KNOWLEDGE, ATTITUDE, AND PRACTICE AMONG HEALTHCARE WORKERS ON PROCEDURAL PAIN MANAGEMENT AMONG PAEDIATRIC ONCOLOGY PATIENTS IN KENYATTA NATIONAL HOSPITAL (KNH)

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DECLARATION

I declare that this is my original work. To the best of my knowledge, it has not been presented either wholly or in part to this or any other university for the award of any degree or diploma.

Signature:  **Date: 2nd June 2022**

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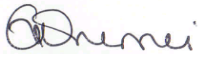
Signature:  **Date: 2nd June 2022**

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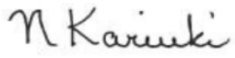
Signature:  **Date: 2nd June 2022**

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LIST OF ABBREVIATIONS

APAGBI	Association of Paediatric Anaesthetists of Great Britain and Ireland
CME	Continuing Medical Education
HCW	Healthcare workers
IASP	International Association for the Study of Pain
KNH	Kenyatta National Hospital
NSAID	Non- steroidal anti-inflammatory drugs
UON	University of Nairobi
VR	Virtual Reality
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Knowledge: The healthcare worker's knowledge on procedural pain management in paediatric oncology

Attitude: Encompasses the set opinions and feelings healthcare workers have towards procedural pain management among paediatric oncology patients

Practice: This study will refer to the actual actions taken by healthcare workers concerning procedural pain management in paediatric oncology patients

Healthcare Worker: A person responsible for the care of paediatric oncology patients, including nurses, clinical officers, and doctors (paediatrics and pathology) working in paediatric oncology settings

Procedural Pain: It is the sensory and affective disturbance that occurs due to a short medical procedure performed frequently in paediatric oncology

Medical Procedures in Paediatric Oncology: Describes an action performed by healthcare workers for diagnostic or therapeutic purposes, for instance, regular procedures, such as, venepuncture, inserting an intravenous cannula, administration of intramuscular medications, and advanced procedures, such as, lumbar puncture, administration of intrathecal chemotherapeutic drugs, bone marrow studies, such as aspiration and trephine biopsy

ABSTRACT

Background: The practice in paediatric oncology entails carrying out several procedures, both therapeutic and diagnostic. The management of procedural pain is a healthcare worker's responsibility. Appropriately addressing procedural pain will significantly improve the quality of life among paediatric oncology patients. The lack of knowledge on these methods or negative deviances in attitude among healthcare workers is an essential contributor to poor procedural pain management practices.

Study Objectives: To assess the level of knowledge, attitude, and practice among healthcare workers on procedural pain management among paediatric oncology patients in Kenyatta National Hospital and to examine the factors that influence the knowledge, attitude and practice among HCWs.

Methods: This was a cross-sectional study that employed a quantitative approach to data collection using self-administered questionnaires (electronic and paper). The study included HCWs who gave informed consent and have more than one month work experience within the study units (general paediatric wards and paediatric oncology wards). We excluded healthcare workers who had no work experience managing paediatric oncology patients. Simple random sampling was used to reach a minimum required sample size of 126, calculated using Fisher's formula. The key outcomes of interest were the aspects of knowledge (good vs poor), the favourable or unfavourable attitudes, and practices (good vs poor) on procedural pain management. The data were analyzed using R version 4.1.2, and presented as frequencies and proportions for categorical data. Correct responses were given a score of one. Knowledge, attitudes and practices were calculated as a percentage, and a score of <60% (poor), (60-79%) moderate and good (≥80%).

Results: One hundred and fifty-six healthcare workers participated in the study. The majority of the respondents were aged between 31 to 40 years (54%) and female (63%). The median number of years of work experience was 8 years. The median number of years of experience in paediatric oncology was 2 years. The majority of respondents had not received any prior training in procedural pain (76%). We found that the HCWs had an overall good score on knowledge (51%), overall unfavourable attitudes (90%) and overall poor score on practice of procedural pain management (92%). The most worrying gap in knowledge found in this study was knowledge on the recommended pain management strategies that should be used when performing a lumbar puncture. We found that HCWs with higher education (OR 0.45) (95% CI 0.21, 0.95) and more than five years work experience had better knowledge (OR 0.33) (95% CI 0.12, 0.90). There was no significant association between attitudes and sociodemographic factors. The HCWs who had received training on procedural pain have 16-fold odds of good practices compared to those who had been trained (OR 15.93) (95% CI 3.30, 51.26).

Conclusion and Recommendations: Knowledge of procedural pain management was good. Healthcare workers with more than five years work experience and higher education had better knowledge. The attitude on procedural pain management was poor. None of the factors assessed were significantly associated with attitude on procedural pain management. The practices on procedural pain management were poor. HCWs who had been trained on procedural pain were more likely to have good practice. We recommend an enhancement of the training offered to healthcare workers on pain among paediatric patients and continuing medical education (CMEs) and practical in-service training.

CHAPTER 1: INTRODUCTION

Pain is a significant source of discomfort and stress to children, parents/guardians, and healthcare workers. Studies carried out in Sub- Saharan Africa at the Kenyatta National Hospital showed the prevalence of pain among hospitalized children is 78%, with 99% of hospitalized children's pain is related to clinical interventions (1). A study in South Africa revealed the prevalence of pain in paediatric oncology patients was 87.5% (2). It is, therefore, an integral role for healthcare workers to provide adequate pain management as unrelieved pain is a common and continuous experience in hospitalized children.

Children living with chronic illnesses, such as cancer, require continuous medical attention and admissions to hospital for investigations and treatment. The practice in paediatric oncology entails carrying out several procedures, both therapeutic and diagnostic. Pain associated with these procedures is referred to as procedural pain. Procedural pain may be from a single intervention, however more than likely, these procedures may be repeated frequently.

The children undergoing these procedures have the right to have their quality of life preserved, and effective procedural pain management will contribute significantly to this. As healthcare professionals, we must take every step to shield children from needless trauma and discomfort, particularly those who may need continuous care. Children who experience poor procedural pain management may develop pathophysiologic mechanisms within the peripheral and central nervous systems that may lead to chronic pain.

Chronic pain is a challenge to treat, and the care involved is costly. This study is motivated by observing varied opinions and actions among healthcare professionals regarding procedural pain among children at the Kenyatta National Hospital. The children undergo several unnecessary indignities due to inadequate knowledge or negative attitudes among

the healthcare providers (3). There is a need to standardize pain management during procedures in paediatric oncology.

CHAPTER 2: LITERATURE REVIEW

2.1 Definition of Acute Procedural Pain

Acute pain is an emotional and sensory experience that is unpleasant, correlated with, or defined in terms of actual or possible tissue damage, as defined by the International Association for the Study of Pain (IASP)(4). An individual patient will experience pain differently; this is influenced by psychological, biological, and social factors. Previous life experiences will affect a person's perception of pain, and their account of it should be respected. Pain is subjective; whatever the patient says, it exists; however, they perceive it, as defined by McCaffery *et al* (5). Pain is classified according to the duration (acute vs. chronic), aetiology (malignant vs. non-malignant), and physiologically (neuropathic vs. nociceptive) (5).

Procedural pain encompasses both the sensory and affective disturbances that occur due to a medical procedure. The medical procedures may include diagnostic, and therapeutic procedures performed on paediatric oncology patients. The procedures may be regular, such as, venepuncture, inserting an intravenous cannula, administration of intramuscular medications, or advanced procedures, such as, lumbar puncture, administration of intrathecal chemotherapeutic drugs, bone marrow studies, such as aspiration and trephine biopsy.

Pain associated with paediatric oncology diagnostic or therapeutic procedures is the most documented concern and is considered worse than cancer itself by paediatric oncology patients (6). These procedures are frequent, especially during the early days following suspected childhood cancer and diagnosis, and the child may develop fear and anxiety towards these procedures. These feelings will make it significantly harder to conduct

these necessary procedures (7). Avoiding these feeling must be a priority among healthcare workers by providing adequate procedural pain analgesia.

2.2 Pathophysiology of Acute Procedural Pain

Procedural pain has various components, including the emotional, cognitive, and sensory aspects associated with pain. Painful stimuli require a conscious patient and an intact nervous system to experience. The transmission of a painful stimulus is facilitated by nociceptors (peripheral nerve fibers), the brain, and the spinal cord (8). Children have a higher sensitivity to pain because they have an increased amount of neuromodulator substances and an increased number of nociceptors per meter than adults (9).

Tissue damage leads to cell injury, which results in the release of intracellular contents into the interstitial space. These substances trigger an inflammatory response drawing white blood cells to the site, leading to the release of substances, such as histamines, neurokinin A, epinephrine, bradykinin, serotonin, prostaglandins, sodium, potassium, and nerve growth factor. These substances bind to the primary afferent nerves. The slow, thinly myelinated Aδ fibers transmit mechanical and thermal stimuli and the unmyelinated C fibers that transmit thermal, chemical, and mechanical stimuli (9). As much as myelination is not complete in childhood, they still perceive pain. Myelination determines the speed of the transmission of a signal; therefore, incomplete myelination in a child is fully compensated for by the shorter length of the nociceptive pathway (10).

Signal transduction follows, whereby the painful stimuli are converted into an action potential. These primary nerve fiber cell bodies lie within the dorsal root ganglia. They synapse with the secondary nerve fibers located within the dorsal horn of the spinal cord. The dorsal horn is a center for integrating the impulses before they are transmitted to the cortex. Studies have been conducted to describe the modulations that occur at this level. The most well-known is Mezlack *et al*. gate theory which showed that stimuli from

other myelinated dorsal horn nerve fibers could reduce the nociceptive sensations reaching the brain (11). Wolf *et al.* shared their theory of neuronal plasticity, referring to the dynamic nature of the response to nociceptive stimuli (12). Changes may occur within the central nervous system (CNS) secondary to acute pain. In children, neuroplasticity leads to neuronal dysfunction and neural death when exposed to prolonged or repeated pain (13).

The primary afferent nerve fibers release substance P and glutamate into the synaptic cleft, which stimulates the secondary afferent nerve fibers by binding to their receptors. Prolonged or repeated painful stimuli may sensitize the dorsal horn nerve fibers leading to the wind-up phenomenon. The wind-up phenomenon occurs when the neurons at various nervous system levels undergo remodeling, leading to an exaggerated perception of pain. Consequently, there is an alteration to the response within the secondary neurons, which leads to hyperalgesia (increased painful response) or allodynia (painful sensation to a stimulus that is not painful) (8).

The signal is transmitted to the brainstem, pons, and the medulla through the spinal cord via the lateral spinothalamic tracts. Projections from this site travel to the thalamus. The thalamus generates projections and transmits signals to the higher centers, e.g. the limbic system and the somatosensory cortex (14). The descending pathways from the higher centers interact with the primary and secondary nerve synapses. The pathways originate from the thalamus, amygdala, and cerebral cortex. They are then integrated into the brainstem periaqueductal gray matter and pass into the dorsal horn. The descending pathway responds to serotonin, adrenaline and is rich in opiate receptors. 'Battlefield analgesia' occurs when soldiers with injuries do not feel pain due to the adrenergic response.

The descending pain modulatory pathways are not well developed in neonates and infants. In children, the excitatory ascending pathways predominate. Studies show that

the nociceptive pathway starts functioning at 20 weeks gestation. The number and types of nociceptors in adults and children are similar; however, the nociceptive pathways undergo developmental changes as the child matures. The synapses between the nociceptive neurons and the dorsal horn are not well differentiated in premature neonates, making it difficult for them to differentiate between noxious and tactile stimuli (10).

2.3 Perception of Pain in the Paediatric Population

Healthcare workers must have a good understanding of pain perception to assess and manage it appropriately. The developmental and cognitive level of a child directly impacts the way they perceive pain (15). During a child's development, they learn how to detect pain, localize it, and learn to verbalize it. Younger children will be unable to communicate their pain level, which is taken into account during pain assessment. These children will give behavioral cues that indicate they are in pain. A study conducted by Hurley *et al*. demonstrated that pain perception in children progresses with the Piaget developmental stages (16).

In children below four years, they cannot localize pain and rely on their caregiver to observe and notice the source of their pain. Babies 0-12 months of age do not comprehend the pain and respond to the caregiver's stress cues. Pain memory is developed in babies older than six months. Children between the age of 1 and 3 years can localize pain but are unable to understand why pain occurs and what is causing it; they may respond with aggressiveness. Children older than four years may be able to vocalize their pain.

In the pre-operational stage (2 years to 7 years), the children perceive pain as a purely physical experience, they may perceive it as a punishment for bad deeds or thoughts, and they may hold others responsible for their pain. The child may strike out physically

when in pain. They require reassurance that the pain is not a punishment. Children in this stage may not understand how an injection with an analgesic or pain medication with a 'bad taste' would help them.

The children in the concrete operational stage (7 years to 11 years) are more aware of their bodies and can localize pain. These children have a strong sense of fear for total bodily injury, and the healthcare workers need to explain the source and cause of the pain. These children can associate pain with disease and may be able to understand the benefit of painful medical interventions. Healthcare workers need to be careful with this age group as they may pretend they are not in pain to appear brave. The formal operational stage (above 11 years) is the most akin to an adult's perception of pain. The children in this stage have a complex understanding of the cause of pain and require adequate information about their condition and treatment to understand and prepare for the pain they will experience during treatment (16).

Paediatric pain is shown to have short and long-term consequences. Studies show that younger children and children who undergo repeated painful procedures are more at risk of suffering from long-term effects. Weisman *et al.* surveyed the impact of inadequate analgesia during painful procedures in the paediatric population. The study demonstrated that insufficient pain control measures in younger children might lead to a diminished effect of appropriate analgesia in subsequent procedures. Compounded by the fact that the children will anticipate pain in the next procedure, an increased amount of analgesia will be required to calm the fear and anxiety (17).

A study carried out by Olmstead *et al.* showed that inadequate pain management would lead to poor sleep cycles, delayed healing, and a weaker immune system. The child may have a prolonged hospital stay. Also, this study demonstrated that children's pain would impact caregivers and healthcare workers. Procedures conducted on anxious and scared children are challenging, requiring more time and more staff to succeed. There is a strain

on the healthcare professional's mental and emotional state. Studies show that the healthcare workers in units that conduct frequent painful interventions on children have reduced morale. The image of being a reliever of pain is profoundly challenged in these settings (18).

2.4 Procedural Pain Management

Procedural pain management refers to the non-pharmacological (psychological) and pharmacological strategies employed to reduce and avoid the acute pain that accompanies necessary medical procedures performed on paediatric oncology patients (Table 1 and 2). Procedural pain management in infants, older children, and teenagers should also address anticipatory procedural fear and anxiety. Relief of procedural pain has a positive impact on their quality of life (19).

2.4.1 Non-Pharmacological/Psychological/Behavioural Procedural Pain Management Strategies

Non-pharmacological strategies are a novel approach available to healthcare workers. Children are particularly amenable to these techniques as they are more amenable to play. The examples described below aim to enhance the ability of children to cope with the fear and anxiety by transferring their attention from the procedural event and to reduce the perception of pain.

Distraction has been used to offer a constructive alternative focus for patients, minimizing painful experiences during interventions. Children are exceptionally responsive to psychological strategies to control pain due to their strong sense of play and imagination. Distraction offered must be communicative, stimulating, and fit the patient's age and developmental stage. One person should carry out the distraction techniques to create one element of focus for the child and offer a relaxed atmosphere. These methods are

not intended to deceive the patient, and they shift their focus during medical procedures. Some distraction methods that have shown success are making bubbles, watching, listening to or singing their favourite song, playing with toys, books that are interactive, such as books with noisy buttons and find it books, technology, such as phones, tablets, or televisions and storytelling and humour. Directed visualization may also be used where imagery is taught to patients by instructing them to draw a picture in their mind that relaxes them, reducing stress and anxiety. This imagery may also be achieved by storytelling (20).

Hypnosis is another technique that can be employed whereby the patient is in a semi-conscious state where they are more responsive to direction and suggestion. This technique will need to be introduced to the patient beforehand. Studies demonstrate that this is a helpful technique in procedural and chronic pain control. There may be an overlap between hypnosis, relaxation, and imagery techniques used to reduce anxiety (21). The most effective psychological methods in children when undergoing venepuncture are hypnosis and distraction (9).

Listening to music using headphones or earphones is an effective method of procedural pain management. Several theories have been postulated to explain the main mechanisms of action; reducing cortisol levels, increased oxytocin levels, and an enhanced sense of relaxation. Nguyen *et al.* showed that when children listen to the music of their choice, their fear and anxiety of the procedure reduces. Studies showed that perceived pain and acute pain from the procedure were also reduced (22).

Virtual reality (VR) is a modern method used to promote relaxation during procedures. VR technology is used to create a simulated world on a computer that provides interaction and engages the senses. Where feasible, the engaging and immersive VR experience may transform the procedure into a relatively painless experience and improve health outcomes in children (23).

Deep breathing exercises may be used as a coping mechanism during medical interventions. It has been shown that increasing the oxygen supply to the brain minimizes the sympathetic response, reduces anxiety and perceptions of pain by activating the parasympathetic nervous system and promoting relaxation. The child should practice deep breathing exercises before the procedure to ensure they will be effective. Depending on the developmental stage and age, deep breathing may be achieved by encouraging the child to blow a pinwheel toy, smelling a flower, or pretending to blow out candles. In older children, ask them to place a hand on their abdomen and do breathing exercises by number, such as inhaling through to the count of 4 and exhaling to the same count of 4 (24).

Creating a calming, low stimulation space to carry out the procedure on paediatric patients may help reduce the child's propensity to become overwhelmed by fear. Healthcare professionals should avoid using the patient's bedside for painful procedures to maintain a secure environment for the child within the ward and ensure other children in the ward are not watching the procedure. Human touch, especially by the parent or the primary caregiver, reduces fear, anxiety, and pain in the paediatric population, especially in neonates and infants. Guiding and coaching older children through a procedure may alleviate their anxiety (9).

Positioning a child for comfort during a procedure should be carried out by the parent or guardian, maintaining the child in an upright position and close contact with the caregiver. Sitting upright reduces fear and anxiety and gives the patient a sense of control. The parent/guardian should practice comforting touch by hugging, stroking, or massaging during the procedure. Procedural holding also facilitates access to the body part required for the medical procedure. Non-nutritive suckling has been shown to promote relaxation and pain relief in infants (25).

The use of a *vibration system* has been shown to reduce pain during a procedure (26). The vibration system works by stimulating the body's peripheral nerves, thereby distracting from the painful stimulus. The vibration system may be used in conjunction with skin cooling therapy, where an ice pack is placed to dull the pain further. The child should be introduced to this before the procedure to ascertain if they can tolerate the intense vibrations and cold sensations (9).

Non-Pharmacological Interventions in Neonates;

The non-pharmacological techniques applied for neonates differ from those used in infants and older children. These include;

Sensory stimulation, such as, rocking, gentle stroking, swaddling or skin-to-skin contact and breastfeeding during procedures has been shown to be highly effective for neonates.

Sucrose solution administration is shown to reduce the behavioural and stress responses to procedural pain and alleviates pain in children below 18 months of age when given before or during the procedure (27). Sucrose may reduce the pain response to venipuncture, this may be through a primarily behavioural effect as opposed to a direct analgesic effect.

2.4.2 Pharmacological Procedural Pain Management Strategies

Drugs are the cornerstone of procedural pain management in medicine. Some factors should be considered when selecting the appropriate medications, such as the setting, nature, and length of procedure, pharmacokinetics and pharmacodynamics of a drug, and the availability of skilled healthcare workers' to administer and monitor response to the drug chosen. Dosing with this medication may be done before, during and after the procedures.

i. Pain Management before the Procedure

Premedication before procedures is not routinely performed in paediatric oncology, however some medications have been shown to be useful.

- **Non- Opioid Analgesics;**

Systemic medications may be used before the procedure. The administration of different types of analgesics several minutes to an hour before the procedure. Medications, such as, paracetamol, and non-steroidal anti-inflammatory drugs (diclofenac, ibuprofen, or ketorolac) have a good safety and side effect profile, however their potency may be insufficient for procedural analgesia.

- **Opioids Analgesics;**

Opioids, such as, morphine, diamorphine, fentanyl, or tramadol may be administered before a planned procedure giving ample time for onset of action of the drug. Safety concerns are a hindrance to the use of opioids. Concerns about respiratory depression, reduced gastrointestinal motility and the development of tolerance and addiction rank high on the list. Careful dose titration (reduced doses and regular dosing intervals) to achieve the desired response together with intensely monitoring for respiratory depression. The practice of prescribing medication to counteract nausea and constipation may also address these concerns.

Fentanyl is a synthetic opioid which is highly lipophilic, allowing its administration through the transdermal, nasal or buccal route. Fentanyl has a rapid onset of action and is recommended for short procedures that are carried out repeatedly. Fentanyl lozenges are recommended in children who undergo recurrent procedures. Transdermal fentanyl patches are not recommended for procedural pain management because peak levels

occur hours after patch application. A double-blind, randomized clinical trial conducted by Sandler *et al*. found that premedication using fentanyl or midazolam significantly reduced anticipatory anxiety and improved negative behavioural symptoms and pain scores using the visual analog scale. This study found that midazolam was the preferred drug, however routine premedication of children with cancer is not recommended (28).

- **Topical Anaesthesia;**

Topical anaesthesia works by diffusion of a cream through the skin rendering the area insensitive to pain, applying the topical cream, using an occlusive dressing, and allowing it enough time to ensure its efficacy. Tools in topical anaesthesia include coolant sprays which provide temporary insensitivity for short-term procedures, especially in needle-related procedures such as venepuncture, blood sampling, and intravenous cannulation.

However, a study conducted by Costello *et al.* proved that vapocoolant sprays are not effective pain relief measures when performing venepuncture in children (29). Some of the topical anaesthetic options available are; 4% tetracaine and Prilocaine 2.5% and Lidocaine 2.5%, and Lidocaine 4% cream topical preparations. 4% tetracaine is superior to Lidocaine; it requires a shorter application time, 30 minutes before a procedure, its effect lasts up to 6 hours (30). Use of topical anaesthetics is effective and does not affect the success rates when used while performing a lumbar puncture (31).

- **Local Anaesthesia;**

Local anaesthetics are commonly used in medical procedures, such as lidocaine and bupivacaine. They may be administered topically, subcutaneously, via intradermal injection, or by regional blocks. A device that contains a cartridge filled with pressurized carbon dioxide, may be used to administer lidocaine into the subcutaneous tissues. Infiltration of local anaesthetics is effective and does not affect the success rates when

used while performing procedures, such as, a lumbar puncture (31). When performing bone marrow aspiration and bone marrow trephine biopsies, the addition of a local anaesthetic to conscious sedation or general anaesthesia especially in cases of repeated procedures is recommended. A clinical trial carried out by Zarnegar-Lumley *et al.* demonstrated that the use of a local anaesthetic reduced pain scores immediately after the procedure. However, it did not lessen the opioid dosage used after the procedure and did not impact the overall quality of life (32).

ii. Pain Management during the Procedure

- **Nitrous Oxide;**

Nitrous oxide is an inhaled gas with analgesic effects that are mediated by the low anaesthetic potency N-methyl-D-aspartate (NMDA) receptor antagonism. One of the advantages of using inhaled nitrous oxide is the fast onset of action and rapid offset. When performing a lumbar puncture alone or together with intrathecal chemotherapy administration, inhalation analgesia using a mixture of oxygen with 50-70% nitrous oxide is shown to be successful. In paediatric oncology, moderate sedation may be performed by non-anaesthesiologists using inhaled nitrous oxide for lumbar puncture and bone marrow aspiration (33).

- **Procedural Sedation and General Anaesthesia;**

When performing bone marrow aspiration and biopsies, sedation or general anaesthesia is recommended. Procedural sedation using sedative-hypnotics and anxiolytics is considered when a medical procedure will require prolonged periods of patient immobilization and is expected to cause severe pain. Ljungman *et al.* found that general anaesthesia for lumbar puncture and conscious sedation had similar outcomes. Healthcare professionals preferred conscious sedation because it was safe and required

fewer resources and less time (34). In addition to this, Iannalfi *et al.* demonstrate that conscious sedation is preferred to general anaesthesia because it has higher compliance rates among healthcare professionals. It is safer and equally effective (35).

A study carried out by Ricard *et al.* showed that the use of midazolam, atropine, ketamine, propofol, and inhaled equimolar nitrous oxide mixed with oxygen significantly reduced the pain and anxiety experienced during diagnostic procedures in paediatric oncology patients (36). The use of synthetic opioids, such as remifentanil and alfentanil, as a single drug or in combination with midazolam is safe and effective when carrying out diagnostic bone marrow aspiration in the paediatric population (35). Hertzog *et al.* recommend that paediatric oncology procedures be scheduled and performed in the paediatric intensive care unit (PICU) using propofol administration. The setting was recommended due to the possibility of development of respiratory depression and hypotension (37).

iii. Pain Management after the Procedure

Post-procedural pain management is best achieved using the World Health Organization (WHO) ladder. The use of the WHO ladder is based on three principles. By the mouth refers to the use of the least invasive route of drug administration. The oral route is preferred because it is inexpensive, easy to use. When it is impossible to use when there is a reduced level of consciousness, the sublingual, per rectal, or subcutaneous route should be considered. Intramuscular administration of analgesics is not recommended.

The second principle is by the clock, referring to giving analgesics to the patient regularly to keep them pain-free at all times. The frequency is tailored to the pharmacology of the drug. The final principle is by the ladder, referring to appropriate drug selection practices depending on pain level (mild, moderate, or severe). In all the steps, psychological techniques and adjuvant analgesics may be used, such as amitriptyline (antidepressant), gabapentin (anticonvulsants), dexamethasone (corticosteroids), and diazepam

(anxiolytics). Moving up the ladder is recommended when pain is persistent or has increased. Once pain control is achieved, the patient is maintained on the drug. The three steps in the ladder are;

1) Step One

Non-opioid analgesics, such as, paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs), such as, diclofenac, ibuprofen, or ketorolac. NSAIDs may be deemed unappealing as they have proven to cause side effects that are detrimental to treatment in paediatric oncology patients, such as antiplatelet effects.

2) Step Two

The use of mild opioids for moderate pain is recommended, such as codeine and tramadol, given in combination with a non-opioid analgesic.

3) Step Three

Strong opioids are recommended for severe pain, for example, morphine and hydromorphone. The use of opioids in children requires close dosage and response monitoring. Potential adverse effects include an increased risk of respiratory depression and hypoventilation in younger children, nausea, vomiting, and constipation. Measures may be taken to counteract these side effects by the administration of an antiemetic and prokinetic drugs (38).

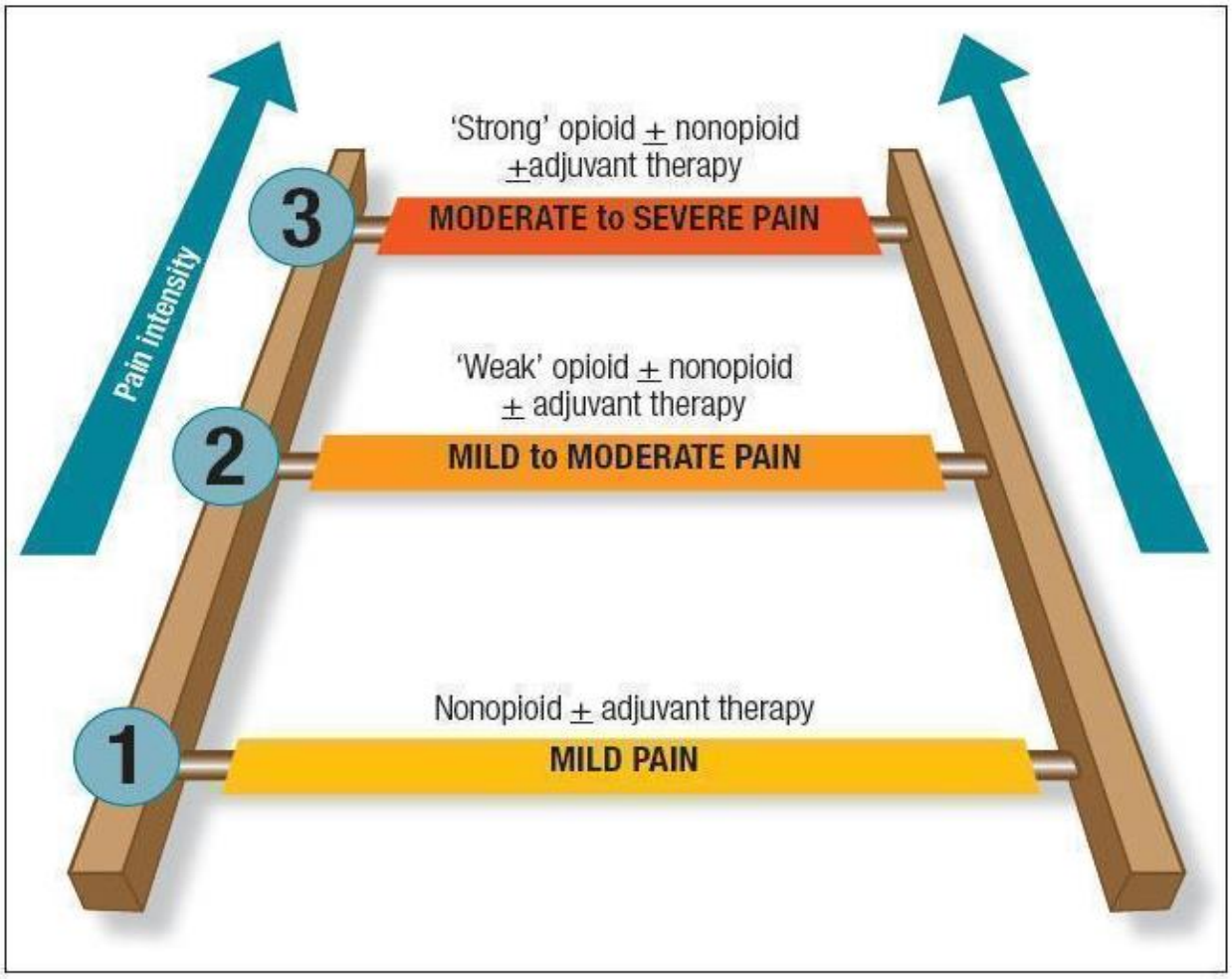

Figure 1: World Health Organization Pain ladder

The WHO pain ladder was created to aid clinicians in pain management. The three steps in the ladder correspond to the pain intensity, with guidance on which medication should be prescribed as the pain worsens. (Pergolizzi et al. The WHO pain ladder: Do We Need another Step. Practical Pain Management. 2014; 14(1):1-6).

iv. Recommended Procedural Pain Management Strategies

Specific recommendations for pain relief are available for different procedures. APAGBI (Association of Paediatric Anaesthetists of Great Britain and Ireland) guidelines on pharmacological and non-pharmacological procedural pain management strategies based on different procedures and age groups are as follows (39);

Table 1: Recommended Procedural Pain Management Strategies for Neonates

Procedures		**Recommended Pain Management Strategies**
Regular	Insertion of an intravenous cannula & Venepuncture	Non-pharmacological techniques (Sensory stimulation) Oral sucrose Non-nutritive suckling Allowing breastfeeding where possible Application of a topical/ local anaesthetic
Advanced	Lumbar puncture & CSF sampling	Application of a topical/ local anaesthetic
	Bone marrow studies (Aspiration and trephine biopsy)	Use of systemic analgesics (Nasal, oral, or sublingual) Infiltration of local anaesthetic Procedural sedation (Sedative-hypnotic drugs and anxiolytics)

Table 2: Recommended Procedural Pain Management Strategies for Older Children

Procedures		**Recommended Pain Management Strategies**
Regular	Insertion of an intravenous cannula & Venepuncture Administration of intramuscular medication	Non-pharmacological techniques (distraction, hypnosis) Use of inhaled Nitrous oxide (Older children who can cooperate with administration) Application of topical local anaesthetic
Advanced	Lumbar puncture, CSF sampling & Administration of intrathecal chemotherapeutic drugs	Non-pharmacological techniques (behavioural techniques) Infiltration of local anaesthetic
	Bone marrow studies (Aspiration and trephine biopsy)	Non-pharmacological techniques Use of systemic analgesics (Nasal, oral, or sublingual) Use of inhaled Nitrous oxide (Older children who can cooperate with administration) Infiltration of local anaesthetic Procedural sedation (Sedative-hypnotic drugs and anxiolytics)

Background on study tools used to assess knowledge, attitude and practice among healthcare workers on procedural pain management in paediatric oncology

We designed a questionnaire based on existing literature on procedural pain management among paediatric patients. The questionnaire items are derived and modified from an adapted and validated version of the Paediatric Nurses' Knowledge and Attitude Survey Regarding Pain (40), and the APAGBI (Association of Paediatric Anaesthetists of Great Britain and Ireland) guidelines on pharmacological and non-pharmacological procedural pain management strategies and other relevant literature studies (39). The assessment of knowledge, attitude and practice among healthcare workers on paediatric pain has been carried out previously using a questionnaire in several studies around the world. A study carried out by Yan et al in China (2020) utilized electronic and paper questionnaire to assess the pain management and procedural sedation practices by paediatric hematology/oncology practitioners (41). Similar studies have also been carried out in sub-Saharan Africa. In southern Nigeria, Eke et al (2019) used paper questionnaires to assess healthcare workers' knowledge and practice of pain management in children (42), and Wuni et al carried out a study in northern Ghana (2020) on the knowledge, practices and barriers of paediatric pain management among nurses (43). This literature informed the choice of the items on the assessment tool used in this study.

Table 3: Summary of studies carried out on knowledge, attitude, and practice among healthcare workers on procedural pain management in paediatric oncology

Country, Year, Author	**Study Setting and population**	**Key Findings**
China. 2020. Yan C et al.	Pediatric haematology/ oncology units. N= 304 clinical staff.	78% of physicians were unlikely to administer sedation for lumbar puncture and 72% for bone marrow biopsy.
Southern Nigeria. 2019. Eke et al.	University of Port Harcourt Teaching Hospital (UPTH). N=197 healthcare workers.	30.4% could name only three non-pharmacological treatments. 52% have never prescribed opioid analgesics to children.
New York, USA. 2010. Fein et al.	Paediatric emergency department. N=353 children who had a lumbar puncture.	Younger children were less likely to receive analgesia. 23.8% received analgesia before the lumbar puncture, 17% had local anesthesia, 12.2% had mild sedation, and 5.4% received both.
Italy. 2011. Benini et al.	Pediatric haematology/oncology units. N= 414 clinical staff.	100% of the respondents believed the procedures are very painful. 77% reported lumbar punctures to have pain scores above 5. 97.5% reported that a bone marrow aspiration has a pain score above 5. 99.5% said that bone marrow biopsy has a pain score above 5. Analgesia practices were considered good across all cadres.

2.5 Factors that Influence Procedural Pain Management by Healthcare Workers

There are many misconceptions concerning pain in the paediatric population that directly influence how caregivers and healthcare workers respond. There is a belief that children cannot recall the pain they experience, that their nervous systems are not mature enough to process pain and that pain has no long-lasting effects. Several studies have disproved these myths; however, their influence may still affect children's appropriate treatment. A few healthcare workers may feel that a child's description of their pain is unreliable, that pain will make them more robust, and that specific procedures have an acceptable amount of pain to be experienced by the child. Also, there is a belief that hospitalized children undergoing several clinical interventions get used to the pain and therefore do not require analgesia. Another hurdle in procedural pain management is the fear of using opioid analgesics for several reasons. The most prevalent risk of fostering opioid tolerance and addiction, and the fear of potential side effects, such as, respiratory depression.

Organizational challenges may present barriers to effective procedural pain management in children. Different hospital environments exist, making it more difficult for healthcare workers to manage procedural pain appropriately. Studies demonstrated that the hospital structure should allow a calm environment where children can be taken for procedures, preventing the other children from witnessing others' experiences. Availability of certain drugs may hinder the healthcare worker's choice of measures to provide comfort to the paediatric patients during procedures.

Healthcare workers state that the requirement to carry out procedures quickly due to understaffing or a large healthcare worker to patient ratio, impacts the quality of care. This feeling of being rushed allows a clinician to justify holding a child down to carry out a procedure, rather than employing well-documented psychological and pharmacological measures to ameliorate the child’s pain. Inadequate space to carry out procedures and

poorly trained staff who cannot carry out procedural sedation are significant barriers to treatment (44).

2.6 Study Justification

As the survival rates among paediatric cancer patients improve, the harsh reality of disease burden is brought to light. These children undergo multiple stressors, including, procedural pain and any attempt to lessen this burden will profoundly affect them and improve their quality of life within the hospital. The importance of offering effective supportive measures in the long-term process associated with the disease's treatment has become increasingly necessary for these children. The continued advances that have been made in paediatric pain research are still being translated into clinical practice. This study will shed light on the positive and negative deviances in knowledge, attitude, and practice among healthcare workers on procedural pain management in paediatric oncology. The study results will inform the development of in-hospital paediatric procedural pain management and sedation policies in the paediatric oncology wards. The study findings will be used to shed a light on the gaps within the healthcare workers curriculum, which will increase the likelihood of the addition of training on procedural pain. Parents and caregivers within cancer support groups may be trained on effective methods of alleviating procedural pain among children living with cancer.

2.7 Research Question

- What is the level of knowledge, attitude, and practice of healthcare workers on procedural pain management in paediatric oncology patients in Kenyatta National Hospital?

2.8 Study Objectives

- **Primary Objectives**

1. To evaluate the level of knowledge of healthcare workers on procedural pain management in paediatric oncology patients in Kenyatta National Hospital
2. To evaluate the attitude of healthcare workers on procedural pain management in paediatric oncology patients in Kenyatta National Hospital
3. To evaluate the practice of healthcare workers on procedural pain management in paediatric oncology patients in Kenyatta National Hospital

❖ **Secondary Objectives**

1. To examine the factors that influence the knowledge of healthcare workers on procedural pain management in paediatric oncology patients in Kenyatta National Hospital
2. To examine the factors that influence the attitude of healthcare workers on procedural pain management in paediatric oncology patients in Kenyatta National Hospital
3. To examine the factors that influence the practice of healthcare workers on procedural pain management in paediatric oncology patients in Kenyatta National Hospital

CHAPTER 3: METHODS

3.1 Study Design

The study carried out was a cross-sectional (quantitative) design.

3.2 Study Setting

The study was conducted at the Kenyatta National Hospital (KNH). KNH is a tertiary teaching and referral hospital located in Nairobi County, Kenya, working with the University of Nairobi. It has a bed capacity of 1800, with 240 general paediatric beds.

The paediatric oncology patients are admitted in the paediatric wards, and the paediatric oncology ward.

The study units are the wards involved in paediatric oncology care, namely; general paediatric wards and the paediatric oncology wards. Within the general paediatric wards, there are approximately fifteen to twenty oncology patients per ward. These patients are under the care of the nurses, clinical officers and doctors (paediatrics and pathology). This approximately totals 250 healthcare workers.

The regular procedures assessed in this study are performed by nurses, and the advanced procedures are performed by medical officers, paediatric residents, and consultants with the assistance of the nurses.

3.3 Study Population

The study involved the health care workers in the study units general paediatric wards and the paediatric oncology wards in Kenyatta National Hospital, including; nurses, clinical officers and doctors.

Inclusion Criteria:

- Healthcare workers who work within the study units, that is, the general paediatric wards and the paediatric oncology ward.
- Healthcare workers who gave informed consent to participate in the study.
- Healthcare workers with more than one month work experience in any of the study units.

- Healthcare workers who have rotated in oncology rooms for less than one month as long as they have previous experience with the management of paediatric oncology patients in KNH.

Exclusion Criteria:

- Healthcare workers who have had less than one month experience in working with paediatric oncology patients in any of the study units and have not had previous experience in the management of paediatric oncology patients in KNH.

3.4 Sample Size Calculation and Sampling Methods

Sample size calculation is based on the primary objectives (the level of knowledge, attitude and practice among healthcare workers on procedural pain management among paediatric oncology patients).

Fisher's formula is used;

$$N = \frac{Z\alpha 2\ p\ (1-p)}{d2}$$

N = estimated minimum sample size

Zα = 2.326, with level of significance set at 98% confidence level

P is the expected proportion of healthcare workers who have adequate knowledge on paediatric pain management which is estimated at 61% based on the findings of Wuni et al in a study carried out in Ghana (43).

D= the level of statistical significance set at 0.10

$$N = \frac{2.326 * 2.326 * 0.61\ (1 - 0.61)}{0.10 * 0.10}$$

Minimal required sample size = 129

The Taro Yamane sample size calculation was used in a cross-sectional study carried out by Wuni et al evaluating the knowledge, practices, and barriers of pediatric pain management among nurses (43).

The formulae states;

n= N/ (1+Ne2)

Where;

n= desired sample size

N= known population under study (250)

e= margin of error (0.05)

Therefore, n=156

This additional 20% was added to the calculated minimum sample size using Fisher's formula to cater to any incomplete questionnaires, therefore we achieved a sample size of 156.

Sampling Methods

Simple random sampling was done. This involved randomly selecting a smaller subgroup to represent the larger population. After data collection, the principal investigator

calculated the percentage of healthcare workers from the total sample size represented from each cadre (Table 4).

Table 4: Sample Frame

Healthcare Worker Cadre	Sample	Percentage (%)
Nurses	74	47
Clinical officer	14	9
Paediatric Doctors	64	41
Pathology Doctors	4	3

3.5 Factors/ Correlates of Knowledge, Attitude and Practice on Procedural Pain Management

1. The age of the healthcare workers.

2. The cadre of the healthcare workers (Nurses, Clinical Officers, paediatric doctors, and Pathology doctors).

3. The level of education of the healthcare workers (Degree vs Diploma).

4. The years of experience after graduation into the medical field.

5. The years of experience in paediatric oncology wards.

6. Whether the HCWs have received any training on procedural pain in paediatric patients.

3.6 Study Tool and Definition of Key Outcomes of Interest

The questionnaire items are derived and modified from an adapted and validated version of the Paediatric Nurses' Knowledge and Attitude Survey Regarding Pain (40), and the APAGBI (Association of Paediatric Anaesthetists of Great Britain and Ireland) guidelines on pharmacological and non-pharmacological procedural pain management strategies and other relevant literature studies (39).

The *study questionnaire* was prepared in English and divided into four parts;

Part 1 seeks demographic information.

Part 2- Knowledge Assessment Tool

Part 2 is the Knowledge scale that has seven questions on procedural pain management.

Table 5: Knowledge on Procedural Pain Management Assessment Tool

Question number	Knowledge on Procedural Pain Management Detail
1	Poor procedural pain management in paediatric oncology negatively affects the entire course of a patient's treatment?
2	The mechanism of action of non-pharmacological strategies for pain management;
3	The non-pharmacological strategies with strongest evidence for efficacy in children:
4	When performing procedures in neonates, which of the following statements is true?
5	A 3-year-old child has presented for administration of vincristine. He needs a blood test done and an IV cannula for hydration. What is the best step to ensure adequate pain relief during cannulation?
6	A Cerebrospinal fluid sample (CSF) sample for CSF cytology is needed on a school-aged child with ALL. The most appropriate action to provide analgesia during this procedure is:

7	Which of the following are appropriate to ensure adequate pain relief when performing a bone marrow aspiration and trephine biopsy?

Correct answers will be given a value of one and incorrect, blank or "I don't know" responses will receive a value of zero. These scores were converted to percentages by dividing the total scores from each respondent with the maximum possible score then multiplying by 100. The overall knowledge was analysed using the Bloom Cut Off which is appropriate to categorise this across 3 tiers, Good (80-100%), fair (60-79%) and poor (<60%) (45).

Part 3- Attitude Assessment Tool

Part 3 was used to collect data on attitude with four statements on the attitude on procedural pain management.

Table 6: Attitude on Procedural Pain Management Assessment Tool

Question number	**Attitude on Procedural Pain Management Detail**
1	Do you think pain resulting from medical procedures is expected and unavoidable?
2	Do you believe that pharmacological methods of procedural pain management in paediatric patients are superior to non-pharmacological methods?
3	Do you believe the lack of a facial pain expression or crying before/during a procedure means the lack of pain?
4	Do you believe that children always cry during medical procedures due to fear, rather than actual pain?

The Likert scale was collapsed into dichotomous values for scoring and data analysis, i.e., Strongly Agree (5), Agree (4), no opinion (3), disagree (2), Strongly Disagree (1). Hence, a maximum score of twenty and a minimum of five. The overall attitude score was converted to percentages and then categorized as favourable if the score was 60–100%, and unfavourable if the score was less than 60%.

Part 4- Practice Assessment Tool

Information concerning practice was collected using nine practice interventions on procedural pain management on a 4-point Likert Scale.

Table 7: Practice on Procedural Pain Management Assessment Tool

Question number	Practice on Procedural Pain Management Detail
1	Do you use non-pharmacological pain management techniques during procedures in paediatric oncology?
2	Do you use several techniques to distract children from pain during procedures?
3	Do you provide pharmacological pain relief when performing intravenous cannulation in paediatric oncology patients?
4	Do you provide pharmacological pain relief when performing intramuscular or subcutaneous injections in paediatric oncology patients?
5	Do you provide pharmacological pain relief when participating in or performing in lumbar puncture and intrathecal administration in paediatric oncology patients?
6	Do you provide pharmacological pain relief when participating in or performing bone marrow aspiration and bone marrow trephine biopsy in paediatric oncology patients?
7	Do you combine non-opioid analgesics (Paracetamol and NSAIDs) and opioids when managing post-procedural pain?
8	Do you reassess children's pain after giving pain medication to evaluate the effectiveness of the treatment?
9	Do you follow a policy in your hospital for paediatric procedural pain management?

The Likert scale was then collapsed into dichotomous values for scoring and data analysis, i.e., always (4), often (3), occasional (2), never (1). Hence, a maximum score of thirty-six and a minimum of four. The score was converted to percentages and then categorized using the Bloom's cut-off point, as good if the score was 80–100%, fair if the score was 60–79% and poor if the score was less than 60%.

3.7 Study Procedures

Prior to the commencement of data collection, ethical approval was sought from the KNH/UoN Ethics and Research Committee (Ref: KNH-ERC/A/262, see Appendix 5) and endorsement from the KNH Paediatrics and Child Health head of department.

Eligibility of Healthcare workers

Based on the inclusion criteria, the healthcare workers eligible to participate in the study were approached, and study details explained. Fourteen healthcare workers were excluded at this stage because they had declined to participate in the study and some had less than one month experience working paediatric oncology patients.

Informed consent

Consent was obtained from the participants after an explanation of the study was done. The consent was in clear language that all the participants understood. The consent forms were sent online via WhatsApp messenger. The participants were expected to choose YES or NO. Those who selected YES were able to progress to part 1 of the questionnaire. The paper consent forms were distributed and signed. After which, the participants were given the questionnaire to fill. The principal investigator was available for feedback and questions from the respondents. Confidentiality was guaranteed as the respondents names were omitted from the questionnaires ensuring anonymity.

Distribution and Collection of Questionnaires

Data were collected using two methods; an online self-administered questionnaire distributed on the phone messenger application, WhatsApp, through a link sent to the healthcare workers mobile number, or a paper self-administered questionnaire distributed

in the wards. Data collection occurred over four months in 2021/ 2022. Upon signing the online written consent form, the participants proceeded to complete the questionnaire using the digital platform, Google forms. The participants who preferred a paper questionnaire or did not have WhatsApp were given a written questionnaire after written consent was obtained. Participation in this study was not compulsory. The right to withdraw at any time and the promise of confidentiality and anonymity was communicated to the participants. The questionnaires had four sections; the demographic data, knowledge, attitude and practice sections, and were similar for all cadres. The questionnaires were collected at a later agreed upon date (within 24-48 hours) for data entry. For the health workers who opted for the electronic format, the questionnaire was sent on the mobile messenger application, WhatsApp. This distribution of questionnaires was carried out by the principal investigator.

Completed questionnaires

The paper questionnaires were collected at a later agreed upon time (within 24-48 hours) for data entry. Twenty-four healthcare workers who accepted a questionnaire did not return. The electronic questionnaires were automatically saved on google forms when completed.

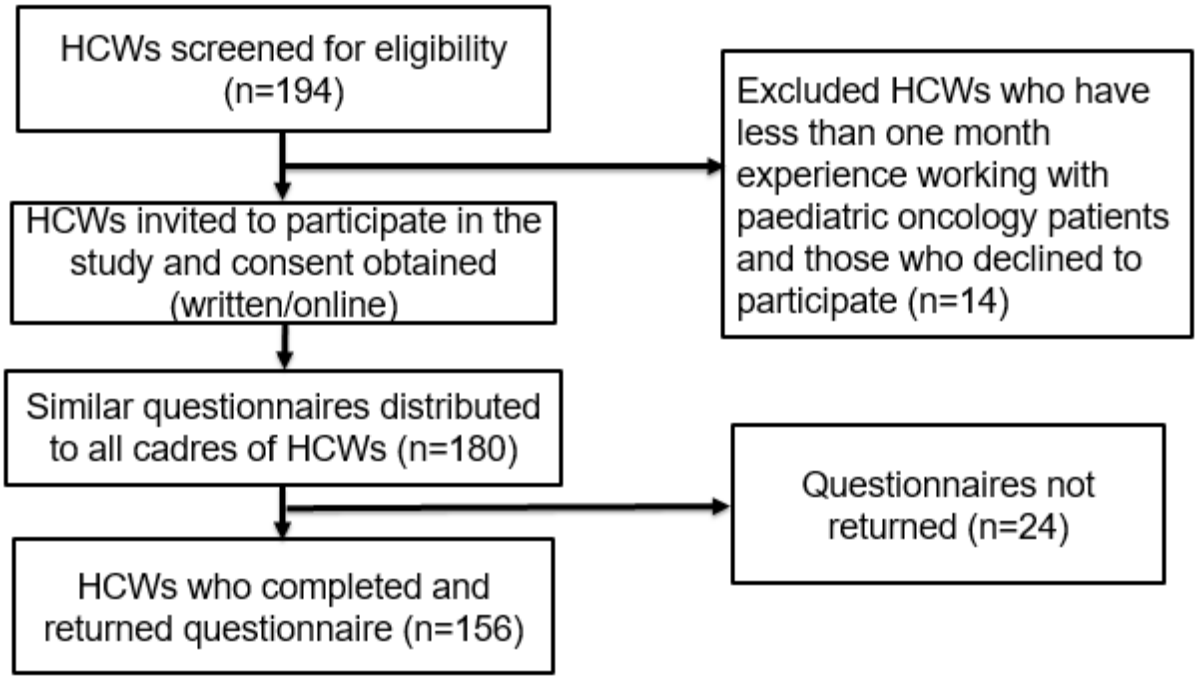

Figure 2: Flowchart of Screening and Enrollment Procedures

3.8 Data Management and Analysis

All the data collected using the questionnaires were entered into a soft copy record form and then reviewed by the primary investigator. Data was cleaned, and stored in a password-protected laptop. The data was exported to R version 4.1.2 and coded for data analysis. Descriptive statistics were used to report healthcare workers' demographic characteristics and bio data (frequencies, percentages, median and inter-quartile range). Frequencies and percentages were used to report healthcare workers knowledge, attitude and practice of procedural pain management among paediatric oncology patients (primary objectives). The prevalence of good vs poor knowledge, favourable vs unfavourable attitude and good vs poor practice was calculated as follows; the numerator was the number of healthcare workers with a correct answer, divided by denominator (All the HCWs who responded), and then converted to a percentage.

When establishing independent influencing factors, univariate analysis was done. We carried out odds ratio tests for each pair of variables independently. The p-values were produced by Pearson's chi square test (secondary objective). The data is presented using tables. To further assess the factors associated with knowledge, attitude and practice on procedural pain management, we fitted a binary logistic regression model (binary outcome) containing overall scores on procedural pain management. Selection of variables was done using Akaike's Information Criteria (AIC) to fit the models to retain only variables that explained the outcome.

3.9 Ethical Considerations

3.9.1 Ethical Approval

Approval to conduct this study was obtained from the KNH/UoN Ethics and Research Committee (Ref: KNH-ERC/A/262, see Appendix 5), as well as endorsement from the KNH Paediatrics and Child Health head of department. The risks of participation in the study were thought to be psychological turmoil among the healthcare workers related to feelings of inadequacy in management of procedural pain, and fear of disclosure of inadequate knowledge and negative attitudes as concerns procedural pain management in the paediatric oncology patients. Participation in this study was not compulsory. The right to withdraw at any time and the promise of confidentiality and anonymity was communicated to the participants.

3.9.2 Control of Biases and Errors

The principal investigator was in charge of the distribution and collection of the questionnaires. The study participants were identified by unique study identification numbers and did not have their names or contacts entered onto the questionnaire to maintain confidentiality. The electronic tool had validity checks where the respondents could not proceed to the next question before completing the previous one. The paper

questionnaires were assessed for completeness at the time of collection. Data was entered into a password-protected laptop.

CHAPTER 4: RESULTS

4.1 Demographic Characteristics of Study Population

One hundred and fifty-six healthcare workers at the Kenyatta National Hospital were enrolled into this study. The majority of the respondents, 84 (54%) were aged between 31 to 40 years, 40 (25%) respondents between 20 to 30 years, 32 respondents (21%) between 41 to 60 years. The majority of the respondents, 97 (63%) were female. The respondents were from various cadres; the majority 74 (47%) were nurses, 64 (41%) paediatric doctors, 4 (3%) pathology doctors, and 14 (9%) clinical officers.

The median number of years after graduation into the medical field was 8 years, a majority (119) of the respondents (76%) had more than 5 years of experience after graduation into the medical field (Nursing/MBChB), and the remaining 37 (24%) had less than 5 years of experience after their graduation into the medical field. The median number of years of experience in paediatric oncology was 2 years. Where 94 (60%) respondents had more than 1 year of experience, and 62 (40%) had less than 1 year experience in paediatric oncology. The majority, 119 (76%) respondents had not received any prior training in procedural pain among paediatric patients. The summary of the findings are presented in table 8.

Table 8: Healthcare Workers Demographic Characteristics

Variable	**Detail**	**Frequency (n= 156)**	**Percentage (%)**
Age	20-30 years	40	26
	31-40 years	84	54
	41-60 years	32	21
Sex	Male	57	37
	Female	99	63
Marital status	Married	103	66
	Single	48	31
	Divorced/separated/widowed	5	3
Cadre	Nurses	74	47
	Clinical officer	14	9
	Paediatric Doctors	64	41
	Pathology Doctors	4	3
Level of Education	Degree	97	62
	Diploma	59	38
Years of work experience	Median years (IQR)	8 (5.25-12)	
	< 5years	37	24
	> 5 years	119	76
Years of experience in paediatric oncology	Median years (IQR)	2 (1-3)	
	< 1 year	62	40
	> 1 year	94	60
Trained in procedural pain	Yes	37	24
	No	119	76

4.3 Primary Objectives

4.3.1 Knowledge of Healthcare Workers on Procedural Pain Management in Paediatric Oncology

We found that 143 (92%) of healthcare workers understood that poor procedural pain management negatively impacts the entire course of a patient's treatment. Of the respondents, 148 (94%) understood that non-pharmacological pain management strategies work by reducing the perception of pain, with 120 healthcare workers (77%) being aware that distraction is shown to be the most effective non-pharmacological method of procedural pain management.

In regards to performing procedures in neonates, 137 healthcare workers (88%) know that breastfeeding during the procedure, where possible, has an analgesic effect. Of the respondents, 115 (74%) were aware of the recommended procedural pain management practices when performing intravenous cannulation. However, only 38 (24%) were aware of the recommended pain management when performing a lumbar puncture. Among the healthcare workers, 110 respondents (71%) were aware of the recommended pain management practices when performing a bone marrow aspiration and trephine biopsy (Table 9a). The proportion of healthcare workers who gave correct or incorrect responses is represented in table 9a. The percentage of healthcare workers who gave a correct response for each question in represented in figure 3.

Table 9a: Healthcare Workers Knowledge on Procedural Pain Management

Variables on Knowledge	Correct Response	HCWs with correct Responses n(%)	Incorrect Responses n(%)
1. Poor procedural pain management in paediatric oncology negatively affects the entire course of a patient's treatment?	Yes	143 (92)	13 (8)
2. Mechanism of action of non-pharmacological strategies	May reduce pain perception	148 (95)	8 (5)
3.Non-pharmacological strategies with strongest evidence for efficacy in children:	Distraction	120 (77)	36 (23)
4. When performing procedures in neonates, which of the following statements is true?	Breastfeeding should be encouraged where possible during painful procedures	137 (88)	19 (12)
5. Recommended pain management for intravenous cannulation	Distraction and application of a topical anesthetic cream	115 (74)	41 (26)
6. Recommended pain management for lumbar puncture	Non-pharmacologic techniques together with application of EMLA 1 hour before procedure	38 (24)	118 (76)
7. Recommended pain management for bone marrow aspiration and trephine biopsy	Non- pharmacologic psychological methods together with infiltration of a local anaesthetic and procedural sedation	110 (71)	46 (29)

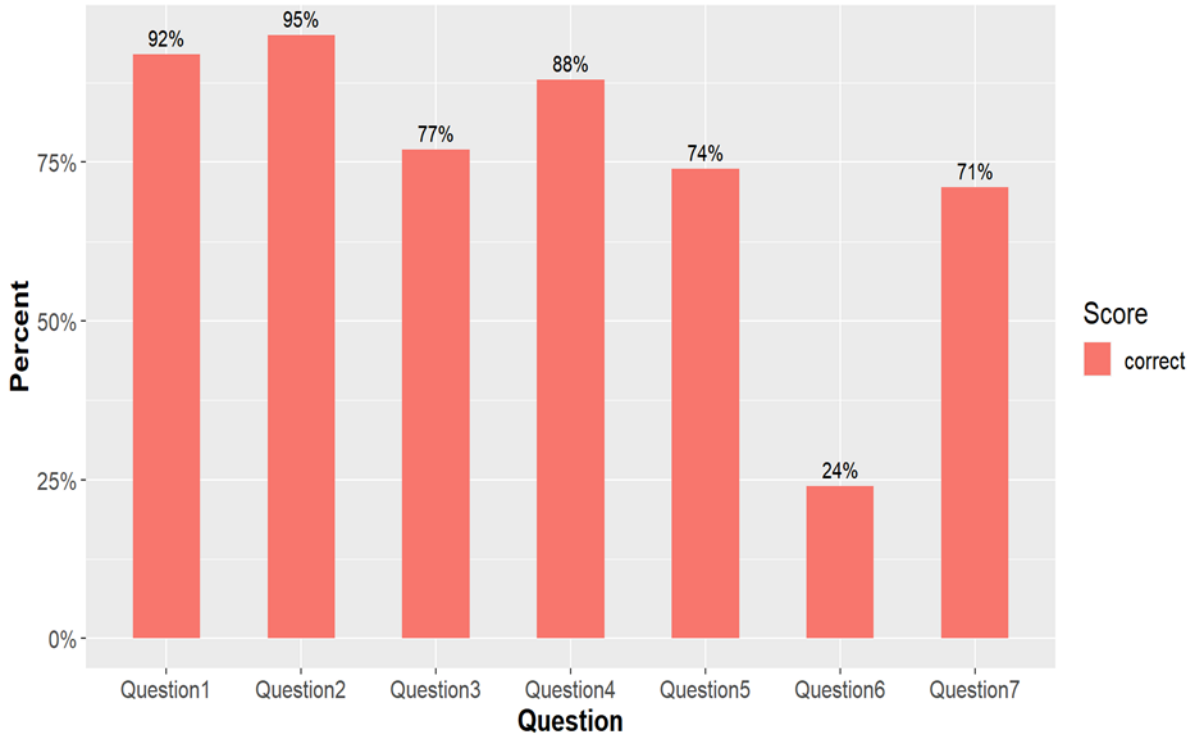

Figure 3: Bar graph representation of the correct responses for knowledge on procedural pain management

Combined score for Knowledge on Procedural Pain Management

Correct answers will be given a value of one and incorrect/ blank responses will receive a value of zero. Each of the 7 items had a score of 1 mark making the maximum score to be 7 if all answers are correct, and the minimum score of 0 if all answers are wrong. The total score of each HCW obtained out of 7 was then converted into a percentage. We categorized the level of knowledge according to their overall score as; good (80-100%), fair (60-79%) and poor (<60%) as in table 9b. In this study, we found that the majority of the healthcare workers 51.0% (n = 80) had an overall good score on knowledge of procedural pain management, and 30% (n = 47) had a fair score. The remainder of the healthcare workers (29%) achieved a poor score.

Table 9b: Overall Healthcare Workers' Knowledge on Procedural Pain Management

Participants Overall Scores	Characteristics	Frequency	Percentage (%)
80-100%	Good	80	51
60-79%	Fair	47	30
<60%	Poor	29	19

4.3.2 Attitude of Healthcare Workers on Procedural Pain Management in Paediatric Oncology

Among the healthcare workers, 31 (20%) believed that pain from medical procedures is unavoidable. Of the respondents, 22 (14%) believed that pharmacological methods of procedural pain management are superior to non-pharmacological methods (Table 10a). The proportion of healthcare workers whose responses were either 'strongly disagree, disagree, neutral, and agree or strongly agree' are shown in table 10a.

Table 10a: Healthcare Workers Attitude on Procedural Pain Management

Attitude Question	Response and Classification	No. of Healthcare workers (%)
1. Do you think pain resulting from medical procedures is expected and unavoidable?	Positive Neutral Negative	98 (63%) 24 (16%) 31 (20%)
2. Do you believe that pharmacological methods of procedural pain management in paediatric patients are superior to non-pharmacological methods?	Positive Neutral Negative	92 (59%) 39 (25%) 22 (14%)
3. Do you believe the lack of a facial pain expression or crying before/during a procedure means the lack of pain?	Positive Neutral Negative	134 (86%) 14 (9%) 5 (3%)
4. Do you believe that children always cry during medical procedures due to fear, rather than actual pain?	Positive Neutral Negative	74 (47%) 56 (37%) 23 (15%)

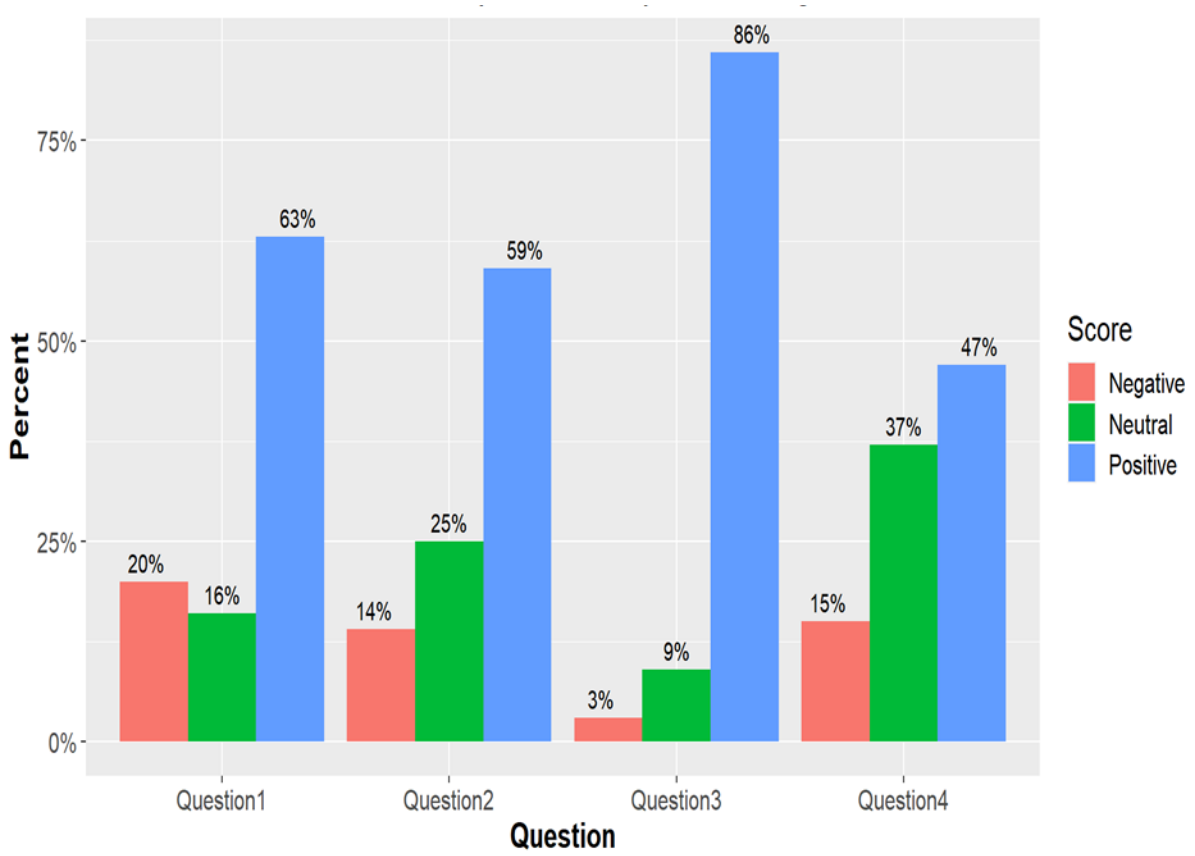

Figure 4: Bar graph representation of the responses for attitude on procedural pain management

The graphical representation of the positive, neutral and negative attitudes by the healthcare workers for each of the attitude statements (Figure 4).

Combined score for attitude on Procedural Pain Management

There are four statements on the attitude on procedural pain management on a 5 point likert scale. The Likert scale was collapsed into dichotomous values for scoring and data analysis, i.e., Strongly Agree (5), Agree (4), no opinion (3), disagree (2), Strongly Disagree (1). Hence, a maximum score of twenty and a minimum of five. The overall attitude score was converted to percentages and then categorized as favourable if the

score was 60–100%, and unfavourable if the score was less than 60%. In this study, we found that the majority 90% (n = 140) of the healthcare workers showed an overall poor attitude on procedural pain management (Table 10b).

Table 10b: Overall Healthcare Workers' Attitude on Procedural Pain Management

Participants Overall Scores	Characteristics	Frequency	Percentage (%)
80-100%	Favourable	16	10
<60%	Unfavourable	140	90

4.3.3 Practice of Healthcare Workers on Procedural Pain Management in Paediatric Oncology

A majority of HCWs (67%) use non-pharmacological pain management techniques when performing paediatric oncology procedures and use several distraction techniques (78%). Only 23% of healthcare workers provide pain relief when performing intravenous cannulation, intramuscular and subcutaneous injections (48%). Only 48% of HCWs offer pharmacological pain relief when performing a lumbar puncture. A majority of HCWs (76%) offer pharmacological pain relief when performing a bone marrow aspiration and trephine biopsy). Among the HCWs, 53% offer pharmacological post-procedural pain management (Table 11a). The proportion of healthcare workers whose responses were either 'always, often, occasional and never' are shown in table 11a.

Table 11a: Healthcare Workers Practice on Procedural Pain Management

Statement on Practice	**Responses and Classification**	**No. of healthcare workers (%)**
1. Do you use non-pharmacological pain management techniques during procedures in paediatric oncology?	Good Occasional Poor	105 (67%) 40 (26%) 8 (5%)
2. Do you use several techniques to distract children from pain during procedures?	Good Occasional Poor	122 (78%) 29(19%) 2 (1%)
3. Do you provide pharmacological pain relief when performing intravenous cannulation in paediatric oncology patients?	Good Occasional Poor	36 (23%) 37 (24%) 80 (52%)
4. Do you provide pharmacological pain relief when performing intramuscular or subcutaneous injections in paediatric oncology patients?	Good Occasional Poor	43 (28%) 29 (19%) 81 (53%)
5. Do you provide pharmacological pain relief when participating in or performing in lumbar puncture and intrathecal administration in paediatric oncology patients?	Good Occasional Poor	75 (48%) 32 (21%) 46 (30%)
6. Do you provide pharmacological pain relief when participating in or performing bone marrow aspiration and bone marrow trephine biopsy in paediatric oncology patients?	Good Occasional Poor	118 (76%) 22(14%) 13 (9%)
7. Do you combine non-opioid analgesics (Paracetamol and NSAIDs) and opioids when managing post-procedural pain?	Good Occasional Poor	83 (53%) 50 (33%) 20 (13%)
8. Do you reassess children's pain after giving pain medication to evaluate the effectiveness of the treatment?	Good Occasional Poor	115 (74%) 35 (23%) 3 (2%)
9. Do you follow a policy in your hospital for paediatric procedural pain management?	Good Occasional Poor	66 (42%) 36 (24%) 51 (33%)

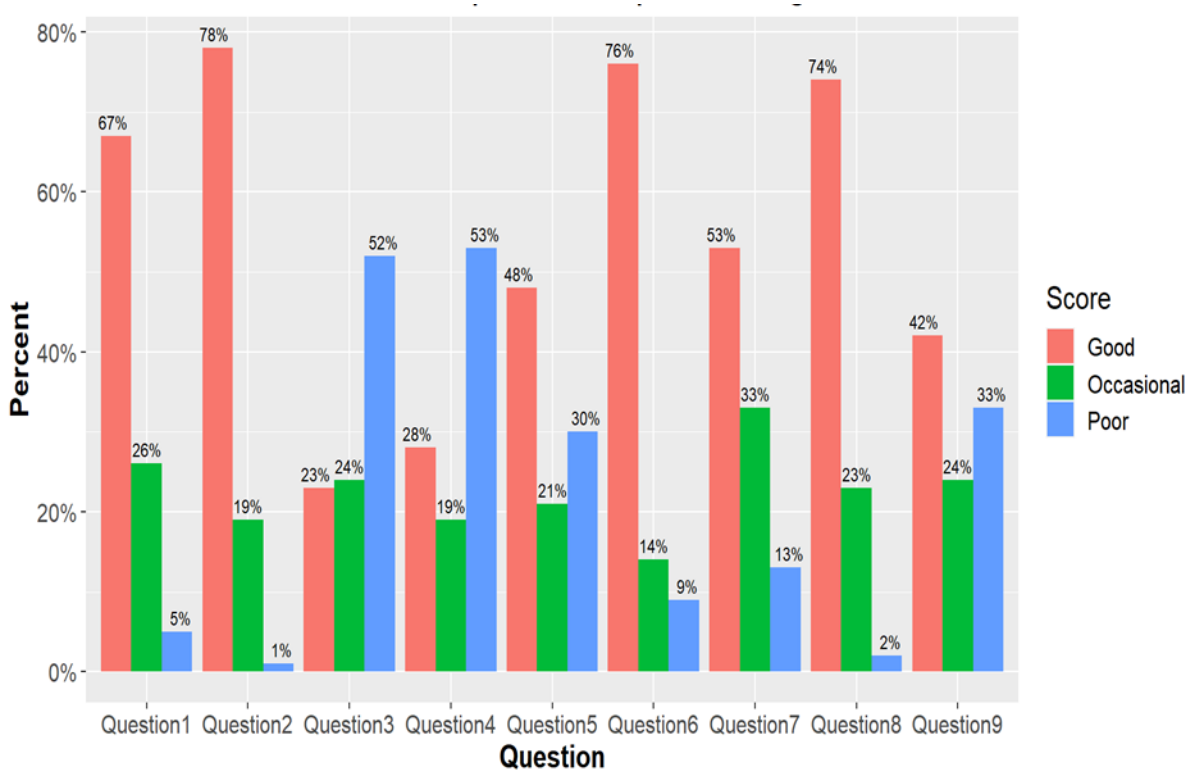

Figure 5: Bar graph representation of the responses for practice on procedural pain management

The graphical representation of the good and poor practice by the healthcare workers for each of the practice statements (Figure 4).

Combined score for practice on Procedural Pain Management

There are nine practice interventions statements assessed on procedural pain management on a 4-point Likert Scale. The Likert scale was then collapsed into dichotomous values, i.e., always (4), often (3), occasional (2), never (1). A maximum score of thirty-six and a minimum of four were achieved. The score was converted to percentages and then categorized, as good if the score was 80–100%, fair if the score was 60–79% and poor if the score was less than 60%. In the study, we found that the

majority of the healthcare workers 92% (n = 144) had an overall poor score on practice of procedural pain management, while the remainder of the healthcare workers had a fair score (Table 11b).

Table 11b: Overall Healthcare Workers' Practice on Procedural Pain Management

Participants Overall Scores	Characteristics	Frequency	Percentage (%)
80-100%	Good	0	0
60-79%	Poor	12	8
<60%	Poor	144	92

4.4 Secondary Objective

4.4.1 Factors/ Correlates of Knowledge on Procedural Pain Management

Professional Cadre

Knowledge on the recommended method of pain management for lumbar puncture and intrathecal administration of chemotherapeutic medication was poorly performed by healthcare workers across all cadres (Table 12). The correct responses given by the different professional cadres is represented below (table 12). There was no statistically significant association between the professional cadre and knowledge on procedural pain management on univariate analysis (Table 13).

Table 12: Healthcare workers knowledge on procedural pain management by professional cadre

Variables on Knowledge	All Respondents (Correct Response (%)	Nurses n(%)	Clinical officers n(%)	Paediatric Doctors n(%)	Pathology Doctors n(%)
1. Poor procedural pain management in paediatric oncology negatively affects the entire course of a patient's treatment?	143 (92)	67 (91)	14 (100)	58 (91)	4 (100)
2.Non-pharmacological strategies for pain management;	148 (95)	69 (93)	13 (93)	62 (97)	4 (100)
3.Non-pharmacological strategies with strongest evidence for efficacy in children:	120 (77)	49 (66)	11 (79)	56 (88)	4 (100)
4. When performing procedures in neonates, which of the following statements is true?	137 (88)	60 (81)	11 (79)	62 (97)	4 (100)
5. Recommended pain management for intravenous cannulation;	115 (74)	51 (69)	10 (71)	52 (81)	4 (100)
6. Recommended pain management for lumbar puncture;	38 (24)	13 (18)	4 (29)	22 (34)	1 (25)
7. Recommended pain management for bone marrow aspiration and trephine biopsy?	110 (71)	41 (55)	12 (86)	53 (83)	4 (100)

Level of Education

On univariate analysis, we found that the level of education (degree vs diploma) is significantly associated with knowledge on procedural pain management (p-value 0.03) at 5% significance level. Healthcare workers with higher education had 0.45 fold better knowledge (OR 0.45) (95% CI 0.21, 0.95).

Years of Work Experience

There was no statistically significant association between the years of work experience and knowledge on procedural pain management (Table 13).

Years of Experience in Paediatric Oncology

There was no statistically significant association between the years of experience working in paediatric oncology and knowledge on procedural pain management (Table 13a).

Training in Procedural Pain among Paediatric Patients

There was no statistically significant association between training on procedural pain and knowledge on procedural pain management (Table 13a).

Table 13a: Factors affecting healthcare workers knowledge on procedural pain management (Univariate analysis)

Characteristics		**Score**			
All Respondents		**Good (ref) N = 114**	**Poor N = 42**	**Crude OR (95% CI)**	**p-value**
Cadre	Clinical officer (ref)	11	3		
	Nurse	45	29	2.36 (0.61, 9.20)	0.24
	Paediatric doctors	54	10	0.68 (0.16, 2.88)	0.69
	Pathology doctors	4	0	N/A	1.00
Level of Education	Diploma	37	23		
	1st Degree	61	17	0.45 (0.21, 0.95)	0.03
	Post-graduate Degree	16	2	0.20 (0.04, 0.96)	0.03
Years of work experience	< 5years	17	10		0.17
	> 5years	97	31	0.54 (0.23, 1.31)	
Years of experience in paediatric oncology	< 1year	33	7		0.14
	> 1year	81	34	1.98 (0.78, 4.90)	
Trained on pain management	Yes	25	11		0.58
	No	89	31	0.79 (0.35, 1.79)	

On multivariate analysis, cadre and years of work experience were significantly associated with the overall knowledge score on procedural pain management. Paediatric doctors had 0.31 odds of having good knowledge (OR 0.31) (95% CI 0.13, 0.61). Healthcare workers with had 0.33 odds of having good knowledge (OR 0.33) (95% CI 0.12, 0.90).

Table 13b: Factors affecting healthcare workers knowledge on procedural pain management (Multivariate analysis)

Characteristics		**Score**			
All Respondents		**Good (ref) N = 114**	**Poor N = 42**	**Crude OR (95% CI)**	**p-value**
Cadre	Nurse (ref)	11	3		
	Paediatric doctors	45	29	0.31 (0.13, 0.69)	0.005
	Clinical officer	54	10	0.45 (0.08, 1.76)	0.28
	Pathology doctors	4	0	N/A	0.99
Years of work experience	< 5years	17	10		0.03
	>= 5years	97	31	0.33 (0.12, 0.90)	
Years of experience in paediatric oncology	< 1year	33	7		0.13
	>= 1year	81	34	2.26 (0.82, 7.09)	

4.4.2 Factors/ Correlates of Attitude on Procedural Pain Management

Professional Cadre

The favourable attitudes on procedural pain management aspects according to different professional cadres is represented below (table 14). There was no statistically significant association between the professional cadre and attitude on procedural pain management on univariate analysis (Table 15a).

Table 14: Healthcare workers attitude on procedural pain management by professional cadre

Variables on Attitude	Healthcare workers with favourable attitude n (%)	Nurses n(%)	Clinical officers n(%)	Paediatric Doctors n(%)	Pathology Doctors n(%)
1. Do you think pain resulting from medical procedures is expected and unavoidable?	98 (63)	19 (26)	2 (14)	24 (38)	1 (25)
2. Do you believe that pharmacological methods of procedural pain management in paediatric patients are superior to non-pharmacological methods?	92 (59)	9 (12)	0 (0)	14 (22)	0 (0)
3. Do you believe the lack of a facial pain expression or crying before/during a procedure means the lack of pain?	134 (86)	20 (27)	4 (29)	27 (42)	1 (25)
4. Do you believe that children always cry during medical procedures due to fear, rather than actual pain?	74 (47)	2 (3)	0 (0)	17 (27)	0 (0)

Level of Education

The level of education is significantly associated with attitude on procedural pain management (p-value 0.001) on univariate analysis. Healthcare workers with higher education had higher odds of having favourable attitudes.

Years of Work Experience

There was no statistically significant association between the years of work experience and attitude on procedural pain management on univariate analysis (Table 15a).

Years of Experience in Paediatric Oncology

On univariate analysis, the years of experience in paediatric oncology is significantly associated with attitude on procedural pain management (p-value 0.012). HCWs who

more than one year work experience had 1.21 fold favourable attitudes (OR 1.21) (95% CI 0.32, 4.61).

Training on Paediatric Procedural Pain

There was no statistically significant association between training on procedural pain in children and attitude on procedural pain management (Table 15a).

Table 15a: Factors associated with attitude on procedural pain management (Univariate analysis)

Characteristics		**Score**			
All Respondents		**Favorable (ref) N = 15**	**Unfavorable N = 141**	**Crude OR (95% CI)**	**p-value**
Cadre	Nurse (ref)	6	68		
	Paediatric doctors	9	55	0.54 (0.18, 1.61)	0.28
	Clinical officer	0	14	N/A	0.58
	Pathology doctors	0	4	N/A	1.00
Level of Education	Diploma (ref)	0	60		
	1st Degree	12	66	N/A	0.001
	Post-graduate Degree	3	15	N/A	0.001
Years of work experience	< 5years (ref)	3	24		0.73
	>= 5years	12	116	1.21 (0.32, 4.61)	
Experience in paediatric oncology	< 1year (ref)	0	40		0.012
	> 1year	15	100	N/A	
Training on procedural pain	Yes (ref)	4	32		0.75
	No	11	109	1.23 (0.37, 4.16)	

On multivariate analysis, none of the factors investigated were significantly associated with attitude on procedural pain management at 5% significance level (Table 15b).

Table 15b: Factors associated with attitude on procedural pain management (Multivariate analysis)

Characteristics		**Score**			
All Respondents		**Favorable (ref) N = 15**	**Unfavorable N = 141**	**Crude OR (95% CI)**	**p-value**
Level of Education	Diploma (ref)	0	60		
	1st Degree	12	66	N/A	0.99
	Post-graduate Degree	3	15	N/A	0.99
Years of experience in paediatric oncology	< 1year (ref)	0	40		0.99
	> 1year	15	100	N/A	

4.4.3 Factors/ Correlates of Practice on Procedural Pain Management

The good practices on procedural pain management according to different professional cadres is represented below (Table 16). There was no statistically significant association between the professional cadre and practice on procedural pain management on univariate analysis (Table 17a).

Table 16: Healthcare workers practice on procedural pain management by professional cadre

Variables on Practice	Healthcare workers with good practice n (%)	Nurses n(%)	Clinical officers n(%)	Paediatric Doctors n(%)	Pathology Doctors n(%)
1. Do you use non-pharmacological pain management techniques during procedures in paediatric oncology?	105 (67)	28 (38)	3 (21)	15 (23)	1 (25)
2. Do you use several techniques to distract children from pain during procedures?	122 (78)	27 (36)	5 (36)	25 (39)	2 (50)
3. Do you provide pharmacological pain relief when performing intravenous cannulation in paediatric oncology patients?	36 (23)	2 (3)	1 (7)	0 (0)	0 (0)
4. Do you provide pharmacological pain relief when performing intramuscular or subcutaneous injections in paediatric oncology patients?	43 (28)	5 (8)	0 (0)	5 (8)	0 (0)
5. Do you provide pharmacological pain relief when participating in or performing lumbar puncture and intrathecal administration in paediatric oncology patients?	75 (48)	29 (39)	4 (29)	16 (25)	4 (100)
6. Do you provide pharmacological pain relief when participating in or performing bone marrow aspiration and bone marrow trephine biopsy in paediatric oncology patients?	118 (76)	37 (50)	9 (64)	45 (70)	4 (100)
7. Do you combine non-opioid analgesics (Paracetamol and NSAIDs) and opioids when managing post-procedural pain?	83 (53)	17 (23)	4 (29)	12 (19)	2 (50)
8. Do you reassess children's pain after giving pain medication to evaluate the effectiveness of the treatment	115 (74)	36 (49)	1 (7)	17 (27)	1 (25)
9. Do you follow a policy in your hospital for paediatric procedural pain management?	66 (42)	13 (18)	4 (29)	8 (13)	2 (50)

Years of Work Experience

There was no statistically significant association between the years of work experience and practice on procedural pain management (Table 17a).

Years of Experience in Paediatric Oncology

There was no statistically significant association between the years of experience working in paediatric oncology and practice on procedural pain management (Table 17a).

Training in Procedural Pain among Paediatric Patients

On univariate analysis, training on procedural pain was significantly associated with practice on procedural pain management, p-value <0.001 at 5% significance level. The healthcare workers who had received training in procedural pain had 13-fold better practices (OR 13.0) (95% CI 3.30, 51.26).

Table 17a: Factors associated with practice on procedural pain management (Univariate analysis)

Characteristics	**Subcategory**	**Score**			
All Respondents		**Good (ref) N = 12**	**Poor N = 144**	**Crude OR ((95% CI)**	**p-value**
Cadre	Nurse (ref)	8	66		
	Paediatric doctors	4	60	1.82 (0.52, 6.35)	0.38
	Clinical officer	0	14	N/A	0.35
	Pathology doctors	0	4	N/A	1.00
Years of work experience	<5 years (ref)	3	24		
	>= 5 years	9	119	1.65 (0.42, 6.56)	0.44
Experience in paediatric oncology	< 1 years (ref)	1	39		
	>= 1 year	11	104	0.24 (0.03, 1.94)	0.19
Education	Diploma (ref)	6	54		
	Degree	6	72	1.33 (0.41, 4.36)	0.63
	Post-graduate	0	18	N/A	0.16
Training on procedural pain	Yes (ref)	9	27		
	No	3	117	13.0 (3.30, 51.26)	<0.001

On multivariate analysis, training on procedural pain in children was significantly associated with practice on procedural pain management after adjusting for years of clinical experience and experience in oncology ward, p-value <0.001 at 5% significance level. The HCWs who had received training on procedural pain are 15.93 times more likely have good practices compared to those who had been trained on procedural pain (OR 15.93) (95% CI 3.30, 51.26).

Table 17b: Factors associated with practice on procedural pain management (Multivariate analysis)

Factor		**Score**			
		Good (ref) N = 12	**Poor N = 144**	**Crude OR ((95% CI)**	**p-value**
Years of work experience	<5 years (ref)	3	24		
	>= 5 years	9	119	4.54 (0.73, 28.59)	0.09
Experience in oncology	< 1 years (ref)	1	39		
	>= 1 year	11	105	0.13 (0.06, 1.08)	0.10
Trained on procedural pain	Yes (ref)	9	27		
	No	3	117	15.93 (3.30, 51.26)	<0.001

CHAPTER 5: DISCUSSION

Introduction

Pain is widely recognized as a complex subjective experience that is difficult to recognize and manage, particularly in young people and children. Procedural pain management is an integral part of patient care in paediatric oncology. The nature of childhood cancers is such that patients undergo several therapeutic and diagnostic procedures during the course of their treatment. The study sought to evaluate the healthcare workers knowledge, attitude and practice, as well as explore the sociodemographic factors that affect procedural pain management among paediatric oncology patients at the Kenyatta National Hospital. It is integral to assess this baseline to inform policy makers on educational needs in our region.

Knowledge on Procedural Pain Management among paediatric oncology patients

The results from the analysis indicated that the majority of the healthcare workers, 51.0% (n = 79) had an overall good score on knowledge of procedural pain management, and 22.0% (n = 35) had a fair score. The remainder of the healthcare workers (27%) achieved a poor score (Table 9b). This shows that healthcare workers in KNH have the appropriate knowledge necessary to carry out procedural pain management in the paediatric oncology patients, which is positive and encouraging.

Healthcare workers who have good knowledge are more likely to conduct procedures appropriately and minimize the negative experiences for paediatric oncology patients. The good scores may be attributed to undergraduate training or through continuing medical education (CMEs) carried out within the hospital. These findings are similar to a study conducted in 2015 by Jin among healthcare workers in KNH, which showed an overall level of knowledge of 47.2% on pain assessment and management in children (46). The findings for this study objective are also similar to those previously carried out in Sub-Saharan Africa by Wuni et al. in Ghana where nurses demonstrated good overall knowledge on paediatric pain management (43).

The respondents were aware of that poor procedural pain management can affect the entire course of a patient's treatment (92%, n=143). Among the respondents, 95% (n=148) understood the mechanism of action of non-pharmacological strategies for procedural pain management and knew that distraction had the strongest evidence for efficacy among paediatric patients (77%, n=120). The majority of healthcare workers who responded in this study knew the recommended procedural pain management practices that should be used when performing intravenous cannulation (74%, n=114), and bone marrow aspiration and trephine biopsy (71%, n=110).

Despite these good scores, only 24% (n=38) of the respondents know the recommended pain management when performing a lumbar puncture. This is the most worrying gap in knowledge found in this study. This may be attributed to negative hospital culture and consistently observing/performing procedures performed in the wrong way. This is especially among the nurses (18%) and the pathology doctors (25%). These findings are similar to a study carried out in a tertiary hospital in Southern Nigeria where results show that only 16% (n=9) of healthcare workers believed that pharmacological pain management is indicated for lumbar puncture (42).

We found that healthcare workers with higher education had better knowledge (OR 0.45) (95% CI 0.21, 0.95). Even when there was no statistical significance, paediatric doctors had 0.31 odds of having better knowledge than healthcare workers from other cadres (OR 0.31) (95% CI 0.13, 0.61). Healthcare workers with more than five years work experience had better knowledge (OR 0.33) (95% CI 0.12, 0.90). The findings on association are similar to a study carried out by Stanley et al in the United States in 2013 that found that there was a statistically significant association between knowledge on paediatric pain management and years of work experience and level of education (47).

Attitude on Procedural Pain Management among paediatric oncology patients

The results from the analysis indicated that the majority (90%, n = 140) of the healthcare workers showed an overall poor attitude on procedural pain management (Table 10b). These findings may be attributed to the ratio of patients to healthcare workers in Kenyatta National Hospital. Pain management remains a low point in the priorities in patient care (48). This may be compounded by understaffing leading to healthcare workers being unmotivated and have an overall negative attitude towards patient care, especially pain management. Another factor that most likely contributes to the negative attitudes is the belief that parents are repeatedly complaining about the children's pain to gain access to more medication for their personal comfort rather than the children actually being in pain.

A majority of the healthcare workers who responded in this study believed that pain from medical procedures is avoidable (63%), however some healthcare workers disagreed especially the clinical officers (14%) and pathology doctors (25%). Among the respondents, only 14% believed that pharmacological methods of procedural pain management are superior to non-pharmacological methods. Majority of the healthcare workers believed a child's pain only when accompanied by facial expressions (86%) and that crying during procedures was mainly due to fear rather than actual pain (47%). These findings are similar to a study carried out in India by Patnaik et al which showed an overall poor attitude among healthcare workers on pain management in children (49). The opinions of healthcare workers influence how they perform their duties, therefore children in our facility are more likely to experience poor procedural pain management and the complications arising from this. We found that healthcare workers with higher education had higher odds of having favourable attitudes. On multivariate analysis, we found that none of the factors was significantly associated with attitude on procedural pain management.

Practice on Procedural Pain Management among paediatric oncology patients

The results from the analysis indicated that the majority of the healthcare workers 92.0% (n = 144) had an overall poor score on practice of procedural pain management, while the remainder of the healthcare workers had a fair score (Table 11b). We found that healthcare workers had an overall good knowledge, however this did not translate as appropriate practices when it came to procedural pain management. The poor practice observed may be due to the poor attitude found in the study. Certain erroneous beliefs that children do not remember pain and that these children need to be 'strong' and develop pain tolerance. This may be attributed to the lack of an in-hospital procedural pain management protocol.

In our setting, the management of procedural pain among paediatric patients has not been prioritized in the clinical management of patients which could lead to inefficiencies at an individual and institutional level. The individual inadequacies may stem from little to no in-service training on recommended procedural pain management strategies. In this study, 76% (n=119) of healthcare workers had not received any training on procedural pain in paediatric patients. These differ from findings in a similar study carried out by Benini et al in Italy which found overall good practice in procedural pain management across all cadres (50). The results also differ from another study carried out by Wuni et al. in Ghana where nurses demonstrated good overall practices on paediatric pain management (43). This discrepancy may be due to the lack of access to appropriate resources necessary to carry out appropriate procedural pain management in our facility. The paediatric residents only showed poor scores (17.17%) in this category. The study findings are similar to a study done in Sudan by Alhassan et al. among paediatric residents where they found residents had overall poor practices when it came to peri-procedural pain assessment and management (51).

Among the healthcare workers who responded in this study, a majority did not offer any pharmacological pain relief when performing intramuscular/subcutaneous injections (72%), intravenous cannulation (77%), and lumbar puncture (52%). Among the healthcare workers, 47% did not offer post-procedural pain management using oral analgesics. In this study setting, despite the overall knowledge being found to be good, the negative attitudes have likely affected procedural pain management practices among the healthcare workers. The HCWs who had received training on procedural pain have 16-fold odds of good practices compared to those who had been trained on procedural pain (OR 15.93) (95% CI 3.30, 51.26).

Implications of the findings

The findings in the study are a representation of the current situation at the Kenyatta National Hospital and should be addressed in order to improve the quality of life for paediatric oncology patients. We found that healthcare workers had overall good knowledge, however this did not translate as appropriate practices when it came to procedural pain management. The hospital could address this by setting up a multidisciplinary team that mandates the prioritization of paediatric pain. The team could develop hospital paediatric pain assessment and management guidelines outlining the clinical roles and responsibilities of all healthcare workers. The guidelines should include a section covering recommended pain management for procedures carried in paediatric oncology wards. This would be a step towards setting up hospital CMEs to solidify knowledge and improve attitudes on paediatric pain. This may also lead to the development of job aids that may be placed in procedure rooms which will improve poor practices. A team may work towards the introduction and implementation of a policy that requires mandatory in-service training of healthcare workers on procedural pain management before working in paediatric oncology wards.

5.2 Study Strengths and Limitations

This is the first study carried out on procedural pain management among the paediatric oncology patients at Kenyatta National Hospital. The study was conducted at the Kenyatta National Hospital, and the results cannot be used as representative of all the healthcare workers in Kenya. The method of data collection in this study was done using a self-administered questionnaire. The healthcare workers may have distorted their answers to avoid providing negative responses. There may be a fear of the consequences of giving honest responses despite the assurance of complete anonymity. A limitation to this study is the method of data collection, the use of qualitative methods where interviews, observations and examination of medical records would have provided a better in-depth understanding of information regarding practice. The healthcare workers in the study units may not have had prior training on management of procedural pain in paediatric oncology patients, therefore they may feel unfairly judged.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

1. The healthcare workers had an overall good score on knowledge of procedural pain management. The most worrying gap in knowledge found in this study was knowledge on the recommended pain management strategies that should be used when performing a lumbar puncture. This is especially among the nurses and the pathology doctors.
2. Using univariate analysis, the level of education and the years of work experience are significantly associated with knowledge of procedural pain management.
3. The healthcare workers had an overall poor attitude on procedural pain management. A majority of the healthcare workers who responded in this study believed that pain from medical procedures is avoidable, however some healthcare workers disagreed especially the clinical officers and pathology doctors.

4. On further analysis, we found that none of the factors assessed were significantly associated with attitude on procedural pain management.
5. The healthcare workers had an overall poor practice on procedural pain management. Among the healthcare workers who responded in this study, a majority did not offer any pharmacological pain relief when performing intramuscular/subcutaneous injections, intravenous cannulation, lumbar puncture or offer post-procedural pain management using oral analgesics. This was found especially among the nurses, clinical officers and paediatric doctors.
6. We found that training on procedural pain in children was significantly associated with healthcare workers practice on procedural pain management. Those who had been trained on procedural pain were more likely to have good practice compared to those who were not trained.

6.2 Recommendations

We recommend;

1. Integration of procedural pain training among paediatric patients in the undergraduate or post-graduate curriculum.
2. Enhance the continuing medical education (CMEs) and practical in-service training on procedures (through apprenticeship and more exposure to paediatric oncology wards) available to HCWs on management of procedural pain in the paediatric oncology patients.
3. The hospital should develop a procedural pain management algorithm to be used to create job aids that are placed in the procedure rooms in paediatric wards in an attempt to influence practice.
4. We recommend qualitative studies involving focus group discussions and in-depth interviews or other methods, could be done to gain more in-depth insight on the sub-optimal practice that has been observed in this study.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

Principal investigator: Dr. Angela C. W. Mugane

Department of Paediatrics and Child Health

Telephone No: 0721 209 604

Email address: amugane@students.uonbi.ac.ke

You are requested to participate in a study on the knowledge, attitudes, and practices among healthcare workers on assessing and managing procedural pain in paediatric oncology and completing this questionnaire voluntarily. It is assured that the data provided by you will only be used for this research study. The data provided and the identity of the respondent will be kept confidential.

Please fill in the following questionnaire on the basis of facts. Please answer all questions as each question carries weightage. The questionnaire contains different types of questions:

- Please tick mark in check boxes provided for selection of options
- Some questions require a written response on the space provided
- Some questions are multiple choice questions or of Yes/No/I don't know category and only one response is appropriate

PART 1: DEMOGRAPHICS

Please fill in the blank spaces and tick mark in check boxes provided for selection of options where applicable

1. Age (years): ___
2. Sex: ☐ Male ☐ Female
3. Marital status:

Married ☐ Single ☐ Widowed ☐ Divorced/ Separated ☐

4. Cadre:

Nurse ☐ Clinical Officer ☐ Medical Officer ☐ Paediatric Resident ☐

Pathology Resident ☐ Consultant ☐

5. Level of Education:

Certificate ☐ Diploma ☐ Degree ☐ Postgraduate degree ☐

6. Experience after graduation: ___years ___months
7. Experience in paediatric oncology: ___years ___months
8. What is your current station in the hospital?
9. Duration in current station: ___years ___months
10. Have you received training in procedural pain among paediatric oncology patients?

a) Yes

b) No

PART 2: KNOWLEDGE

The questions in this section require a response on the blank spaces and only one response to the multiple choices is appropriate

1. Poor procedural pain management in paediatric oncology negatively affects the entire course of a patient's treatment?

a) Yes

b) No

2. Non-pharmacological strategies for pain management;

   a) May reduce pain perception

   b) Render pharmacologic strategies unnecessary

   c) Take too long to implement

   d) Trick a child into believing they have no pain

3. Non-pharmacological strategies with strongest evidence for efficacy in children:

a) Hypnosis

b) Music

c) Massage

d) Distraction

4. When performing procedures in neonates, which of the following statements is true?

a) Sucrose cannot be used in preterm neonates

b) Breastfeeding should be encouraged where possible during painful procedures

c) Sucrose is not effective for reducing pain from heel lance procedures

d) Rocking, stroking and sensory stimulation are not effective for pain relief

5. A 3-year-old child has presented for administration of vincristine. He needs a blood test done and an IV cannula for hydration. What is the best step to ensure adequate pain relief during cannulation?

   a) Oral Codeine/ Oral Morphine

   b) Oral Paracetamol

   c) Distraction and Sucrose solution orally

   d) Distraction and application of a topical anesthetic cream

6. A Cerebrospinal fluid sample (CSF) sample for CSF cytology is needed on a school-aged child with ALL. The most appropriate action to provide analgesia during this procedure is:

   a) Infiltrate Lidocaine 15 minutes before procedure

   b) A transdermal fentanyl patch before procedure

   c) Non-pharmacologic techniques together with application of Eutectic mixture of local anaesthetics (EMLA) 1 hour before procedure

   d) Apply Eutectic mixture of local anaesthetics (EMLA) 1 hour before procedure

7. Which of the following are appropriate to ensure adequate pain relief when performing a bone marrow aspiration and trephine biopsy?

   a) Non-pharmacological psychological methods only

b) Infiltration of a local anaesthetic only

c) Non- pharmacologic psychological methods together with Oral/Parenteral analgesia after procedure

d) Non- pharmacologic psychological methods together with infiltration of a local anaesthetic and procedural sedation

PART 3: ATTITUDE

The following items require you to indicate your disagreement or agreement by ticking your response using the scale provided;

8. Do you think pain resulting from medical procedures is expected and unavoidable?

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

9. Do you believe that pharmacological methods of procedural pain management in paediatric patients are superior to non-pharmacological methods?

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree

- ☐ Strongly agree

10. Do you believe the lack of a facial pain expression or crying before/during a procedure means the lack of pain?
    - ☐ Strongly disagree
    - ☐ Disagree
    - ☐ Neutral
    - ☐ Agree
    - ☐ Strongly agree
11. Do you believe that children always cry during medical procedures due to fear, rather than actual pain?

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

PART 4: PRACTICE

Please tick the most appropriate response

	Always	Often	Occasional	Never
12. Do you use non-pharmacological pain management techniques during procedures in paediatric oncology?				
13. Do you use several techniques to distract children from pain during procedures?				
14. Do you provide pharmacological pain relief when performing intravenous cannulation in paediatric oncology patients:				
15. Do you provide pharmacological pain relief when performing intramuscular or subcutaneous injections in paediatric oncology patients:				
16. Do you provide pharmacological pain relief when participating in or performing in lumbar puncture and intrathecal administration in paediatric oncology patients:				
17. Do you provide pharmacological pain relief when participating in or performing bone marrow aspiration and bone marrow trephine biopsy in paediatric oncology patients:				
18. Do you combine non-opioid analgesics (Paracetamol and NSAIDs) and opioids when managing post-procedural pain?				
19. Do you follow a policy in your hospital for paediatric procedural pain management?				

APPENDIX 2: HEALTHCARE WORKER CONSENT FORM

Principal Investigator: Dr. Angela C.W. Mugane, Contact: 0721 209 604

Dear Nurse/ Doctor,

I would like to request your voluntary participation in this research study. A questionnaire will be provided for you to complete.

TITLE OF THE STUDY: Knowledge, attitude, and practice of healthcare workers on procedural pain assessment and management in paediatric oncology patients in Kenyatta National Hospital (KNH)

PURPOSE OF THE STUDY: This study will shed light on the positive and negative deviances in knowledge, attitude, and practice among healthcare workers on procedural pain management in paediatric oncology. It will illuminate areas that need improvement, thereby forming the foundation for interventions.

RISK OF THE STUDY: The risks of participation in the study are mainly psychological turmoil among the healthcare workers related to feelings of inadequacy in assessment of pain, inability to control pain and fear of disclosure of wanting knowledge and practice as concerns pain management. There is no compensation provided to participants in this study.

RIGHT TO WITHDRAW: Participation in this study is not compulsory and those who decline to give consent will not be penalized. The right to withdraw at any time and the promise of confidentiality and anonymity will be protected. You are free to change your mind at any point and withdraw from the study without giving any explanation.

CONFIDENTIALITY: All responses obtained from you will be treated as confidential information. They will be anonymously documented and analysed. The researchers are the only ones who have access to the information, and your identity remains confidential. The researchers aim to publish this research for scientific and academic purposes. You will be required to fill in a consent form.

DATA DISSEMINATION: The results of this study will be shared with the managerial team in the hospital and the University of Nairobi (UoN) Paediatrics and Child Health Department in fulfilment of the requirements for the award of the master of medicine degree. The findings of this study will be shared in conferences and at continuing medical education (CMEs) meetings. The findings may also be shared with the Ministry Of Health for purposes of informing policy generation.

Please contact me, the supervisors, or the KNH/UON Ethics and Research committee chairman, if you have any questions about the study.

The contact information is below;

1) Kenyatta National Hospital / Ethics & Review Committee (KNH/ERC)

Tel No: 020-2726300/0722829500/0733606400/EXT 44102, PO BOX 20723, Nairobi, Kenya.

2) Supervisors: Professor Grace Irimu,

Dr. Nyambura Kariuki,

Dr. Brian Maugo,

Department of Paediatrics and Child Health, University of Nairobi.

PART II: CERTIFICATE OF CONSENT

I have carefully read all the information provided, or a trusted party has read it to me. I have been offered the opportunity to ask questions about it and seek clarifications to my satisfaction. I voluntarily consent to participate in the study.

Participant's signature _____

Investigator's signature _____

Date _____

APPENDIX 3: STUDY BUDGET

Name of the Item	Cost of Each Item (Kshs)	Number of Items Needed	Total Cost (Kshs)
Proposal Development (printing drafts/proposal copies)	350	10 copies	3,500
Ethics and Research Committee Submission			2,000
Printing questionnaires and consent forms	10 per page	40 x 153 20 x 153	9,180
Stationery	100	20	2,000

Airtime			2,000
Statistician			35,000
Contingency Funds			20,000
GRAND TOTAL			73, 680

APPENDIX 4: STUDY TIMELINE

	Activity	**Estimated Time**
1	Proposal Development and presentation	Sept 2020 to Jan 2021
2	Submission of proposal to ERC	March 2021
3	Ethical corrections and seeking permission	July 2021
4	Data Collection	August 2021 to Feb 2022
5	Data Analysis	March 2022
6	Thesis Writing	April 2022

APPENDIX 5: ERC APPROVAL LETTER

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

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

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

Ref: KNH-ERC/A/262

19th July, 2021

KENYATTA NATIONAL HOSPITAL APPROVED 15 JUL 2021 KNH/UoN-ERC P. O. BOX 20723 - 00202 NAIROBI

Dr. Angela Christine Wanjiku Mugane
Reg. No.H58/34649/2019
Dept. of Paediatrics and Child Health
School of Medicine
College of Health Sciences
University of Nairobi

Dear Dr. Mugane

RESEARCH PROPOSAL: KNOWLEDGE, ATTITUDES AND PRACTICES AMONG HEALTHCARE WORKERS ON ASSESSMENT AND MANAGEMENT OF PROCEDURAL PAIN IN PAEDIATRIC ONCOLOGY PATIENTS IN KENYATTA NATIONAL HOSPITAL (P273 /04/2021)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH-UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 19th July, 2021 – 18th July, 2022.

This approval is subject to compliance with the following requirements:

i. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
ii. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
iii. Death and life threatening problems and serious 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.
iv. 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.
v. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
vi. 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).
vii. 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 **http://www.erc.uonbi.ac.ke**

Yours sincerely,

PROF. M.L CHINDIA
SECRETARY, KNH- UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Senior Director, CS, KNH
The Chair, KNH- UoN ERC
The Assistant Director, Health Information Department, KNH
The Dean, School of Medicine, UoN
The Chair, Dept. of Paediatrics and Child Health, UoN
Supervisors: Prof.Grace Irimu, Dept. of Paediatrics and Child Health, UoN
Dr.Nyambura Kariuki, Dept.of Paediatrics and Child Health, UoN
Dr.Brian Maugo, Dept.of Paediatrics and Child Health, UoN

APPENDIX 6: PLAGARISM REPORT

ORIGINALITY REPORT

7%	5%	4%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Yu Wang, Qiang Liu, Jia-Ning Yu, Hai-Xia Wang et al. "Perceptions of parents and paediatricians on pain induced by bone marrow aspiration and lumbar puncture among children with acute leukaemia: a qualitative study in China", BMJ Open, 2017 Publication	1%
2	journals.sagepub.com Internet Source	1%
3	bmcpregnancychildbirth.biomedcentral.com Internet Source	<1%
4	Basheerahmed Abdulaziz Mannasaheb, Mohammed Jaber Al-Yamani, Sarah Abdulrahman Alajlan, Lamyaa Munahi Alqahtani et al. "Knowledge, Attitude, Practices and Viewpoints of Undergraduate University Students towards Self-Medication: An Institution-Based Study in Riyadh", International Journal of Environmental Research and Public Health, 2021 Publication	<1%