POSTOPERATIVE FEEDING PRACTICES IN PATIENTS UNDERGOING ORTHOPAEDIC SURGERY AT KENYATTA NATIONAL HOSPITAL

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DECLARATION

I, **Dr. Mmakgomo Bapoga King,** do hereby declare that this dissertation is my original work and it has not been presented before either in whole or part to this institution or any other institution elsewhere for academic qualification.

I further declare that all material cited in this report which are not my own have been duly acknowledged.

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DEDICATION

For the King legacy, my parents the late Lot and the matriarch, the brave heart the late and beloved Neltah King and the descendants to follow.

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ABREVIATIONS AND ACRONYMS

ASA-	American Society of Anaesthesiologists
ASPEN-	American Society for Parenteral and Enteral Nutrition
BMI-Body	Mass Index
BMR-Basal	Metabolic Rate
CS-	Categorical Scale
DALY's -	Disability Adjusted Life Years
EN-	Enteral Feed(s)
ERAS-	Enhanced Recovery After Surgery
ERP-	Enhanced Recovery Protocols
ESPEN-	The European Society for Clinical Nutrition and Metabolism
G.A-	General Anaesthesia
GCP-	Certificate of Good clinical practice
ICU-	Intensive Care Unit
IPC-	Infection and Prevention Control
K.N.H-	Kenyatta National Hospital
LMICs-	Low and middle income countries
LOS-	Length of Stay
NCD-	Non Communicable Diseases
NPO-	Nil Per Oral
NRS-	Nutrition Risk Screening
PACU-	Post Anaesthesia Care Unit
SLIM-	Satiety Labelled Intensity Magnitude
SOP's-	Standard Operating Procedures
SPSS-	Statistical Package for Social Sciences
TPN-	Total Parenteral Nutrition
UoN-	University of Nairobi
VAS-	Visual Analogue Scale

DEFINITION OF TERMS

Feeding Practices; The customary or expected application and way of providing nutrition or feeds to a person.

Orthopaedic Surgery- Operations concerned and relating to the correction of deformities, disorders or injuries of the skeleton and associated structures (tendons and ligaments)

Post-Operative- Relating to, occurring in, or being the period following a surgical operation

Perioperative- Occurring or performed at or around the time of an operation.

ABSTRACT

Background: Nutrition is a pivotal factor in the maintenance of health and even more so in recovery following an illness and surgery. Optimising nutritional needs for surgery has been a challenging and evolving matter; in the past decade evidence based recommendations and guidelines from the Enhanced Recovery After Surgery (ERAS) motivate for the transition to early enteral post-operative feeding within 4 hours for non-complicated surgery and to solids within 24 hours. The aim of this study was to identify the total fasting times, hunger and thirst scores post operatively and factors influencing onset of feeding post operatively in patients post orthopaedic surgery.

Study Objective: To determine the post-operative feeding practices amongst patients who have had orthopaedic surgery in Kenyatta National Hospital.

Study Design: This was a longitudinal observational study to establish the post-operative feeding practices in orthopaedic surgical patients at Kenyatta National Hospital.

Methodology: Non probability consecutive sampling method was used to recruit participants. A sample size of 384 has been determined using Fisher's formula. A total of 391 was recruited and analysed. Data was collected by participant interviews and review of patient anaesthetic and surgical records. Data was captured with the RedCap application, transferred to Microsoft excel and imported into SPSS version 23 for analysis.

Results: 403 participants were recruited; 391 were analysed with a male predominance and ASA 1 and 2 majority. Post-operative fasting averaged 5.5 hours(SD 2.1) with total fasting times averaging 22.9(SD 5.0) hours longest fast reaching 39hours, factors found to influence initial feeding were prolonged surgery in elective orthopaedic surgery.

Conclusion: The primary feeding modality in the post-operative phase was Enteral. At point of feeding there was established hunger and thirst scores at 2/10 And 5/7 respectively. There was established prolonged total fasting times at an average of 22.9 hours. Factors found to influence onset of feeding were prolonged surgery and elective orthopaedic surgery. Our findings demonstrate a strong rationale for further study to develop interventions targeting specified and improved post-operative nutritional care following orthopaedic surgery.

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background

The value of good nutrition in surgical patients was demonstrated in 1936 by Studley when he established a direct correlation of low weight and surgical mortality (1) . The historic practice of delayed feeding until bowel sounds are heard has been successfully challenged and proven not only as unnecessary but might be detrimental to patient outcomes.

The concept of nutrition is multifaceted and essential for the healthy subject and even more crucial for the sickly and injured. Abunnaja S et al suggests that nutritional support prior to surgery start as early as 7 to 10 days prior to surgery (2). It has been shown that sub optimal nutrition is an independent strong indicator for poor postoperative surgical outcomes with increased morbidity and mortality (3). Poor nutrition is linked to impaired intestinal and systemic immunological function, as well as reduced ability to digest and absorb because of the alteration of the architecture of the gut barrier (4).Undernourished colorectal surgical patients have double the odds to readmission within 30 days of discharge (5).

Weimann 2006 et al demonstrated that surgery results in an increase in the metabolic and nutritional demands. Surgical stimuli cause a release of inflammatory mediators that trigger a stress response resulting in raised insulin levels and a highly catabolic state. Optimal wound healing requires maintenance of anabolism; hence optimal nutrition is an essential component in surgical management. Nutritional support is crucial in the maintenance of nutritional balance in the catabolism of the postoperative period. The of Enhanced Recovery Protocols (ERP) emphasises this with evidence of good outcomes linked to early and sustained oral feeding after surgery (6). Metabolic and nutrition requirements differ in accordance with the type and duration of surgery. Focused surgery specific feeding practices must be developed and implemented.

Delivery of nutritive support may be enteral or via Total Parenteral Nutrition (TPN) when enteral feeds (EN) are ill advised. Previous research suggests that enteral feeding whenever possible is the preferred route due to the added benefit of maintenance and support of overall gut health. Enteral nutrition is also associated with less complication rates, reduced hospital stay and overall favourable cost-benefit (4). Early enteral feeding and particularly of oral feeds by the second to third day postoperatively has been shown to be of great benefit to surgical patients with reduction in hospital length of stay, readmissions, early mobilisation and better wound healing (7).

It could be inferred that economic burden associated with surgical ailments reduces with early feeding post operatively as it improves surgical outcomes. Fast track advocates for the reduction in total fasting times and the onset of a protein rich diet as early as possible post operatively. Studies have demonstrated that despite the strong evidence to initiate early feeding and reduce total fasting times patients are still fasting for longer durations than is desirable. Agegnehu 2016 et al showed a mean preoperative fasting of 15.9 hours for solid food in surgical patients in Botswana (8). Njoroge et al showed average total fasting times to be greater than 15 hours in the surgical patient in Kenya in 2017 (9). Some research has shown that surgeons still have some hesitancy to implement routine screening and nutritional support according to evidence-based guidelines (10) (11).

Other studies have been conducted with an elucidation of the effects of nutrition to the outcomes in orthopaedic surgery. Briguglio et al (2019) conducted a study to investigate the nutritional support for enhanced recovery programs in orthopaedics surgeries. The major observation from this study was that most orthopaedic patient's lack streamlined nutritional support, which affects recovery (46). The study suggests implementation of nutritional support interventions to optimize postoperative outcomes (46). Another study was conducted by Gunningberg et al., (2008) focusing on the Pre-and postoperative nutritional status and predictors for surgical-wound infections in elective orthopaedic and thoracic patients in a Swedish University Hospital. In the study the risks associated with malnutrition was diversified based on the nutrition assessment methods used on different patients (47).

It is vital to establish the current practice and compare it to the recommended in order to understand the factors and limitations to meeting the desired target which at the moment is being extrapolated to the orthopaedic patient based on the colorectal surgeries studies that have been done despite variability in patient profiles and surgeries.

Currently, there is very limited data to suggest the appropriate post-operative feeding practices for the orthopaedic patient. The lack of data also extends to a lack of evidence to influence optimal feeding post orthopaedic surgery, this results in provider-based practice with significant variance and minimal standardisation.

The development of evidence based post-operative feeding protocols requires an outline of the current post-operative feeding practices. The implementation of the protocols will then govern appropriate post-operative nutrition and consequently contribute to the restoration of optimal nutritive status post-surgery resulting in improved outcomes for the orthopaedic surgical patient.

There is limited data on the current post-operative feeding practices for orthopaedic patients in Kenyatta National hospital. The objective of the study was to assess post-operative feeding practices in orthopaedic patients and associated predictors of feeding practices post operatively.

2.0 CHAPTER TWO: LITERATURE REVIEW

The burden of orthopaedic related ailments on the economy is significant, inpatient surgical care increases proportionately to hospital stays. Time spent in recovery reduces time spent as a productive member of society. Enhanced orthopaedic recovery post-surgery is warranted and economically sound. Kenya has a population of 47.6 million with 4.4 million in the capital of Nairobi (12).Orthopaedic related injuries in Kenya are listed amongst the topmost non communicable diseases (NCD) causes of morbidity and mortality; ranking seventh (38). These place a significant burden in the health care system from orthopaedic related ailments.

Surgery inflicts a stress response that increases the metabolic demands of the patient that are hardly met in the postoperative period. Improvement of the nutritional: metabolic balance post-surgery should improve outcomes and relieve cost burden.

A study that was done in Kenyatta National Hospital comparing early and delayed onset of feeding in patients that had small gut anastomosis by (Olang Ogutu in 2013) justifies early (oral sips 6 hours post op) initiation of enteral feeds with improved patient outcomes (wound healing and reduced incidences of anastomosis leak). The same study however revealed that the practice in KNH is to delay feeding until bowel sounds heard. There is need to define the post-operative feeding practices for each surgical demographic and surgery type.

Current literature discusses preoperative feeding practices and guidelines for patient's surgery extensively. Data regarding nutrition and feeding in the post-operative period has been insufficiently researched for surgical patients and even more limited for orthopaedic patients (13).

There are no available guidelines on when to initiate the feeding for patients that have undergone orthopaedic surgeries. The available data though streamlined to abdominal surgery also shows some variation in the time frame definition of early feeding, further emphasising the need to define the post-operative surgical feeding pattern parameters (14).

2.1 History of Post-Operative Nutrition

In 1936 Sturdley showed a direct corelation between low weight and postoperative mortality, demonstrating the need to treat malnutrition and maintain good nutrition peri-operatively for the surgical patient (1). Previously and until recently patients were starved from midnight to avoid aspiration risk. Following surgery patients were maintained Nil Per Oral (NPO) until return of bowel function evidenced by return of peristalsis noted by clinical signs such as audible bowel sounds and passage of flatus. This practice contributes to increase post-operative

fasting time up to five times more. This prolonged patient nutritional deficit for a long time has been shown by meta-analysis that it unnecessary and is associated with poor surgical outcomes(7). The widely accepted Enhanced Recovery After Surgery (ERAS) protocols done on colorectal surgery patients has shown immense benefit with optimisation of nutrition peri-operatively including early post-operative enteral oral feeding where not contraindicated (7). Limited data exists for orthopaedic patients that fall outside the colorectal surgical bracket.

2.2 Physiologic Nutritional Demands in Surgery

Surgery induces stress resulting in postoperative insulin resistance, reduced immune function and increased patient discomfort (4).

Surgery of any kind is considered a major stressor to the body and makes the patient susceptible to changes in metabolism and physiology. The stress response is an increase in basal metabolic rate (BMR), consumption of nitrogen reserves leaving a negative nitrogen balance (15). There has been an observed increase glucose production with the synthesis of acute phase proteins (16). The body rummages for the needed nutrients brought about by surgical stress. The consequences to continued nutritional deficit could be dire. Nutritive supplementation in the perioperative period is crucial to dampen catabolic effects the state of high energy (17). During surgery an increase in intestinal permeability rises fourfold and normalises around postoperative day five. The increase in permeability, is linked to shortening of the villi, leading to disturbances in absorption as well as disruption in gut barrier function against endogenous bacteria and toxins (17) (18). Surgical stimulus and malnutrition can both add stress on the heart, causing changes in the heart cells structure and increment in consumption of substrates utilized by the heart for mechanical function (19). It is postulated that optimising patient nutrition prior to surgical intervention would improve performance of the cardiovascular system and limit cardiovascular associated complications, subsequently lowering perioperative mortality.

Surgery particularly raises protein requirements to account for the additional demands of synthesis of proteins required for proper immune function and wound healing. Post-surgery it is therefore advised rather than a general calorie increment have a focused increase in protein intake. Target protein intake for surgery is currently poorly defined, nonsurgical nutrition guidelines suggest consumption of about 1.2–2.0 g of protein/kg/day for the stressed patient (20).

2.3 Assessment of Nutritive Status

Nutritional assessment remains an area that lags behind in routine clinical assessment but must be incorporated in the perioperative and postoperative assessment of surgical patients to allow optimisation in this regard. Nutritional status is critical after the period of stress induced by surgery that raises the need.

Limited guidelines exist on how to effectively screen for malnutrition in surgical patients and optimize their nutritional perioperatively, particularly within Enhanced Recovery Protocols (ERP). There is need to define adequate nutrition for patients undergoing surgery (21).

The European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines endorse the use of the Nutrition Risk Screening (NRS) 2002 tool, coupled with a global clinical examination and serum albumin levels of <30 g/L in evaluation of undernutrition. There is attached recommendation to action of nutritional care based on the score (22). In a study by Jie B and colleagues patients scoring 5 or greater on the NRS 2002 tool were noted to have gleaned the most benefit from additional nutritional support perioperatively(23).

A meta-analysis examining the use of NRS 2002 as an indicator for post-operative outcomes in abdominal surgery showed that those classified as ‘at risk’ had a higher complication rate than those with the ‘not at risk classification (OR 3.13, $p<0.00001$). The ‘at risk’ group has a significantly higher mortality and associated long hospital length of stay(LOS) (24).

Table 1: Nutritional Risk Scoring tool (NRS) Version 23.

Nutritional Risk Scoring (NRS)			
Initial Screening			
		Yes	No
Is BMI < 20.5?			
Has the patient lost weight within the last 3 months?			
Has the patient reduced dietary intake in the last week?			
Is the patient severely ill (e.g., in intensive therapy)?			
Yes: If the answer is "Yes" to any question, the final screening is performed.			
No: If the answer is "No" to all questions, the patient is re-screened at weekly intervals. If the patient, e.g., is scheduled for a major operation, a preventative nutritional care plan is considered to avoid the associated risk status.			
	Final Screening		
	Impaired Nutritional Status		***Severity of Disease (≈Increase in Requirements)***
Absent Score 0	Normal Nutritional Status	Absent Score 0	Normal Nutritional Requirements
Mild Score 1	Wt loss >5% in 3 months or Food intake below 50%–75% of normal requirement in preceding week	Mild Score 1	Hip fracture * Chronic patients, in particular with acute complications: Cirrhosis *, COPD *. Chronic hemodialysis, diabetes, oncology
Moderate Score 2	Wt loss >5% in 2 months or BMI 18.5–20.5+ impaired general condition or food intake 25%–60% of normal requirement in preceding week	Moderate Score 2	Major abdominal surgery * Stroke * Severe pneumonia, hematologic malignancy
Severe Score 3	Wt loss >5% in 1 month (>15% in 3 months) or BMI > 18.5+ impaired general condition or Food intake 0%–25% of normal requirement in preceding week in preceding week.	Severe Score 3	Head injury * Bone marrow transplantation * Intensive care patients (APACHE410)
Score	+	Score	=Total score:
Score ≥3: The patient is nutritionally at-risk and a nutritional care plan is initiated.			
Score <3: Weekly rescreening of the patient. If the patient, e.g., is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status.			
* Indicates that a trial directly supports the categorization of patients with that diagnosis.			

2.4 Assessment of Hunger and Thirst

Patient perception of hunger and thirst though subjective may influence or contribute to feeding practices. Perception of satiety influences patient feeding portions regardless of caloric content of food taken. Multiple satiety assessment tools and scales exist but the Satiety Labelled Intensity Magnitude (SLIM) scale was shown by Cardello et al to be sensitive, dependable, and user friendly for evaluating perceived satiety with multiple advantages over the customary visual analogue scales (VAS) (25). He also graded the semantic interpretations of 47 phrases that describe various levels of satiety using magnitude approximation. Applying a criteria of response consistency, symmetry, bipolarity, and inclusion of the end-point anchor of 'greatest imaginable hunger, there was selection of eleven phrases(25). These phrases were plotted along a vertical line scale with correspondence to their geometric magnitude estimates to extrapolate a labelled satiety magnitude scale. Such a scale enables finer distinction of satiety sensations, particularly at higher levels of fullness.

The figure below shows the placement of the descriptive phases on the scale.

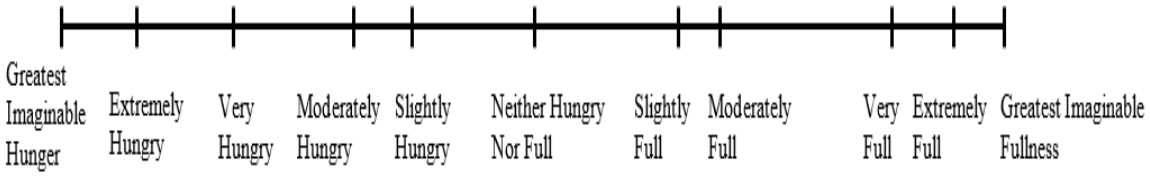

Figure 1: Satiety Labelled Intensity Magnitude Scale

Thirst has multiple causes and stimulants but is also considered to sometimes influence patient onset of feeding. In some instances, drink is accompanied by food and sometimes patients quench thirst with beverages that have nutritional value not just water. Ratings of thirst intensity do not always predict the practices of volitional drinking following dehydration (31). Levels of thirst are often measured using subjective ratings. these are either categorical or visual analogue scales. It has not yet been established which of the scales yields better sensitivity to changes in hydration (26).

One categorical scale is shown in figure 2 below.

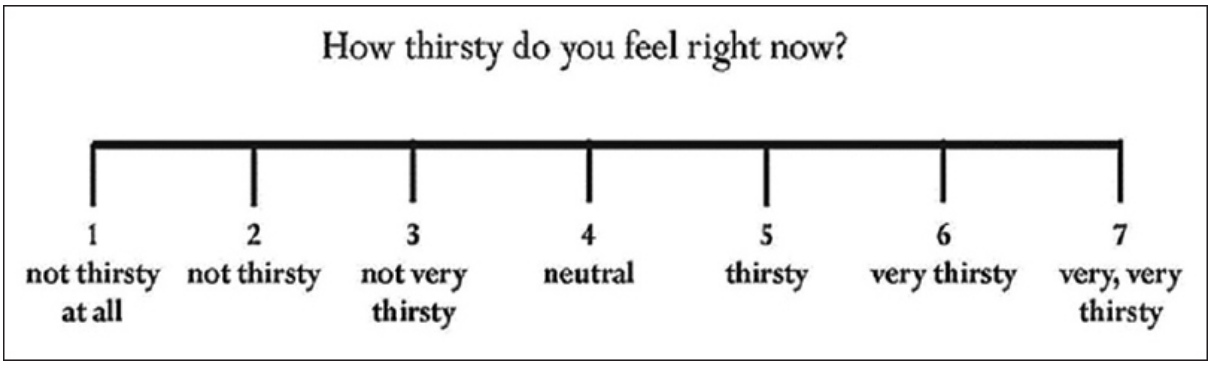

Figure 2: Thirst Categorical Scale

Hausel *et al.* (2001) observed 116 elective abdominal surgery patients and discovered that patients with shorter preoperative fasting times and lower thirst and hunger scores on the visual analogue scale were given a carbohydrate rich beverage 2 hours before surgery (27).
Francisco showed that in postoperative fasting period hunger and thirst intensity increased, however showed no relation to fasting time with hunger and thirst scores. Patients with longer preoperative fasting times reported hunger and thirst levels no different to those with less fasting times. (28)

2.5 Complications of Poor Nutrition in Surgery

Poor nutrition in surgical patients have been associated with detrimental outcomes. Some that have been identified by studies are

- Infections (nosocomial and surgical site): The pro inflammatory state that follows surgical procedure if it is not balance with proper nutrition causes a break in the gut barrier function with increased gut permeability. Bacterial translocation from the gut occurs easier with gut permeability, consequence from this will be development of infections. (29)
- coagulopathic states: these may be related to the sepsis that develops post infection.
- worsening nutritional status post operatively compared to preoperative
- increased insulin resistance: Post-operative nutrition improves early voluntary mobility, poor nutrition results in prolonged periods of bed rest (30). Lack of exercise stimulation contributes to a reduction in muscle capillaries, protein synthesis, sensitivity to insulin and function of the mitochondria.
- Proper nutrition results in short duration to readmission, reduced initial hospital length of stay (31) (32)

2.6 Current Post-Operative Feeding/Nutrition Guidelines

Current guidelines recommend nutrition support in surgery. The general recommendation is that post-operative food intake should not be interrupted and that oral or enteral feeding should be re-established in the 24 hour period after the surgery unless otherwise contraindicated.

The ERAS protocols were designed from multiple studies regarding colonic resections grouped to formulate post-surgery optimal pathways, these protocols have since been extended to other surgeries but evidence to support the practice is needed. Regarding post-operative nutrition ERAS emphasises the need to dampen the stress response to surgery by encouraging early feeding post operation (33).

The ERAS guidelines recommend liberal subscription of oral supplements pre- and postoperatively. Equally ERAS protocols support early oral intake for the return of gut function.

From a metabolic and nutritional point of view, the key recommended aspects of perioperative care include: (33)

- Nutrition incorporations into the overall care of the patient.
- Reduction of preoperative fasting periods.
- Initiation of oral feeding as soon as possible following surgery.
- Early nutritional therapy.
- Optimisation of blood glucose concentrations.
- Control of factors which worsen stress-related catabolism.
- Reduce the use of paralytic agents.
- Encourage early mobility to enhance protein synthesis and facilitate muscle function.

ESPEN adopted nutritional segments of ERAS protocols and also highlights preference to early oral feeding with reductions in fasting times (7).

ASPEN- American Society for Parenteral and Enteral Nutrition Clinical nutrition guideline in surgery 2017 makes reference to the ERAS protocol and advocates for early oral feeding post-surgery as the preferred mode of nutrition. ASPEN advocates for initiation of oral feeding to be within hours of surgery (34).

The challenge is not only with development of evidence-based guidelines and protocols but with the implementation once the evidence has been established.

2.7 Total Fasting Times

Early oral feeding practice recommendations have been incorporated into evidenced-based post-operative care guidelines for gynaecologic, hepatic, pancreaticoduodenal, gastric, and colorectal, rectal and pelvic patients. In general, these guidelines recommend liquid feeding to recommence within 24 hours, or ideally within 4 hours following surgery in low risk patient populations (e.g. lower gastrointestinal). Solid feeding is then suggested to commence within 24 hours of surgery (14).

There is minimal data on total fasting times in surgical patients from pre-operation to post operation, however average total preoperative fasting time has been documented. Most of the data excludes the orthopaedic patient which this study will focus on. The recommended fasting times preoperatively are clear but there are still variations with practice (35). There is wide variation in post-operative fasting times without clear definitions of acceptable post-operative fasting times especially for non-abdominal surgery.

Prospective audit done in the United Kingdom in multiple centres showed an overall median fasting time of 16.1 hours preoperatively (29).

Assis et al had a prospective study in Spain for elective surgical patient which did not include the orthopaedic patient and demonstrated that surgical patients on average postoperatively fast for a period equal to and exceeding 1 day some to 5days and longer fasts associated with Gut surgeries. (36)

The preoperative fasting average time was 16 hours in a study done in Brazil (28). A study done in south Africa to compare prescribed and actual fasting times pre surgery revealed a median fasting time of 14 hours and 45 minutes (35). Agegnehu 2016 et al showed a mean preoperative fasting of 15.9 hours for solid food in surgical patients in Botswana (8). A descriptive cross-sectional study done in Kenya at a referral hospital by Njoroge (2017) indicated surgical preoperative fasting times to go beyond 15 hours (9). There is very limited data in the country about post-operative feeding durations and or practices.

2.8 Study Justification

Orthopaedic patients carry a high disease morbidity and mortality in Kenya and the world. More than 5 million deaths annually in the world are injury related. Low- and middle-income countries (LMICs) account for more than 90% of these deaths (37). In 2010 road traffic accidents are listed 7th top cause of DALY's (Disability adjusted life years)in Kenya (38). Optimising patient recovery in this group shall aid in the improvement of patient morbidity and mortality, reducing disability years and improving the economic workforce. It shall also

decompress and reduce the burden on the health care system. Nutrition is a key modifiable element in recovery from orthopaedic trauma and surgery, this study establishes a framework to improvement and optimisation of nutrition and consequently, recovery.

In the recent years' anaesthesia options have expanded and with the use or regional anaesthesia in orthopaedic surgery. Use of regional anaesthesia decreases the fasting requirements in patients. A study done in an Indian orthopaedic referral hospital 85% of the cases were regional anaesthesia (39). The study identifies factors that are associated with feeding times, which serve to inform nutritive practices with strata to type of anaesthesia as well.

Previous research has consistently reflected the key role of optimisation of nutrition, reduction in fasting times and maintenance of metabolic function for the surgical patient to optimise wound healing, patient recovery and for improved surgical outcomes. The Enhanced Recovery after Surgery (ERAS) emphasises benefits of multimodal perioperative care pathways for early recovery post-surgery one of which is reduction in fasting times and early establishment of feeding post-surgery. (40) ERAS however address specific populations particularly colorectal surgical patients from whom the guidelines were studied and developed. (40) Although in clinical practice these guidelines have been extrapolated to include other surgeries, there exists very little evidence and published research for the orthopaedic patient demographic. There is limited and insufficient data about post-operative feeding practices in the orthopaedic patient to support any current practice (41) (42) (43)

The study will serve to inform clinicians of the current post-operative feeding practices regarding orthopaedic surgery, which may be used as a basis or framework to refine the practice. Furthermore, it may serve to advice the development and adaptation of an evidence based orthopaedic surgical post-operative feeding protocol in K.N.H that will standardise care and improve patient outcomes.

2.9 Conceptual Framework

The figure below shows the study dependent and independent variables

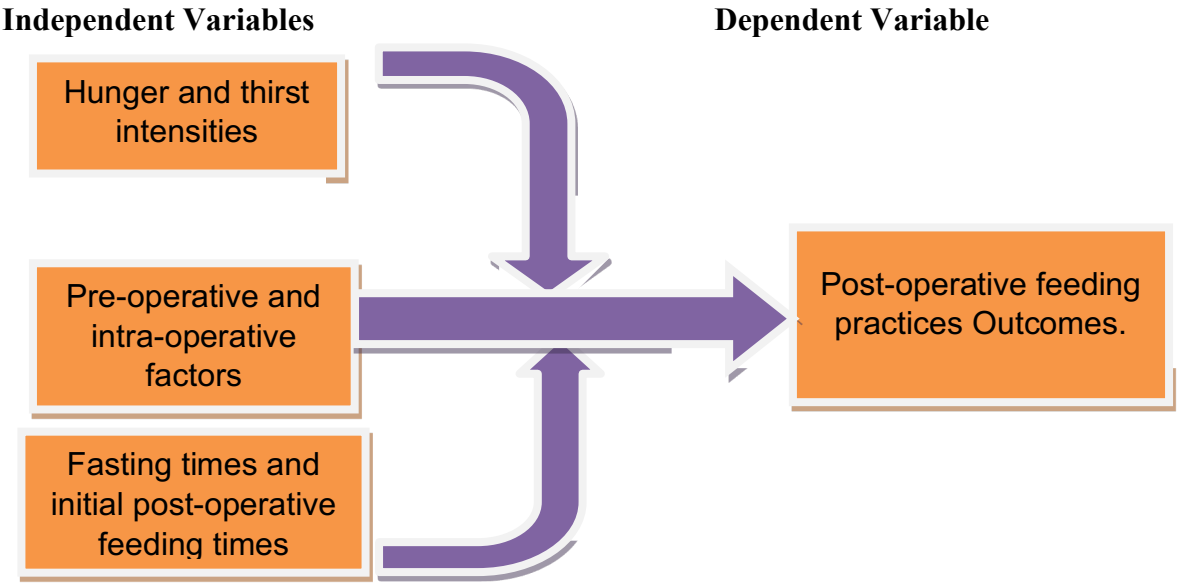

Figure 3: Conceptual Framework

2.10 Study Question

What are the post-operative feeding practices for orthopaedic patients in Kenyatta National Hospital?

2.11 Broad Objective

- To determine the post-operative feeding practices amongst patients who have had orthopaedic surgery in K.N.H

2.12 Specific Objectives

- To establish total perioperative fasting times.
- To determine intensity of patient hunger and thirst at time of onset of feeding post orthopaedic surgery.
- To identify factors contributing to post-operative feeding times.

3.0 CHAPTER THREE: METHODOLOGY

3.1 Study Design

This was a longitudinal observational study that used a standard designed questionnaire to collect data.

3.2 Study Area

The study was carried out in K.N.H, a national level 6 referral hospital and teaching hospital for the University of Nairobi. Patients were from orthopaedic wards and theatres. Kenyatta national hospital has 4 orthopaedic wards averaging 628 admissions a month. K.N.H operates 3 orthopaedic theatres, one of which is a 24 hour emergency trauma theatre. These average 122 surgeries in total a month.

3.3 Study Population

The study population were patients admitted to Kenyatta National Hospital orthopaedic wards during the period of study. Average number of orthopaedic ward admissions was 628 a month.

3.4 Eligibility Criteria

3.4.1 Inclusion Criteria

- Patients scheduled to undergo orthopaedic surgery.
- Patients who gave informed consent to participate in the study.

3.4.2 Exclusion Criteria

- Patients who declined to consent or are were unable to consent for participation in the study.
- Patients admitted to ICU post orthopaedic surgery.
- Patients fasting for non-medical reasons.

3.5 Sample Size Determination

The desired sample size was determined using Fisher *et al.*, 1998 formula (44):

$$n = \frac{Z^2 pq}{d^2}$$

Where;

n = the desired sample size (if the target population is more than 10,000)

z = the standard normal deviation at the required confidence level of 1.96.

d = the level of statistical significance set which is 0.05

p = the proportion in the characteristics being measured i.e. orthopaedic patients (the proportion is unknown), is estimated to 50% (0.50). If there is no estimate available of the proportion in the target population assumed to have the same characteristics, the researcher may use 50% of the given sample as recommended by Fisher *et al*., 1998

q = 1 – p (1 - 0.5 = 0.5)

$$n = \frac{1.96^2 \; x \; 0.5 \; x \; 0.5}{0.05^2}$$

n = 384

3.6 Sampling Method

Consecutive sampling was used and carried out until the determined sample size was met.

3.7 Sampling Procedure and Recruitment

The Research assistant was trained on the approved data collecting tool, acquisition of informed consent from the study participants and the data protection protocol by the Principal investigator. All eligible patients were recruited to the study as per the eligibility criteria. Patients cleared for surgery were recruited preoperatively in theatre. Informed written consent was sought from the potential study participant after a detailed explanation of the study.

3.8 Data collecting procedure

Partial data was collected after recruitment for participants scheduled for surgery on the day of surgery preoperatively. Such data included time of last preoperative feed and participants were instructed to note time of feeding postoperatively. Follow-up was done once in the orthopaedic wards in K.N.H within 24 hours of surgery. Participants were interviewed and some data retrieved from the patient anaesthetic, nursing and surgical record.

The data collected was used to establish connection with post-operative feeding practices. Data included factors influencing time to initial post-operative feeding, feeding instructions, hunger and thirst intensities.

3.9 Consenting Procedures

Informed consent was taken by the data collector; either the research assistant(s) or the principal investigator. Informed consent was obtained once the patient had been verified for orthopaedic surgery pre operatively. The study purpose, study subject participation and role in the study was explained fully in the patient preferred language (Swahili/ English). Patient was informed of the voluntary base of their participation and offered to opt in or out without consequence nor perceived self-benefit. Any clarifications were made by the consenting personnel and then patient enrolled into the study.

3.10 Role of Providers

Patient care in the preoperative and immediate postoperative period was by the attending clinicians based on their clinical discretion. Post-operative nutritional practices continued as per the provider's team approach. The study shall then observe and note the current practices.

3.12 Quality Assurance Procedures

The safety and wellbeing of the study participants was under the care of all participating medical health professional teams as per the Kenyatta National Hospital protocol and guidelines. Covid-19 precautions were adhered to at all times. Access of Data protection system were username and password protected. Meetings by the Principal investigator and research assistants was held weekly to discuss study progress.

3.13 Ethical Considerations

Permission to proceed with the study was sought from and granted by the KNH/UoN Research and ethics committee and K.N.H administration before the study onset. Written informed consent was obtained from the study participant, consenting was offered in Swahili and English, with verbal clarifications offered and delivered as required in the preferred official language.

Participants were assigned study numbers so as to maintain confidentiality. No participant names or other identifiers were used in the study materials. Enrolment into the study was on a voluntary basis, no incentives nor remuneration was offered. There were no added costs to the participants for engaging in the study.

The study participants were permitted to opt out of the study at any point during the study period without penalty for declining to participate in the study. Patients noted to have been fasting for longer than 24 hours post-operatively had the primary clinician informed so as to have the necessary interventions as per clinician discretion done; patients fasted for longer than 24 hours in the results were the patient group that had concurrent gastrointestinal surgery and provider review to determine feeding modality contributed to the prolonged fasts.
Standard patient care and precautionary measure for Covid-19 were maintained for all.

3.14 Data Management and Analysis Plan

Data was collected using Redcap application data collection tool installed in password protected devices. Passwords were generated to include symbols, numbers and combinations of upper and lower case letters to increase the password strength. The password to the devices used for storage of data was only known to data handlers (principal investigator, research assistant, statistician). The data collected was patient information pre-operatively, intraoperatively, and post operatively to establish the connection with the feeding practices post-operatively.
Once data collection was complete for the week, the data sets were checked for errors and cleaned. It was then uploaded into Microsoft excel. The Microsoft excel sheets were transferred to the Statistical Package for the Social Sciences (SPSS) version 23 software for statistical analysis within a device that is password protected. The data was analysed using different statistical methods. The descriptive statistics method, which includes the use of frequency tables, visual representation using charts, was used to show the general insights of the data. Bivariate comparisons were done, the significance level of the bivariate association tests was set at $\alpha=0.05$.
Odds ratios where used to establish the strength of association. The reliability and validity checks were done in this study using the retest technique where measurements were repeated on the same patient to enhance the probability of comparisons. The statistician and the Principal investigator randomly selected a patient and repeated the data collection and took measurements to ensure that the data collected was accurate and the similarity was approximately 80%.

3.15 Study Results Dissemination Plan

Results and findings from the study were presented to the anaesthesia, theatre and orthopaedic UON departments. Study results will also be shared at national and international scientific conferences. There is intention to publish the results of the study in an anaesthesia peer reviewed journal.

3.16 Materials

This study required stationery supplies; tablets installed with REDCap and SPSS version 23 for the principal researcher, research assistants and a statistician, Internet access was also needed. The principal researcher was the research co-ordinator she oversaw and co-ordinated the work of the two research assistants and a statistician.

4.0 CHAPTER FOUR: RESULTS

4.1 Patient Characteristics and Demographic Data

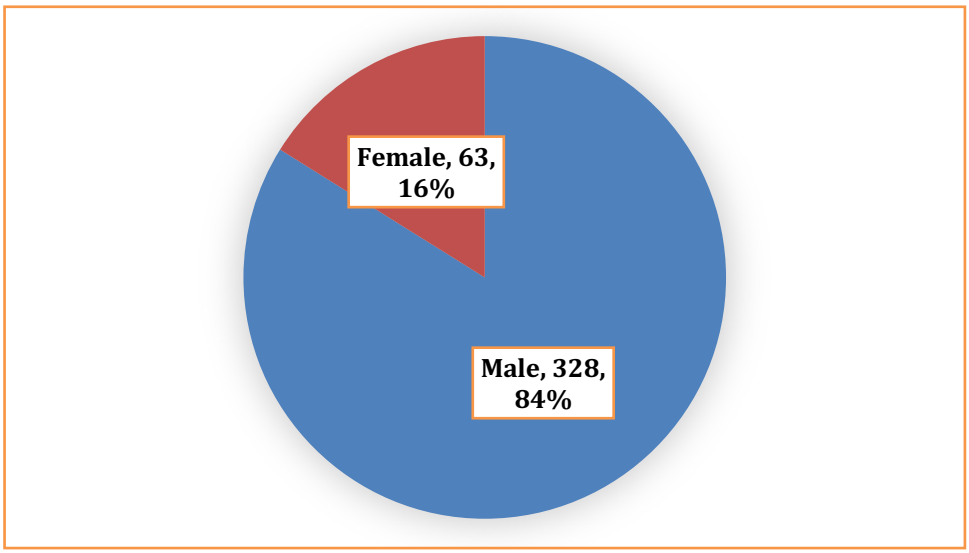

Figure 4: Sex of the patients

Out of the 391 participants there was a predominance of the male sex at 84% to 16% of females.

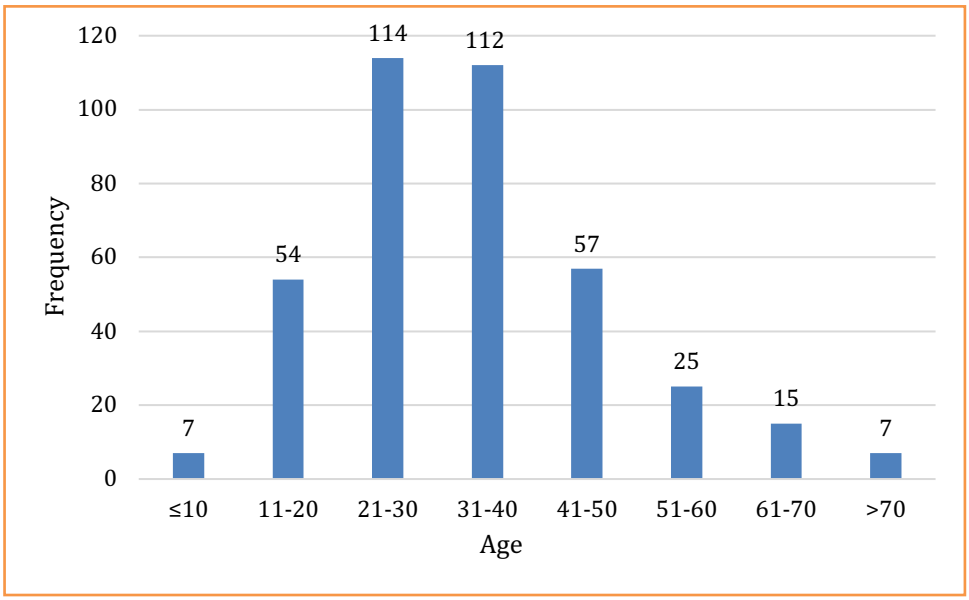

Figure 5: Age of the patients

The mean age of the patients was 33.9 (SD 14.3) years, while the median age was 33.0 (IQR 23.0 – 41.5) years. The youngest patient was 4.0 years while the oldest was 90.0 years.

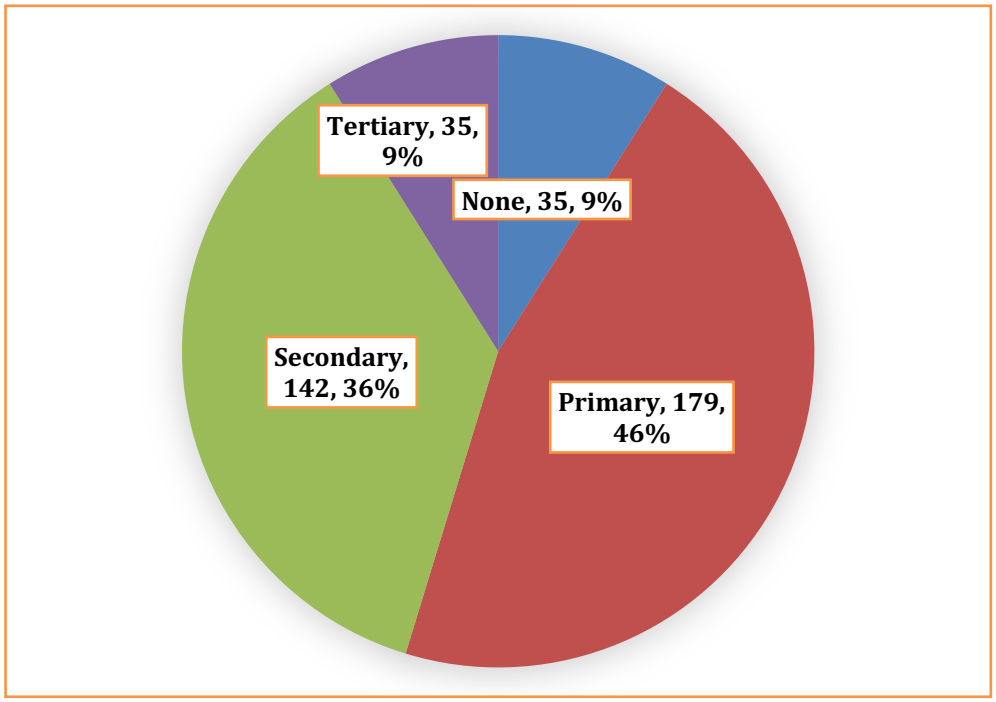

Figure 6: Patient level of education

54% of the participants had primary level of education or less with 9% with tertiary education and 36% with secular education up to secondary level.

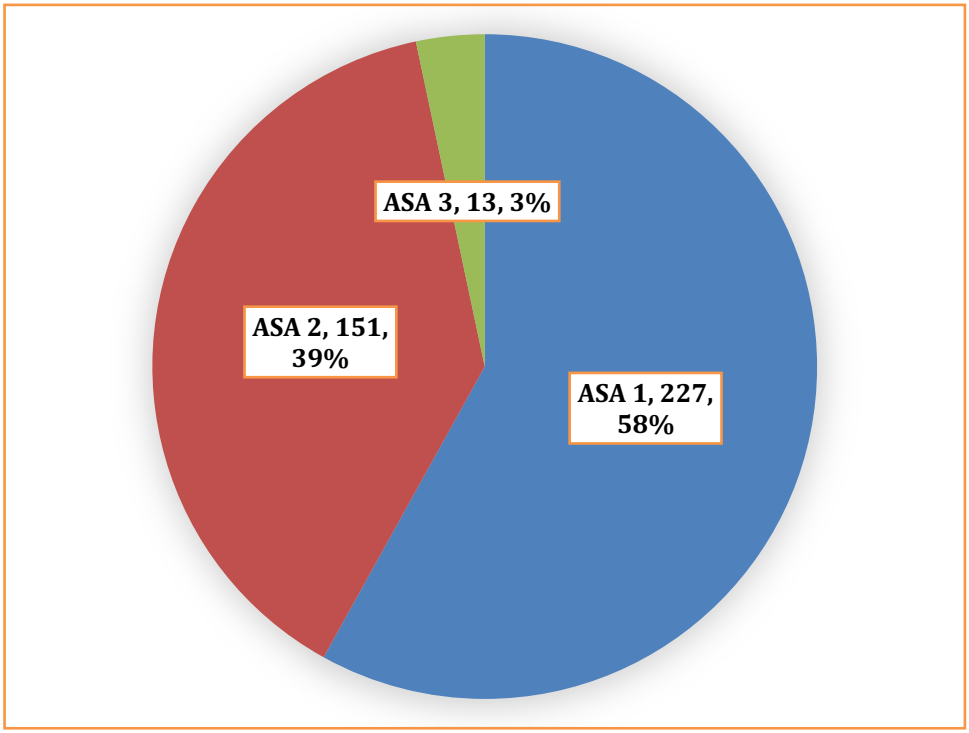

Figure 7: ASA status of the patients

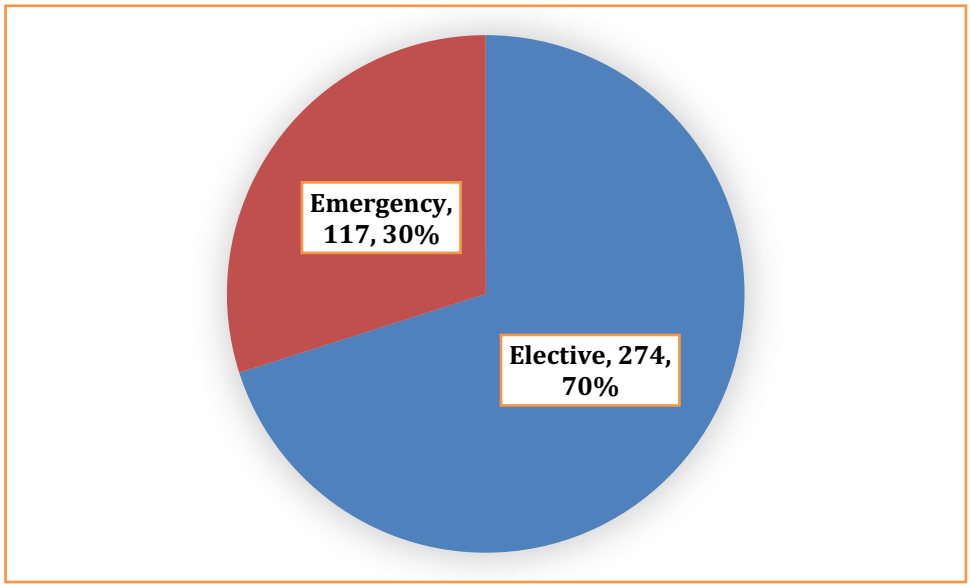

Figure 8: Type of surgery of the patients

Patient diagnostic presentation was varied as shown in figure 6 below. Majority presenting with lower limb fractures (65.0%).

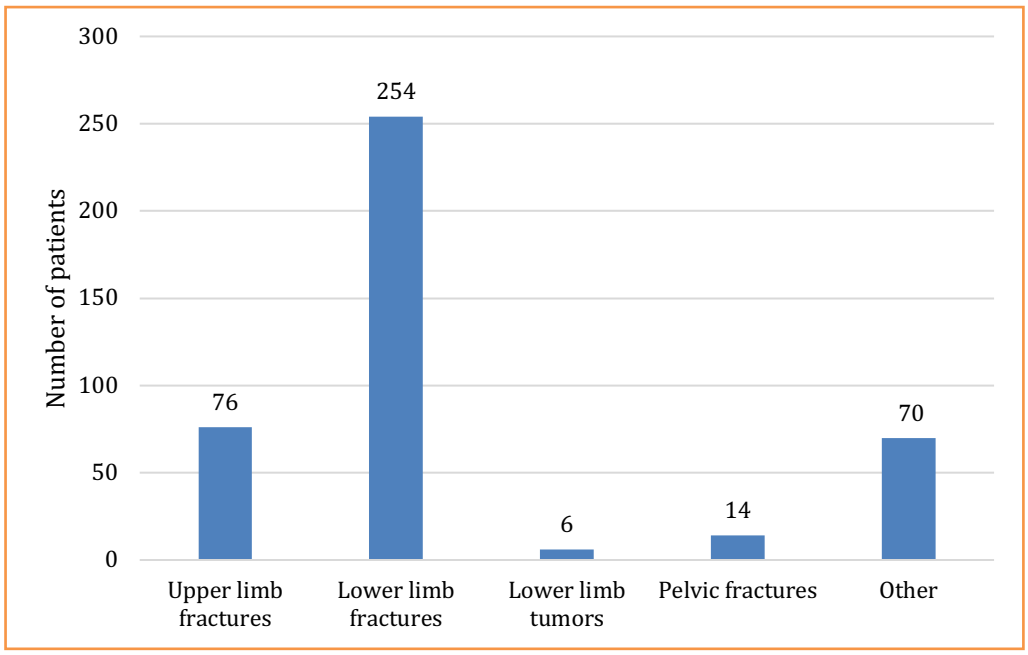

Figure 9: Patient diagnosis

The mean duration of surgery (from time of induction to end of surgery) was 146.5 (SD 78.9) minutes, where the minimum was 20 minutes and maximum was 619 minutes. The median time was 135.0 (IQR 90.0 – 186.0) minutes.

Table 2: Surgery Information

The mean duration of anaesthesia (or is it surgery) was 146.5 (SD 78.9) minutes, where the minimum was 20 minutes and maximum was 619 minutes. The median time was 135.0 (IQR 90.0 – 186.0) minutes.

A larger proportion of the participants and elective surgery under regional anaesthesia.

		Frequency *(n=391)*	**Percent**
Type of surgery	Elective	274	70.1
	Emergency	117	29.9
Concurrent gastrointestinal/abdominal surgery	Yes	10	2.6
	No	381	97.4
Anesthesia type	Regional	266	68.0
	General	125	32.0
Duration of surgery	Up to 60 min	29	7.4
	61-120	126	32.2
	121-180	134	34.3
	181-240	67	17.1
	241-300	18	4.6
	301-360	8	2.0
	>360	9	2.3

Table 3: Discomforts in the post-operative period

	Frequency	**Percent of patients *(n=391)***
Sore throat	47	12.0%
Vomiting	5	1.3%
Nausea	117	29.9%
Pain	157	40.2%
Other	41	10.5%

4.2 Total Orthopaedic Perioperative Fasting Times

Total perioperative fasting time was calculated as the difference from the time the patient had their last meal preoperatively to the time when the patient had their first feed postoperatively in hours. The mean total perioperative fasting times was 22.9 (SD 5.0) hours, where the minimum was 11 hours and maximum was 39 hours. The median time was 22.0 (IQR 20.0 – 25.0) hours.

Table 4: Total perioperative fasting times

Hours	**Frequency**	**Percent of patients *(n=391)***
11	1	0.3
12	1	0.3
13	4	1.0
14	4	1.0
15	7	1.8
16	3	0.8
17	13	3.3
18	16	4.1
19	30	7.7
20	32	8.2
21	52	13.3
22	46	11.8
23	42	10.7
24	39	10.0
25	26	6.6
26	26	6.6
27	12	3.1
28	2	0.5
29	1	0.3
31	2	0.5
32	2	0.5
33	4	1.0
34	3	0.8
35	3	0.8
36	8	2.0
37	4	1.0
38	3	0.8
39	5	1.3

Table 5: Postoperative fasting times

This was calculated as the difference of time in hours from induction of anaesthesia to the time when the patient had their first feed postoperatively. The mean postoperative fasting times was 5.5 (SD 2.1) hours, where the minimum was 2 hours and maximum were 16 hours. The median time was 5.0 (IQR 4.0 – 6.0) hours.

Hours	**Frequency**	**Percent of patients *(n=391)***
2	9	2.3
3	32	8.2
4	86	22.0
5	113	28.9
6	66	16.9
7	39	10.0
8	15	3.8
9	11	2.8
10	7	1.8
11	4	1.0
12	5	1.3
14	2	0.5
15	1	0.3
16	1	0.3

Table 6: Feeding instructions

		Frequency *(n=391)*	**Percent**
Documented Feeding instructions	Yes	258	66.0
	No	133	34.0
If yes, instructions from	Anesthetist	54	20.9
	Surgeon	204	79.1
Verbal instructions given post-operatively	Yes	332	84.9
	No	59	15.1

Table 7: Initial feeding method used post operatively

	Frequency *(n=391)*	**Percent**
Oral	383	98.0
Nasogastric tube	5	1.2
Total parenteral nutrition	3	0.8

Table 8: Initial feeding method used post operatively if oral or nasogastric

	Frequency	**Percent of patients *(n=391)***
Oral sips	223	57.0%
Water	217	55.5%
Non-water liquids	23	5.9%
Solids	186	47.6%

Table 9: Initial postoperative feed well tolerated

		Frequency *(n=391)*	**Percent**
Yes		266	68.0
No		125	32.0
If no, reason	Nausea	49	39.2%
(n=125)	Vomiting	18	14.4%
	Food bad taste	68	54.4%
	Pain	54	43.2%
	Sore throat	26	20.8%
	Other	3	2.4%

4.3 Hunger and Thirst Intensity at Time of Onset of Feeding Post Orthopaedic Surgery

Table 10: Hunger intensity at time of first feed post operatively

Intensity	**Frequency *(n=391)***	**Percent**
0-Greatest imaginable hunger	71	18.2
1-Extremely hungry	111	28.4
2-Very hungry	152	38.9
3-Moderately hungry	42	10.7
4-Slightly hungry	6	1.5
5-Neither hungry nor full	4	1.0
6-Slightly full	3	0.8
7-Extremely full	2	0.5

Table 11: Intensity of thirst at time of feed post operatively

Intensity	**Frequency *(n=391)***	**Percent**
Not thirsty at all	9	2.3
Not thirsty	44	11.3
Not very thirsty	52	13.3
Neutral	69	17.6
Thirsty	156	39.9
Very thirsty	44	11.3
Very very thirsty	17	4.3

4.4 Factors contributing to post-operative feeding times

The post-operative feeding time was defined as the time from the induction of anaesthesia to first feeding which has been categorized as ≤4 hours and >4 hours (dependent variable).

The bivariate analysis indicate that ages from 10 and below were 1.8 times more likely to have first feeding less than 4 hours when compared with those above 70 years. The overall trend of the odds indicate that as age increases and so is the likelihood of having postoperative feeding times of less than 4hours decreases. Regarding gender, the male patients were less likely to have first feeding less than 4 hours as compared to female patients, this was not statistically significant. There was a statistical difference for patients with Primary education when compared with those with Tertiary education, where results indicate they were 2.5 times more likely to have first feeding less than 4 hours.

Table 12: Patient factors

	n	≤4	>4	OR (95% CI)	p-value
Age in years					
≤10	7	4 (3.1)	3 (1.1)	1.8 (0.2 – 14.8)	0.594
11 – 30	168	50 (39.4)	118 (44.7)	0.6 (0.1 – 2.6)	0.465
31 – 50	169	60 (47.2)	109 (41.3)	0.7 (0.2 – 3.4)	0.692
51 – 70	40	10 (7.9)	30 (11.4)	0.4 (0.1 – 2.3)	0.338
>70	7	3 (2.4)	4 (1.5)	Reference	
Gender					
Male	328	104 (81.9)	224 (84.8)	0.8 (0.5 – 1.4)	0.457
Female	63	23 (18.1)	40 (15.2)	Reference	
Education					
None	35	10 (7.9)	25 (9.5)	1.6 (0.5 – 4.8)	0.405
Primary	179	69 (54.3)	110 (41.7)	2.5 (1.1 – 6.1)	**0.041**
Secondary	142	41 (32.3)	101 (38.3)	1.6 (0.7 – 4.0)	0.293
Tertiary	35	7 (5.5)	28 (10.6)	Reference	
Patient discomfort					
Sore throat					
Yes	47	10 (7.9)	37 (14.0)	0.5 (0.3 – 1.1)	0.080
No	344	117 (92.1)	227 (86.0)	Reference	
Vomiting					
Yes	5	2 (1.6)	3 (1.1)	1.4 (0.2 – 8.4)	0.718
No	386	125 (98.4)	261 (98.9)	Reference	
Nausea					
Yes	117	35 (27.6)	82 (31.1)	0.8 (0.5 – 1.3)	0.479
No	274	92 (72.4)	182 (68.9)	Reference	

Pain					
Yes	157	44 (34.6)	113 (42.8)	0.7 (0.5 – 1.1)	0.123
No	234	83 (65.4)	151 (57.2)	Reference	
Other (Headaches/dizziness)					
Yes	36	7 (5.5)	29 (11.0)	0.5 (0.2 – 1.1)	0.080
No	355	120 (94.5)	235 (89.0)	Reference	

Results of the surgical factors show that those patients that had elective surgery were 1.7 times more likely to have first feeding less than 4 hours when compared with those patients that had emergency surgery, and this was statistically significant. The results also indicated that as the duration of surgery increased, the likelihood of having first feeding less than 4 hours decreases, which implies longer surgeries are associated with late feeding times, and this was statistically significant.

Table 13: Surgical factors

	n	**≤4**	**>4**	**OR (95% CI)**	**p-value**
Type of surgery					
Elective	274	98 (77.2)	176 (66.7)	1.7 (1.1 – 2.8)	**0.035**
Emergency	117	29 (22.8)	88 (33.3)	Reference	
Region of surgery (diagnosis)					
Upper limb fractures					
Yes	76	28 (22.0)	48 (18.2)	1.3 (0.8 – 2.1)	0.366
No	315	99 (78.0)	216 (81.8)	Reference	
Lower limb fractures					
Yes	254	76 (59.8)	178 (67.4)	0.7 (0.5 – 1.1)	0.142
No	137	51 (40.2)	86 (32.6)	Reference	
Lower limb tumors					
Yes	6	2 (1.6)	4 (1.5)	1.0 (0.2 – 5.8)	0.964
No	385	125 (98.4)	260 (98.5)	Reference	
Pelvic fractures					
Yes	14	3 (2.4)	11 (4.2)	0.6 (0.2 – 2.0)	0.375
No	377	124 (97.6)	253 (95.8)	Reference	
Other					
Yes	70	23 (18.1)	47 (17.8)	1.0 (0.6 – 1.8)	0.941
No	321	104 (81.9)	217 (82.2)	Reference	
Duration of surgery					
Up to 60 min	29	16 (12.6)	13 (4.9)	23.9 (7.5 – 76.1)	**<0.001**
61-120	126	64 (50.4)	62 (23.5)	20.0 (7.6 – 52.5)	**<0.001**
121-180	134	42 (33.1)	92 (34.8)	8.9 (3.4 – 23.4)	**<0.001**
>180	102	5 (3.9)	97 (36.7)	Reference	
Concurrent abdominal surgery					
Yes	10	2 (1.6)	8 (3.0)	0.5 (0.1 – 2.4)	0.402

No	381	125 (98.4)	256 (97.0)	Reference	
Mode of anesthesia					
Regional	266	92 (72.4)	174 (65.9)	1.4 (0.9 – 2.2)	0.195
General	125	35 (27.6)	90 (34.1)	Reference	
Feeding instructions					
Yes	258	87 (68.5)	171 (64.8)	1.2 (0.8 – 1.9)	0.466
No	133	40 (31.5)	93 (35.2)	Reference	

A multivariate analysis with the use of logistic regression was used to ascertain the influence of certain factors that were found to be significant on the postoperative feeding time. The factors found to be significant at the univariate analysis were type of surgery and duration of surgery. The results indicate that patients on elective surgery increased their odds to 3.3 times from 1.7 times as compared to the emergency patients for the likelihood of having postoperative times of less than 4 hours, and this remained statistically significant on multivariate analysis. The duration of surgery was both statistically significant at univariate as well as multivariate analysis. The results showed a trend where the increase of the duration of surgery saw decrease in the odds of having a postoperative feeding before 4 hours. This implies that as duration of surgery increases and so are the odds of feeding past 4 hours.

Table 14: Factors that influence initial feeding

	n	**≤4**	**>4**	**cOR (95% CI)**	**p-value**	**aOR (95% CI)**	**p-value**
Type of surgery							
Elective	274	98 (77.2)	176 (66.7)	1.7 (1.1 – 2.8)	**0.035**	3.3 (1.9 – 5.9)	**<0.001**
Emergency	117	29 (22.8)	88 (33.3)	Reference		Reference	
Duration of surgery							
Up to 60 min	29	16 (12.6)	13 (4.9)	23.9 (7.5 – 76.1)	**<0.001**	45.9 (13.4 – 156.8)	**<0.001**
61-120	126	64 (50.4)	62 (23.5)	20.0 (7.6 – 52.5)	**<0.001**	27.6 (10.3 – 74.0)	**<0.001**
121-180	134	42 (33.1)	92 (34.8)	8.9 (3.4 – 23.4)	**<0.001**	10.2 (3.9 – 27.2)	**<0.001**
>180	102	5 (3.9)	97 (36.7)	Reference			

5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECCOMMENDATIONS

5.1 Discussion

The purpose of this study was to investigate the post-operative feeding practices in orthopaedic patients. Reduced overall fasting times and early feeding is a strategy that has been identified to improve patient outcomes (7). Post-operative feeding practices in orthopaedic patients influences patient overall fasting times, hunger and thirst discomforts and commencement of feeding post-surgery.

It may be expected that with set preoperative fasting guidelines and the widespread use of regional anaesthesia with the orthopaedic patients (39) fasting times in this patient demographic would be much reduced and in the least compliant to the fasting guidelines (although these are not based on orthopaedic surgical patients) with a subsequent reduction in hunger and thirst scores. However, our data revealed total fasting times of an average of 22.9 hours with a SD of 5 hours and significant thirst and hunger scores at time of onset of feeding post operatively ant 5/7(thirsty) and 2/10 (very hungry) respetively. Further patients who had prolonged surgeries seemed to experience delays in feeding post operatively.

The study recruited a total of 403 participants but enrolled 391 with 12 excluded from participation due to transfer to ICU post-surgery.

5.1.1 Participant Demographics

Patient demographic data were comparable to the Kenyatta National hospital Orthopaedic ward admissions of a majorly young, male, ASA classification 1and 2 (45).

The study had a male predominance of 328(84%) male, mean age of 33.9 (SD 14.3 years) with an age range of 4 to 90 years. Most participants some formal educational exposure with at 9% having no formal education. ASA status was mostly ASA1 and 2 totalling 97% cumulatively and the rest were ASA 3 at 3% of the total. Most patients are scheduled elective surgeries 272(70%) of the study populations.

It can be conclusively drawn from the results that the patient demographic is predominantly male, young in mid-thirties relatively healthy with ASA classification on 1and 2, some formal education. It is within reason as most of the orthopaedic patients are mostly trauma patients from motorcycle accidents that are operated by healthy young men. (46).

5.1.2 Surgical Information

Orthopaedic surgeries were greatly elective, with reduced numbers with concurrent abdominal surgeries, largely regional anaesthesia was used which is in line with the global trend in shift to regional anaesthesia for these patients. (39). Most surgeries relatively short lasting 1 to 3 hours.

5.1.3 Feeding Plans and Methods

Study findings were that 133 (34%) of the participants had no documented postoperative feeding instructions from the patient records, a considerably high figure for a target of early feeding within a few hours of surgery. It was also discovered that the 66% documented instruction were mostly from the surgical team 204 of the 258. Anaesthetist accounted for 20.9% of documented post-operative feeding instructions, this shows the need to improve on the provider post-operative feeding instruction documentation.

Initial post-operative feeding was mostly enteral feeding in line with the ERAS guidelines (7). 0.8 percent initiated on total parenteral feeding, and these were a proportion from the patients that had concurrent gastrointestinal surgery, 1.2% of the same subset were started naso-gastric tube feeding. The prevailing majority 98% initial feeding was oral, and the intake was mostly sips and water.

Tolerance to initial feed was at 68% (266 of the 391), 32% had poor tolerance to initial post-operative feed for varying reasons; topmost was non palatable food followed by post-operative nausea and vomiting and pain with sore throat.

5.1.4 Fasting Times

5.1.4.1 Total Fasting Times

Total fasting times: measured from the last preoperative meal to the first post-operative meal was found to be an average of 22.9 hours (SD 5.0 hours). Median of 22 hours (IQR 20.0-25 hours). Range was 11 to 39 hours. It may be difficult to compare our study findings to other studies because of the difference in firstly the populations of most studies is patients undergoing gastrointestinal surgeries as these are comparable to the ERAS populations where there is silence to the orthopaedic patients as well as the fasting times seem to be divided into pre- operative and post-operative without a total fasting period.

ERAS guidelines are unclear on the post-operative target for fasting but however mention solid to start within the 24-hour period and enteral feeding to start as soon as possible (6) For

orthopaedic patients that most often do not have gut manipulation it may be of increased nutritional benefit to have onset of full feeding within a few hours.

5.1.4.2 Post-operative fasting times

Recommended post-operative fasting time for low-risk population groups mentioned to be lower gastrointestinal surgery is 4 hours (14) this could not be compared to this study as most of the study participants did not have gastrointestinal surgery.

Measured from induction to first post-operative feed. Found to be at an average of 5.5 hours (SD 2.1 hours) range was 2 to 16 hours.

5.1.5 Hunger and Thirst Intensities

T.Cestonaro et al reported in a gastrointestinal surgical based study that in the post-operative period a great majority of patient reported hunger and thirst discomforts but did not scale the intensity (47). Their findings highlight the discomforts but would not compare to this study because of the differing patient populations. This study discovered that in the post-operative period with onset of feeding patients had significant thirst and hunger scores.

Very few patients had no thirst sensation (2.3%), and a great majority was thirsty (5/7 score) at the time of feeding post operatively 39.9%, this correlates with increased number of the initial feed of the patient being oral sips and water. It is worthy to note that these have very little caloric benefit to the patient and may seem to be more to relieve patient discomfort than the needed caloric benefit. Hunger score was predominately at very hungry (2/6) at 38.9% of the participants with 18.2% with no hunger sensation at all at time of first feed in the post-operative period. Possibly a reduction in fasting times may improve the hunger and thirst discomforts in the post-operative period hence improving patient satisfaction.

5.1.6 Factors Contributing to Post-Operative Feeding Times

Patient related factors found to influence onset of feeding were Patient discomfort and a primary level of education. Patient discomforts can be grouped into pain and post-operative nausea and vomiting. Patients may self-delay initiation of feeding because of the associated discomforts in the post-operative period (48). Patient vomiting in the post-operative period was found to have a 1.4 increase likelihood to delay feeding past 4 hours although this bears clinical significance it was found to not have statistical significance. The multivariate analysis however found patient factors to not have statistical significance.

Patients with a younger age had a 1.8 times likelihood to feed before 4 hours and the results show an increase in age with and association to feed later. Children are a vulnerable group and don't tolerate prolonged fasting well and that may be a contributor to earlier feeding, this bears clinical significance, but the analysis showed no statistical significance, and this may be related to fewer children enrolled in the study.

Surgical factors that were found to influence onset of feeding were elective surgery and duration of surgery. Elective surgery increased the likelihood of delayed onset of feeding from 1.7 to 3.3 times in the multivariate analysis; however, the data may be skewed towards elective surgeries because a larger proportion of the participant pool had elective surgery over emergency surgery, about 2 times more. Another strong association was with prolonged surgical duration leading to later onset to feeding postoperatively. Perhaps longer surgical duration results in increased exposures to anaesthesia, more likelihood to develop post-operative discomforts that may cause patient self-delay to initiating feeding, this study did not determine these factors and given the paucity of data in the matter further research is warranted to determine these as factors.

5.2 Conclusions

a) The primary post-operative feeding modality was found to be enteral
b) Total fasting times were prolonged averaging 22.9 hours
c) In the post-operative phase, there were significant thirst and hunger scores.
d) Factors found to influence onset of feeding were prolonged surgery and elective orthopaedic surgery

5.3 Limitations

a) The study was a single centre study and results can be extrapolated to the specific study site.
b) The study was limited to orthopaedic post-surgical patients only.

5.4 Recommendations

a) Food service in the peri-operative phase :There could be a light meal service that has been approved by nutrition team in PACU for orthopaedic postoperative patients to reduce overall fasting times and improve nutritional recovery.
b) Regular patient reviews by providers to ensure timely initiation of feeding post operatively
c) Improve documentation for post-operative feeding instructions; develop and incorporate a feeding instruction section in the anaesthesia and surgical chart coupled with a corresponding nursing chart for feeds administered.
d) Develop and set Nutrition guidelines for the orthopaedic patient with set checks for interventions.
e) Extend the study to be multicentre and include other surgeries that are non-orthopaedic and non-gastrointestinal such as ophthalmology, ear nose and throat.

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APPENDICES

Appendix I: Consent Form/Assent Form

Study title: Post-operative feeding practices in patients undergoing orthopaedic surgery at Kenyatta National Hospital

Introduction

I, Mmakgomo Bapoga King, am a registrar in anaesthesia and I am conducting a research study to explore the current post-operative feeding practices for patient that have had orthopaedic surgery (surgery to the bone and related structures) in Kenyatta National Hospital. Information from the study may be useful in future developments of a feeding and nutrition guideline for the care of patients after surgery. I invite you to participate in this study.

Procedures to be followed in the study

- A descriptive observational study aims to determine what the current post-operative feeding practices are for orthopaedic surgical patients
- Patients post orthopaedic surgery once in their respective wards at Kenyatta National Hospital will have informed consent sought and information pertaining to feeding practice obtained by questionnaire and data from the anaesthetic record and surgical notes.
- I and my research assistant will purely observe and see how the patients feed and factors that influence the feeding practices and analyse the data collected.
- The surgical and anaesthetist care will be at the discretion of the qualified personnel and there will be no interference in anyway whatsoever at any point during the medical care given.
- A hunger and thirst assessment using Satiety Labelled Intensity Magnitude (SLIM) scale for hunger and a Categorical Scale (CS) will be used to determine hunger and thirst intensity at time of feeding post operatively. The scale will have been clearly elaborated to the patient during consent explanation.

Study Purpose

The purpose of this study to establish the current post-operative feeding practices in orthopaedic patients after surgery. Nutritional assessment as well as appropriate nutritional replacement post-surgery has been shown to be of great benefit to improving patient outcomes and recovery after surgery. The feeding practices post-surgery is well defined for patients having gastrointestinal related surgery and not so much for patients having surgery like orthopaedics. The aim of this study is to establish what the current practice is regarding feeding

post orthopaedic surgery so as to form a base for evidence-based practice that will help improve and formulate nutrition guidelines for the orthopaedic patient and hence improve surgical outcomes.

Participation

Your participation should you choose to enrol in the study is purely on a voluntary basis. You will be interviewed by a research assistant relating to practices of nutrition in the time period surrounding your operation. Some information will be obtained from the record of your care and management. There shall be no form of remuneration offered. You may also if you so desire at any point withdraw your participation from the study. Your enrolment in the study shall neither favour no prejudice your health care.

Risks to participation

Participation in this study carries no risks and your participation shall not affect your intended treatment plan nor compromise your care.

Confidentiality

Throughout the collection of data your anonymity shall be maintained. Names and any other patient identifiers shall be withheld and therefore not appear in any of the research documentation. Instead, each study participant will be assigned a unique number for the purposes on analysing the data.

Data sharing

Results of the study are intended to guide and influence optimal post-operative feeding in orthopaedic patients. The results from this study are therefore intended to be shared with other experts in formal platforms particularly the KNH institution and possibly a peer reviewed journal publication as well.

If any clarifications are needed regarding your participation or the study itself the consenting personnel shall address them. Should you need to contact me, my contact details are attached at the end of this form.

If you are agreeable to participation after explanation has been given and you understand information regarding the study kindly indicate with a signature at the attached form.

Contacts

Principal investigator:

Dr. Mmakgomo Bapoga King
Nairobi
Tel: 0796850187

Supervisors Contacts:

Dr. Susane Nabulindo
Department. of Anaesthesia
Tel: 0721418587

The Secretary:

KNH/UON Ethics and Review committee
Tel:2726300 Ext:44102

Consent Form

I…… hereby give written consent for the participation in the cross sectional descriptive observational study assessing post-operative feeding practices in orthopaedic surgical patients in Kenyatta National Hospital

I have understood the information regarding the study. I have had my questions addressed.

I have the right to withdraw at any point

Signed……. Date…….

Investigator's Declaration:

I have explained to the patient about the study. I have addressed all their questions and concerns to the best of my knowledge.

Signed……. Date……

Assent Form

I am Mmakgomo Bapoga King, am a registrar in anaesthesia and I am conducting a research study to explore the current post-operative feeding practices for patient that have had orthopaedic surgery (surgery to the bone and related structures) in Kenyatta National Hospital. Permission has been granted to undertake this study by the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee (KNH-UoN ERC Protocol No. _____)

This informed assent form is for children above 7 years of age and above who will undergo orthopedic surgery at the Kenyatta National Hospital. **(You will be given a copy of the full informed assent form)**

Information will be given to you and you may feel free to ask questions before participating in the research. There may be some words that you do not understand, please ask me to explain as we go through the information. If you have questions later, you can ask them, my contacts are available on this assent form.

Purpose: Why are you doing this research?

Several patients undergo different types of orthopedic surgeries in a day in KNH. The purpose of this study is to establish what the current practice is regarding feeding post orthopaedic surgery so as to form a base for evidence-based practice that will help improve and formulate nutrition guidelines for the orthopaedic patient and hence improve surgical outcomes.

Choice of participants: Why are you asking me?

We want to get some information from children undergoing orthopedic surgery.

Participation is voluntary: Do I have to do this?

You don't have to be in this research if you don't want to be. It's up to you. If you decide not to be in the research, it is okay and nothing changes.

I have checked with the child and they understand that participation is voluntary

……(signature)

Procedures: What is going to happen to me?

If you allow us, we will purely observe and see how the patients feed and factors that influence the feeding practices and A hunger and thirst assessment using Satiety Labelled Intensity Magnitude (SLIM) scale for hunger and a Categorical Scale (CS) will be used to determine hunger and thirst intensity at time of feeding post operatively.

I have checked with the child and they understand the procedures……(Signature)

Risks: Is it bad or dangerous for me?

You will not be in any harm when you take part in this research.

I have checked with the child and they understand the risks ……(signature)

Benefits: Is there anything good that happens to me?

Nothing might happen to you, but the information you give us will help improve and formulate nutrition guidelines for the orthopaedic patient and hence improve surgical outcomes at our health institutions including KNH.

I have checked with the child and they understand the benefits…… (signature)

Reimbursements: Do I get anything for being in the research?

Unfortunately, there will be no gifts if you choose to participate in this study or it's not going to affect the services you will get in whatsoever way.

I understand that this research is about **Post-operative feeding practices in patients undergoing orthopaedic surgery at Kenyatta National Hospital**,

I have read this information (or had the information read to me) I have had my questions answered and know that I can ask questions later if I have them.

I agree to take part in this research. OR

I do not wish to take part in this research and I have NOT signed the assent below.

(Initialed by child/minor)

Only if child aasents

Print name of child……

Signature of child……. Date…….

If Illiterate

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

Print name of witness (not a parent) AND thumb print of the participant.

I have accurately read or witnessed the accurate reading of the assent form to the potential

participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given the assent freely

Signature of witness……... Date……...

Statement of the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the child understands the purpose and procedure of the study. I confirm that the child was given an opportunity to ask questions about the study, and all the questions asked by him/her have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this assent form has been provided to the participant.

Name of the researcher……...

Signature of the researcher…… Date…….

Copy provided to the participant (initialed by researcher)

Parent/guardian has signed an informed consent: Yes ☐ No ☐

Appendix II: Cheti Cha Ridhaa/Fomu Ya Kukubali

Kichwa cha Somo: Mazoea ya kulisha baada ya kufanya upasuaji kwa wagonjwa wanaofanyiwa upasuaji wa mifupa katika Hospitali ya Kitaifa ya Kenyatta

Nambari ya uchunguzi_____

Utangulizi

Mimi Mmakgomo Bapoga King ni msajili katika anaesthesia na ninafanya utafiti ili kuchunguza mazoea ya sasa ya kulisha baada ya upasuaji kwa mgonjwa ambaye amepata upasuaji wa mifupa (upasuaji kwa mfupa na miundo inayohusiana) katika Hospitali ya Kitaifa ya Kenyatta. Habari kutoka kwa utafiti inaweza kuwa muhimu katika maendeleo ya baadaye ya mwongozo wa lishe na lishe kwa utunzaji wa wagonjwa baada ya upasuaji. Nakualika ushiriki katika utafiti huu.

Taratibu Zinazopaswa Kufuatwa Katika Utafiti

- Utafiti wa uchunguzi unaoelezea unakusudia kuamua ni nini mazoea ya kulisha baada ya kazi ni ya wagonjwa wa upasuaji wa mifupa
- Wagonjwa baada ya upasuaji wa mifupa waliochaguliwa mara moja katika wodi zao katika Hospitali ya Kitaifa ya Kenyatta watakuwa wamepewa taarifa inayotafutwa na habari zinazohusu mazoezi ya kulisha yaliyopatikana na dodoso na data kutoka kwa rekodi ya anesthetic na maelezo ya upasuaji.
- Mimi na msaidizi wangu wa utafiti tutachunguza na kuona jinsi wagonjwa wanavyolisha na sababu zinazoathiri mazoea ya kulisha na kuchambua data iliyokusanywa.
- Huduma ya upasuaji na ya ganzi itakuwa kwa hiari ya wafanyikazi waliohitimu na hakutakuwa na kuingiliwa kwa vyovyote vile wakati wowote wakati wa huduma ya matibabu iliyotolewa.
- Tathmini ya njaa na kiu kwa kutumia kiwango cha Satiety Labeling Intensitension Magnitude (SLIM) kwa njaa na Scorical Scale (CS) itatumika kubaini njaa na kiwango cha kiu wakati wa kulisha chapisho kwa ufanisi. Kiwango hicho kitakuwa kimeelezewa wazi kwa mgonjwa wakati wa ufafanuzi wa idhini.

Lengo kuu la uchunguzi

Madhumuni ya utafiti huu kuanzisha mazoea ya sasa ya kulisha baada ya upasuaji, kwa wagonjwa wa mifupa baada ya upasuaji. Tathmini ya lishe pamoja na uingizwaji sahihi wa lishe baada ya upasuaji imeonyeshwa kuwa na faida kubwa katika kuboresha matokeo ya mgonjwa na kupona baada ya upasuaji. Mazoea ya kulisha baada ya upasuaji hufafanuliwa vizuri kwa wagonjwa wanaofanyiwa upasuaji unaohusiana na njia ya utumbo na sio sana kwa wagonjwa wanaofanyiwa upasuaji kama vile mifupa. Lengo la utafiti huu ni kubainisha mazoezi ya sasa ni nini juu ya kulisha upasuaji wa mifupa ili kuunda msingi wa mazoezi ya msingi wa ushahidi ambayo itasaidia kuboresha na kuandaa miongozo ya lishe kwa mgonjwa wa mifupa na kwa hivyo kuboresha matokeo ya upasuaji.

Ushiriki

Ushiriki wako ikiwa utachagua kujiandikisha katika utafiti ni kwa hiari. Utahojiwa na msaidizi wa utafiti unaohusiana na mifumo ya lishe katika kipindi cha wakati wa shughuli yako. Habari zingine zitapatikana kutoka kwa rekodi ya utunzaji na usimamizi wako. Hakutakuwa na aina yoyote ya ujira itakayotolewa. Unaweza pia ikiwa unatamani wakati wowote kuondoa ushiriki wako kwenye utafiti. Uandikishaji wako katika utafiti huu hautafanya upate mapedeleo yoyote ya huduma ya afya.

Hatari za kushiriki

Ushiriki katika utafiti huu hauna hatari yoyote na ushiriki wako hautaathiri mpango wako wa matibabu uliokusudiwa wala kuhatarisha utunzaji wako.

Usiri

Wakati wote wa ukusanyaji wa data kutokujulikana kwako kutahifadhiwa. Majina na vitambulisho vingine vyovyote vya mgonjwa vitahifadhiwa na kwa hivyo haitaonekana kwenye hati yoyote ya utafiti. Badala yake, kila mshiriki wa utafiti atapewa nambari ya kipekee kwa madhumuni ya kuchambua data.

Ugawanyaji wa data

Matokeo ya utafiti huo yamekusudiwa kuongoza na kushawishi kulisha bora baada ya ushirika kwa wagonjwa wa mifupa. Matokeo ya utafiti huu kwa hivyo yamekusudiwa kugawanywa na wataalam wengine katika majukwaa rasmi haswa taasisi ya KNH na pengine rika lilipitia uchapishaji wa jarida pia.Ikiwa ufafanuzi wowote unahitajika kuhusu ushiriki wako au utafiti wenyewe wafanyikazi wanaokubali watawashughulikia. Ikiwa unahitaji kuwasiliana nami, maelezo yangu ya mawasiliano yameambatanishwa mwishoni mwa fomu hii.Ikiwa unakubali kushiriki baada ya maelezo kutolewa na unaelewa habari kuhusu utafiti unaonyesha kwa saini kwenye fomu iliyoambatishwa.

Mawasiliano

Mchunguzi mkuu: Dr. Mmakgomo Bapoga King
Nairobi
Tel: 0796850187

Mawasiliano ya Msimamizi: Dr. Susane Nabulindo
Department of Anaesthesia
Tel: 0721418587

Katibu: KNH/UON Kamati ya Maadili na Mapitio
Tel: 2726300 Ext:44102

Fomu ya idhini

Mimi…… ninatoa idhini iliyoandikwa kwa ushiriki wa uchunguzi wa maelezo ya uchunguzi wa sehemu ya msalaba kutathmini mazoea ya kulisha baada ya upasuaji kwa wagonjwa wa upasuaji wa mifupa katika Hospitali ya Kitaifa ya Kenyatta.

Nimeelewa habari kuhusu utafiti. Nimejibiwa maswali yang una kua nina haki ya kujiondoa wakati wowote

Sahihi/kidole cha gumba…… Tarehe …….

Tamko la Mchunguzi:

Nimeelezea mgonjwa kuhusu utafiti. Nimeshughulikia maswali yao yote na wasiwasi kwa kadiri ya ufahamu wangu.

Sahihi ya mtafiti……. Tarehe……

Fomu Ya Kukubali

Mimi ni Mmakgomo Bapoga King, mimi ni msajili katika anesthesia na ninafanya utafiti ili kuchunguza mazoea ya kulisha baada ya upasuaji kwa mgonjwa ambaye amepata upasuaji wa mifupa (upasuaji kwa mfupa na miundo inayohusiana) katika Hospitali ya Kitaifa ya Kenyatta. Ruhusa imepewa kufanya utafiti huu na Hospitali ya Kitaifa ya Kenyatta-Kamati ya Maadili na Utafiti ya Chuo Kikuu cha Nairobi (Itifaki ya KNH-UoN ERC No. _____)

Fomu hii ya idhini ya habari ni ya watoto zaidi ya miaka 7 na zaidi ambao watapitia upasuaji wa mifupa katika Hospitali ya Kitaifa ya Kenyatta. (Utapewa nakala ya fomu kamili ya idhini)

Utapewa habari na unaweza kujisikia huru kuuliza maswali kabla ya kushiriki kwenye utafiti. Kunaweza kuwa na maneno ambayo huelewi, tafadhali niulize nieleze tunapopitia habari hiyo.

Ikiwa una maswali baadaye, unaweza kuwauliza, anwani zangu zinapatikana kwenye fomu hii ya idhini.

Kusudi: Kwa nini unafanya utafiti huu?

Wagonjwa kadhaa hupitia aina tofauti za upasuaji wa mifupa kwa siku katika KNH. Kusudi la utafiti huu ni kubainisha mazoezi ya sasa ni nini juu ya kulisha upasuaji wa mifupa baada ya hapo ili kuunda msingi wa mazoezi ya msingi wa ushahidi ambayo itasaidia kuboresha na kuandaa miongozo ya lishe kwa mgonjwa wa mifupa na kwa hivyo kuboresha matokeo ya upasuaji.

Chaguo la washiriki: Kwa nini unaniuliza?

Tunataka kupata habari kutoka kwa watoto wanaofanyiwa upasuaji wa mifupa.

Kushiriki ni kwa hiari: Je! Lazima nifanye hivi?

Sio lazima uwe katika utafiti huu ikiwa hutaki kuwa. Ni juu yako. Ukiamua kutokuwa kwenye utafiti, ni sawa na hakuna mabadiliko.

Nimeangalia na mtoto na wanaelewa kuwa ushiriki ni wa hiari

……(Sahihi)

Taratibu: Ni nini kitatokea kwangu?

Ikiwa utaturuhusu, tutaangalia na kuona jinsi wagonjwa wanavyolishwa na vitu vinavyoathiri mazoea ya lishe na Tathmini za njaa na kiu kwa kutumia (Satiety Labelled Intensity Magnitude (SLIM) scale for hunger and a Categorical Scale (CS)) itatumika kuamua kiwango cha njaa na kiu wakati wa kulisha chapisho kwa ufanisi.

Nimemchunguza mtoto na anaelewa taratibu ……(saini)

Hatari: Je! Ni mbaya au hatari kwangu?

Hautakuwa na ubaya wowote wakati utashiriki katika utafiti huu.

Nimemchunguza mtoto na anaelewa hatari …… (saini)

Faida: Je! Kuna chochote kizuri kinachonitokea?

Hakuna kinachoweza kukutokea, lakini habari unayotupatia itasaidia kuboresha na kuandaa miongozo ya lishe kwa mgonjwa wa mifupa na kwa hivyo kuboresha matokeo ya upasuaji katika taasisi zetu za afya pamoja na KNH

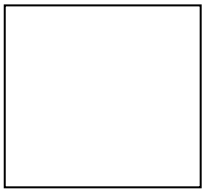
Nimemchunguza mtoto na wanaelewa faida …… (saini)

Kulipwa: Je! Ninapata chochote kwa kuwa katika utafiti?

Kwa bahati mbaya, hakutakuwa na zawadi ikiwa utachagua kushiriki katika utafiti huu au haitaathiri huduma utakazopata kwa njia yoyote ile.

Ninaelewa kuwa utafiti huu unahusu mazoea ya kulisha baada ya kazi kwa wagonjwa wanaofanyiwa upasuaji wa mifupa katika Hospitali ya Kitaifa ya Kenyatta,

Nimesoma habari hii (au habari hiyo imesomwa kwangu) nimekuwa na maswali yangu alijibu na kujua kwamba ninaweza kuuliza maswali baadaye ikiwa nina maswali hayo.
Ninakubali kushiriki katika utafiti huu. AU
Sitaki kushiriki katika utafiti huu na SIJATIA saini idhini hapa chini.
Ila tu ikiwa mtoto anapendezwa
Chapisha jina la mtoto……
Saini ya mtoto ……. Tarehe…….
Ikiwa hajui kusoma na kuandika
Nimeshuhudia usomaji sahihi wa fomu ya idhini kwa mtoto, na mtu huyo ana alikuwa na nafasi ya kuuliza maswali. Ninathibitisha kuwa mtu huyo ametoa idhini kwa uhuru.
Chapisha jina la shahidi (sio mzazi) NA chapa ya gumba ya mshiriki.
…….



Nimesoma kwa usahihi au kushuhudia usomaji sahihi wa fomu ya idhini kwa uwezo
mshiriki, na mtu huyo amepata nafasi ya kuuliza maswali. Ninathibitisha kwamba mtu binafsi ametoa kibali kwa uhuru
Saini ya shahidi …… ... Tarehe ……

Taarifa ya mtafiti / mtu anayekubali idhini

Nimesoma kwa usahihi karatasi ya habari kwa mshiriki anayeweza kushiriki, na kwa bora wa uwezo wangu ulihakikisha kuwa mtoto anaelewa madhumuni na utaratibu wa utafiti. Mimi thibitisha kwamba mtoto alipewa nafasi ya kuuliza maswali juu ya utafiti huo, na yote Maswali aliyoulizwa yamejibiwa kwa usahihi na kwa uwezo wangu wote. Mimi thibitisha kwamba mtu huyo hajalazimishwa kutoa idhini, na idhini hiyo imetolewa kwa hiari na kwa hiari.
Nakala ya fomu hii ya idhini imetolewa kwa mshiriki.
Jina la mtafiti …… ...
Saini ya mtafiti …….
Nakala imetolewa kwa mshiriki (aliyeingizwa na mtafiti)
Mzazi / mlezi amepata idhini ya kuarifiwa: Ndio [ ] Hapana [ ]

Appendix III: Data Collection Tool

Study number…….

Bio Data

1. Age in years…… months……
2. Gender: Male ☐ Female ☐
3. Level of education

None ☐

Primary ☐

Secondary ☐

Tertiary ☐

Preoperative Data

4. What time was the last meal preoperatively?

……

Intra Operative Data

5. Diagnosis ASA class ……

Upper limb fractures ☐

Upper limb tumours ☐

Lower limb fractures ☐

Lower limb tumours ☐

Pelvic fractures ☐

Other……

6. Type of surgery

Elective ☐ Emergency ☐

Concurrent gastro intestinal/Abdominal surgery? Yes ☐ No ☐

7. Type of anaesthesia (check all that apply)

General anaesthesia ☐

Regional anaesthesia

Spinal anaesthesia ☐

Peripheral nerve block ☐

Epidural ☐

8. Start time of anaesthesia induction ……. End time of surgery……

Post-Operative Data

9. Was there any of the following discomforts in the post-operative period? (tick all that apply)

Sore throat ☐
Vomiting ☐
Nausea ☐
Pain ☐ other……..

10. We're feeding instructions given in post-operative notes?

Yes ☐ No ☐

If yes who gave the instructions?

Anaesthetist ☐ Surgeon ☐

11. At what time was the first feed post operatively?

……

12. Were there any verbal feeding instructions given post-operatively?

Yes ☐ No ☐

13. What was the initial feeding method used post operatively? (Check all that apply)

Oral ☐
Nasogastric tube ☐
Total Parenteral Nutrition ☐

If Oral or nasogastric tube was used, what was the initial feed post operatively?

Oral sips ☐
Water ☐
non water liquids ☐ specify…….
Solids ☐

14. Was the initial postoperative feed well tolerated?

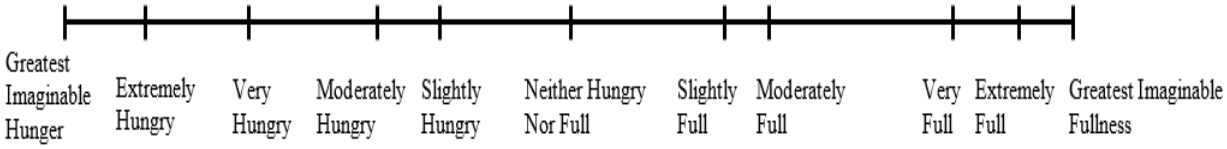
Yes ☐ No ☐

If no why? (check all that apply)

Nausea ☐
Vomiting ☐
Food bad taste ☐
Pain ☐
Sore throat ☐ Other…….

15.What was the patient's hunger intensity at time of first feed post operatively? (circle the appropriate point)

Scale of 0-10



16.What was the intensity of thirst at time of feed post operatively?(circle where appropriate)