PREVALENCE OF MALNUTRITION AND ITS IMPACT ON CLINICAL OUTCOME IN ELECTIVE GENERAL SURGICAL PATIENTS AT KENYATTA NATIONAL HOSPITAL

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STUDENT'S DECLARATION

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

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Special appreciation goes to my supervisors. Am indebted to Dr. Ojuka Kinyuru Daniel for his guidance throughout the development of this Dissertation and Dr. Nyaim Elly Opot whose contribution has been invaluable.

Also, my appreciation goes to all patients who voluntarily participated in this study.

DEDICATION

To my family, for the patience they have accorded me over the period of writing this
dissertation.

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LIST OF ABBREVIATIONS

BMI: Body Mass Index

ESPEN: European Society for Parenteral and Enteral Nutrition

KNH: Kenyatta National Hospital

MNA: Mini Nutritional Assessment Tool

MST: Malnutrition Screening Tool

MUST: Malnutrition Universal Screening Tool

NRS: Nutritional Risk Screening

SGA: Subjective Global Assessment

SNAQ: Short Nutrition Assessment Questionnaire

PI: principal investigator

ABSTRACT

Background

Malnutrition has long been associated with negative post-operative outcomes such as delayed recovery times, higher complications rates, higher rates of morbidity and mortality, elevated readmission rates, lengthened hospitalization and increased cost of health care. In our set-up, there are no studies on prevalence and impact of malnutrition on surgical outcomes.

Objectives

The aim of this study was to determine the prevalence of malnutrition and its impact on clinical outcomes in elective general surgical patients at the Kenyatta National Hospital (KNH).

Methodology

This was a descriptive observational study conducted in KNH general surgical wards for three months. Adult 18 years and above who were admitted for elective general surgical procedures were recruited by consecutive sampling until the sample size of one hundred and five was achieved. The Patients were evaluated within 24hrs after admission using Subjective Global Assessment (SGA) tool. Data collected included demographics, anthropometric and laboratories measurement, and subjective nutritional habits. The principal investigator and a trained research assistant performed clinical assessment of the patients and filled the study questionnaire/tool. The research assistant was a medical officer trained on how to use the SGA tool. Data was entered, cleaned and analyzed using of SPSS version 21 Chicago Illinois for means, proportions, frequencies as well bivariate analysis using Chi-square and Odds ratio. A P value <0.05 was considered statistically significant.

Results

One hundred and five (105) patients were recruited. The mean age was 41.1 (SD=15.3) years. Overall prevalence rate of malnutrition was at 36.2%. Severe malnutrition was noted in 15.2%. The overall complication rate was 30.5%, majority (56.3%) of the complications were wound

infections. There was significant association between complications and nutritional status of the patients (p=0.005). The mean length of stay was 8.6 (SD=8.4) days, while the median was 5 (IQR=6) days. There was statistical difference between those malnourished and those well-nourished on independent sample t-test with p-value of 0.001. Malnourished patients had a significantly longer LOS.

Conclusion

Malnutrition is common in surgical patients admitted at Kenyatta National Hospital and is associated with poor surgical outcomes. Therefore, nutritional screening, assessment and management should be an integral part in the care of the surgical patient.

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The burden of malnutrition is on the rise and remains unrecognized by health care providers (1). The patient's nutritional status during hospitalization worsens due lack of appropriate nutritional support. The risks for new infections increases and there is suboptimal response to regular medical treatment, deranged wound healing and organ failure rates is high (2). Prevalence and impacts of hospital malnutrition has been shown to be a key parameter in the outcome of disease (1). Surgical procedures are major stress factors which activate several catabolic and inflammatory pathways (3). This cause or aggravate an already existing poor nutrition status.

Broadly, "malnutrition" has been described as any imbalance in the diet. WHO confirmed malnutrition as an urgent health problem in 2009. In surgical practice, studies have shown the prevalence of malnutrition in up to 50% of patients and demonstrated an association between inadequate nutritional status and surgical outcome (4). Often times, the consequences are prolonged duration of treatment, increased levels of morbidity and mortality and increased hospital costs. In many instances malnutrition is unrecognized, untreated and worsened in hospitals (1). In an experiment where normal volunteers were semi starved, there was a 25% loss in body weight and was associated with fatigue, depression, apathy and loss of will to recover. There are multiple negative consequences of poor nutritional status to the patients (2), including impaired wound healing, increased muscle loss, reduction in cardiac function, increased susceptibility to chest infections, longer hospital stay and increased morbidity and mortality (1).

There have been strong correlations between increased risk of subsequent morbid events and the severity of the nutritional deficits. This has been identified from various studies among the

hospitalized patients especially among the elderly, where it has been shown that the incidence of malnutrition to be approximately 30-50 % (3, 5).

Nutritional assessment is a method of identifying malnourishment. Nutritional screening tools like mini- nutrition assessment tool (MNA) and the subjective global assessment (SGA) have been used to assess nutritional status of hospitalized patients.(6)

A tool such as the Malnutrition Screening Tool (MST) assess recent weight and appetite loss from three simple questions, and has been validated for use in the general medical, oncology and surgical patients. The tool uses a simple scoring system that can be used by non-nutrition-trained personnel to identify those patients with a high nutrition risk so as to provide the basis for dietetic referrals and intervention (7). Closely similar to MST is the Malnutrition Universal Screening Tool (MUST) that was purposely created to detect under-nourishment in adult patient and those that are obese. It was designed to work in both hospitals and nursing homes. Scores from this tool are derived from the body mass index (BMI), presence or absence of serious disease and unplanned weight loss which would indicate if nutrition intervention is required. However, the tool has not been validated amongst the pediatric population or renal patients, but despite this, it has consistently given reliable results (8).

For the elderly patients 65 years and above, Mini Nutritional Assessment (MNA) was specifically developed for their use in health facilities, nursing homes and the community (7). The 18 item assessment tool takes into consideration their medical history, anthropometrical measures, living conditions, dietary and psychosocial factors using a points-based scoring system in determining risk of malnutrition or if the patient is afflicted by it. (9). A shorter and abridged version of this tool is the MNA (MNA-SF), which provides a simple two-step nutrition screen, and those deemed to be at nutritional risk ,the full MNA is completed (10).

A tool that has been recommended by the European Society for Parenteral and Enteral Nutrition (ESPEN) is the Nutritional Risk Screening (NRS-2002) that uses decreased BMI, recent loss of weight, reduction of the patients dietary intake, and disease severity assessment to generate a nutritional risk score status of the patient (7). However, it has been noted that it does give a definitive diagnosis for malnutrition since the grading of the severity of the patients illness is subjective, and as such, it may not reflect accurately the current nutritional status. The recommendation by ESPEN is that, it can be useful in hospitalized patients for prompting the initiation of nutrition support (8).

The Short Nutrition Assessment Questionnaire (SNAQ) is tool that has been validated, and was developed and for diagnosis of malnutrition in hospitalized patients. It's a four item questionnaire that provides an pointer towards nutritional intervention as well as a roadmap for a treatment plan (7). It has also been validated for ambulatory use, as well as inpatients and BMI calculation is not a requirement (11). It provides for dietician referrals and provides for a treatment plan.

The commonly used tool for assessing the nutrition status is the Subjective Global Assessment (SGA). Assessment or data items on the tool includes the dietary intake change, weight change data, gastrointestinal symptoms, ascites, presence of oedema, assessment of fat and muscle stores, and functional capacity changes arising from malnutrition (12). Malnutrition is then classified into three categories: Category A, B and C for well-nourished, mildly/moderately malnourished, and severely malnourished.

Clinicians have found the SGA tool to be appealing and the one of the best technique of evaluating the nutritional status due to its subjective nature as it also allows change patterns of the various variables to be captured such as weight loss as opposed to taking absolute weight loss. The tool has been associated with a high degree of classifying patients correctly and a

high inter-rater reproducibility where two clinicians agreeing on the same classification based on the categories (13).

This study aimed to determine incidence of malnutrition in hospitalized patients and its effects on outcome of the disease. Therefore, the study elaborated; nutrition and a surgical patient, assessment of a nutritional status and post-operative outcomes.

1.2 Problem Statement

Importance of nutrition status of patients has been demonstrated in several surveys to have effect on the health and ultimate recovery from injury or illness. Malnutrition as a problem is under-recognized and undertreated more often exacerbated in hospital settings, as the hospital staff are usually uninformed and untrained in its diagnoses (14).

There could be serious consequences to malnourished patients undergoing surgical procedures. Notably, malnutrition has been associated with inferior wounds healing, increased risk of surgical and non-surgical organ complications (15). There is also increased risk of infectious and non-infectious complications, prolonged length of hospital stay (LOS) and higher nosocomial infection rates that ultimately leads to slowed functional recovery and increased cost of care (16).

Nutritional assessment as a method to identify malnourishment has long been documented as an essential component of patient management. In severely malnourished patients, a period of nutritional intervention to improve the nutritional status of patients may help lessen the adverse outcomes. Patients should be treated with nutritional intervention and then the results compared to see the effect of intervention. The concept of nutritional support plays an important role in treating critically ill patients and is well established in developed societies: unfortunately, Kenya falls far behind in this concept and there is a need for continuous effort to establish it as an important part of health care delivery systems.

The main aim of this study was to find out the prevalence rate of malnutrition in patients admitted in surgical wards. The study also focused on the complications and rate of mortality. This may draw attention of the clinicians to provide early nutritional interventions to improve patient's quality of life and decrease the incidence of adverse outcomes of the patients with malnutrition.

1.3 Significance of the study

Numerous adverse consequences associated with malnutrition can be avoided through early detection of malnutrition, provision nutritional support, planning of patients' diet and coming up with strategies aimed at improvement of appetite and treatment of nausea and vomiting with a goal of preventing malnutrition occurrence and therefore improving disease and surgical outcomes. Results from this study will provide a basis for the provision of a more stringent approach in nutrition monitoring with aims of reducing the complications associated with and arising from malnutrition. Previous studies have shown high prevalence of malnutrition in surgical patients but to the best of our knowledge, no such study has been conducted locally.

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Insufficient intake of nutrients or the inability to use or absorb ingested nutrients leads to a state of nutrient deficiency, hence malnutrition. Medical personnel must take note that even those patients who have not presented with symptoms that are suggestive of malnutrition can be afflicted. Malnutrition has severe consequences, but also easily treatable. The best results are achieved where there is teamwork and cooperation from all members of staff.

Hill et al. (17) in their study showed that the prevalence of malnutrition among the surgical patients was 50% and 40% among the medical patients. They study also noted that the risk increases during hospitalization in the majority of these patients (4). It is estimated that 70-80% of cases of malnutrition in hospitalized patients are not identified while some are underdiagnosed, hence no intervention is put in place to treat their malnutrition and its diagnosis is not part of the hospital discharge notes and no treatment plan is offered as an outpatient (18).

Underreporting of malnutrition has been highlighted by professional organizations around the world who are advocating for the implementation and use of simple and valid screening tools for identification patients at risk (19). For example, the European Society of Enteral and Parenteral Nutrition is at the forefront in advocating nutritional screening because it saves resources, shortens length of hospitalization, improvement of the patients physical and mental function, speeds recovery and reduces the number of complications and severity of disease (6). Due to this deleterious consequences and high prevalence rates associated with malnutrition and the availability of its treatment, it's only imperative that an introduction of a routine screening be put in place to identify those patients who are at risk of malnutrition. For that, there is existence of various screening tools, which include, the Malnutrition Universal Screening Tool (MUST), Nutritional Risk Screening (NRS-2002), and the Mini Nutritional

Assessment (MNA), among others (6). The tools offer different parameters, and usually there is a tradeoff between validity and complexity on the other hand. For example the NRS 2002 is best applied to non-ambulant patients, as its two stage screening takes into account the severity of disease, age and other various parameters, while a tool such MUST which has only three variables and lacks the other parameters, making it easier to use. For this study, the choice of assessment tool was the SGA because of its high validity, reliability and simplicity even though it may lack some of the variables found in other tools.

The objective of this study was to carry out an investigation as to the nutritional status of the adult general surgical patients scheduled for elective surgeries at the Kenyatta National Hospital, and to define the correlation between the risk of malnutrition and the clinical outcome.

2.2 Prevalence of Malnutrition in General Surgical Patients

Malnutrition has long been known to predict adverse patients' outcomes like higher morbidity, mortality and a decrease of the patients' quality of life.

A cross-sectional study by Wu G.H. et al found the rates of malnutrition of patients using the parameters of Mid-arm Circumference (MAC), Body Mass Index (BMI), lymphocyte count, albumin, prealbumin, Triceps skin fold thickness (TSF), Arm Muscle Circumference (AMC), 20.5%, 21.3%, 55.8%, 24.2%, 35.4%, 50.6%, and 21.2% respectively. The study also found the prevalence of malnutrition to be at 20.8% and 38.8% with the use of Mini Nutritional Assessment (MNA) and the Subjective Global Assessment (SGA) respectively. The younger patients had a lower prevalence of malnutrition (31.6%) than the older patients (> 60 years old) whose prevalence was at 47.6%. It was also observed that cancer patients higher rate of malnutrition than non-oncologic patients (64.5% vs. 22.4%). Patients with digestive tract disease had higher rates of malnutrition than those without digestive tract disease (52.6% vs.

30.0%) (20). Likewise, in a cross-sectional study done by Bruun L.I et al looking at prevalence of malnutrition in surgical patients, found that, 39% of the patients were malnourished with their status ranging from mildly/borderline to severely malnourished (21).

The results from a prospective study by Mignini et al. looking at outcomes of major surgeries and impacts of patients nutritional status using the Mini Nutritional Assessment (MNA) tool, found that a more than half (54%) of the patients had a compromised nutritional status; 10% were malnourished cases while the other 44% were at the risk of malnutrition. On gender, though not found to be statistically significant, it was observed that the female patients (48%) were reported to be at slightly more risk of malnutrition and clearly more malnourished than the male patients (41%). Among the elderly group (>80 years), malnutrition was diagnosed at 16.7%, and those diagnosed with the risk at 58.3%. They concluded that old age was an independent risk factor for development of malnutrition in patients undergoing major surgery (3).

2.3 Effects of Malnutrition in Post-operative Complications

Studies have shown that the rate of malnutrition is as high as 50% in surgical practice and that there is a strong association between outcomes of surgery and inadequate nutritional status that is linked to a negative post-operative outcome (22).

In an eight-week observational study by O'shea et al on 460 patients, the prevalence of malnutrition was at 52% for those scheduled for emergency surgery and 38% for elective surgery. The malnourished patients were also significantly associated with a negative post-surgery outcome (23).

Nosocomial infections are a common occurrence in malnourished patients and have been demonstrated in studies that have shown the prevalence to be at 4.4 % in those not malnourished, 7.6 % and 14.6% in the moderately and severely malnourished patients,

respectively (24). Malnourishment alters both immune response and tissues repairing in surgical patients (25). Ana et al observed a negative correlation between the numbers of days spent in the hospital and the patients BMI ($p = 0.017$), and positive correlation with the weight loss and duration of hospitalization ($p = 0.036$) (26).

The patients' preoperative condition is yet another factor that has a potential in affecting postoperative malnourishment, for example cancer patients mostly those that are localized at the brain, neck and gastrointestinal (27) have been found to a high risk in developing postoperative malnourishment. Among these patients, a prevalence of about 79% has been observed on esophageal cancer patients (28). This is due to patients nutritional condition on admission, existing comorbidities, being elderly, mal-absorption and gastrointestinal obstruction/gastric stasis occurrence, dysphagia (29).

Mignini et al. found that at days 3 and 6 post-surgery, patients registered systemic complications. However, it was observed that a day post-surgery, there was partial resolution of complications for the patients who were at risk of malnutrition and the well-nourished one. This was not the case for the malnourished patients at the 3-rd post-operative day where they fewer complications but had a worse outcome six days after surgery. Interestingly enough, there was less appropriate stress response to surgery for more than half of patients with an impaired nutritional status. These finding would suggest that it may be prudent to identify those patients who pose a potential risk of surgical complications through prior nutritional status assessment for purposes of promptly arranging and employing early nutritional interventions (3).

2.4 Complications Rates in Malnourished Patients

Majority of malnourished patients face complications, which include prolonged hospital stay, surgical site infection, delayed wound healing, and formation of fistula/stoma, as well as other complications.

Thomas et al. using the Nutritional Risk Screening Tool in their study found the prevalence of the risk of malnutrition (NRS ≥3) of the patients to be 24.1% (300 of 1244). There was a significant increase in the length of stay in hospital amongst these patients (13 versus 7 d). Additionally, complication rates were also observed more in this group postoperatively (7.23% versus 6.91%) (30).

Wu G.H. et al observed large differences in the morbidity and complications between well-nourished patients and malnourished patients (4.0% vs. 1.1%, $P < 0.01$ for morbidity; 19.8% vs. 5.9% for complications) (20).

In a pilot cross-sectional study by Ferreira C. et al, which examined the status and nutritional risk of patients undergoing surgery with the assistance of the Malnutrition Universal Screening Tool (MUST) and the Subjective Global Assessment (SGA) tools, additionally employing other measurable parameters for examining nutritional status i.e. the Body Mass Index (BMI), and the waist circumference (WC). The results according to waist circumference indicated that overweight/obese patients were 58%, while those at a high cardio-metabolic risk were 54%; there were also 30% of patients who had significantly lost weight (≥ 5%), whereas 28% of the patients had gained weight. From the MUST tool, 46% of patients were classified at low risk, while 34% at high risk. According to the SGA tool, the well-nourished patients were 58%, while 40% had moderate/severe under-nutrition. Those identified as moderate/high risk by MUST and under-nutrition by SGA (p = 0.01) (31)had associated longer length of stay.

2.5 Length of Hospital Stay in Malnourished Patients

Improved clinical outcomes and early discharge of patients is dependent on choices made on the appropriate approach to clinical management for those admitted in hospitals. Factors such as the clinical setting, age of the patients, existing comorbidities, disease severity, the quality and interventions done are highly associated with prolonged hospital stay (32). Additionally, there is a growing body of evidence that the length of hospital stay and overall healthcare costs is associated with factors of nutrition, in which they may or may not have a relation to the leading diseases (25). This implies that, a prolonged hospital stay is dependent on the status of nutrition which may be poor at the time of admission or develop during the hospital stay. Insufficient nutritional intervention may lead to a negative nutrition status and likely poor prognosis (25).

Garcia et al conducted a cross-sectional study with the use of Malnutrition Screening Tool to assess the prevalence of nutritional risk and its associated factors in 565 surgical patients (mean age of 52.8±15.6 years and the majority (51%) were female) in a teaching hospital, found that more than 30% of the patients presented with an average or high nutritional risk, and 7% of them were at high risk. Their findings also revealed that there was great association in the high-risk group with aging, cancer, surgery and mortality. There was also a linear increase in the length of hospital stay according to nutritional risk (33).

Results from a prospective observational study by Offir B. et al on malnutrition in surgical patients found 32 patients (33%) had a score of 2 or higher and were defined to be at high malnutrition risk with the use of Malnutrition Universal Screening Tool (MUST). The patients at risk were observed to have longer hospitalization and worse outcome. Malnourished patients had a significantly (p=0.003) longer hospital stay of 18.8 (SD=11.5) days versus 7.0 (SD=5.3) days than patients without malnutrition risk. Overall, there was a higher mortality observed in the hospital for the high-risk group in six months to one year of follow up (34).

Caccialanza et al. did an assessment on factors of nutrition that are associated with an increased length of hospital stay in a prospective hospital-based observational study. The results pointed to factors such as score of less than 97.5 on the Nutritional Risk Index tool (relative risk of 1.64, 95% CI, 1.31-2.06), and an in-hospital weight loss of 5% or more (RR 1.60, 95% CI, 1.30-1.97). Similar findings for the sensitivity analysis were observed on the data for patients who were discharged alive and who had at least 3 days of hospitalization (n = 1073) where the adjusted relative risk for Nutritional Risk Index score < 97.5 was 1.51 (95% CI, 1.20–1.89). In the same study, a significant association was observed with a relative risk of 1.14 (95% CI 1.01–1.28) for those with three or more days of in-hospital starvation (35).

2.6 Study justification

In the clinical setting, the nutritional status of patients is rarely assessed specifically for those going for elective surgery. This may lead to poor clinical outcomes if special attention is not given to deal with malnutrition prior to surgery. The post-surgery nutrition status may worsen due to their underlying disease status or due to procedure conducted. Malnutrition may be present prior to surgery due to various reasons such as metabolic disorders, inflammatory or neoplastic disease, poor access to adequate nutrition, altered nutrient utilization due to metabolic state, or alimentary track dysfunction (36).

The high prevalence of malnourished patients post-surgery as observed in these studies is a factor that should not be overlooked in the local setting. Results from this study will provide a much-needed basis for the provision of a more stringent approach in nutrition monitoring with aims of reducing the incidence of complications that are associated and arising from malnutrition. Numerous consequences associated with malnutrition can be avoided through early detection and intervention aimed at provision of nutritional support, planning of diet,

improvement of appetite, treatment of nausea and vomiting with the goal of preventing the occurrence of malnutrition and improvement of disease outcomes.

2.7 Objectives

2.7.1 Broad Objective

To determine the prevalence of malnutrition and its impact on clinical outcomes in elective general surgical patients in Kenyatta National Hospital.

2.7.2 Specific Objectives

a) To determine the prevalence of malnutrition in General surgical patients undergoing elective Surgery at KNH.

b) To determine 30-days complications rates in malnourished patients

c) To assess the length of hospital, stay in malnourished patients

d) To determine the association between nutritional status and clinical outcomes

CHAPTER 3 METHODOLOGY

3.2.1 Study Design

Descriptive observational study.

3.2.2 Study Area

The study was conducted at the KNH general surgical wards (wards 5A, 5B and 5D). KNH is the largest referral and teaching hospital located in Nairobi Kenya with a bed capacity of 2000 and serves as a training site for College of Health Sciences, University of Nairobi for both undergraduate and post graduate programs. It receives patient from several parts of Kenya. It therefore serves as the best site in sampling for malnutrition amongst surgical patients in Kenya. Total combined bed capacity of general surgical wards in KNH is 150.

3.2.3 Study Population

The study population consisted of elective general surgical patients seen at KNH adults' surgical wards.

3.2.4 Inclusion Criteria

The participants recruited into the study were:

- All elective adult general surgical patients admitted at KNH surgical wards.

- Patients willing to provide written informed consent

- Patients with ASA 1/2

3.2.5 Exclusion Criteria

- Patient unwilling to participate in the study

- Patients with ASA 3 and above

3.3 Sample Size Determination

Sample size was calculated using the Fisher's formula;

$$n = \frac{Z^2 x\ P(1-P)}{d^2}$$

Where,

n = Desired sample size

Z = value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI)

P = expected true proportion (estimated at 38.8%, from a study by Wu G.H. et al found the prevalence of malnutrition as defined by Subjective Global Assessment (SGA) was 38.8%) (20)

d = desired precision (0.05)

$$n_0 = \frac{1.96^2 x\ 0.388(1 - 0.388)}{0.05^2} = 365$$

Data collection was over a period of three months. In that, time it was expected that 148 patients were to be admitted and operated upon in general surgical wards.

However, given that the patients population in the hospital is less than 10,000, the final sample size was calculated using an adjusted Fischer formula below

$$nf = \frac{n_0}{1 + \frac{n_0 - 1}{N}} = \frac{365}{1 + \frac{365 - 1}{148}} = 105$$

Where:

nf = the adjusted sample size (when population is less than 10,000).

n = the desired sample size (when the population is more than   10,000).

N = the estimate of the population size (in this case 148 patients admitted and operated on in 3 months)

A Sample size of 105 patients was used.

3.4 Sampling Procedure

Consecutive sampling of all patients admitted in general surgical wards and who meet the inclusion criteria were selected for the study.

3.5 Recruitment and Consent

Participants for the study were recruited from the general surgical wards. Informed consent by the Principal Investigator and a trained research assistant was obtained from them prior to recruitment.

3.6 Study Variables

The dependent variable was surgical outcome, while the independent variables were patients' SGA status, comorbidities, type of surgery and demographic characteristics.

3.7 Research Instrument

Nutritional status was assessed by use of Subjective Global Assessment (SGA) tool.

3.8 Data Collection

Data was collected via a printed questionnaire after obtaining informed consent from the patient. Demographic data as well as clinical data relevant for the study was obtained from the patient and their medical records. The data was collected by the Principal Investigator and trained research assistant. The research assistant was a medical officer who was taken through the SGA nutritional assessment tool to familiarize with it and have the abstraction process.

Patients were followed up until death or discharge or up to 30 days after the surgical procedure. They were monitored by an observer with no patient care responsibility for objective complications recording. Patients were followed up after discharge through phone calls and were seen at surgical outpatient clinics during routine clinic follow up or at accident and emergency in case of emergency occurring within 30 days of initial operation. The complications monitored included but not limited to the following: Septicemia which required a positive blood culture for diagnosis and an association of hypotension and hypo perfusion.

Intra-abdominal sepsis diagnosis was defined as collection of intra-abdominal purulent that required operative drainage. Fistulas was diagnosed clinically and radiologically. Urinary Tract Infection was diagnosed by a quantitative culture of 100,000 organisms or greater from a urine sample. Pneumonia was documented by abnormal chest x-ray and positive sputum culture, and treatment with antibiotics. Wound infection was defined as drainage of purulent material through operative or spontaneous means and by a positive culture. Wound dehiscence was defined by a re-closure of the wound post-operatively. Respiratory failure implied a need for ventilatory support for more than 6 hours post-surgery. Pulmonary Embolus required a demonstration by a pulmonary angiography or a lung scan and that the patient was on treatment with heparin. Cerebrovascular Accident required a documentation of a new and persistent neurologic deficit. Renal failure was defined as renal dysfunction necessitating hemodialysis. Shock was defined as presence of hypotension, hypo-perfusion, and treatment with systemic vasopressors. Readmission was any admission within 30 days of initial surgery. Other complications were recorded as documented by primary physician.

For anthropometric measurements, weight was measured with patients in light clothes using a portable seca electronic scale to the nearest 0.1 kg and height was measured using a portable stadiometer to the nearest 0.1 cm. Weight and height will be used to calculate BMI. Mid upper arm circumference (of the non-dominant arm) was measured to the nearest 0.1 cm with a non-elastic tape measure and triceps skinfold will measured to the nearest 0.1mm with a Holtain caliper on the non-dominant arm halfway between the tip of the acromion and the olecranon process

3.9 Study Procedure

The study involved a face-to-face interview with the patient and extraction of other relevant data from patient's medical records.

3.10 Data Management and Statistical Analysis

Prior to data collection ethical approval was sought, thereafter recruitment of research assistant was done to assist in data collection. The research assistant was trained on maintenance of confidentiality, interviewing techniques, information retrieval and filling of the questionnaire. To maintain confidentiality, all questionnaires did not have identifying features such as names of the patients but a pre-assigned serial number. The questionnaires were then checked for completeness prior to storing them in a secure lockable cabinet only accessible to the PI and the research assistant.

Data was entered and analyzed by the use of SPSS version 21. The prevalence of malnutrition in general surgical patients undergoing elective surgery at KNH was calculated and presented as a proportion from the SGA assessment tool. Complication rates in malnourished patients were analyzed and presented as frequencies and proportions, while the length of hospital stay in malnourished patients was assessed and compared with those with good nutritional status. Demographic as well as other patient characteristics was analyzed and presented as frequencies and proportions, means and medians where applicable. Bivariate and multivariate analysis which included use of Chi-square and Regression analysis was used to assess factors associated with severe outcomes. P-values, Odds ratio, and 95% confidence intervals (CIs) were calculated and reported where applicable. A P value <0.05 was considered statistically significant. Study data will be kept in a safe and locked place for 3 years after publication then destroyed.

Complications rates and length of hospital stay in malnourished patients was compared with those of well-nourished patients.

3.11 Ethical Considerations

3.11.1 Ethical Approval

Prior to commencement of the study, permission and clearance was sought from the Kenyatta National Hospital and University of Nairobi Ethical Review committee (KNH-UON ERC) and obtained authorization from KNH administration to conduct study in the institution.

3.11.2 Informed Consent

Informed consent was administered to all participants by the principal investigator and study assistant. Persons who declined to provide informed consent were not allowed to participate in the study. Persons who choose to withdraw from the study were not coerced not to do so.

3.12 Risk of the Study

There were no potential risks to the patients during the course of the study, as no invasive procedures were performed on them. Confidentiality was maintained throughout by storing all data in secure cabinet that remained locked during the study period. There was no extra cost incurred for participating the study.

3.13 Study Results Dissemination

The results of this study will be shared with clinicians both at UON and KNH general surgical wards ,clinics and as well as with the nutritionists for the purpose of improving nutritional assessment ,nutritional care practices and overall improvement of patients' care.

3.14 Study Limitations

Loss to follow up, but this mitigated by taking telephone numbers of the patients and regular calls. Despite this 3 patient were lost to follow up. This was a small-scale study with a limited number of patients. It was carried out in KHN, a tertiary referral Centre, which may present some referral bias with patient characteristic being different from other settings. Severely ill patients, who may have been the most malnourished, were not included as their weight and

height could not be measured. Further studies are warranted so that optimal nutritional protocols are set

Roles and responsibilities of the principal investigator and the research assistant

The principal investigator bore the ultimate responsibility for all activities associated with the conduct of study including but not limited to;

- ✓ Compliance with KNH-UON ERC policies, ethical principles and obligations.
- ✓ Take the primary responsibility for protecting the rights of all participants recruited for the study.
- ✓ Personally conduct patients' interviews and assessment using SGA tool or delegate this to research assistant.
- ✓ Offer sufficient oversight and training of the research assistant to ensure safety procedures and protocol adherence.
- ✓ The PI was also responsible for ensuring that patients recruited for the study understood the nature of the study and their role in participation in the study and that they give their informed consent.

The research assistant performed tasks delegated by the principal investigator such as

- ✓ Patient's nutritional status assessment using SGA tool.
- ✓ Taking informed consent
- ✓ Patients data retrieval from medical records
- ✓ Patient's clinical assessment relevant to the study
- ✓ Ensuring safety procedures and protocols are followed
- ✓ Recording patients' complications as defined by the attending clinicians
- ✓ Patients follow-up through phone calls after discharge.

Roles and responsibilities of the principal investigator and the research assistant

The principal investigator will bear the ultimate responsibility for all activities associated with the conduct of study with including but not limited to;

- ✓ Compliance KNH-UON ERC policies, ethical principles and obligations.

- ✓ Take the primary responsibility for protecting the rights of all participants recruited for the study.

- ✓ Personally, conduct patients' interviews and assessment using SGA tool or delegate this to research assistant.

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- ✓ Patients data retrieval from medical records

- ✓ Patient's clinical assessment relevant to the study

- ✓ Ensuring safety procedures and protocols are followed

- ✓ Recording patients complications as defined by the attending clinicians

- ✓ Patients follow-up through phone calls after discharge

CHAPTER FOUR: RESULTS

Hundred and nine (109) patients were enrolled for the study but four dropped out due to different reasons. Two patients' phones did not go through, the next of kin when called severally could not update on patients' clinical conditions. One prisoner did not have a phone and he did not come for routine clinic follow-up on appointment date, one patient opted out of the study midway and choose not to answer any question on phone and moved to private wing of the hospital for follow up. Therefore, we analyzed 105 patients.

The mean age was 41.1 (SD=15.3) years, while the median age was 39 (IQR=21) years (Table 1). Majority of patients were females accounting for 53.3% while males accounted for 46.7%. Patients with secondary level of education accounted for majority of patients screened (Table 1).

Table 1: Sample demographic data/Patient characteristic

	Frequency	Percent
Age (years)		
18-34	41	39.0
35-44	23	21.9
45-54	20	19.0
55-64	11	10.5
Above 65	10	9.5
Mean age (SD)	41.1	15.3
Min-Max	18	83
Gender		
Male	49	46.7
Female	56	53.3

Education		
Primary	34	32.4
Secondary	36	34.3
Tertiary/University	27	25.7
None	8	7.6
Marital status		
Married	59	56.2
Single	34	32.4
Divorced	4	3.8
Widowed	8	7.6
Occupation		
Employed	22	21.0
Self-employed	41	39.0
Retired	4	3.8
None	38	36.2
Residency		
Rural	28	26.7
Urban	77	73.3

The SGA tool used classifies nutritional status into three classes, well nourished,

mildly/moderately nourished and sever malnutrition. The overall prevalence rate of

malnutrition at 36.2% (Table 2). Severe malnutrition was noted in 15.2% (Table 2).

Table 2: Nutritional status using subjective global assessment (SGA) tool

Nutritional status	Frequency	Percentage
Well nourished	67	63.8
Mildly / moderately malnourished	22	21.0
Severely malnourished	16	15.2

There was no significant difference in malnutrition as far as gender, employment, marital or residency status was concerned (Table 3). Patients with no formal education had a higher prevalence of malnutrition (p value of 0.25) (Table 3)

Table 3: Nutritional status according to age, gender, education, marital status, occupation and residency.

	Nourished	Malnourished	p-value
Age			
18-34	31 (46.3)	10 (26.3)	0.044
35-44	11 (16.4)	12 (31.6)	0.071
45-54	15 (22.4)	5 (13.2)	0.247
55-64	5 (7.5)	6 (15.8)	0.200
Above 65	5 (7.5)	5 (13.2)	0.490
Gender			
Male	33 (49.3)	16 (42.1)	0.480
Female	34 (50.7)	22 (57.9)	

Education			
Primary	22 (32.8)	12 (31.6)	0.895
Secondary	22 (32.8)	14 (36.8)	0.678
Tertiary/University	21 (31.3)	6 (15.8)	0.080
None	2 (3.0)	6 (15.8)	0.025
Marital status			
Married	38 (56.7)	21 (55.3)	0.885
Single	23 (34.3)	11 (28.9)	0.571
Widowed	4 (6.0)	4 (10.5)	0.456
Divorced	2 (3.0)	2 (5.3)	0.619
Occupation			
Employed	14 (20.9)	8 (21.1)	0.985
Self-employed	26 (38.8)	15 (39.5)	0.946
Retired	3 (4.5)	1 (2.6)	1.000
None	24 (35.8)	14 (36.8)	0.917
Residency			
Rural	15 (22.4)	13 (34.2)	0.188
Urban	52 (77.6)	25 (65.8)	

Majority (29)27.6% of patients recruited, had either upper gastrointestinal or colorectal pathologies (Table 4).

Table 4: Diagnostic considerations

Diagnosis	Frequency	Percent
Gastric, small bowel and colorectal pathologies	29	27.6
Benign perianal conditions	11	10.5
Endocrine (breast and thyroid)	23	21.9
Hernias	18	17.1
Hepatopancreatobilliary	11	10.5
Others	13	12.4
Total	**105**	**100.0**

Prevalence of malnutrition in benign and malignant conditions

Benign conditions accounted for 62.9% of patients screened while 37.1% patients had malignant conditions. Distribution of nutritional status according to disease status is shown in table 5 below.

Table 5: Distribution of malnutrition in benign and malignant conditions

	Benign condition	Malignant condition	p-value
Well nourished	49 (74.2)	18 (46.2)	0.004
Mild/Moderately	11 (16.7)	11 (28.2)	0.160
Severely malnourished	6 (9.1)	10 (25.6)	0.023
Total	**66 (100.0)**	**39 (100.0)**	

Table 6: Distribution of nutritional status by BMI, MUAC and TSF

	Nourished Mean (SD)	Malnourished Mean (SD)	p-value
BMI	25.6 (4.9)	22.7 (4.5)	0.003
MUAC	30.7 (4.5)	27.4 (4.8)	0.001
TSF	20.0 (9.6)	16.9 (8.9)	0.111

TSF=triceps skin fold: MUAC=mid upper arm circumference: BMI=body mass index

Compared to SGA, both BMI and MUAC can be   measures of nutritional status   depending on the cut off-in this case 22.7 and 27.4 respectively. TSF does not compare well with SGA in measurement of nutritional status (Table 6).

The average blood loss was 206 ml for well nourished and 260 ml for malnourished (p value 0.334) while the average operative time was 86.7 minutes for well nourished and 122.2 minutes for malnourished (P value of 0.004). There was statistical significance difference between those who are malnourished and those who are well nourished concerning operative time. Majorities 9 (6.7%) of patient had hypertension as a comorbidity followed by HIV/AIDS at 6 (5.7%) (Table 7).

Table 7: Comorbidities

Comorbidities		
Arthritis	2	2.0
Atopic allergy	1	1.0
Diabetes	2	2.0
Fibroids	1	1.0
HIV/AIDS	6	5.7

BPE	2	2.0
Hypertension	9	6.7
Lymphoma	1	1.0
None	82	78.1
Rheumatoid arthritis	1	1.0

There was no statistical significance association between commodities and nutritional status (p=0.309) (Table 8).

Table 8: Proportions of Co-morbidities and malnutrition

	Nourished	Malnourished	Total	p-value
Comorbidity	12 (17.9)	10 (26.3)	22 (21.0)	0.309
No Comorbidity	55 (82.1)	28 (73.7)	28 (73.7)	

The mean BMI was 24.5 (SD=4.9) while mean mid upper arm circumference was 29.5cm (SD=4.8) mean triceps skin fold thickness (TSF) were 18.9 mm (SD=9.4). The majority (95.1%) of the patients had more than 10g/l, only 4.9% had less than 10g/l. Majority (66.7% (70)) of patient had more than 1.8 cells/ml of total lymphocytes count, thirteen (12.4%) has 1.6-1.8 cells/ml, fifteen (14.3%) had 0.9-1.5 cells /mls while seven (6.7%) had less than 0.9cells/ml.

Complication rates

The overall complication rate was 30.5%, majority (56.3%) of the complications were wound infections (Table 9).

Table 9: specific complications and their percentages

	Frequency	Percent of Cases (n=32)
Wound infection	18	56.3%
Wound dehiscence	6	18.8%
Pneumonia	3	9.4%
Urinary Tract Infection	3	9.4%
Intra-abdominal sepsis	3	9.4%
Septicaemia	2	6.3%
Bacteraemia	1	3.1%
Urinary incontinence	1	3.1%
Dyspepsia	2	6.3%
Seroma	4	12.5%
Perianal abscess	1	3.1%
Transient hypocalcaemia	1	3.1%
Transient Recurrent laryngeal nerve injury	2	6.3%
Cholangitis	1	3.1%
Scrotal haematoma	1	3.1%
Paralytic ileus	2	6.3%
Burst abdomen	1	3.1%
Diarrhoea	2	6.3%
Poor wound healing	1	3.1%

Recurrent laryngeal nerve injury	1	3.1%
Haematoma accumulation	1	3.1%

The complications were 20.9% of well-nourished and 47.4% of malnourished, while those without complications were 79.1% of the well-nourished and 52.6% of the malnourished. The p-value of Chi-square was p=0.005 on the association between complications and nutritional status of the patients. The mean length of stay was 8.6 (SD=8.4) days, while the median was 5 (IQR=6) days. There was statistical difference between those malnourished and those well-nourished on independent sample t-test with p-value of 0.001.

CHAPTER 5: DISCUSSION

Prevalence of malnutrition

In this study, the younger patients (35-44 years) accounted for the highest number of patients with malnutrition at 31.6% as compared to older patients (more than 65 years) at 13.2%. This is in contrast to what was reported by Wu G.H et al (20). Using a combined screening method i.e. SGA, MNA and anthropometric measures they showed that, older patients had higher prevalence of malnutrition at 47.6% as compared to younger patients at 31.6%. This could be explained by the fact that this study had smaller sample size with fewer patients above 65 years. Additionally, in this study we used SGA while it has been shown that MNA and MNA-SF performs better for elderly patients 65 years and above (7, 9, 10).

The overall prevalence of malnutrition in general surgical patients undergoing elective surgeries at KNH was at 36.2%. This was not different from studies elsewhere that has shown prevalence of malnutrition in surgical patients to be between 38.8% -63% (17, 20, 21, 23). This difference can be explained by the fact that prevalence was assessed using different tools. Wu G. H et al (20) using SGA to assess 1780 surgical patients, found a prevalence of 38.8%, Brunn et al (21) looking at 244 patients using BMI got 39%. Hill et al (17) using different anthropometric measures, laboratory measures, protein and vitamin body stores to asses one hundred and five patients, showed a malnutrition prevalence of 50% in surgical patients and Oshea et al using Mini-Nutritional assessment tool in 609 hospitalized older patients got 63% (23). As noted earlier in the literature review, difference tools have difference sensitivities in measuring nutritional status.

It was observed that severe malnutrition was more prevalent in patients afflicted by cancers than those with benign conditions (p value<0.05), being 25.5% for those benign and 63.8% for malignant disease. Wu et al got similar results with, 22.4% for benign and 64.5% for

malignant disease (20). Though they had larger sample size, they used similar tool and that can explain the finding.

A cross-sectional study by Wu G.H. et al found the rates of malnutrition of patients using the parameters of Mid-arm Circumference (MAC), Body Mass Index (BMI), lymphocyte count, and Triceps skin fold thickness (TSF), to be 20.5%, 21.3%, 55.8%, and 35.4%, respectively. This is different from the current study that found the prevalence of malnutrition using BMI, to be 7.6% MUAC and 0.0%. This could be due to the population screened and lack of standardized cut offs for MUAC in this population. MUAC given by WHO/GOK guidelines is less 18.5cm for diagnosis of malnutrition and less than 16cm for severe malnutrition. BMI has low sensitivity for picking up malnutrition and it is not recommended by ESPEN as a tool for screening and diagnosing malnutrition.

A Cameroonian study using BMI and MUAC to assess the nutritional status in 251patients, found a prevalence of 11.5% and 8.4% respectively. Their patient characteristic was similar to ours. This is different from our study that had much lower prevalence at 7.6% and 0% for BMI and MUAC respectively. They used a cut off value of 22cm and 23cm in men and women to interpret the MUAC values (40)

Complication rates in malnourished patients
The 30 days complication rate in this study was 30.5% of the patients screened. Complications in well -nourished patients accounted for 13.4% of the total complications while those in malnourished patients accounted for 17.1%. It was also found out that there was a positive association between nutritional status and complications (p=0.005). Using a bigger sample size of 608 and NRS-200 (validated tool), a Zurich study in 2005 found a lower overall complication rate. In that study, overall incidence of complication was 19%,

well-nourished patients accounted for 13.2% while malnourished accounted for 5.8% (39). The difference could be explained by the fact that they used a different tool and had a larger sample size.

In this study, 56.3% of the patients with post-operative complications were malnourished as compared to 43.7% who were well nourished. Commonest complication observed was wound infections. This was similar to the Zurich study (39).

Mortality

Only one patient died during the study period. The patient had cholangiocarcinoma and at laparotomy was found to have intra-abdominal abscess secondary to overstayed biliary stent. Patient subsequently developed severe sepsis and succumbed day 8 post-surgery. This patient was well nourished. This was not in keeping with other studies where higher mortality has been recorded. An observational Study by Offir B. et al on malnutrition in general surgical patients, reported higher mortality after 6 months to one year follow up. The study involved 100 (similar to our study) patients using MUST tool (34). This could be because our follow up was just 30 days where other studies have reported longer follow up periods (6-18 months). Also, part of our inclusion criteria was patient in ASA 1/2. This could have bias in omitting the most serious cases.

Length of hospital stay (LOS)

Poor nutritional status was associated with longer length of hospitalization. The mean hospital stay was 8.6 days. For well-nourished, mean LOS was 6.39 days and 12.53 days for malnourished. Malnourished patients stayed in the ward 6 days longer than well nourished. This was found to be statistically significant (p=001). This mirrored studies elsewhere (33, 35). Schiesser m et al screened 608 patients using NRS-200 found out that well-nourished patient's mean LOS was 5 days while nourished patients mean was 13 days (39). The German malnutrition study using SGA found similar results (38). This was a multi-Centre

involving 13 hospitals and 1886 patients. There was a significant longer LOS among the malnourished; on average 4.6 days.   An Australian study in 2009 (37) found malnourished patients had a significantly longer LOS by 4.5 days compared to well-nourished patients. Patients with a LOS of more than 30 days accounted for 7.6percentage in our study.

Study by Offir B. et al on malnutrition in general surgical patients, found out that, patients at risk of malnutrition and those already malnourished, had longer hospitalization and worse outcome. Malnourished patients had a significantly longer hospital stay of 18.8 days versus 7.0 days for patients without malnutrition risk. The study involved 100 patients using MUST tool (34). This is different from the current study. This could be due to their population sample that had a median age of 54 years, which was older than ours, which was at 41.1 years. As well as different screening, tool.

To the best of our knowledge, no local studies have been conducted before to assess the nutritional status in adult general surgical patients.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATION

6.1 Conclusion

About a third of the patients in our study were either mildly or severely malnourished, confirming that malnutrition in hospitalized patients is high. Epidemiologists define 'common disease' as having a prevalence above 10%. Malnutrition is therefore a prevalent disease and has association with longer length of stay and higher complications rates. Identifying patients at risk is easy and feasible. Screening for malnutrition should be performed on a routine basis using a validated tool. Malnutrition is problem that is under-reported, unrecognized untreated in most hospital setting. This has profound deleterious effects on patients' outcome as demonstrated in this study.

6.2 Recommendations

Nutritional assessment should be routinely be performed at in hospitalized patients on admission or shortly thereafter in an attempt to reduce nutrition-related complications.

Optimal nutrition treatment protocols should be set up in all hospital departments and form part of discharge summary plan.

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TIME FRAME

Activity	Jan	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019
Proposal development	██	██							
Ethical approval			██	██	██				
Data collection						██	██	██	
Data analysis and results write up									██
Presentation of results									

BUDGET

Budget Item	Amount (Kshs.)
KNH-ERC fees	2,000
Research assistant 1 research assistant at ksh 500@day	30,000
Airtime	3,000
Data entry clerk	4,000
Statistician fee	30,000
Stationery a) Printing b) Photocopying c) Binding d) Pens	20,000 10,000 15,000 500

Contingency fund	15,000
Total	**129,500**

APPENDICES

Appendix I: Informed Consent Form

STUDY TOPIC: prevalence of malnutrition and its impact on clinical outcome in elective general surgical patients at Kenyatta National Hospital**.**

This informed consent form is for patients planned to undergo elective general surgeries at KNH. I am inviting you to participate in this research on a voluntary basis.

Principal Investigator**:   Dr. Ali Kariuki**

Institution**:   University of Nairobi, School of Medicine, Department of Surgery.**

This Informed Consent Form has three parts:

1)   Information Sheet (to share information about the research with you).

2)   Certificate of Consent (for signatures if you agree to take part).

3)   Statement by the researcher.

You will be given a copy of the full informed consent form.

PART I: Information Sheet

Introduction

My name is Dr. Ali Kariuki, a post graduate student in General Surgery at the University of Nairobi. I am carrying out a research to determine the prevalence of malnutrition and its impact on clinical outcome in elective general surgical patients at KNH.

Study Purpose

Patients going for elective surgery are rarely assessed for their nutritional status which may lead to poor clinical outcomes due to malnutrition. Malnutrition may be present prior to surgery due to various reasons such as metabolic disorders from inflammatory or neoplastic disease, poor access to adequate nutrition, altered nutrient utilization of

nutrients or alimentary track dysfunction. This study seeks to determine prevalence of malnutrition and its impact on clinical outcome in patients undergoing elective general surgery. Results from this study will provide a much needed basis for a more stringent approach in nutrition monitoring in an attempt to reduce complications associated with malnutrition.

I will give you information regarding this study and request your participation in this study. You may ask any questions if you do not understand any terminology or need clarification at any point during this conversation.

Study procedures

The study will involve face to face interview with the you. Your nutritional status will be assessed within 24 hrs of your admission using the SGA tool. Athropometric measurements will be taken in the same sitting by me and or the research assistant. Other data relevant to this study will be retrieved from your medical records. Data will be collected via a printed questionnaire after obtaining your informed consent. You will then be followed up post operatively for upto 30 days and assessed for any complications arising from or associated with the surgery. You will be followed up after discharge through phone calls and you will be seen at surgical outpatient clinic during routine clinic follow up or at accident and emergency in case of emergency occurring within 30 days of initial surgical procedure. Phone calls will be done on day 14 and day 30 after surgery. The results of the study will be shared with clinicians at KNH general surgical wards ,clinics and as well as with the nutritionists for the purpose of improving nutritional assessment ,nutritional care practices and overall improvement of patients' care.

Voluntary Participation/Right to Refuse

It is your choice whether to participate or not. Whether you choose to participate or not, all the services you receive at this hospital will continue and nothing will change. If you choose not to participate in this research project, you will be offered the treatment that is routinely offered in this hospital for your condition. You have a right to refuse or withdraw your participation in this study at any point.

Confidentiality

The information obtained will be treated with confidentiality and only be available to the principal investigator and the study team. Your name will not be used. Any information about you will have a number on it instead of your name. We will not be sharing the identity of those participating in this research.

Sharing the Results

The knowledge that we get from this study will be shared with the policy makers in the Ministry of Health, KNH and doctors through publications and conferences. Confidential information will not be shared.

Risks and Discomfort

There is no direct risk resulting from your participation in the study, as your participation will be through interviews with the research team and allowing us to evaluate your test results.

Cost and Compensation

There will be no extra cost incurred for participating in this study nor is there compensation offered. However, your time will be required to participate in the interview.

This proposal has been reviewed and approved by UoN/KNH Ethics Committee, which is a Committee whose task is to make sure that research participants are protected from harm.

Contacts

If you wish to ask any questions later, you may contact:

1. Principal Researcher

Dr. Ali Kariuki

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 1081-20100,Nakuru.

Mobile no. 0721585944

Email: - alihkariuki@gmail.com

2.University of Nairobi Supervisors:

Dr. Daniel Kinyuru Ojuka

MBChB, MMED (Gen. Surgery), FCS (ECSA)

Consultant Surgeon/ Senior Lecturer,

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 19676 KNH, Nairobi 00202.

Tel:- 0202726300

Dr. Opot Elly Nyaim

MBCh.B, M.MED (Gen Surg.),

Consultant Surgeon/ senior Lecturer,

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 19676 KNH, Nairobi 00202.

Tel:- 0202726300

If you have any ethical concerns, you may contact:

Secretary,

KNH/UoN-ERC,

P.O. Box 20723 KNH, Nairobi 00202

Tel +254-020-2726300-9 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

PART II: Certificate of Consent

I have read the above information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant _____

Signature of Participant _____

Date _____

If Illiterate:

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

Print Name of witness

_____

Signature of witness

_____

Thumb print of participant

Date _____

PART III: Statement by the Researcher

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

**•	Refusal to participate or withdrawal from the study will not in any way compromise the care of treatment.**

**•	All information given will be treated with confidentiality.**

**•	The results of this study might be published to facilitate improving nutritional assessment, nutritional care practices and overall improvement of patients' care**

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

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

Name of researcher/person taking consent

_____

Signature of researcher/person taking consent

_____

Date_____

SWAHILI

Fomu ya Idhini

Utafiti: **Kuamua kiwango cha utapia mlo na madhara yake katika matokeo ya matibabu kwa wagonja waliolazwa kwa ajili ya kufanyiwa upasuaji katika kitengo cha upasuaji hospital kuu ya taifa ya Kenyatta**

Mtafiti: **Dkt. Ali Kariuki**

Kituo: shule ya afya, kitengo ya upasuaji. chuo kikuu cha nairobi

Fomu hii ya makubaliano Ina sehemu tatu

1. Habari itayokukusaidia kukata kauli

2. Fomu ya makubaliano(utakapo weka sahihi)

3. Ujumbe kutoka kwa mtafiti

Utapewa nakala ya fomu hii.

Sehemu ya Kwanza – Maelezo ya Daktari mtafiti**.**

Mimi ni Dkt Ali Kariuki, kutoka shule ya Elimu ya Afya idara ya upasuaji Chuo Kikuu cha Nairobi (University of Nairobi). Mimi nataka kufanya utafiti kuamua kiwango cha utapiomlo na madhara yake katika matokeo ya matibabu kwa wagonja waliolazwa kwajili ya kufanyiwa upasuaji katika kitengo cha upasuaji hospital kuu ya taifa ya Kenyatta .

Nia ya Utafiti Huu

Wagonjwa wanofanyiwa upasuaji huwa nadra kuchunguzwa hali yao ya lishe ambayo inaweza kusababisha matokeo duni ya matibabu kutokana na utapiamlo. Utapiomlo huenda ukawawepo kabla ya upasuaji kutokana na sababu mbalimbali kama vile kutopata lishe ya kutosha, saratani, ua shida ya njia/mfereji wa chakula. Utafiti huu utaamua kiwango cha utapiomlo na madhara ya kwa matokeo ya matibabu/upasuaji. Matokeo ya utafiti huu yatatoa msingi unaohitajika katika ufuatiliaji wa lishe katika jaribio la kupunguza matatizo yanayohusiana na utapiamlo . Unaweza kuuliza maswali yoyote kuhusu utafiti huu na ukiridhika tafadhali ijaze fomu ya idhini iliyo hapa chini.

Haki ya kukataa kushiriki utafiti

Unaweza ukachagua kutoshiriki katika utafiti huu, Na huduma zote utapewa pasi na pingamizi.

Uhusiano wako na wafanyikazi wa hopspitali hautatiwa mashakani iwapo utakosa kujihusisha na

utafiti huu. Ni uamuzi wako kama ungependelea kuendelea na utafiti.Uko na haki kamili ya kujitoa

katika utafiti wakati wowote unapoamua.

Tandhima ya Siri

Ujumbe kuhusu majibu yako yatahifadhiwa. Ujumbe kuhusu ushiriki wako katika utafiti huu

utawezekana kupatikana na wewe na wanaoandaa utafiti na wala si yeyote mwingine. Jina lako

halitatumika bali ujumbe wowote kukuhusu itapewa nambari badili ya jina yako.

Anwani za Wahusika

•Mtafiti: Dkt. Ali Kariuki

Idara ya Upasuaji ya Shule ya Afya – Chuo kikuu cha Nairobi,

Sanduku la Posta 1081-20100,Nakuru.

Nambari ya simu: 0721585944

•Walimu wakuu wa Chuo kikuu cha Nairobi

Dkt. Daniel Kinyuru Ojuka

MBCh.B, MMED (Gen. Surgery), FCS (ECSA)

Consultant Surgeon/Lecturer,

Department of Surgery, School of Medicine, University of Nairobi

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Tel:- 0202726300

•Dkt. Opot Elly Nyaim

MBCh.B, M.MED (Gen Surg.),

Consultant Surgeon/ senior Lecturer,

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 19676 KNH, Nairobi 00202.

Tel:- 0202726300

•Katibu wa utafiti, Hospitali kuu ya Kenyatta na Chuo kikuu cha Nairobi. Sanduku la Posta 20723 KNH, Nairobi 00202.

Nambari ya simu;+254-020-2726300-9. Ext 44355

Email:uonknh_erc@uonbi.ac.ke

SEHEMU YA PILI: Fomu ya makubaliano

Nimeelezewa utafiti huu kwa kina. NakubaIi kushiriki utafiti huu kwa hiari yangu. Nimepata wakati wa

kuuliza maswali na nime elewa kuwa iwapo nina maswali zaidi, ninaweza kumwuliza mtafiti mkuu au

watafiti waliotajwa hapa juu.

Jina la Mshiriki_____

Sahihi ya mshiriki _____

Tarehe_____

Kwa wasioweza kusoma na kuandika

Nimeshuhudia usomaji Na maelezo ya utafiti hii Kwa mshiriki, Na mshiriki alipewa nafasi ya kuuliza

maswali. nathibitisha kuwa mshiriki alipeana ruhusa ya kushiriki bila ya kulazimishwa.

Jina la shahidi_____

Sahihi la shahidi_____

Tarehe _____

Alama ya kidole cha mshiriki

Tarehe _____

SEHEMU YA TATU

Ujumbe kutoka kwa mtafiti

Nimemsomea mshiriki ujumbe kiwango ninayoweza na kuhakikisha kuwa mshiriki amefahamu yote

yanayohusika katika utafiti huu. Nimemueleza yafuatayo;

• **Kwamba kushiriki ni kwa hiari yake mwenyewe bila malipo.**

• **Kushiriki hakutasababisha madhara ama kuhatarisha maisha kamwe.**

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

Nahakikisha kuwa mshiriki alipewa nafasi ya kuuliza maswali na yote yakajibiwa vilivyo.Nathibitisha kuwa mshiriki alitoa ruhusa bila ya kulazimishwa.

Jina la mtafiti: _____

Sahihi ya Mtafiti /Anaechukua ruhusa_____

Tarehe _____

Appendix II: Study Questionnaire

STUDY SERIAL NUMBER: _____ TELEPHONE CONTACT: _____

DEMOGRAPHIC DATA

Age: _____   Gender: Male   ☐   Female   ☐

Level of education: None   Primary ☐   Secondary   ☐ Tertiary/University   ☐
                                                        ☐

Marital status: Single   ☐ Married   ☐ Widowed   ☐ Divorced   ☐

Occupation: None   ☐ Self-employed   ☐ Unemployed   Ret☐ ed   ☐

Residency   Rural ☐   Urban ☐

CLINICAL INFORMATION

Diagnosis: _____

Type of planned surgery: _____

Duration of surgery: _____

Operative blood loss: _____

Any transfusion given: Yes   ☐ No   ☐

Co-morbidities (specify): _____

Laboratory measurements

Haemoglobin _____   Total lymphocyte count_____

4. ANTHROPOMETRIC DATA

Weight: _____ (kg)   Height: _____ (cm)

Triceps Skin Fold: _____

Mid Upper Arm Circumference: _____

LIST OF COMPLICATIONS

Septicemia ☐   Intra-abdominal sepsis ☐   Fistulas ☐   Renal failure ☐

Urinary Tract Infection ☐ Pneumonia ☐ Wound Infection ☐ Wound Dehiscence ☐

Respiratory Failure ☐   Cerebrovascular Accident   Sho☐   ☐

Pulmonary Embolus ☐

Others (specify): _____

SUBJECTIVE GLOBAL ASSESSMENT FORM

MEDICAL HISTORY

Study Serial Number _____ **Telephone contact** _____

NUTRIENT INTAKE

No change; adequate

Inadequate; duration of inadequate intake _____

Suboptimal solid diet   Full fluids or only oral nutrition supplements   ☐

Minimal intake, clear fluids or starvation   ☐

Nutrient Intake in past 2 weeks*

Adequate   Improved but not adequate   No improvement or inadequate   ☐

WEIGHT   Usual weight _____   Current weight _____

Non fluid weight change past 6 months   Weight loss (kg) _____

< 5% loss of weight stability   5–10% loss without stabilization or increase   ☐

> 10% loss and ongoing   ☐

If above not known, has there been a subjective loss of weight during the past six months?

None or mild ☐   Moderate ☐ Severe ☐

Weight change past 2 weeks* Amount (if known) _____

Increased   No change   Increased   ☐

SYMPTOMS (Experiencing symptoms affecting oral intake)

Pain on eating   ☐ Anorexia   Vomiting   ☐ Nausea   ☐ Dysphagia   ☐

     Diarrhea ☐

56

Dental problems ☐   Feels full quickly ☐   Constipation ☐

None ☐ Intermittent/mild/few ☐ Constant/Severe/multiple ☐   ☐

Symptoms in the past 2 weeks*

Resolution of symptoms ☐ Improving ☐ No change or worsened   ☐

FUNCTIONAL CAPACITY (Fatigue and progressive loss of function)

No dysfunction

Reduced capacity; duration of change _____

Difficulty with ambulation/normal activities ☐ Bed/chair-ridden   ☐

Functional capacity in the past 2 weeks*

Increased ☐   No change ☐   Decreased ☐

METABOLIC REQUIREMENT

High metabolic requirement   No ☐   Yes ☐

PHYSICAL EXAMINATION

Loss of body fat	No ☐	Mild/Moderate ☐	Severe ☐
Loss of body muscle mass	No ☐	Mild/Moderate ☐	Severe ☐
Presence of edema/ascites	No ☐	Mild/Moderate ☐	Severe ☐

SGA RATING

☐ Well-nourished: Normal

☐ Mildly/moderately malnourished: Some progressive nutritional loss

☐ Severely malnourished: Evidence of wasting and progressive symptoms

CONTRIBUTING FACTOR

☐ **CHEXIA –** (fat and muscle wasting due to disease and inflammation)

☐ **RCOPENIA –** (reduced muscle mass and strength)

SUBJECTIVE GLOBAL ASSESSMENT GUIDANCE FOR BODY COMPOSITION

SUBCUTANEOUS FAT

Physical examination	Normal	Mild/Moderate	Severe
Under the eyes	Slightly bulging area	Somewhat hollow look, Slightly dark circles,	Hollowed look, depression, dark circles
Triceps	Large space between fingers	Some depth to fat tissue, but not ample. Loose fitting skin.	Very little space between fingers, or fingers touch
Ribs, lower back, sides of trunk	Chest is full; ribs do not show. Slight to no protrusion of the iliac crest	Ribs obvious, but indentations are not marked. Iliac Crest somewhat prominent	Indentation between ribs very obvious. Iliac crest very prominent

MUSCLE WASTING

Physical examination	Normal	Mild/Moderate	Severe
Temple	Well-defined muscle	Slight depression	Hollowing, depression
Clavicle	Not visible in males; may be visible but not prominent in Females	Some protrusion; may not be all the way along	Protruding/prominent bone
Shoulder	Rounded	No square look; acromion process may protrude slightly	Square look; bones prominent
Scapula/ribs	Bones not prominent; no significant depressions	Mild depressions or bone may show slightly; not all areas	Bones prominent; significant depressions
Quadriceps	Well defined	Depression/atrophy medially	Prominent knee, Severe depression medially

Interosseous muscle between thumb and forefinger (back of hand)**	Muscle protrudes; could be flat in females	Slightly depressed	Flat or depressed area

FLUID RETENTION

Physical examination	Normal	Mild/Moderate	Severe
Edema	None	Pitting edema of extremities / pitting to knees, possible sacral edema if bedridden	Pitting beyond knees, sacral edema if bedridden, may also have generalized edema
Ascites	Absent	Present (may only be present on imaging)	

- Well-nourished no decrease in food/nutrient intake; < 5% weight loss; no/minimal symptoms affecting food intake; no deficit in function; no deficit in fat or muscle mass **OR** *an individual with criteria for SGA B or C but with recent adequate food intake; non-fluid weight gain; significant recent improvement in symptoms allowing adequate oral intake; significant recent improvement in function; and chronic deficit in fat and muscle mass but with recent clinical improvement in function.

- Mildly/moderately malnourished definite decrease in food/nutrient intake; 5% - 10% weight loss without stabilization or gain; mild/some symptoms affecting food intake; moderate functional deficit or recent deterioration; mild/moderate loss of fat and/or muscle mass **OR** *an individual meeting criteria for SGA C but with improvement (but not adequate) of oral intake, recent stabilization of weight, decrease in symptoms affecting oral intake, and stabilization of functional status.

- Severely malnourished severe deficit in food/nutrient intake; > 10% weight loss which is ongoing; significant symptoms affecting food/ nutrient intake; severe functional deficit **OR** *recent significant deterioration obvious signs of fat and/or muscle loss.

Cachexia – If there is an underlying predisposing disorder (e.g. malignancy) and there is evidence of reduced muscle and fat and no or limited improvement with optimal nutrient intake, this is consistent with cachexia.

Sarcopenia – If there is an underlying disorder (e.g. aging) and there is evidence of reduced muscle and strength and no or limited improvement with optimal nutrient intake.

**   **In the elderly prominent tendons and hollowing is the result of aging and may not reflect malnutrition.**

Follow up questions after discharge

Weight

Bmi

Any readmissions within 30 days of initial surgery

 yes **no**

If yes, indicate reason for admission according to attending/admitting clinician

Recorded complications

Septicemia ☐ **Intra-abdominal sepsis** ☐ **Fistulas** ☐ **Renal failure** ☐

Urinary Tract Infection ☐ **Pneumonia** ☐ **Wound Infection** ☐ **Wound** ☐
Dehiscence

Respiratory Failure ☐ **Cerebrovascular Accident** ☐ **Shock** ☐

Pulmonary Embolus ☐

Others (specify): _____

Appendix III: Dummy Tables

DEMOGRAPHIC CHARACTERISTICS

	Frequency n (%)
Age (years)	
<18	
18-25	
26-35	
36-45	
46-55	
Above 55	
Gender	
Male	
Female	
Level of education	
None	
Primary	
Secondary	
Tertiary/University	

CLINICAL CHARACTERISTICS

	Frequency n (%)
Diagnosis	
Type of planed surgery	
Duration of surgery	
Operative blood loss	
Transfusion given	
Yes	
No	

ANTHROPOMETRIC DATA

	Frequency n (%)
BMI	
Percentage weight loss	
Triceps Skin Fold	
Mid Upper Arm Circumference	

LIST OF COMPLICATIONS

	Frequency n (%)

SGA RATING

	Frequency n (%)
Well-nourished: Normal	
Mildly/moderately malnourished	
Severely malnourished	