2012), it emphasizes the shortcomings of a retrospective case series and supported the establishment of the retrospective Kenya Burn repository to be utilized at other hospitals in Kenya and enhance burn data collection, establishment, prevention and treatment strategies and measure outcomes. Survival of injuries greater than 40% total body surface area is rare in the developing world (Potokar et al 2007). According to a study conducted at Kenyatta National Hospital, Mean age of patients admitted with major burn injury is 14.4 years and mean Total Body Surface Area (TBSA) is 22% (Ndiritu et al, 2006).

2.3 Classification of burns and relationship to pain

Burn pain involves several components that cause the patient to experience severe and prolonged pain. Pain is associated with the injury itself and felt at the wound site or in the surrounding areas. Superficial burns involving only the epidermises, such as sunburn, are mild to moderately painful and usually heal within 2 weeks. Partial-thickness burns, are very painful, with deeper burns causing more damage to nerve endings. These wounds have exposed nerve endings that cause excruciating pain when in contact with air currents. Full-thickness burns have historically been considered painless because of the complete destruction of nerve endings. Patients rarely have only one depth of burn, however; it is more common for burn depth to be variable throughout the wound bed. In full-thickness burns pain is usually not felt on the surface of the skin, but painful edges surround the injury where viable pain receptors at the margins of the wound are hypersensitive to pain. This hypersensitivity can result in intense pain for the patient with full-thickness injuries. Full-thickness injury may also involve underlying structures, causing deep muscle or ischemic pain (Robert, 2004).

American Burn Association devised a classification system to help in decision making process especially in referrals. Burns can be classified as major, moderate or minor. This is assessed based on total body surface area burnt, involvement of specific anatomical zones, age and associated injuries.

Major burn injury is defined as partial thickness burns of more than 25% of total body surface area within ages 10-50 years, partial thickness burns of more than 20% in patients below 10 years or more than 50 years, full thickness burns of more than 10%, burns that cross major joints, electrical burns, burns involving face, feet, hands and perineum, burns in infant and elderly and

burns associated to inhalational injury. This type of burn injury require referral to specialized burn center.

Moderate burn injury is defined as partial thickness burns between 15-25% in ages between 10-50 years, partial thickness burns between 10-20% in ages below 10 years or above 50 years and full thickness burns between 2-10%. This type requires hospitalization for burn care. Minor burn injury is defined as partial thickness burns below 15 % of ages between 10-50 Years, Partial thickness burn of below 10% in ages below 10 years or above 50 years or full thickness burns below 2%. This type does not require hospitalization. (Mary et al, 2009).

2.4 Burn pain

2.4.1 Pathophysiology of pain

Melzack and Wall (1965) proposed 'gated theory of pain control' which has been subsequently modified but still remain valid. The theory proposes that transmission of information across a synapse between A delta fibres and C fibres and the cells in the dorsal horn of the spinal cord can be diminished or blocked. The activation of the large mechanical nerve fibres (A beta fibres) is associated with low threshold mechanoreceptors such as touch which stimulate inhibition nerve in spinal cord that inhibit synaptic transmission (Nilesh P, 2010).

Pain is a complex phenomenon or syndrome and has three major aspects: Nociception is a consequence of tissue injury causing release of chemical mediators which activate nociceptors. Pain perception, another major aspect is as a result of nociceptive input plus a pattern of impulses of different frequency and intensity from other peripheral receptors for example heat and mechanoreceptors whose threshold of response is decreased by chemical mediators. Lastly,

Suffering is a consequence of pain and a lack of understanding by patients of the meaning of pain. It comprises anxiety and fear in acute pain and depression in chronic pain (Bennet et al, 2003).

2.4.2 Components of burn pain

Burn pain involves several components that cause severe pain. Background pain is felt at wound site and surrounding areas. It is generally constant and made worse by movements eg changing position, turning in bed, breathing or walking.

Procedural pain is related to therapeutic procedures carried out during the course of treatment. These procedures include dressing changes, wound cleansing and physiotherapy sessions. Other sources of pain include immobilization of limbs in splints or garments and multiple surgical interventions for example skin crafting.

Finally, the third component of burn pain is related to tissue regeneration and healing process. When nerves regenerate along with those destroyed at the time of injury, pain is experienced along with intense tingling or itching sensation and may mimic neuropathic pain rather than acute pain due to thermal injury (Wall and Melzack, 2003).

2.5.3 Pain intensity and variations

Many factors influences pain intensity in a burned patient. The depth of burn, location and size influences clinical outcome of burn injury. First degree burn cause less pain since the damage is only the superficial layer of epidermis in contrast to second degree superficial burns which usually require skin crafting where nerve terminals are exposed. In full thickness or third degree burns which entire dermis are destroyed and nerve terminals, patient will also experience pain

since deep burns are always intermixed with or surrounded with superficial burns in which nerve terminals are intact (Wall and Melzack,2003).

2.5. Assessment of Pain

2.5.1 Goal of pain assessment.

Ongoing comprehensive assessment is the foundation of effective pain management, including interview, physical assessment, medication review, medical and surgical review, psychosocial review, review of physical environment and the appropriate diagnostics. Assessment must determine the cause, effectiveness of treatments and impact on quality of life for the patient and their family. (VIHA, 2008).

2.5.2 Pain assessment using acronym O P Q R S T U V

O: Onset: When did it begin? How long does it last? How often does it occur?

P: Provoking: What brings it on? What makes it better? What makes it worse?

Q: Quality: What does it feel like? Can you describe it?**R: Radiating/Region:** Where is it? Does it spread anywhere?

S: Severity: What is the intensity of this symptom (On a scale of 0 to 10 with 0 being none and 10 being worst possible)? Right now? At best? At worst? On average? How bothered are you by this symptom? Are there any other symptom(s) that accompany this symptom?

T: Treatment: What medications and treatments are you currently using? How effective are these? Do you have any side effects from the medications and treatments? What medications and treatments

U: understanding/ impact: What do you believe is causing this symptom? How is this symptom affecting you and / or your family?

V: Values: What is your goal for this symptom? What is your comfort goal or acceptable level for this symptom (On a scale of 0 to 10 with 0 being none and 10 being worst possible)? Are there any other views or feelings about this symptom that are important to you or your family? (VIHA, 2008).

2.6. Pain measurement scales

Pain is sometimes termed as 5th vital sign and nursing assessment of pain is significant for optimal pain management. Commonly used tools are numerical rating scale, visual analog scale and behavioral pain assessment scale. According to National Institute for Health (U.S), numerical rating scale can be used for both adults and children who can express themselves where 0 is having no pain, 1-3 (Mild pain), 4-6 (moderate pain) and 7-10 (Severe pain). For patients who are unable to provide a self report of pain, behavioral assessment scale can be used as evidenced by Elizabeth et al (2012) who successfully used it in children and noted excellent reliability and generally accepted by caregivers. The table below shows behavioural assessment scale:

Table 1. Behavioral pain assessment scale.

Face	0 Face muscles relaxed	1 Facial Muscle tension, Frown, Grimace	2 Constant frown, clenched jaw	Face Score
Restlessness	0 Quite, relaxed, normal movement	1 Occasional restless, shifting position,	2 Frequent restless, movement may include extremities or head	Restlessness score
Muscle tone*	0 Normal Muscle tone	1 Increased tone, flexion of fingers and toes,	2 Rigid tone	Muscle tone score
Vocalization**	0 No abnormal sounds	1 Occasional moans, grunts	2 Continuous moans, cries or grunts	Vocalized score
Consolability	0 Content, relaxed	1 Reassured by touch or talk	2 Difficult to comfort by touch or talk	Consolability score
Behavioural pain assessment scale total (0 to 10)				10
*Assess muscle tone in patients with spinal cord lesion or injury. Assess patients with hemiplegia on the unaffected side **This item cannot be assessed in patients with artificial airways				
How to use behavioural pain assessment scale Observe behaviours and mark appropriate number for each category Total the number in the pain assessment behavioural score column Zero=no evidence of pain. Mild=1-3. Moderate=4-5. Severe pain=>6				

Behavioural pain assessment scale. (Erdek and Pronovost, 2004).

2.7. Management of burn pain

2.7.1 Mechanisms of pain generation during procedures

Manipulation of burn sites for example movement, change of dressing, debridement and physiotherapy triggers neural and chemical mechanisms. Recurrent inputs from damaged and redamaged tissue contribute to short and long term changes in central nervous system. Moreover, the healing process leads to the formation of contractures in injured areas and donor sites have been harvested more than once (Wall and Melzack 2003).

2.7.2 Mechanism of opioids and NSAIDS analgesia

Opioids drugs are one of the largest, most widely used, and most effective classes of drugs employed for the treatment of moderate to severe pain. Opioids exert their analgesic action at opioid receptors of which there are three major subtypes, mu (μ), delta (δ) and kappa (κ), each of which has been cloned. Opioid analgesics can be divided into two major classes based on the predominant receptor subtypes thought to mediate their analgesic effects, the μ -agonists and the κ -agonist-antagonists (Hardman and Limbird, 2001).

All three opioid receptor subtypes are G-protein-coupled metabotropic receptors that have been shown to inhibit adenylyl cyclases, decrease calcium currents, increase intracellular calcium levels, increase potassium currents and regulate the mitogen-activated protein (MAP) kinase second messenger cascade. In general, these actions inhibit neurotransmitter release (e.g. substance P) and/or hyperpolarize the cell membrane. In other words, activation of opioid receptors inhibits neuronal activity (Law et al, 2000).

Non Steroidal Anti-inflammatory drugs act by inhibiting cyclooxygenase enzyme responsible for production of prostaglandins hence anti-inflammatory action on tissues. These drugs includes: Aspirin, ketobrufen, meloxicam, diclofenac among other drugs in this category (Meade et al,1994).

2.7.3 Local treatment in pain management

Covering open wounds with dressing reduces burn wound pain and early excision of wounds and skin crafting alleviate pain and reduce the need for long and painful debridement. Moreover, application of synthetic wound dressing can reduce or eliminate pain at wound site (Wall and Melzack, 2003).

2.7.4 Pharmacological pain management

Pharmacologic interventions are the cornerstone of procedural pain management. Common pharmacologic agents for managing procedural comfort include local anesthetics, nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, opioids, anxiolytics, and sedatives. Some particularly invasive and painful procedures may benefit from the use of regional or general anesthesia. Several factors should be considered when selecting appropriate pharmacologic agents for patients undergoing procedures, including the type and length of the procedure, how much pain is associated with the procedure, the setting in which the procedure will be performed, age of the patient, accessibility to pharmacologic agents and techniques, and availability of skilled personnel to administer and monitor the effects of the selected pharmacologic interventions (Tobias and Deshpande, 2005). A combination of ketamine, tramadol and dexmedetomidine has been found to be safe and ideal treatment option for prevention of procedural pain suffered by adult patients during dressing changes (Zor et al 2010).

Currently, "pain ladder" is used as a guideline in the management of pain according to WHO. The WHO guidelines recommend prompt oral administration of drugs when pain occurs, starting, if the patient is not in severe pain, with non-opioid drugs such as paracetamol (acetaminophen), dipyrrone, non-steroidal anti-inflammatory drugs (NSAIDs) or COX-2 inhibitors. Then, if complete pain relief is not achieved or disease progression necessitates more aggressive treatment, a mild opioid such as codeine phosphate, dextropropoxyphene, dihydrocodeine or Tramadol are added to the existing non-opioid regime. If this is or becomes insufficient, a mild opioid is replaced by a stronger opioid, such as morphine, diamorphine (heroin), fentanyl, buprenorphine, oxymorphone, oxycodone, hydromorphone, while continuing the non-opioid therapy, escalating opioid dose until the patient is pain free or at the maximum possible relief without intolerable side effects. If the initial presentation is severe pain, this stepping process should be skipped and a strong opioid should be started immediately in combination with a non-opioid analgesic (Bennet and Yuan, 2008).

2.8 Non pharmacological pain management

The use of non pharmacologic measures has also proven effective in the management of burn pain. These measures include relaxation techniques, distraction, guided imagery, hypnosis, therapeutic touch, and music therapy .Studies have shown that Rapid induction analgesia had an impact on pain perception, anticipatory anxiety and relaxation state during and after burn care(Wright and Drummond, 2000). Music therapy has gained interest recently in the treatment of pain. Researchers have found that music affects both the physiologic and psychological aspects of the pain experience. Music diverts the patient's attention from the painful stimulus; provides reality orientation, distraction, and sensory stimulation (De Jong et al,2007).

CHAPTER 3: METHODOLOGY

3.1 Study setting

The study was conducted in Burns unit and Burns ward, Kenyatta National Hospital Nairobi. It is a national referral hospital with burns unit bed capacity of 20 and 36 for Burns ward (4D). Average monthly admissions are 35 in burns unit and more than 100 in 4D. There are 27 qualified nurses working in burns unit with a resident doctor, consultants and physiotherapist. Burns unit is located within 1st floor while ward 4D is in 4th floor. It admits patient referred from provincial hospitals countrywide and those referred from private hospital without burns units and also during fire disasters around Nairobi County. Patients are admitted through hospital's Accident and Emergency Department.

Burns unit admits adult patients with more than 29% TBSA and more than 19% TBSA for children (major burn injuries). Ward 4D admits <29% TBSA in adults and <19% for children (Moderate burn injuries).

3.2 Study population

The study population were patients who are admitted at Burns unit and burns ward, KNH. More than 60 patients are admitted at any given time in burns unit and ward with average monthly turnover of 100. Data collection took three weeks, and turn over was approximately 100 patients in both sites.

3.3 Study design

The study was a hospital-based cross sectional study to explore effectiveness of pain management in patients with major burn injuries during wound care procedures. Cross sectional studies involves collection of data at a specific point in time.

3.4 Sampling technique

The study was a purposive sampling technique and focused on the total population of in- patient adults and children in Burns Unit and ward 4D including new admissions within 1 month available to the investigator until the desired sample size of 79 was attained. In an attempt to assist in group analysis, sample was grouped according to age groups: 0-1 years, 2-5 years,5-10 years, 11-12 years, 13-17 years, 18-30 years, 31-65 years and above 65 years.

3.5 Sample size determination

For this study, sample size was determined using Fischer's formula (Mugenda and Mugenda, 2003) with unknown Prevalence, P of 50%. Since the target population is 100 patients, thus less than 10,000:

$$nf = n/1+(n/N)$$

Where nf=Desired sample size when population is less than 10,000

n =Desired sample size when population is more than 10,000

N=Estimate of population size.

Desired sample size when population is more than 10,000:

$$N = Z^2 pq / d^2$$

Where N= Estimated sample size

Z =Standard normal distribution value for 95% confidence =1.96

P = Expected prevalence of burns in the general population

$$q = 1 - p$$

d =degree of precision 5%

$$= (1.96 * 1.96) (0.50) (0.50) / (0.05 * 0.05)$$

$$N = 384$$

Therefore, desired sample size when population is less than 10,000:

$$nf = 384 / 1 + (384 / 100)$$

$$= 384 / 4.84$$

$$= 79$$

The calculated minimum sample size was 79 participants

3.6 Data collection and instruments

The investigator administered structured questionnaire to study participants. A numerical pain assessment scale between 0 and 10 for adults and children who are able to provide self report on pain and also behavioral pain assessment scale for children and adults who are unable to provide self report on pain was used to collect data. Numerical pain assessment scale was deployed for patients before and during burn wound care procedures while behavioral pain assessment scale was used by clinicians during wound care procedures.

The scales were to determine effectiveness of procedural burn pain management. The questionnaire had two sections: Patient's demographic data and pain scale before and after procedure and clinician management of pain for the specific patient which also has Behavioral pain assessment tool incase of children and adults who are unable to provide self report of pain including both pharmacological and non pharmacological procedural burn pain management practices. The two sections (patient and clinician) was be separated for confidentiality of both patient and clinician and later put together for analysis.

3.7 Pre- testing of Questionnaire

The questionnaire was tested by investigator in Burns unit Kenyatta National Hospital to ascertain its reliability. Written consent was sought from 3 patients and three clinicians working in the unit.

3.8 Data analysis and presentation

Data collected was entered and analyzed using SPSS version 18. T-test and P values was used to calculate statistical significance of the findings and statistical significance was set at $P < 0.05$. Mann-Whitney-Wilcoxon (MWW) test was used to test statistical difference in pain intensity between age distribution of burn patients, burn severity, self rated pain, heart rate and pharmacological and non pharmacological pain management practices Data was presented using charts, graphs and tables.

3.9 Inclusion criteria

1. Adults and children with moderate to major burn injuries.
2. Consenting patients and clinicians

3.10 Exclusion criteria

1. Children without guardians.
2. Adult and children whose parent(s) or guardians are not willing to consent including clinicians.

3.11 Ethical Consideration

Approval to carry out research was obtained from Kenyatta National Hospital/University of Nairobi Ethics and Review Committee. The aim of the study was explained to the respondents in a language they understand most (English or Kiswahili). The participants were be allowed to take part in the study voluntarily and were free to withdraw any time they wish without

intimidation .There was an informed consent form (appendix 4) which the respondent was expected to verbally agree and sign after being explained to the purpose of the study.

For children, their parents or guardian was requested to consent. Confidentiality and anonymity was maintained throughout the study and no names were used. The only part where names appeared was the consent form and not the questionnaire. The study instrument had a serial number and access to data was limited to the investigator. There was no coercion through monetary or any other payment for participation. There was no invasive procedure to the participants or any other risks involved in the study.

3.12 Study limitation

The study instrument relies on patient's subjective pain perception before and during wound care procedure, therefore, the data generated may have been subjective.

CHAPTER 4: RESULTS

This was a cross sectional study involving 80 participants with burn injuries at Kenyatta National Hospital. The aim of the study was to determine pain management practices during wound care procedures in patients with moderate to major burn injuries, Kenyatta National Hospital.

4.1 Demographic characteristics of burn patients

Majority of admitted respondents 52% (n=41) were children below 18 years. In addition, a substantial number 48.1% (n=39) respondents were adults above 18 years. Among the children interviewed, majority 78% (p<0.001) were aged between 2-10 years as shown in Table 1 below.

Table 1: Age distribution of burn patients at KNH

	Frequency (n)	Percent (%)
0-1 years	5	6.3
2-10 years	32	40.5
12-17 years	4	5.1
18-65 years	39	48.1
Total	80	100.0

Gender distribution

Majority of the respondents were male 57.5% (n=46). Among children, 54.1% (n=20) were aged between 2-10 years. Adult male above 18 years were 60.5% (n=23) and females 39.5% (n=15). Average age was 21.3 years SD = 4.8 as shown in the table 2 below.

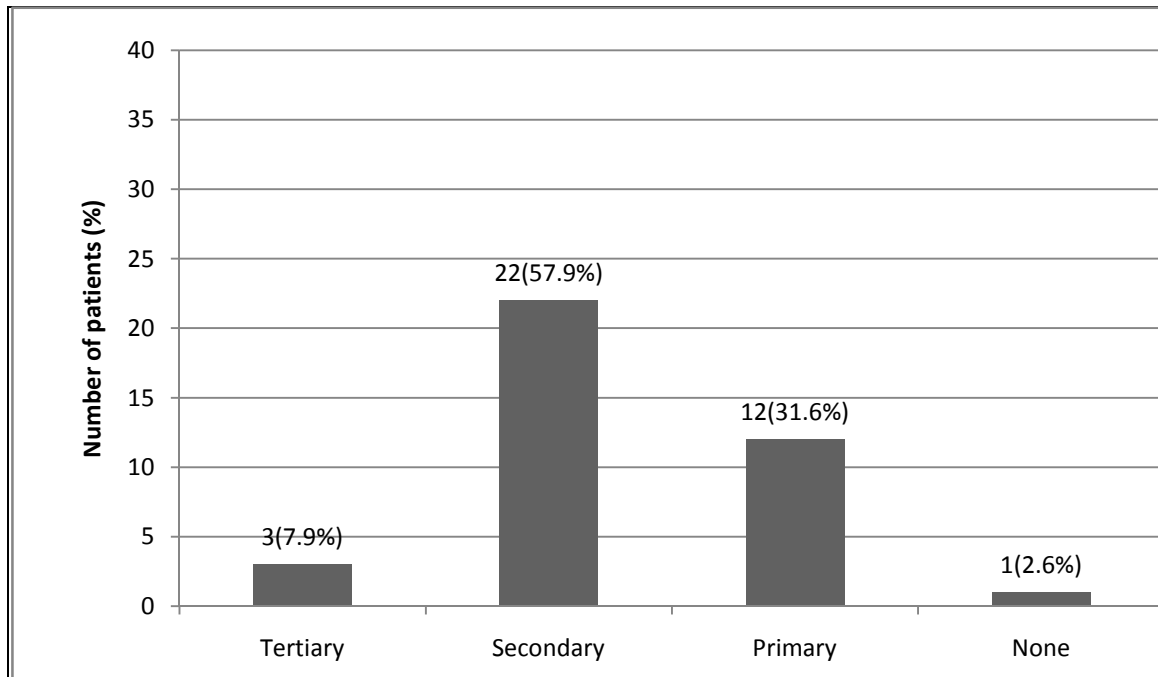
Table 2: Age distribution (gender)

	Male		Female		P value
	N	%	N	%	
0-1 years	4	80	1	20	0.60
2-10 years	16	50	16	50	
12-17 years	2	50	2	50	
18-65 years	23	60.5	15	39.5	
Total	46		34		

Level of education (adults)

Most adults 57.9% (n=22) were educated up to secondary level while those who attained primary and tertiary were 31.6% (n=12) and 7.9% (n=3) respectively (figure 1).

Figure 1: Level of education (adults)



Residence at time of injury

Majority 63.8% (n=56) of patients resided within Nairobi and its metropolitan, while 36.25% (n=24) were referrals from other regions outside Nairobi and metropolitan. Informal inhabitants within Nairobi accounted for 53.1% (n=25) while formal dwellers were 46.8% (n=22) as shown in table 3 below.

Table 3: Residence at time of injury

Residence	Freq	Percent
Nairobi formal	22	25
Nairobi informal	25	27.5
Nairobi metro	9	11.3
Other regions	29	36.25
Total	80	100

Source of burn injury and patient activities:

A higher proportion of patients were burnt by stove 40% (n=32) while hot liquids accounted for 25% (n=20) whereas hot flames from firewood were 15% (n=12). Most of the respondents were playing 31.3 % (n=25), or cooking 28.8% (n=23) whereas 27.5% (n=22) were near a source of fire as shown in table 4 below.

Table 4: Source and activity at time of burn injury

	Frequency (n)	Percent (%)
--	---------------	-------------

Source of injury		
Stove	32	40.0
Electricity	5	6.3
Gas	4	5.0
Firewood(flame)	12	15.0
Hot fluids	20	25
Others	7	8.7
Activity at time of injury		
Cooking	23	28.8
Playing	25	31.3
Near a fire source	22	27.5
Others	10	12.5

Chronic diseases and lifestyle factors

A relative high proportion of adults 28.2% (n=11) regularly indulged in alcoholic drinks who were largely males while 2.5% (n=2) were epileptic children as shown in table 5 and 6 below.

Table 5: Proportion of male and female on alcohol use.

	Male		Female		P value
	N	%	N	%	
Alcohol use					
No	35	77.7	34	97.1	0.02
Yes	10	22.2	1	2.9	
Total	46	100.0	34	100.0	

Table 6: Distribution of epilepsy

	Paediatric patients		Adult patients		P value
	N	%	N	%	
Epilepsy					
Yes	2	5.3	0	0	0.22
No	36	94.7	42	100.0	
Total	46	100.0	34	100.0	

Burn total body surface area (TBSA)

Majority 58.8% (n=47) of patients were admitted with more than 21 % burns, Mean TBSA 24.5% (range 5-60%) as shown in table 7 below.

Table 7. Total Burn Surface Area (TBSA)

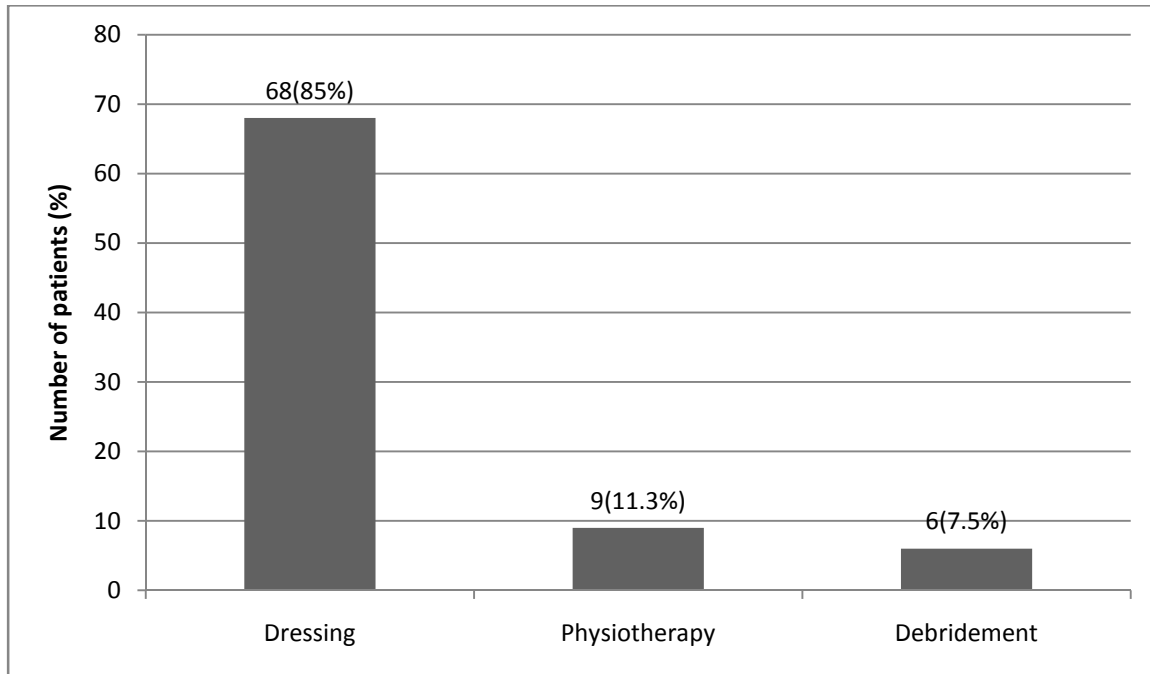
	Frequency	Percent
TBSA category		
Below 10%	11	13.8
11-20%	22	27.5
21-30%	27	33.8
Above 30%	20	25.0
Total	80	100

4.2 Clinician practices for managing procedural pain

Wound care procedures:

Wound dressings, physiotherapy and debridement were the main procedures performed on patients with moderate to severe burn injuries. Dressings were frequently performed 85% (n=68) followed by physiotherapy 11.3% (n=9) and debridement 7.5% (n=6) as shown in figure 2 below.

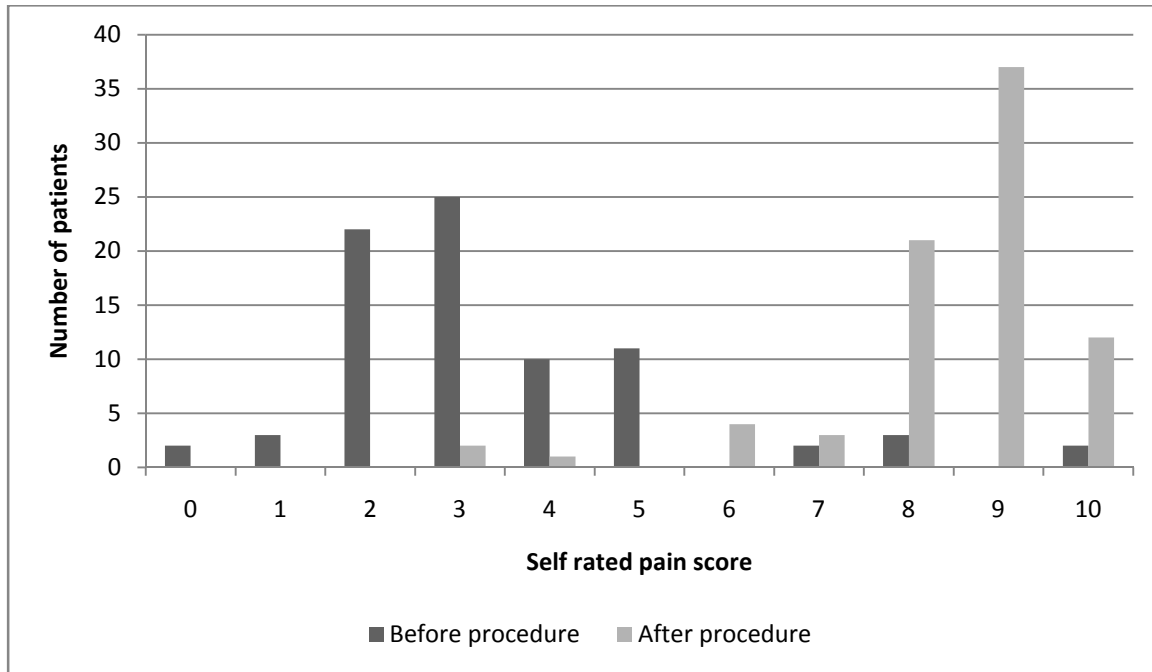
Figure 2: Wound care procedures



4.3 Effectiveness of procedural pain management practices on patients with moderate to major burn injuries

Majority of patients (n=80) reported significant increase in pain during procedures. The mean score before procedure was 3.4 (SD 1.9) and significantly ($p < 0.001$) painful during procedure 8.5 (SD 1.4) as shown in figure 3 below. Patients with major burn injury felt more pain than those with moderate burn injury during wound care procedures but not significant (table 8).

Figure 3. Self rated pain severity



Mean score before procedure 3.4 SD 1.9

Mean score after procedure 8.5 SD 1.4

P Value < 0.001

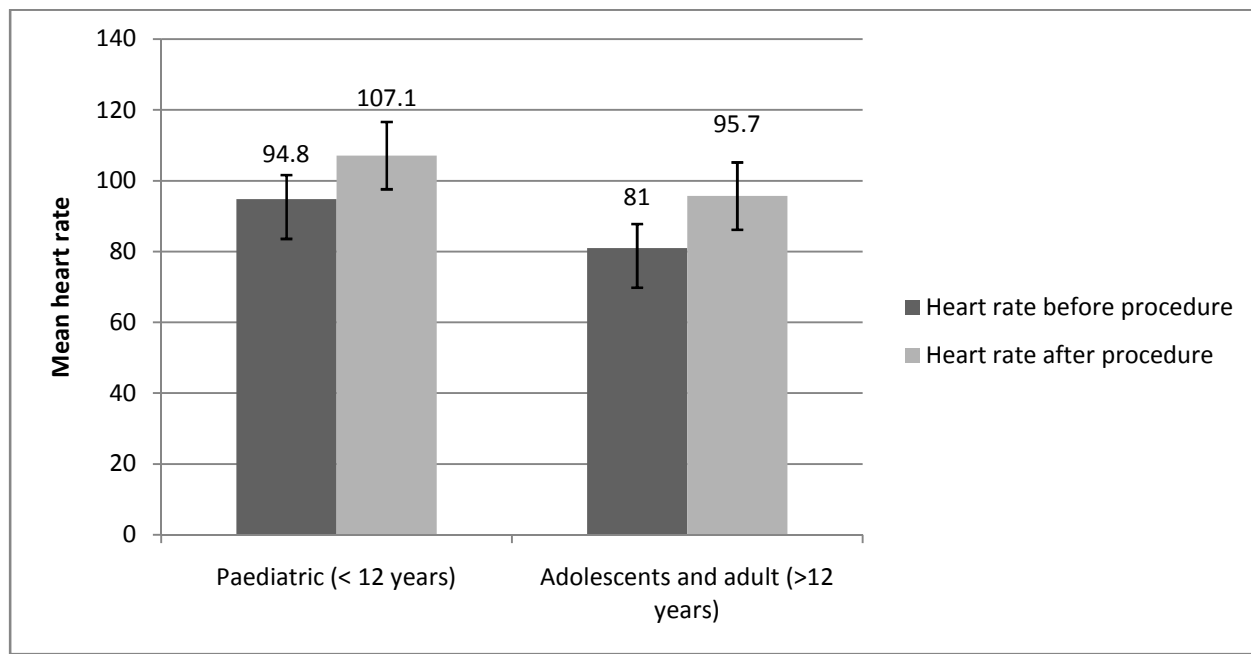
Table 8. Self rated pain (moderate vs major)

	N		Self rated pain		P value
			Mean ± SD		
	Moderate	Major	Moderate	Major	
Self rated pain before procedure					
0-3.0	41	11	3.2 ± 2.0	4.0 ± 1.7	0.13
4.0-6.0	12	9			
7.0-10.0	4	3			
Self rated pain after procedure					
3.0-6.0	6	1	8.3 ± 1.5	8.7 ± 0.9	0.24
7.0-8.0	19	5			
9.0-10.0	32	17			

Heart rate during procedure

Children below 12 years of age had a mean change in heart rate of 12.1 and. while patients above 12 years had a mean change of 14.7 during wound care procedures as shown in figure 4 below.

Figure 4: Heart rate before and during procedure



4.4 Procedural pain management

Patients who were on paracetamol monotherapy reported greater increase in pain during wound care procedure (mean change = 5.7) compared to those on morphine (mean change = 4.4), p value = 0.033. Patients on paracetamol alone also reported more pain than those on paracetamol plus morphine (mean = 4.00), although the difference between the groups did not attain statistical significance, p=0.46. Patients who received non pharmacological pain management reported less pain than those not receiving non pharmacological management, P= 0.04. There was no significant difference between patients who received both pharmacological and non pharmacological pain management and those patients who received either of the two pain management modalities, P=0.13.as shown in figure 9 below.

Figure 9. Procedural pain management

	N	Self rated pain		P value
		Mean change	SD	
Pharmacological management				
Paracetamol alone	40	5.7	2.3	NA
Morphine alone	30	4.4	2.6	0.03
Paracetamol and morphine	5	4.0	4.5	0.46
Non pharmacological management				
Yes	56	4.8	2.1	0.04
No	24	5.5	3.5	
Pharmacological and non pharmacological				
Yes	53	4.8	2.2	0.13
No	27	5.3	3.3	

CHAPTER 5: DISCUSSION

5.1 Patient characteristics

A high proportion of patients admitted with moderate to severe burn injuries were children. Among the children below 18 years, majority were aged between 2-10 years. This may be because children are naturally curious, impulsive and active increasing risk for burn injuries. These findings are consistent with Vilasco and Bondurand (1995) who found that children under

the age of 10 years in Cote D'Ivoire were more likely to be burnt (46.8%).The study found more males and specifically children sustaining burn injuries than females. This attribute may be due to the fact that male boys are more active than girls. This is consistent with a United Nation report of 2005 which reported that ratio of male to female burn injuries were greater in majority of countries but inconsistent with that of China where it is 1:1(UN, 2005).A higher percentage of patients suffer from epilepsy and all were children. Though the study did not find sufficient evidence that it may have contributed to burn injuries, Epileptic seizures can be a predisposing factor to burn injuries through falls near fire or hot liquids. These findings are inconsistent to A World Health Organization report of 2012 where they found that Prevalence of epilepsy in developing countries is below 1% of general population (WHO, 2012) and also inconsistent to Ngugi et al (2013) where they found prevalence in Sub-Saharan Africa to be 0.8% This may be due to the small sample size used in this study compared to other studies. It is worth noting that it strongly associated with burn injuries in Australia (Ansari et al 2008)). The study findings showed that a higher proportion of adults frequently indulged in alcoholic drinks mainly males. This may be risk factor in sustaining burn injuries through falls near flame or hot liquids (scalds) when drunk. These findings may suggest similarity consistent to William and Holmes (2009) where they found that alcohol related burn injuries admissions in United Kingdom comprise nearly 20% and more males and females abuse alcohol. Nairobi and its environs (Nairobi metropolitan) have a very high ratio of patients admitted with burns than in other regions. Informal inhabitants (slums) within Nairobi were higher than formal dwellers (especially those transiting from informal to formal). This may be due to higher population and more risk to burn injuries in urban areas for example use of kerosene stoves, congestion especially in informal settlements that makes fires spread quickly, electricity etc.It is consistent with Park et al (2008)

where they found that incidences of burn injuries in Korea were higher in urban than rural areas. It is also consistent with Ombati et al (2012) where they found that the commonest socioeconomic class that sustained burns was the poor/lower middle class from slum areas and semiformal settlement in Nairobi. Kerosene stove was found to be the main source of burn injuries. This may be because Kerosene stove is a common cooking appliance in informal urban areas in Kenya and can explode if not properly handled. The same characteristics was found in Egypt (Amr et al, 2000) and Kenyatta National Hospital, Kenya (Ombati et al, 2008) where kerosene-associated burn injury was 40%. Other main sources of burn injuries were hot liquids like water, milk and uji, flames from firewood during cooking in rural areas, and electricity. Playing among children was found to be the main activity at time of injury, cooking among adults, being near a source of fire and various activities including rescuing burn victims and being burnt by mob justice.

The study found that mean burn total body surface area was 24.5% in Kenyatta National Hospital which is similar to other studies elsewhere for example in a study in Komfo Anokye Hospital in Ghana, where mean TBSA was 24.79%., (Agneborku et al, 2011).

Pain management practices

The study found out that majority of patients reported significant increase in pain during procedure. This may be attributed to inadequate pain control before wound care procedures. This is consistent to Akram et al (2010) where they found that mean of procedural pain intensity was 8.5 SD 1.8 In Tabriz hospital Iraq. Patients who were only on paracetamol felt more pain compared to those on morphine. Patients on paracetamol alone also reported more pain than those on paracetamol plus morphine .Patients who received non pharmacological pain

management reported less pain than those with none. There was no significant difference between patients who received both pharmacological and non pharmacological pain management and those patients who benefited only on either of the two. A weak analgesic in combination with opioid has a synergistic effect. Bennet and Yuan, (2008) recommends escalating opioid dose until the patient is pain free or at maximum possible relieve without intolerable side effects or a combination between a weak analgesic and an opioid The study found that the use of non pharmacological pain management measures has proven to be effective in the management of burn pain. It showed that clinicians practice mainly distraction technique for children, counseling and reassurance. De Jong et al (2008), in their study in selected hospitals in Netherlands, supported numerous non pharmacological techniques effective in controlling procedural pain.

Study weakness

Though the study found important information on pain management practices during wound care procedures which have good implication in practice, it has some limitations. The study population was small to confidently generalize and some questions were subjective and answers may differ from one person to another.

Conclusion and recommendation

The study found that majority of patients admitted in burns unit and ward were children aged between 2-10 years and a significant proportion was from urban (informal inhabitants).Clinicians pain management practices during wound care procedures involved pharmacological as well as

non pharmacological pain management, however their pain dissipation was inadequate. Public health interventional strategies need to be instituted to prevent and protect children and informal inhabitants to mitigate the dangers of fire. Innovative pain management practices combining both pharmacological and non pharmacological therapies need to be implemented and / or researched on.

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APPENDIX 1: QUESTIONNAIRE

SECTION I (TO BE FILLED BY PARTICIPANT)

(i) **Ward:** Burns Unit 4D

(ii) **Gender** Male Female

(iii) **Age (Yrs):** *Please tick appropriately*

- 0-1 2-4 5-10 11-12 12-17
- 18-30 31-65 Above 65

(iv) **Level of education:** *Please tick appropriately*

- Tertiary Secondary Primary None

(v) **Religion**.....

(vi) **Ethnicity**.....

(vii) **Residence**.....**County**.....

(v) **Occupation:**

(vi) **Activity at time of injury**.....

(vii) **Source of fire:** *(Please tick appropriately)*

- Stove Electricity Gas Firewood

(viii)Lifestyle: *Please tick 'yes' or 'no'*

Smoking: **Yes** **No**

Alcohol : **Yes** **No**

(ix) Do you suffer from the following disease(s)? *Please tick*

Diabetes Epilepsy Hypertension

(x) Pain intensity before procedure-For children and adults who can provide self report on pain
(please circle your pain level before procedure-0 as no pain at all and 10 as worst possible pain)

0 1 2 3 4 5 6 7 8 9 10

(xi) Pain intensity during procedure: *(please circle your pain level during procedure)*

0 1 2 3 4 5 6 7 8 9 10

(xii). In your own words, what do you think contributed most to pain(if any) during wound care procedures?.....

.....
.....

(xiii). How do you express or communicate pain to clinician during wound care procedures?.....

.....
.....

SECTION II (To be filled by clinician)

(i)Severity of burn: *Please tick appropriately*

Moderate - % of Burn?.....

Major - % of burn?.....

(ii) Site of burn.....

(iii)Which wound care procedure are you performing for the patient?

Dressing Physiotherapy Debridement

Other(s)

(iv)Medication patient is on to manage procedural wound care pain.....

(vi) Duration given before procedure

(vii)Non pharmacological pain management for this procedure/ adjuvant treatment
.....
.....

(viii) Kindly measure and record the following vitals before and after procedure:

Heart rate : Before procedure.....Bpm ; After procedure.....Bpm

(viii) Behavioural pain assessment tool for adults and children who cannot provide self report on pain:

Face	0 Face muscles relaxed	1 Facial Muscle tension, Frown, Grimace	2 Constant frown, clenched jaw	Face Score
Restlessness	0 Quite, relaxed, normal movement	1 Occasional restless, shifting position,	2 Frequent restless, movement may include extremities or head	Restlessness score
Muscle tone*	0 Normal Muscle tone	1 Increased tone, flexion of fingers and toes,	2 Rigid tone	Muscle tone score
Vocalization**	0 No abnormal sounds	1 Occasional moans, grunts	2 Continuous moans, cries or grunts	Vocalized score
Consolability	0 Content, relaxed	1 Reassured by touch or talk	2 Difficult to comfort by touch or talk	Consolability score
Behavioural pain assessment scale total (0 to 10)			
				Out of 10
*Assess muscle tone in patients with spinal cord lesion or injury. Assess patients with hemiplegia on the unaffected side				
**This item cannot be assessed in patients with artificial airways				
How to use behavioural pain assessment scale Observe behaviours and mark appropriate number for each category Total the number in the pain assessment behavioural score column Zero=no evidence of pain.Mild=1-3.Moderate=4-5. Severe pain=>6				

APPENDIX 2: CONSENT INFORMATION FORM

Dear Respondent,

My name is **Moses Kiplagat**. I am a student at the University of Nairobi pursuing a Master's degree in Nursing (Critical Care). I am carrying out a research on **“Pain management during wound care procedures in patients with moderate to severe burn injuries, Kenyatta National Hospital.”** The research has been approved by the Ethics and Research committee of KNH and permission to carry out the research granted by the Hospital.

In order to obtain the information, I have developed a questionnaire. I am kindly requesting you to participate in the study by filling in the questionnaire. Participation is voluntary and there is no penalty for declining to participate. There are no risks involved in participating in this study. The information you provide will be treated with confidentiality as permitted by law. You are not required to write your name or any other identification number on the study questionnaire. You are free to withdraw from the study at any stage without fear of victimization.

The results of the study will enable clinicians evaluate quality of pain management during wound care procedures. The results of the study will be availed to you after the study is completed in case you wish to know the findings. You may ask any questions about your rights as a participants or anything else about the research that is not clear. Your participation will be highly appreciated.

In case of any questions or clarifications feel free to contact the principal investigator on mobile number 0722 495 624 or contact the Secretary to the KNH/UON- ERC at 2726300 Ext 44102.

Thank you.

MOSES KIPLAGAT (INVESTIGATOR).

Respondent's consent

I have read and understood the above details about the research. I voluntarily agree to participate in the study.

Respondent's signature

Date

Investigator signature.....

Date.....

If participant is a child, parent/guardian to consent but indicate relationship.....

ISHO

KIAMBATISHO 1: FOMU YA MAELEZO KUHUSU IDHINI

Kwa Mhusika,

Jina langu ni **Moses Kiplagat**. Mimi ni mwanafunzi katika Chuo Kikuu cha Nairobi ambapo ninanua kuhitimu na shahada ya juu ya uuguzi. Nafanya utafiti kuhusu Jinsi uumivu wakati taratibu za uangalizi wa vidonda inayotokana na kuchomeka hapa hospitali kuu ya Kenyatta. Utafiti huu umeidhinishwa na kupitishwa na Kamatii ya Maadili ya Utafiti ya hospitali ya Kenyatta na chuo kikuu cha Nairobi.

Ili kupata habari kuhusu swala ninalo tafitia, nimeunda dodoso ama fomu ya maswali. Ombi langu kwa unyenyekevu ni kuwa utashiriki kwa kujibu maswali yaliyoko katika fomu hii. kushiriki kwako kutakuwa kwa hiari na hakuna adhabu kwa kudinda kushiriki. Hakuna hatari ya kushiriki katika utafiti huu. Majibu katika fomu hii yatahughulikiwa kwa siri kama inavyoruhusiwa kisheria. Haitaji kuandika jina lako au kitambulisho cha aina yoyote katika fomu hii. Pia, unaruhusa ya kujitoa katika utafiti huu katika hatua yoyote bila hofu ya uonevu.

Matokeo ya utafiti huu yatasaidia madaktari kutathmini ubora wa udhibiti wa maumivu inayotokana na taratibu za uangalizi wa vidonda kwa wagonjwa waliyochomeka. Ikiwa utapenda kujua matokeo ya utafiti huu unahaki ya kuyapata. Unaweza kuuliza maswali yoyote kuhusiana na haki yako kama mshiriki au kitu kingine chochote kuhusu utafiti huu ambacho unahisi si wazi. Shukran kwa kukubali kushiriki.

Ikiwa unamaswali, maoni au mapendekezo yoyote au ufafanuzi jisikie huru kuwasiliana na mpelelezi mkuu kwa nambari ya simu 0722 495 624 au wasiliana na Katibu wa KNH/UON-ERC kwa nambari ya simu 2726300/ 44,102.

Asante.

MOSES KIPLAGAT (MTAFITI).

Ridhaa ya kushiriki utafiti

Nimesoma na kuelewa maelezo yote katika fomu hii kuhusu utafiti unaofanywa na ninakubali kwa hiari yangu kushiki.

Sahihi ya mhusika

Tarehe.....

Mtafiti.....

Tarehe.....

Kama Mhusika ni mtoto,mzazi ataidhinisha na ashiria undugu.....

APPENDIX 3: LETTER TO KNH/ U.o.N ERC

Moses Kiplagat,

School of Nursing Sciences,

University of Nairobi,

P.O Box 30197.

Nairobi.

June 3 2013.

The Chairman,

KNH/ UoN Ethics and Research Committee,

P.O Box 20723,

Nairobi.

Dear Sir/Madam

RE: PERMISSION TO CONDUCT A STUDY ON PAIN MANAGEMENT DURING WOUND CARE ON PATIENTS WITH MODERATE TO MAJOR BURN INJURIES , KNH.

My name is Moses Kiplagat. I am a second year student pursuing Masters degree of Science in Nursing (Critical Care Nursing) at University of Nairobi.

I am kindly requesting for permission to collect data on the above study in your hospital to be enable me complete the project.

Attached please three (3) copies of my research proposal

Yours faithfully,

Moses Kiplagat

H56/74263/2012