

**NUTRITION STATUS OUTCOMES OF ESOPHAGEAL, HEAD AND NECK CANCER
PATIENTS UTILIZING GASTROSTOMY TUBE AT KENYATTA NATIONAL
HOSPITAL, NAIROBI, KENYA**

Elizabeth Ndunge Kasimu

**A Thesis Submitted to the School of Public Health, Biomedical Sciences & Technology in
Partial Fulfillment for the Requirements of the Award of Master of Science Degree in
Medical Dietetics of Masinde Muliro University of Science and Technology**

JULY 2024

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Professor Gordon Nguka (PhD)

Department of Nutritional Sciences

School of Public Health Biomedical Sciences and Technology

Masinde Muliro University of Science and Technology

Signed _____ Date _____

Dr. Rose Shikuri (PhD)

Department of Nutritional Sciences

School of Public Health Biomedical Sciences and Technology

Masinde Muliro University of Science and Technology

Signed _____ Date _____

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Elizabeth Ndunge Kasimu

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Professor Gordon Nguka (PhD)

Department of Nutritional Sciences

School of Public Health Biomedical Sciences and Technology

Masinde Muliro University of Science and Technology

Signed _____ Date _____

Dr. Rose Shikuri (PhD)

Department of Nutritional Sciences

School of Public Health Biomedical Sciences and Technology

Masinde Muliro University of Science and Technology

Signed _____ Date _____

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DEDICATION

This thesis is dedicated to my beloved family, whose unwavering support has been my greatest strength. To my dear daughters, Kelsey and Keysha, your love and inspiration has been the driving force behind my perseverance. I extend my heartfelt gratitude to my diligent research assistants, whose dedication and hard work has been invaluable to this project. Lastly, I dedicate this work to all the patients diagnosed with esophageal, head and neck cancers. Your courage and resilience in the face of adversity are truly inspiring. May this research contribute to your journey towards a healthier life.

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ABSTRACT

Esophageal, head, and neck cancers present significant challenges in maintaining adequate nutrition due to the anatomical and functional impairments associated with these malignancies and their treatments. The aim of the study was to determine the nutrition status outcomes of esophageal, head and neck outpatients utilizing gastrostomy tubes at Kenyatta National Hospital. The study design was descriptive institutional-based cross-sectional with an analytical component and was carried out between October 2023 to March 2024 with a sample size of 103 outpatients. The study employed a purposive sampling with criterion technique. Nutrition data was collected using Patient Generated-Subjective Global Assessment tool (PG-SGA), with caloric intake from 24-hour recall. Socio-demographics, anthropometrics, biochemical parameters, and subcutaneous fat were recorded via a questionnaire. Statistical Package for Social Sciences version 25.0 was used for data analysis at 0.05 significance level. The Socio-demographic analysis revealed that Central region had the highest number of patients 54.4% (n=56) having esophageal, head and neck cancers. Gender distribution was 61.2% male and 38.8% female, with a mean age of 56.2 years. Majority (81.6%) of patients consumed less than 500 Kcal/day, below the European Society for Parenteral and Enteral Nutrition recommendations of 25-30 Kcal/kg/day for cancer patients, thus indicating a high risk of undernutrition. Protein intake was suboptimal, with 58.1% not meeting the minimum recommendations of 0.8 g/kg body weight. Malnutrition assessment revealed varying degrees of nutritional deficits among patients, with a significant association found between energy intake and nutritional status ($p=0.047$). The average Body Mass Index (BMI) was 18.03 ± 3.39 kg/m², with 56.3% underweight, 40.8% normal, and 2.9% overweight. In terms of muscle status, 31.1% had no abnormalities, 23.3% had mild, 22.3% moderate, and 23.3% had severe muscle wasting. According to PG-SGA, 34.0% had normal nutritional status, 45.6% mild and 20.4% were severely malnourished. Independent sample t-test was conducted to compare the mean BMI between patients consuming a modified diet and those consuming a normal diet. There was a significant difference in BMI scores between the two groups where the mean BMI for the modified diet group was 16.1 kg/m² (SD = 1.68), and for the normal diet group was 20.7 kg/m² (SD = 2.10). This difference was statistically significant, $t(101) = 8.95$, $p < 0.001$, indicating that patients on a modified diet had a significantly lower BMI compared to those on a normal diet. Furthermore, a Pearson correlation coefficient was computed to assess the relationship between food modification and BMI. The analysis revealed a strong, positive significant relationship, $r(101) = 0.694$, $p < 0.001$. PG-SGA indicated varied levels of malnutrition, highlighting the need for tailored nutritional interventions in cancer care. The findings show the need for establishing a multidisciplinary nutritional support and monitoring programs specifically tailored for esophageal, head, and neck cancer patients utilizing gastrostomy tubes. This will be crucial in improving the nutritional status, treatment outcomes, and overall quality of life for the patients, thereby addressing the critical issue of malnutrition among this vulnerable population.

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ABBREVIATION AND ACRONYMS

AIDS	:	Acquired Immune Deficiency Syndrome
ANOVA	:	Analysis of Variance
BMI	:	Body mass index
BW	:	Body Weight
CED	:	Mild Chronic Energy Deficiency
CEM	:	Chronic Energy Malnutrition
CRT	:	Chemotherapy
CTC	:	Cancer Treatment Centre
DXT	:	Deep Xray Therapy
EC	:	Esophageal cancer
ECOG	:	Eastern Cooperative Oncology Group
ERC	:	Ethical Review Committee
ESPEN	:	European Society of Parenteral and Enteral Nutrition
HNC	:	Head and neck cancer
HNCSCC	:	Head and Neck Squamous Cell Carcinoma
KNH	:	Kenyatta National Hospital
MCV	:	Mean Corpuscular Volume
MTRH	:	Moi Teaching and Referral Hospital
NACOSTI	:	National Commission of Science, Technology, and Innovation
NIS	:	Nutrition Impact Symptoms
PEG	:	Percutaneous endoscopic gastrostomy
PG-SGA	:	Patient generated-subjective global assessment
PI	:	Principal investigator
SCC	:	Squamous Cell Carcinoma
SGA	:	Subjective Global Assessment
SOPs	:	Standard Operating Procedures
SPSS	:	Statistical Package for Social Sciences
TCC	:	Texas cancer center
UON	:	University of Nairobi
WHO	:	World Health Organization

OPERATIONALIZATION OF TERMS

24-hour dietary recall	It is a structured interview designed to gather specific information about all the foods, drinks, and dietary supplements the respondent may have ingested over the previous 24 hours. It was used to determine energy intake to assess if a patient is meeting the daily caloric requirements.
Cancer Diagnosis	This is used to mean the type of cancer diagnosis and when the patient was diagnosed with the oesophageal or head and neck cancers.
Diet modification	This includes pureed or mashed foods so that the consistency changes for easy swallowing
Dysphagia	Difficulty in swallowing due to site of the tumour.
Nutrition status outcomes	Nutrition status outcomes in this study was used to define the results of nutrition care in different sessions of treatment. This was determined through checking anthropometric assessments i.e., weight and height to determine BMI. The nutrition indicators that measured the nutrition status outcomes were muscle wasting, loss of subcutaneous body fat and weight loss. The biochemical parameters which included haemoglobin, ferritin, pre-albumin, and albumin were used as comparative variables to nutrition status. These values were compared with normal ranges for reporting of any derangements.
Nutrition therapy	This was used in the study to mean the intake of foods and liquids that helped in treatment and healing with the main goal of achieving good support.
Nutrition-related complications	These were problems that affected intake of food when a

	patient undergoing cancer treatment and made them unable to achieve optimal nutrient intake. These complications included inflammation of the mouth, back of the tongue and food pipe, nausea, and vomiting.
Odynophagia	Pain while a patient is swallowing food or liquid because of the nature of the disease.
PG-SGA	Patient generated-subjective global assessment is a validated, standardized tool used primarily to assess nutritional status in patients, particularly those with cancer or other chronic conditions. In this study it included the following categories: - Changes in dietary intake, food modification, Nutrition impact symptoms, assessment of functional status, co-morbidities, metabolic demand physical examination and classification of malnutrition status categories.
Treatment Characteristics	This has been used to collectively include the duration the patient has been on treatment, type of gastrostomy and type of treatment.
Socio-demographic Characteristics	In this study these characteristics include: - Gender, Age, Marital Status, Religious beliefs, Education level, Income and region of residence.
Xerostomia	Dry mouth because of radiotherapy which negatively affects optimal daily caloric intake.

CHAPTER ONE

1.0 INTRODUCTION

This chapter discusses in depth the background information, statement of the problem, objectives, significance, justification, hypotheses, theoretical framework, and conceptual framework of the study. It sheds more light on the purpose of the research study and how it intends to accomplish the objectives of the study.

1.1 Background information of the Study

Esophageal cancer, one of the worst cancers with a 5-year survival rate of only about 17%, impacted more than 600,000 people globally in 2020 (Li *et al.*, 2021). Esophageal cancer new cases increased by more than 50% between 1990 and 2017. There were 440,000 fatalities from esophageal cancer in 2013 and 442,000 new cases (Odera *et al.*, 2017).

Esophageal and head and neck cancers pose substantial health issues throughout Africa, particularly in Sub-Saharan Africa, where they are important causes of cancer morbidity and mortality.

Esophageal cancer, particularly squamous cell carcinoma (ESCC), is one of the most common cancers in Africa, having some of the highest age-standardized rates in the world. For example, ESCC incidence and mortality rates in Kenya, Tanzania, and Malawi are frighteningly high when compared to other regions. The five-year survival rate for ESCC patients in Sub-Saharan Africa is extremely low, owing primarily to late-stage diagnosis, weak healthcare infrastructure, and inadequate treatment options (AfrECC, 2023). In many African countries, access to critical therapies such as chemotherapy, radiation, and surgery remains limited, particularly in rural areas. Head and neck cancers are also a concern in Sub-Saharan Africa, with tobacco and alcohol use, poor oral hygiene, and viral infections such as HPV all contributing to their high occurrence

(IARC, 2022). However, like esophageal cancer, survival rates are frequently low due to delayed diagnosis, limited cancer care resources, and a lack of understanding about prevention and early detection. Overall, the cancer burden in Africa is predicted to increase significantly in the coming years. The Lancet Oncology Commission predicts that cancer-related fatalities in Sub-Saharan Africa would nearly double by 2030 unless significant advances in cancer prevention, early detection, and treatment are achieved (IARC, 2022).

Kenya is one of the leading countries when it comes to the incidence rates of esophageal cancer in the continent with a marked rate of 17.6 per every 100,000 citizens. Kenya is among the incidence regions commonly referred to as Africa's esophageal cancer (EC) corridor (Asombang *et al.*, 2019). The term "head and neck cancer" (HNC) refers to a variety of malignant tumours that appear in or around the mouth, nose, sinuses, throat, or larynx (Gilyoma *et al.*, 2015). With 890,000 new cases and 450,000 fatalities in 2018, head and neck squamous cell carcinoma is the sixth most prevalent malignancy worldwide (Ferlay, 2018). According to GLOBOCAN (gco.iarc.fr/today), the incidence of HNSCC will continue to rise and will likely increase by 30% (1.08 million new cases yearly) by 2030. Laryngeal, hypopharyngeal, nasal cavity, paranasal sinus, and thyroid cancer are the five primary kinds of head and neck cancer and others include the nasopharynx, mouth, oropharynx, and the salivary glands. Oral intake maybe affected by both EC and HNC, and most cases require gastrostomy insertion for feeding.

To stop weight loss caused by the disease as well as the treatment for EC and HNC, nutritional therapy is crucial. Additionally, malnutrition before and throughout therapy for EC and HNC indicates a worse chance of survival (Orell *et al.*, 2019). Although toxicity has been a concern,

chemotherapy and radiotherapy have demonstrated improved cancer outcomes in the treatment of HNC (Lo Nigro et al., 2017). Treatment interruptions due to undernutrition brought on by severe mucositis, dysphagia, and odynophagia lower quality of life (Cristofaro *et al.*, 2021) treatment efficacy and affect the nutrition status outcomes.

Post-biopsy or before therapy, patients with head/neck and oesophageal tumours may report food sensitivities. This could also be a result of the tumor's location or inflammation of the mucous membranes lining the mouth, throat, and esophagus, which could lead to symptoms like severe discomfort, xerostomia (dry mouth), altered taste, and a higher risk of oral infections (Sroussi *et al.*, 2017). Cancer treatment programs may be disrupted and hunger and dehydration may occur. *“It hurts to eat, even water aches to swallow, my mouth and throat are on fire, and it feels like I'm swallowing blades”* are the most common complaints of people suffering from severe mucositis. Chemotherapy, surgery, and radiotherapy treatments can have adverse effects that are connected to diet. Oral feeding and enteral feeding such as percutaneous endoscopic gastrostomy are common feeding methods applied (Johannes *et al.*, 2019).

When the treatment field for radiation therapy involves the mouth, throat, or mediastinum, it may result in mucositis or esophagitis (Baker & Fairchild, 2016). Mucositis is more likely to affect the mouth's floor, soft palate, lips, and cheeks. By advising non-irritating, nutrient-dense diets, and fluids, the nutritional goal is to provide appropriate hydration and maintain or enhance overall nutritional status (Talwar *et al.*, 2016). More aggressive nutritional support is required, especially for patients with grade 4 dysphagia, as patients with severe mucositis of the mouth, throat, and esophagus may find it too uncomfortable and difficult to eat.

After a careful evaluation of the available information, a huge gap regarding the local nutrition care protocols for EC and HNC patients exists because the nutrition care guidelines available in the country are based on studies majorly conducted outside Africa. The studies are done in America, Europe and Asia informing the development of the nutrition care protocols with minimal nutrition data available in the Kenyan context. Therefore, this research was necessitated by scanty information on these types of cancers whose anatomical and functional impairments are associated with need to use alternate route of feeding and predisposes these patients to severe malnutrition. There is also a surge of EC and HNC in the country. This research is therefore, aimed at gathering evidenced based information on nutrition status outcomes and use of gastrostomy tube feeding among EC and HNC patient care.

1.2 Problem statement of the Study

The Global Cancer Observatory projects that the incidence of head and neck squamous cell carcinoma (HNSCC) will keep rising, with an anticipated 30% increase to about 1.08 million new cases annually by 2030 (gco.iarc.fr/today) while esophageal cancers burden continue to increase with Kenta leading at an incidence rate of 17.6 per 100,000 persons (Asombang *et al.*, 2019). In 79% of patients with esophageal, head and neck cancer, malnutrition develops. These patients thus represent the most nutritionally challenged subset of cancer patients. Upon diagnosis, dysphagia and a weight loss of more than 10% already exists. Kenya is one of the few nations that is located on the EC corridor in Africa, meaning that the country is burdened by the disease. The Eastern and Western Rift Valley is said to have the highest EC incidences in Africa (Odera *et al.*, 2017), but research on EC in Kenya has received very little attention. A distinctive feature of EC in Kenya is the large proportion of young cases is below 30 years of age which is a very productive age bracket that contributes heavily to the national economy. According to a study conducted at Moi teaching

referral, patients with DXT radiation alone had a maximum one-year survival rate. When combined with chemotherapy, there was a maximum survival of two years and a median survival of 12 to 20 months. With over 48 million people, Kenya still lacks the medical professionals needed to keep up with the 40,000 new instances of cancer that are diagnosed each year. It's reported that as at 2014 the country had only 25 oncologists, 14 physicians, 4 radiation oncologists, 6 medical oncologists and 4 paediatric oncologists (Joab *et al*, 2017; (Orel *et al.*, 2019).). The fact that nutritionists were not listed means that there's a gap in the nutrition care. The gap widens when it comes to information and protocol much needs to be done so to comprehend the complexities and mechanisms involved in esophageal cancer and head and neck to create preventative and treatment plans. Nutrition care is an integral component in EC and HNC treatment. Secondly, over 50% of patients with EC and HNC present with dysphagia grades 3 and 4. Dysphagia and odynophagia pose a higher risk of underfeeding, hence necessitating the insertion of a gastrostomy tube which has a direct impact on the overall nutrition care outcomes (Orel *et al.*,2019).) The disease burden of EC and HNC can be attributed to increased prevalence in Kenya. Failure to identify malnutrition early because of the low uptake of Patient-Generated Subjective Global Assessment (PG-SGA) which is a reported tool used to evaluate cancer patients' nutritional status has led to poor survival rate and poor nutritional outcomes.

Pretreatment factors including the illness stage, tumor site, and intra-treatment factors like weight loss during treatment are reliable predictors for the need for gastrostomy tube insertion, as well as the proportion of patients who require them and the timing of their placement. The use of gastrostomy tubes has been reported to promote a longer period of non-oral feeding due to deconditioning of the deglutition muscles. Concerns have also been expressed about premature

removal, wound infection, and other complications like leakage, aspiration, and peritonitis. Tumor implantation, gastric perforation, gastric bleeding, and gastrocolic fistula are fewer common complications. Patients with head and neck cancer are often nutritionally depleted. Factors that contribute to this depletion include dysphagia, odynophagia, cachexia associated with cancer, and the morbidity associated with surgery, chemotherapy, and radiation therapy. These factors contribute to a 10% or greater loss of baseline body weight during treatment. Malnutrition can lead to a worse prognosis for patients with head and neck cancer, so gastrostomy tube feeding is essential to meet their nutritional needs. Hence, Patients with head and neck cancer who are undergoing resection, radiotherapy, chemoradiotherapy, or a combination of these treatments require nutritional support prior to treatment, which may include the placement of a prophylactic gastrostomy feeding tube (Douglas *et al.*, 2000).

Therefore, the aim of the study was to explore the nutritional care outcomes and nutritional management techniques of patients with head and neck cancer undergoing radiotherapy and/or chemotherapy treatment sessions and to suggest approaches for enhancing their clinical and nutritional outcomes. Patient Generated-Subjective Global Assessment (PG-SGA) has been proved globally as an efficient tool for assessing nutrition status and identify cancer patients at risk of malnutrition (Thibault *et al*, 2021). However, this tool has not been adopted in management of cancer patients in Kenya. A lot has been done on the guidelines for treatment but there is limited information on feeding protocol for these patients and Patient-Generated Subjective Global Assessment tool for nutrition assessment of cancer patients has not been properly used in Kenya.

1.3 Objectives of the Study

1.3.1 Broad Objective

To determine the nutrition status outcomes of esophageal, head and neck cancer patients utilizing gastrostomy tube at Kenyatta National Hospital, Nairobi, Kenya

1.3.2 Specific Objectives

The specific objectives of the study will be to;

- i. Establish the socio-demographic, cancer diagnosis and treatment characteristics among esophageal, head and neck cancer patients utilizing a gastrostomy tube in Kenyatta National Hospital
- ii. To determine the energy and protein intake of esophageal, head and neck cancer patients utilizing a gastrostomy tube in Kenyatta National Hospital
- iii. To determine the nutritional status of esophageal, head and neck cancer patients utilizing a gastrostomy tube using anthropometrics, biochemical indicators and PG-SGA among esophageal, head and neck cancer patients at Kenyatta National Hospital
- iv. Establish association between energy intake and nutritional status outcome of patients diagnosed with esophageal, head and neck cancer utilizing a gastrostomy tube at Kenyatta National Hospital
- v. Determine the relationship between food modification and nutritional status of esophageal, head and neck cancer patients utilizing a gastrostomy tube at Kenyatta National Hospital

1.4 Research Questions

- i) What are the demographic cancer diagnosis and treatment characteristics among esophageal, head and neck cancer utilizing a gastrostomy tube patients in Kenyatta National Hospital?
- ii) What is the energy and protein intake of esophageal, head and neck cancer patients utilizing a gastrostomy tube in Kenyatta National Hospital?
- iii) What is the nutritional status of the esophageal, head and neck cancer patients utilizing a gastrostomy tube using anthropometric and biochemical indicators at Kenyatta National Hospital?

1.5 Hypotheses

1.5.1 Null Hypothesis

- i. H_0 : There is no association between energy intake and nutritional status outcome of patients diagnosed with esophageal, head and neck cancer utilizing a gastrostomy tube at Kenyatta National Hospital
- ii. H_0 : There is no relationship between food modification and nutritional status of esophageal, head and neck cancer patients utilizing a gastrostomy tube at Kenyatta National Hospital

1.6 Justification of the Study

The need for research on patients with esophageal, head, and neck cancer using a gastrostomy is in tandem with the Global Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-Being), which places an emphasis on lowering the premature death rates from non-communicable diseases through better patient care and treatment. In order to improve cancer therapy, SDG 9 (Industry, Innovation, and Infrastructure) encourages scientific research and technical innovation. By addressing differences in cancer patients' treatment and nutrition, SDG 10 (Reduced Inequalities) seeks to provide equitable access to healthcare. In order to improve results

for all patients, SDG 17 (Partnerships for the Goals) promotes international cooperation in research and healthcare (United Nations, 2015).

African Agenda 2063 prioritizes sustainable development, equitable growth, and raising living standards throughout the continent. Concerning this study, it highlights the importance of improving healthcare systems, tackling health disparities, and encouraging scientific research and innovation. This contributes to greater health and well-being, which is a major objective of Agenda 2063, by enhancing nutritional support and treatment outcomes for cancer patients (African Union, 2015).

The objectives of Kenya's Universal Health Coverage (UHC) and BETA Health Strategic Plan aim at managing non-communicable diseases like cancer, guarantee fair access, and enhance healthcare delivery. They place a strong emphasis on developing health systems, encouraging all-encompassing treatment, and encouraging innovation and research. These strategies are in tandem to this study because this study emphasizes the significance of timely and equitable healthcare access, complete nutritional support, and focused treatments to enhance patient outcomes and quality of life. Therefore this study focuses in operationalization of the Kenya Health Policy 2017-2030 which aims to achieve a healthy nation by ensuring equitable, affordable, and high quality health services (MOH, 2018). It also supports the integration of comprehensive nutritional care for cancer patients into the health system through the following strategies, the Kenya National Cancer Control Strategy (2017-2022), the Kenya Nutrition Action Plan (2018-2022), Kenya Vision 2030 and Universal Health Coverage (MOH, 2023). In relevance to this study, it underscores the importance of specialized nutritional support and interventions in managing chronic conditions,

ensuring these cancer patients receive adequate and effective nutritional care to improve their treatment outcomes and overall well-being.

1.7 Significance of the Study

The findings of this study will guide healthcare professionals in preventing undernutrition in patients diagnosed with esophageal, head & neck cancers utilizing gastrostomy tube and thus enhancing their nutritional status. Additionally, the study would also be useful in the prevention of undernutrition, efficient and effective categorization of cancer patients at risk of malnutrition, provision of essential data for operationalization of the Patient-Generated Subjective Global Assessment tool for nutrition screening among cancer patients, direction in the management of cancer, and to aid in the development of standard operating procedures and management of malnutrition. This study is therefore of great importance to the following beneficiaries:

Table 1. 1: Beneficiaries of the Study

BENEFICIARIES	HOW THEY WILL BENEFIT
Policymakers	To improve and/or develop policies, guidelines, and protocols in clinical nutrition during nutrition management for cancer patients utilizing PEG
Researchers	Further research opportunities from the findings that will emerge from the study and resource repository.
Registered Nutritionists/Dieticians	Availability of data/information that can be used to Improve the nutrition status outcomes for patients with EC and HNC cancers with PEG tubes in situ
Learning Institutions	To help identify gaps in the curriculum and actual subject content.
Hospitals/Healthcare Institutions	Avail data that can be used to Improve and harmonize nutritional care/improved healthcare/ better quality of life for cancer patients Improved treatment indicators/outcomes through better nutritional care and improving quality of life for EC and HNC patients.
Ministry of Health	Development/improvement of Guidelines, protocols and policies.

1.8 Scope of the Study

This study aimed at evaluating the nutritional status outcomes of esophageal, head, and neck cancer patients at Kenyatta National Hospital. The scope encompassed a detailed assessment of the nutritional profiles of 103 respondents, including their dietary intake, anthropometric measurements and biochemical markers. The research investigated the patients at risk of malnutrition using PGSGA, identified specific nutritional deficiencies, and examined the correlation between nutritional status and treatment outcomes. By focusing on this patient population, the study provided insights that could inform nutritional interventions and support strategies to improve patient care and recovery. The study was carried out for a period of six

months with a sample size of 103 patients using cross-sectional study design with an analytical component. It took place in Kenyatta National Hospital. Research assistants with nutrition qualification background were recruited for the study.

1.8.1 Limitations

There was possibility of recall bias from data collected from 24-hr dietary recall. During questionnaire administration I exhaustively asked the patients questions and obtained as much information as possible. To address the possible limitations or bias in this study, a purposive sampling approach with criterion-based selection was used to include only patients meeting specific criteria relevant to the research objectives, ensuring the sample was precisely aligned with the study's goals and enhancing the accuracy and relevance of the findings. Secondly, the sample size of 103, enhanced the study's statistical power by focusing on patients with esophageal, head, or neck cancer using gastrostomy tubes, making the findings more reliable and relevant to the research objectives. A descriptive institution-based cross-sectional study with an analytical component was ideal for assessing the nutritional outcomes of esophageal and head & neck cancer patients utilizing gastrostomy at KNH. This analytical component allowed for examining associations between factors like energy intake, food modification and nutritional status, therefore, minimizing bias by enabling comparison and control for confounders.

1.8.2 Delimitations

The present investigation was restricted to individuals aged 18 years or older who were receiving treatment at Cancer Treatment Centre, Kenyatta National Hospital diagnosed with esophageal, head and neck cancer. Consequently, conclusions could only be extrapolated to populations and geographic areas that shared similarities with the study population.

1.9 Theoretical Model

The Health Belief Model (HBM) serves as the theoretical foundation for this study. Originating in the 1950s by psychologists at the US Public Health Service, the HBM forecasts a wide array of health-related behaviors, particularly those requiring sustained behavior maintenance, such as adherence to nutritional regimens in chronic illness management. The model focuses on various constructs, including perceived severity, perceived threat, perceived benefits, perceived barriers, modifying variables, cues to action, and self-efficacy, all of which influence health behaviors (Rosenstock & Irwin, 1974). In this study, the HBM constructs are applied to understand the factors influencing the nutritional status of patients with esophageal, head, and neck cancers who are using gastrostomy tubes.

Perceived severity- It is the subjective evaluation of the seriousness of a health issue and its possible effects. The HBM postulates that people who consider a particular health issue to be significant are more likely to take action to stop the issue from arising (or lessen its severity). Perceived seriousness includes perceptions of the disease itself, such as whether it is fatal or may result in disability or suffering, as well as more general effects of the condition on performing social and professional responsibilities (Janz *et. al*, 1984). This is how it was used in this study to illustrate how well the ECOG performed and how the sample size functioned. Most esophageal, head, and neck cancer patients believe that these illnesses will have significant financial consequences and as a result absenteeism from work for several days will lead to them perceiving that it's a serious condition.

Perceived threat- This term refers to the intersection between perceived severity and perceived susceptibility. Knowledge of the condition has an impact on perceptions of its severity and

susceptibility to a medical diagnosis. According to the HBM, people are more likely to participate in behaviors that promote their health when they perceive a greater threat.

Perceived benefits- The perceived advantages of acting are another factor that affects health-related behaviors. The term "perceived benefits" refers to a person's evaluation of the benefit or effectiveness of engaging in a behavior that promotes health in order to lower their risk of disease. Regardless of the objective facts regarding the action's efficacy, a person is likely to act in a certain way if they think doing so will lessen their vulnerability to a health problem or the severity of it. To prevent malnutrition, slow disease progression and enhance treatment outcomes, for instance, a patient with grade four dysphagia will opt to have a gastrostomy feeding tube placed.

Perceived barriers- Play a role in health-related behaviors. This encompasses how a person perceives the impediments to behavioral change. For behaviour change to occur, the perceived benefits must outweigh the perceived barriers; which include cost, and adverse effects of a medical procedure/treatment e.g., in this study the side effects of chemotherapy, radiotherapy, pain, and emotional disturbance of having a cancer diagnosis.

Modifying variables- The HBM contends that altering variables modify perceived severity, susceptibility, advantages, and barriers, which in turn modify health-related behaviors indirectly. Individual traits, such as demographic, psychological, and structural variables, might have an impact on how health-related actions are regarded (i.e., their perceived seriousness, susceptibility, advantages, and barriers). Age, sex, race, ethnicity, and education are some examples of demographic factors.

Cues to action- According to the HBM, engaging in behaviors that promote health requires a cue, or trigger. Both internal and external cues can prompt action. Internal signals to action are an example of physiological cues, such as pain and discomfort. Events or information from family

members, friends, the media, or medical professionals are examples of external cues. To-come-again (TCA) dates for a patient's review, a friend's or family member's illness, media campaigns on health issues, and product health warning labels are a few examples of cues to action.

Self-efficacy- In 1988, self-efficacy was added to the HBM's original four elements—perceived vulnerability, severity, benefits, and barriers. An individual's perception of his or her capacity to carry out a behavior successfully is referred to as self-efficacy. The HBM now includes self-efficacy in an effort to better account for individual variations in health behaviors. The model was initially created to explain involvement in one-time health-related actions like getting a cancer screening or getting vaccinated. Later, the HBM was used to change more significant, long-lasting behaviors like smoking, exercise, and food modification.

In summary based on the study's specific objectives this is how HBM forms theoretical basis for this research:-

- i) **Establish the demographic, cancer diagnosis, and treatment characteristics among esophageal, head, and neck cancer patients utilizing a gastrostomy tube in Kenyatta National Hospital:-** This objective corresponds to the "Perceived Susceptibility" and "Perceived Severity" constructs. Understanding the demographics and treatment characteristics helps in assessing how susceptible patients feel to nutritional concerns and the severity of their diagnosis.
- ii) **To determine the energy and protein intake of esophageal, head, and neck cancer patients utilizing a gastrostomy tube in Kenyatta National Hospital:-** This aligns with "Perceived Benefits" and "Perceived Barriers." By determining energy and protein intake, the stu

dy can highlight the benefits of adequate nutrition and potential barriers patients face in meeting their nutritional needs.

iii) **To determine the nutritional status of esophageal, head, and neck cancer patients utilizing a gastrostomy tube using anthropometric and biochemical indicators at Kenyatta National Hospital:-**

This objective pertains to "Perceived Benefits" and "Cues to Action."

By assessing the nutritional status, the study provides evidence of the benefits of monitoring and improving nutrition, acting as a cue for patients and healthcare providers to take action.

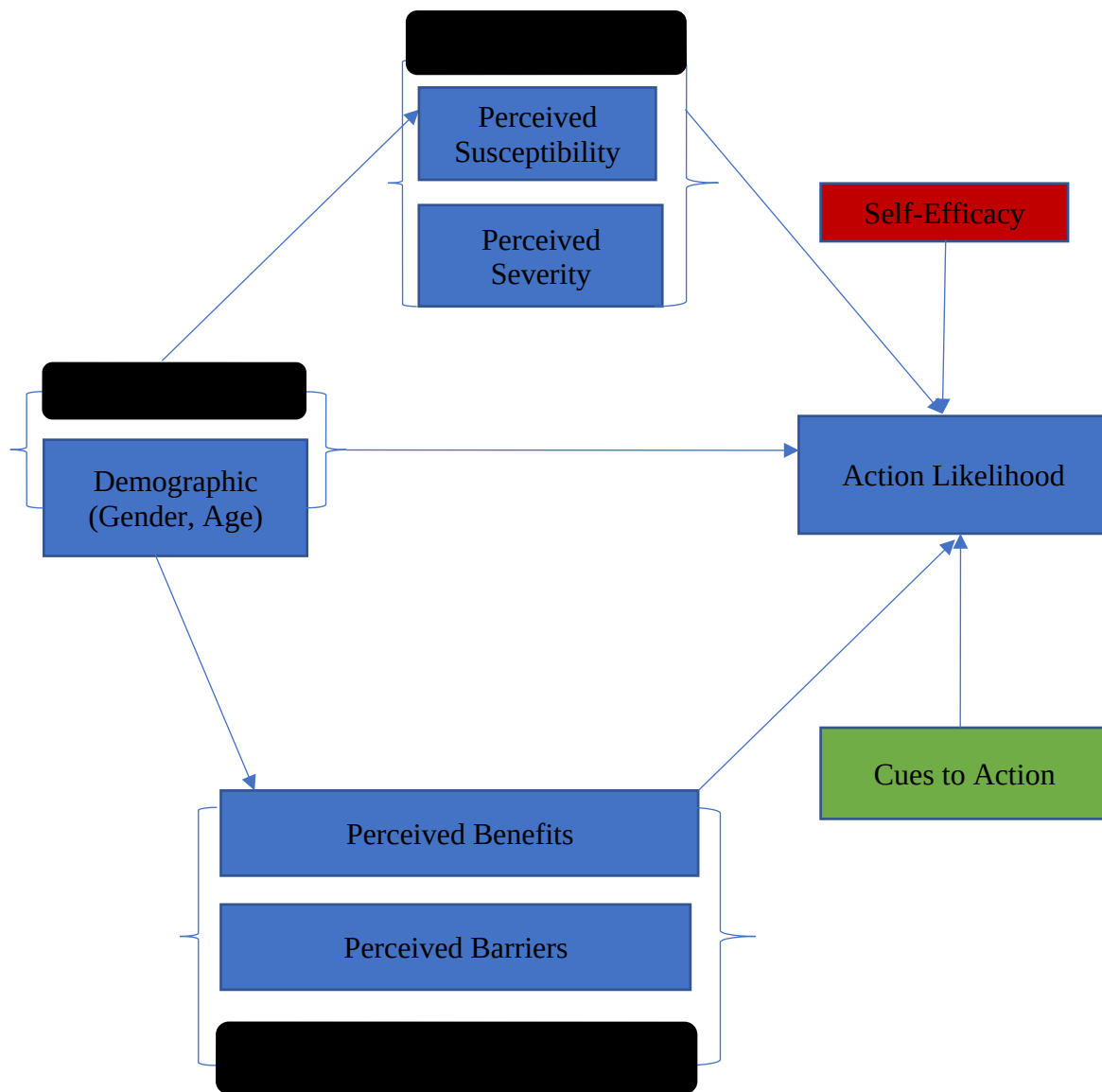
iv) **Establish the association between energy intake and nutritional status outcome of patients diagnosed with esophageal, head, and neck cancer utilizing a gastrostomy tube at Kenyatta National Hospital:-**

This relates to "Perceived Benefits" and "Self-Efficacy." Demonstrating a clear association between energy intake and nutritional outcomes can empower patients to believe in their ability to improve their nutrition and health.

v) **Determine the relationship between food modification and nutritional status of esophageal, head, and neck cancer patients utilizing a gastrostomy tube at Kenyatta National Hospital:-**

This ties to "Perceived Benefits," "Perceived Barriers," and "Self-Efficacy."

Understanding the impact of food modification on nutritional status can elucidate the benefits and barriers of dietary adjustments, thereby boosting patients' confidence in managing their nutrition.



Adopted and modified: Social Scientists at the U.S Public Health Service (1950)

Figure 1. 1: Theoretical model

1.10 Conceptual framework

The goal of this study's conceptual framework is to clarify the connections between each of the variables affecting the nutritional status outcomes of esophageal, head, and neck cancer patients at Kenyatta National Hospital. At the core of this framework are the independent variables: energy intake and food modification, which directly impact the nutritional well-being of the patients. Energy intake refers to the amount of caloric consumption, while food modification encompasses dietary adjustments made to meet the patients' nutritional needs.

Intervening variables, such as the type of cancer, the period since diagnosis, and specific characteristics of cancer treatment (including the type and duration of gastrostomy and overall treatment regimen), are anticipated to mediate the relationship between the independent variables and the dependent variables. These intervening variables play a crucial role in modifying the effects of dietary intake and food modifications on nutritional outcomes.

The dependent variables in this study include key nutritional status indicators such as weight changes, weight loss, BMI changes, and biochemical indicators. These metrics will be used to assess the overall nutritional health of the patients. By examining these relationships, the conceptual framework aims to provide a comprehensive understanding of how energy intake and food modifications, moderated by cancer type and treatment specifics, influence the nutritional status of cancer patients, ultimately guiding targeted nutritional interventions and improving patient outcomes.

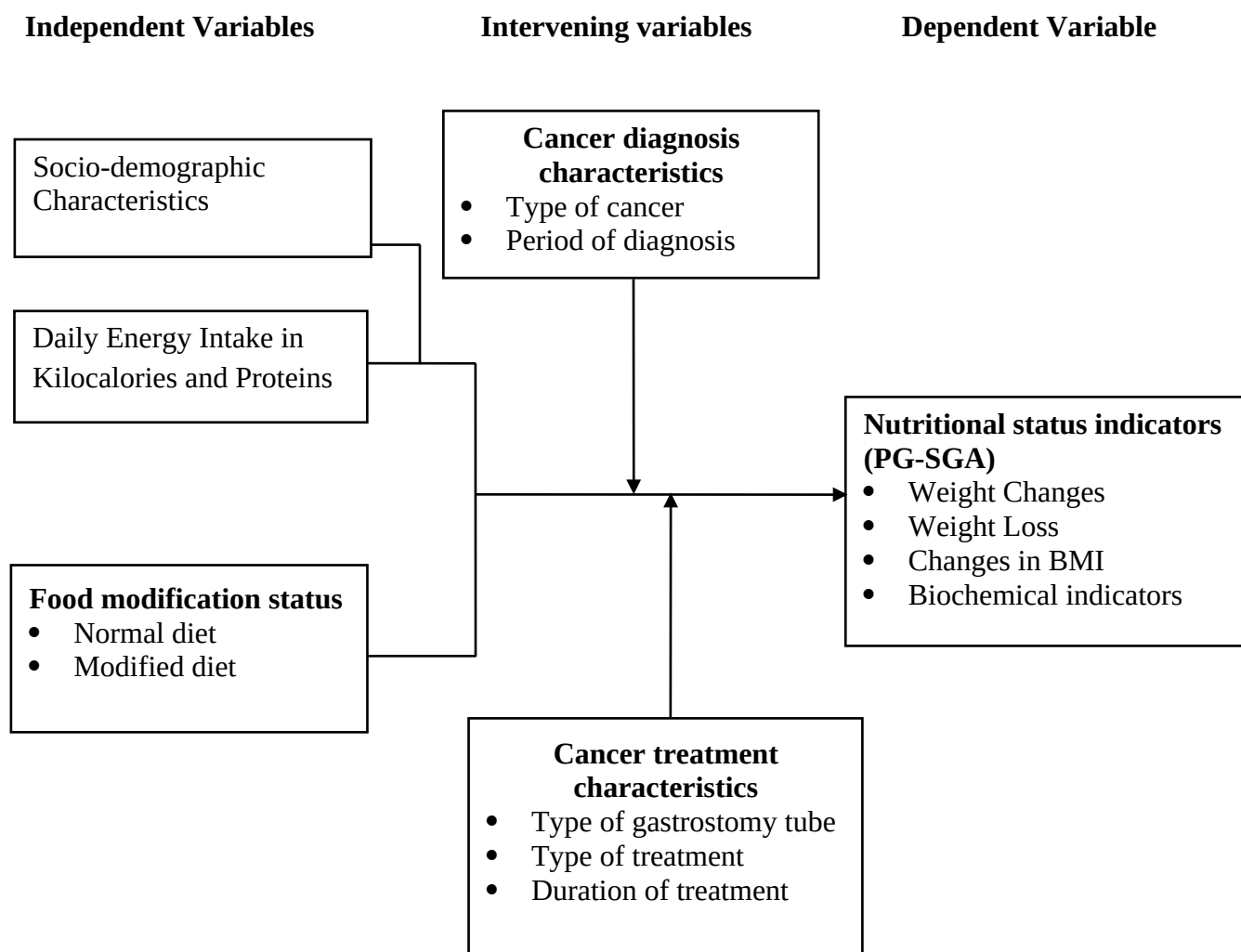


Figure 1. 2 : Conceptual Framework

Source: Adopted from UNICEF, 1991 and modified for this study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter gives a summary of earlier studies on intranets and knowledge sharing. The study's framework, which includes the primary emphasis of the research, is presented in this part. Surveys from earlier research that are related to the subject have been included in the literature evaluation.

2.1 Demographic, Cancer Diagnosis and Treatment Characteristics of Esophageal, Head and Neck Cancer Patients

Globally, there is a fresh diagnosis of more than 890,000 instances of worldwide incidence of esophageal and gastro-esophageal cancer (Ferlay, 2018). Less than 20% of patients survive for longer than five years, which is a dismal long-term survival rate. According to a retrospective study on the nutrition status and management and clinical outcomes in patients with esophageal cancer conducted in Liverpool, the study concluded that these patients present with a substantial amount of weight loss, which persists on during their anti-cancer treatment. The researchers recommended the need to develop a standardized protocol of nutrition management for esophageal cancer patients, especially those from culturally and linguistically diverse backgrounds. The study had 69 patients and 80% of them were assessed as malnourished. Over 500,000 cancer deaths are attributed to it each year, making it the sixth most common cause of cancer mortality (Bray *et al.* 2018).

In the opinion of Junjie *et al* (2021) after conducting a study on the global burden, risk factors, and trends of esophageal cancer in 48 countries the findings were; 572,034 new cases of esophageal cancer in 2018, with an incidence of 6.3 per 100,000 people, indicating a roughly 13-fold variation

globally. Eastern Asia, Eastern Africa, Southern Africa, and Northern Europe recorded the greatest rates, while Latin America, Western Africa, Northern Africa, and Western Asia recorded the lowest rates. Males experienced this spatial disparity more severely than females. In every location, male incidence rates were higher than female incidence rates. With a notable rate of 17.6 cases for every 100,000 residents, Kenya is one of the top nations on the continent when it comes to esophageal cancer incidence rates (Asombang *et al.*, 2019).

Chemo-radiotherapy has improved head and neck cancer and EC patient outcomes, but toxicity is still a significant issue. Because of undernutrition, mucositis, dysphagia, and odynophagia, treatment disruptions and a poor quality of life may develop. Many patients are given gastrostomy tubes to help with feeding while receiving CRT. The best time to insert PEG in patients receiving CRT is still up for debate (McClelland *et al.*, 2018). A comparative study on clinical outcomes in patients with head and cancer patients utilizing prophylactic versus reactive nutrition support recommended prophylactic gastrostomy to yield improved nutrition outcomes and minimized hospital admissions (Brown *et al.*, 2018). However, the study concluded that further research on the features of the patients who utilize feeding tubes or have minor weight loss needs to be done to sharpen and improve the technique. This widens the nutrition gap in nutrition outcomes in EC and HNC cancer utilizing a gastrostomy tube hence the importance of carrying out this study.

The care of esophageal, head, and neck cancer must include nutritional support and intervention. The typical (oral) food intake is impacted by the locations of the tumors in these cancers. Most patients receiving therapy for esophageal, head, and neck cancer require nutritional care, and patients can be emaciated when they are first seen. To avoid or restrict weight loss, retain lean body

mass, reduce treatment delays and unanticipated hospitalizations, and enhance treatment outcomes, the main nutrition goal for EC and HNC patients is to maximize nutrient intake, either orally or through nutrition support therapy.

This study contributes to the development of more evidence-based nutrition management strategies for esophageal cancer patients and head and neck cancer patients using a prophylactic or reactive gastrostomy tube. For the treatment of esophageal and gastro-intestinal malignancies, there are standard recommendations and protocols. This study focuses on patients with head and neck cancers and esophageal cancer, and it will provide nutrition management information to help these patients improve their quality of life and treatment outcomes.

2.2 Energy Intake and Protein Intake of Esophageal, Head and Neck Cancer Patients

The change in specific nutrition care indicators between assessment and reassessment can be determined through nutritional measurements and biochemical tests. PG-SGA is an effective tool for identifying cancer patients at risk of malnutrition. Opanga *et al* (2017) also recommended the need to adopt the use of the PG-SGA tool for cancer patients after testing its effectiveness at Kenyatta National Hospital (KNH) and Texas Cancer Centre (TCC). In oncology and other chronic catabolic conditions, the Scored Patient-Generated Subjective Global Assessment (PG-SGA) currently sets the bar and is the premier interdisciplinary patient assessment that evaluates the most recent weight loss, the nutrition-related complications resulting from treatment, the patient's dietary intake, physical performance, nutrition impact of the disease, muscle and fat wasting and edema (Bauer et al, 2002). However, this tool has not been used in Kenya and this study found the

need to recommend the use of PG-SGA and there is need for the tool to be constituted as part of the nutrition assessment for oncology patients in KNH and among other health care institutions.

Patients diagnosed with EC and HNC have difficulties when it comes to oral feeding. During treatment dysphagia is a common problem the option to have a prophylactic or reactive percutaneous endoscopic gastrostomy tube in situ is key. This has a direct negative implication on the overall well-being of these patients. Undernourishment makes cancer patients particularly vulnerable, and consequent weight loss is common. 15% of patients lose more than 10% of their normal body weight, 40–80% of them become malnourished, and 20% of them die as a result. Nutritional management is essential because well-nourished patients have a greater survival rate than patients who are at risk of undernutrition (Serralde-Zúñiga, 2018). Additionally, the incidence of undernourishment affects a patient's prognosis negatively and is influenced by the type and location of the tumor, the illness stage, the course of treatment, and the nutritional evaluation technique used.

2.3 Nutritional Status of Esophageal, Head and Neck Cancer Patients

2.3.1 Anthropometric Indices of Esophageal, Head and Neck Cancer Patients

Anthropometric indices like adult height and body weight have been used as indicators of the current diet and nutrition. Significant weight loss is a common presenting symptom for patients with EC and HNC malignancies, and this symptom persists throughout their anti-cancer treatment. For these cancer patients, a standardized regimen for dietary management is advised. Patients with HNC and esophageal cancer must have thorough nutritional assessments and management. It has been observed that these patients can benefit from the use of the body mass index, albumin,

prognostic nutritional index, regulating nutritional status, and PG-SGA as assessment tools. Treatment outcomes are influenced by the patient's overall health, including dietary state (Sohda, 2017).

2.3.2 Biochemical Parameters for Esophageal, Head and Neck Cancer Patients

Early detection of useful outcome markers for esophageal cancer patients may aid in guiding treatment decisions. Due to its short (2–3 day) half-life, prealbumin—also known as transthyretin and thyroxine-binding prealbumin—is a substantially more reliable indicator of protein status. This measurement is most beneficial when assessing patients for a sudden change in nutritional status or a quick reaction to nutrition management. Subjective global assessment (SGA) and the association of prealbumin levels were used in prospective research on 154 patients with esophageal cancer receiving concurrent chemo-radiotherapy to measure nutritional status. Esophageal cancer patients receiving concurrent chemo-radiotherapy had a high rate of malnutrition (Pan, 2005). The findings form the foundation for providing nutritional interventions to patients receiving care at radiotherapy units. Prealbumin shown a relationship with the PG-SGA score and should be taken into consideration as a sensitive nutritional biomarker for assessing the nutritional status of esophageal cancer patients undergoing concurrent chemo-radiotherapy This study will therefore use prealbumin as a variable that will be a marker of nutrition status for EC and HNC patients for the study.

When esophageal cancer is first diagnosed, the albumin level is a standalone predictor of early (6 month) mortality. The albumin level may be utilized in conjunction with other clinical factors to

help patients and their families make prognostic decisions and to implement palliative care plans including early esophageal stenting and feeding tube insertion (Nassri,2014).

Patients with esophageal cancer and HNC are given a prognosis for treatment result based on their hemoglobin level, as has been shown for other solid tumors. Therefore, this is a very important variable to assess so that we see the relationship it has on nutrition outcomes during treatment of these patients. Numerous studies have shown that anemia is a frequent component of a variety of malignancies and that it serves as a distinct prognostic indicator for survival in particular cancer types. Patients with EC head and neck cancer are at risk for nutritional deficiency. Those with adenocarcinoma who are anemic have a worse chance of survival than those with normal hemoglobin levels. Anemia was found to be a strong predictive indication of survival in adenocarcinoma but not squamous cell carcinoma, which is frequent at diagnosis in esophageal cancer (Tanswell, 2011).

The iron status marker serum ferritin also serves as a sign of inflammation and/or malnutrition. This was determined by laboratory values of haemoglobin and ferritin. A new prognostic marker for esophageal cancer and HNC may be anemia prior to initial radiation, which is linked to a poor prognosis and a higher chance of relapse. Identification of possible causes of anemia during treatment can inform early interventions so that there is seamless treatment since relapse reduces the efficacy of treatment and affects overall quality of life of these patients.

2.4 Food modification of Esophageal, Head and Neck Cancer Patients

Food modification in patients with esophageal, head, and neck cancer who rely on a gastrostomy tube (G-tube) is essential for ensuring proper nutrition and preventing malnutrition. These patients often face swallowing difficulties due to tumor growth, treatment effects, or surgery. The G-tube allows direct nutrition delivery to the stomach, bypassing oral intake. Food consistency must be modified to liquidized, pureed, or semi-solid forms to prevent clogging and accommodate the patient's condition, while ensuring a balanced intake of macronutrients, vitamins, and minerals for healing and nutritional support (Sullivan & Rogers, 2020).

In addition to the consistency of food, the energy density of the enteral nutrition formula is another key consideration. Patients with head and neck cancers may have increased metabolic demands due to the cancer itself and its treatments, such as radiation and chemotherapy. High-calorie, nutrient-dense formulas are often necessary to meet these needs without requiring large volumes of intake (Lazarus & Williams, 2021).

2.5 Summary

Optimal nutrition is essential for effective oncology care, yet remains a significant challenge in Kenyan public hospitals, as highlighted in the Ministry of Health's *National Guideline for Healthy Diets* (2017). With rising incidences of esophageal, head, and neck cancers in Kenya, many patients suffer from tumors that severely hinder oral intake due to complications such as dysphagia, odynophagia, and mucositis, especially during treatment. These challenges necessitate tailored strategies that address nutritional needs and improve the quality of life for affected patients. This study, seeks to address this gap by investigating the nutritional outcomes and unique needs of cancer patients reliant on gastrostomy tubes. The findings aim to inform healthcare approaches and support the development of effective nutritional interventions that could enhance the care, treatment outcomes and nutrition well-being of patients undergoing cancer treatments.

This study therefore underscores the critical role of tailored nutrition interventions in improving the overall nutritional outcomes of patients with esophageal and head and neck cancers utilizing a gastrostomy tube. Modifications in food consistency and the use of energy-dense, protein-rich formulas are essential for meeting the increased metabolic demands of these patients, who often experience difficulty with oral intake due to the nature of their cancers or treatments. Moreover, the study emphasizes the importance of monitoring anthropometric measures, such as weight and body mass index, alongside biochemical markers (e.g., serum albumin levels) and using PG-SGA tool, to monitor nutritional support and ensure that the patients are receiving adequate nourishment to support recovery and prevent further malnutrition.

CHAPTER THREE

MATERIALS AND METHODS

The study's methods for gathering data and analyzing it are covered in this section. The overall plan and explanation for the research investigation are discussed in this chapter. It entails researching the theories and ideas that underpin the procedures that will be applied in the field to create a strategy that aligns with the objectives.

3.1 Study Area

The study was conducted in Kenyatta National Hospital (KNH). It's the largest referral hospital in East and Central Africa. KNH is older than 120 years. In Nairobi, Kenya's capital and largest city, the hospital is situated immediately to the west of Upper Hill. It is situated around 3.5 kilometers (2 minutes) west of the city's major commercial sector. Its original name was Native Civil Hospital, and it could accommodate 40 patients and in 1952 it was renamed King George VI. There were 45 beds available in 1908, and 712 inpatients and 6,425 outpatients were seen. After the country gained independence in 1963, King George VI Hospital was renamed KNH and designated a national teaching and referral hospital. Currently, KNH has 50 wards, 22 outpatient clinics, 24 theaters (16 specialized) and Accident & Emergency Department.), 1,800 beds, and more than 6,000 employees. KNH handles all types of cancers with patients from all over the country (Kenyatta National Hospital, 2020). The approximate 2023 case load of patients diagnosed with esophageal, head and neck cancers utilizing gastrostomy tube in KNH is 140 bi-annually as per MOH reporting tool.

3.2 Study Design

The research used a descriptive institutional-based cross-sectional study with an analytical component (Gashaye *et al.*, 2019). It compared several variables which included nutrition status and dietary modification, energy intake and nutrition outcomes. The study describes the subjects' initial nutritional state to assist the descriptive part of the investigation. This design was adopted to investigate the nutritional outcomes of EC and HNC patients using gastrostomy tube for feeding.

3.3 Study Population

EC and HNC outpatients diagnosed with stage one to four cancers, above 18 years of age with an ECOG performance status grade 1, 2 and 3 attending CTC and Radiotherapy clinic at Kenyatta National Hospital. This study enrolled outpatients because they have greater autonomy in managing their nutrition at home, offering a chance to examine how gastrostomy feeding and nutrition status at home are handled outside of a hospital setting.

3.3.1 Inclusion Criteria

The respondents were patients utilizing gastrostomy tube and those receiving treatment at the CTC and Radiotherapy clinics in Kenyatta National Hospital. The patients must have been pathologically proven to have esophageal, head and neck cancers with an ECOG performance status of 0, 1, 2 or 3. The age limit was over 18 years and must have consented to participate in the study.

3.3.2 Exclusion Criteria

The exclusion criteria were the patients with an ECOG performance status of 4 and those patients who were assessed by the oncologists and classified as hemodynamically unstable by the use of the following symptoms: -hypotension, chest pain, restlessness, shortness of breath and confusion.

3.4 Study Variables

3.4.1 Dependent variables

Nutritional Status

This variable was used to determine the patients at risk of malnutrition by use of the PG-SGA tool.

Categorization was done as follows as per numerical scoring:

- Well-nourished (0–1 points)
- Mildly malnourished (2–3 points),
- Moderately malnourished (4–8 points)
- Severely malnourished (≥ 9 points)

The indicators of nutrition status included: -

Biochemical Parameters

Biochemical assessment is a very precise and reliable method of assessing the nutrition status of an individual. Biochemical assessment is conclusive in provision of information on the body status based on specific nutrients (Lee & Nieman, 2007). Assessment of ferritin, pre-albumin, albumin, and haemoglobin in patients diagnosed with cancer is very important. The ranges of these parameters have been tabulated in *Appendix C: Table 2, Biochemical nutrition status assessment*.

- **Prealbumin**

Prealbumin, often referred to as transthyretin and thyroxine-binding prealbumin, is a significantly more accurate predictor of protein status due to its short (2–3 day) half-life. When evaluating patients for an acute change in nutritional status or a short-term response to nutrition intervention, this measure is most helpful.

- **Ferritin**

The risk of nutritional depletion exists for patients with EC head and neck cancer. Serum ferritin is a marker of iron status and an indicator of inflammation and/or malnutrition.

- **Haemoglobin**

This was used to determine the patients with anemia. To determine if the anemia is secondary to low intake of iron in the diet the mean corpuscular volume (MCV) was factored.

Anthropometric indices

This included weight and height. These two measurements were used to determine body mass index. The nutritional status of patients was assessed using the World Health Organization (WHO) criteria: -

- Obese: BMI > 30
- Overweight: BMI 25 to 29.9
- 18.5 to 24.99: Normal
- < 18.5: Underweight

3.4.2 Independent variables

- **Energy and Protein intake**

This was sourced from the 24-hour dietary recall to estimate the daily energy requirements. The researcher used calibrated cups to estimate the amount every participant reported. The Kenyan Food composition tables were thereafter used to determine the total amount of kilocalories and grams of protein each respondent had consumed within the last 24 hours. It was later determined if the patients were meeting their daily calories intake by the use of European Society for Parenteral and Enteral Nutrition (ESPEN) guidelines.

Indicators that affect energy intake include: -

- **Dietary modifications**

This is change in food consistency i.e., pureed or mashed foods.

- **Nutrition Impact Symptoms**

These include mucositis, neutropenia, vomiting, nausea, diarrhoea, and dry mouth.

3.4.3 Intervening variables

These included cancer type, treatment duration, cancer stage.

Cancer Type

Different types of cancer (e.g., esophageal cancer, head and neck cancer) can affect nutritional status in unique ways. For example, cancers in the head, neck, or esophagus often directly impact the ability to swallow, chew, or digest food, making malnutrition a more immediate concern. Additionally, the metabolic demands and tumor characteristics vary by cancer type, which can influence the patient's energy needs, risk of weight loss, and response to nutritional interventions.

Treatment Duration

The length of treatment (e.g., chemotherapy, radiation, surgery) can also affect nutritional status. Longer treatment durations may lead to cumulative side effects, such as nausea, taste changes, and loss of appetite, increasing the risk of malnutrition over time. Patients undergoing prolonged treatments may require more intensive nutritional support, such as PEG feeding, to maintain adequate nutrition and avoid treatment interruptions due to malnutrition-related complications.

Cancer Stage

The stage of cancer impacts overall prognosis, metabolic demand, and nutritional needs. Advanced stages often require more aggressive treatments that may come with stronger side effects, affecting

dietary intake and nutritional needs. For example, patients in later stages may experience greater cachexia (muscle and fat loss due to the disease), necessitating tailored nutritional interventions to support body weight and energy levels.

3.5 Sampling Methods

The initial step entailed the purposive sampling of Kenyatta National Hospital. KNH was purposively selected for this study due to its status as the largest referral and teaching hospital in Kenya, providing specialized care for cancer patients, thereby offering a diverse and representative sample of esophageal, head, and neck cancer patients utilizing gastrostomy tubes.

The study employed a purposive sampling where all the patients with EC & HNC patients were considered in study. Thereafter a criterion technique was used to select patients who met the predefined criteria; in which case, patients with esophageal, head, or neck cancer using gastrostomy tubes in Cancer Treatment Centre clinic and Radiotherapy clinics. Criterion sampling ensured that the sample is directly relevant to the study's objectives, focusing only on those who met the specific inclusion requirements. It involved selecting 103 patients who met the inclusion criteria. By concentrating on this particular subset of patients, the researcher aimed to gather detailed and relevant data on the nutritional status outcomes by the use of data collection tools that were to be used for this study. The selection process involved close coordination with healthcare providers at the clinics to identify eligible patients, ensuring that the sample accurately represented the population of interest for the study. Consent was sought and the data was collected until the required number of respondents was achieved. The researchers recorded all the names of the

patients with EC and NHC in the clinic in a coded registration form. Thereafter the patients were recruited after filling in the consent form.

3.6 Sample Size Determination

The determination of sample size was based on the Fisher's *et al* formula, 1983;

where;

n= the desired sample size

z=normal deviation at the desired confidence interval (95 probability error equal to 1.96²)

p=the proportion of occurrence of the phenomenon (0.5 for unknown)

d=the level of statistical significance (0.05 for 95 percentage level of significance)

n=desired sample size when the population is >10,000

Substitution in the formula $n = 1.96^2 \times 0.5 \times (1-0.5)/0.05^2$

$n = 1.96^2 (0.5) (0.5)/0.05^2$ therefore $n = 384$

Since the population size is <10,000

N= Adjustment formula will be $NF = n/1 + (n/N)$

NF- is desired sample when population is <10,000

N-the estimated population of the area being studied 140

$NF = 384/1 + (384/140) = 384/1 + 2.74$

$NF = 384/3.74 = 103$

3.7 Data and information collection

The socio-demographic, economic status, staging of the disease, treatment was obtained via questionnaires and medical notes (Ryan & Dundon, 2008). The nutrition assessment data was collected before and once after four weeks of treatment period.

3.7.1 Data Collection Instruments

The study tools have been listed in the appendices section. All ethical processes were applied by the researcher. The data collection tools were: - coded questionnaires, PG-SGA tool (which comprised of changes in dietary intake, food modification, Nutrition Impact Symptoms, assessment of functional status, co-morbidities, metabolic demand, physical examination and classification of malnutrition status categories) the 24-hour recall form, SECA weighing scale and SECA stadiometer. Data was collected as per the respondent's nutrition status outcomes, biochemical data and as per responses given. This was filled in the questionnaire and kept safely and confidential. The interview captured data on socio-demographics, county of residence, nutrition status, and graded risk of malnutrition, energy intake, haemoglobin, ferritin and pre-albumin readings. The socio-demographic data was obtained via questionnaires and medical notes. The weight and biochemical readings were collected at first contact and weight was taken again after four weeks during the data collection period.

3.7.2 Data Collection Procedures

Newly diagnosed adults with EC and HNC attending scheduled clinics were ethically recruited for the study after seeking consent. The questionnaire was administered and data on anthropometry recorded on the questionnaire, and PG-SGA. The 24-hour recall was used to collect data on dietary intake and nutrition-related complications data was also collected.

In this study, weight and height were measured to assess the patients' nutritional status. Weight was measured using a calibrated SECA scale with patients in light clothing, ensuring accuracy to the

nearest 0.1 kg. Height was measured using a stadiometer, with patients standing upright without shoes, recorded to the nearest 0.1 cm. These measurements provided data for calculating Body Mass Index (BMI), a key indicator of nutritional health. The height of the patients was measured using a stadiometer. The weight loss was categorized as follows: -

- < 2% loss- No weight loss
- 2-5% loss in 1 month- Mild
- 5-10% loss in 1 month- Moderate
- >10% loss in 1 month- Severe (Ryan & Yockey, 2017)

Blood samples were collected from patients to measure serum albumin, prealbumin, hemoglobin (Hb), ferritin, and lymphocyte levels. These biochemical markers are essential for assessing nutritional and immune status. Serum albumin and prealbumin were analyzed as indicators of protein status, while Hb and ferritin were evaluated for iron status. Lymphocyte count helped gauge immune function, which can be impacted by malnutrition in cancer patients. The researcher worked together with the ~~doctor~~doctors for requisition of the blood sample testing. The blood samples for biochemical parameters thereafter, the researcher followed up with the trained KNH laboratory technicians to draw blood samples for analysis using hematology analyzer. Biochemical data was collected based on the standard operating procedures of accessing information on laboratory reports filed in the patients' file. i.e., prealbumin, albumin, ferritin and lymphocytes count. The hematology analyzer was routinely calibrated under the management of medical engineering department, this was put into consideration to ensure accuracy and validity of the data.

Nutrition status on the basis of Patient Generated-Subjective Global Assessment (PG-SGA) was determined. This tool assessed recent weight loss, patients' intake, complications connected to nutrition, physical performance, the impact of diseases on nutrition, muscle and fat wasting, and edema. For the score of dysphagia, it was classified as shown below: -

- No dysphagia-0
- Able to eat normal diet-1
- Moderate passage: able to eat some solid foods-2
- Poor passage: able to eat semi-solid food-3
- Very poor passage: able to swallow liquids only-4
- No passage: unable to swallow anything (Homs *et al*, 2004)

For physical examination status a systematic approach was taken to assess muscle status, fat stores, and fluid status in patients. Muscle status was evaluated through palpation of muscle areas such as the upper arms and thighs to detect any signs of muscle wasting. Fat stores were assessed by examining areas like the triceps and subscapular regions for fat depletion. Fluid status was checked by observing for signs of edema or dehydration, including examining skin turgor and the presence of pitting edema. This physical exam protocol provided a comprehensive view of each patient's nutritional and hydration status.

The dietary intake for the patients was recorded by the use of 24-hour recall. Energy and protein intake was determined by the use of the Kenyan Food Composition Tables (2018). The energy requirements were based on the ESPEN guidelines (Thibault *et al.*, 2021). Insufficient energy intake was defined as consumption of less than 60% of the patients' needs. Biochemical parameters

were sourced from individual laboratory tests. These biochemical parameters included: - pre-albumin, haemoglobin, ferritin and lymphocytes count. To ensure confidentiality, this interview took place in a private room. The interviewer first did an introduction about the study and created rapport. Informed consent was sought from the participant before administration of the data collection tool. The interviewer thanked the patients for participation and cooperation.

3.7.3 Training of Research assistants

In preparation for data collection in the study, two research assistants underwent a comprehensive three days training session to ensure accuracy and consistency in the use of the PG-SGA tool. The training covered the fundamentals of the PG-SGA. Specific attention was given to recognizing and scoring symptoms, evaluating weight and dietary changes, and performing the physical examination required to assess nutritional status. Additionally, the assistants practiced scoring sample cases to familiarize themselves with the tool's scoring system and improve inter-rater reliability. By the end of the training, both research assistants demonstrated competence in using the PG-SGA and showed readiness to collect data systematically and effectively. For the 24-hour recall, the assistants learned how to guide participants in recalling food and beverage intake accurately to capture dietary intake. They were also trained on standardized techniques for measuring anthropometric indicators, including weight and height. Additionally, they practiced administering the questionnaire to ensure clarity, completeness, and reliability of responses. This training ensured the research assistants were well-prepared to collect high-quality, reproducible data across all aspects of the study.

3.8 Quality Assurance

Administration of the questionnaire and PG-SGA tool was done carefully. Kiswahili or English was used in cases where the respondents did not comprehend either language. I worked closely with the CTC clinic and Radiotherapy clinic. Confidentiality and safekeeping of the data collected was mandatory. A statistician was consulted during data analysis.

3.8.1 Reliability

Reliability refers to a quality assurance check on the data that was gathered. The study's objectives served as the foundation for data collection, and appropriate data collection procedures were used. Reliability of the research instruments was done during pre-test. The researcher used 10 respondents to pilot the questionnaire then calculated the reliability co-efficient. The researcher obtained a reliability co-efficient of 0.7 for standardized items and was considered as statistically significant and therefore the questionnaire was considered reliable (Griethuijsen *et al.*, 2015; Taber, 2018).

3.8.2 Validity

The PGSGA used to collect data in the study is an internationally recognized tool and therefore considered valid. The other data collection tools were subjected to review of nutrition and dietetics technical personnel to ascertain validity of the data collection instruments. The comments of the professionals were considered in the final tool used in the field for pre-test. Results from the pre-test were used to improve validity of the data collection tools. During the data collection process, the questionnaires were reviewed daily for accuracy, consistency, and clarity. The research methodology and protocols were followed when gathering the actual data. A pilot study was conducted to test the appropriateness of the research methods or instruments.

3.8.3 Pre-test

To evaluate the study materials and equipment beforehand, ten patients with esophageal, head and neck cancers who were using gastrostomy tubes were chosen from Mbagathi Hospital. A good rule of determining the pre-test number is 10% of the main study (Bordens & Abbott, 2018). The sample size was 103 patients; therefore, the researcher calculated 10 patients. During the pretest, the time required to complete the surveys and the respondents understanding of the template was documented. Noteworthy observations such as clarity of questions and the choices availed in all the questions were addressed accordingly to ensure proper understanding and sufficiency respectively. Reliability was determined and categorized as acceptable. The reliability coefficient was 0.7. The knowledge was used to instruct the research assistants.

3.9 Data Analysis

To gather nutrition-related data, including weight and height, the research used an internationally recommended assessment and a PG-SGA tool. Data on energy intake was gathered using a 24-hour recall approach. To record socio-demographic data, anthropometric measurements, biochemical parameters, and data on subcutaneous body fat loss through physical examination, a semi structured questionnaire and PG-SGA tool was used. Body weight and height was determined using a portable stadiometer and a SECA bathroom scale, respectively, and the anthropometric data was utilized to calculate BMI. The 24-hour recall data was analyzed with Nutri-survey software, and the PG-SGA tool data was analyzed with the Statistical Package for Social Sciences version 25.0 and Microsoft Excel sheets. The association between nutrition with energy intake and relationship between food modification and nutrition status was measured using an Pearson correlation co-efficient and independent t-test respectively at 0.05 significance level for statistical analysis.

Table 3. 1 Summary of Data analysis and Presentation plan

Objective variables	Statistical tool/ analysis	Data presentation
1.Demographics, diagnosis & treatment	Descriptive and Chi-square analysis (Frequencies and percentages)	Tables
2. Energy & Protein intake	Descriptive and Chi-square analysis (Frequencies and percentages)	Bar graphs
3. Nutrition status	Descriptive and Chi-square analysis (Frequencies and percentages)	Tables, pie charts and bar graphs
4.Association between energy intake and nutrition status	Inferential analysis (Pearson correlation)	Tables
5. Relationship between & Nutrition status	Inferential analysis (independent t-test, Pearson correlation)	Tables

3.10 Ethical Considerations

Before the study began, the permission documentation for its authorization was verified. A research protocol plan was then developed. The Masinde Muliro Science and Technology Ethics Review Committee (Ref. MMU/COR:509099), KNH/UoN ethics committee (Ref. No. KNH-ERC/A/126) and the National Council of Science and Technology research permits (NACOSTI/P/23/25076) were obtained. One of the most important criteria for determining a research's effectiveness is adherence to the highest ethical standards. In the clinical setting, maintaining anonymity is required and it followed general research ethics guidelines. Confidentiality violations result in serious legal repercussions, which were avoided by making sure the information acquired was shielded from unauthorized access (Park *et al.*, 2014).

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents the results of the study obtained from analysis of the data collected. The results have been presented based on the objectives of the study.

4.1 Demographic, cancer diagnosis and treatment characteristics among patients diagnosed with esophageal, head and neck cancer at Kenyatta National Hospital

4.1.1 Demographic characteristics of the patients

As detailed in Table 4.1, more than half of the study patients 61.2% (n=63) were male cancer patients while 38.8% (n=40) were female cancer patients. The mean age of the patients' age was 56.2 ± 14.7 years, with minimum and maximum ages of 18 years and 86 years respectively. Notably, majority of the patients (70.9%, n=73) were aged above 50 years. Based on the marital status, 67% (n=69) of the patients were married, 20.4% (n=21) were widowed/divorced/separated while 12.6% (n=13) were single. In terms of religious beliefs, majority of the study patients 97.1% (n=100) were Christians while 2.9% (n=3) were Muslims. From the findings, 11.7% (n=12) patients had less than basic education, more than half (56.3%, n=58) had attained basic education, 24.3% (n=25) had attained intermediate education while 7.8% (n=8) patients had attained advanced education at the time of the survey. Majority of the study patients, 93.2% (n=96) were unemployed and therefore did not have any source of monthly income, 1.9% (n=2) were employed while 4.9% (n=5) were in self-employment sector. Central region had the highest number of patients 54.4% (n=56) having esophageal, head and neck cancer with Murang'a and Kiambu counties accounting for 21.4% (n=22) and 9.7% (n=10) of the cases respectively.

Table 4.1: Demographic characteristics of the patients

Characteristic	Categories	n	%
Gender of the participant	Male	63	61.2
	Female	40	38.8
Age of the participant (years)	≤ 30	8	7.8
	31-50	22	21.4
	>50	73	70.9
Marital status	Single	13	12.6
	Married	69	67.0
	Widowed/Divorced/separated	21	20.4
Religious beliefs	Christian	100	97.1
	Muslim	3	2.9
Education level	Less than basic	12	11.7
	Basic education	58	56.3
	Intermediate education	25	24.3
	Advanced education	8	7.8
Employment status	Employed	2	1.9
	Self-employed	5	4.8
	Unemployed	96	93.3
Average monthly income in Kenyan Shillings	No income	96	93.2
	< 5,000	2	1.9
	5,001- 10,000	2	1.9
	10,001 - 15,000	3	2.9
Region of residence	Central	56	54.4
	Eastern	22	21.4
	North Eastern	3	2.9
	Rift valley	9	8.7
	Western	13	12.6

4.1.2 Cancer diagnosis and treatment characteristics of the patients

From the findings in Table 4.2, more than half of the patients, 63.1% (n=65) had esophageal cancer while 36.9% (n=38) had head and neck cancer. Majority of the patients 69.5% (n=73) were diagnosed with cancer less than a year ago while 30.5% (n=32). Majority of the study patients, 80.6% (n=83) had been receiving cancer treatment services for a period less than a year while 19.4% (n=20) patients had been on cancer treatment for a period of more than one year. Three quarters of the study patients, 75.3% (n=78) were on prophylactic gastrostomy tube while 24.7% (n=25) patients had reactive gastrostomy tube. From the findings, 34.0% (n=35) patients were

receiving radiotherapy services, 33.0% (n=34) were receiving chemotherapy services while those receiving chemo-radiotherapy were 34 patients (33.0%).

Table 4.2: Cancer diagnosis and treatment characteristics among patients

Characteristic	Categories	n	%
Type of cancer diagnosis	Esophagus	65	63.1
	Head and neck cancer	38	36.9
When the patient was diagnosed with cancer	< 1 year ago	73	69.5
	>1 year ago	32	30.5
Duration the patient has been on treatment	< 1 year	83	80.6
	>1 year	20	19.4
Type of gastrostomy tube	Prophylactic	78	75.3
	Reactive	25	24.7
Type of treatment	Radiotherapy	35	33.3
	Chemotherapy	35	33.3
	Chemo-radiotherapy	35	33.3

4.2 To determine the energy and protein intake of esophageal, head and neck cancer patients utilizing gastrostomy tube in Kenyatta National Hospital

Energy and protein intake assessment

Generally, the overall energy intake was low with majority of the patients 81.6% (n=84) having a very low-energy intake of < 500 Kcals, 16.5% (n=17) having a caloric intake of 500-1,000 Kcals and 1.9% (n=2) with >1,000 Kcals as detailed in Figure 4.3. The mean net kilocalories consumed in patient's meals was 329.12 ± 274.4 , with minimum and maximum of 310 and 2,000 kilocalories respectively. The mean protein intake was 0.8 ± 0.2 g/kg body weight (BWT) with the majority 58.1% (n=61) having a protein intake of less than 0.8 g/kg body weight and 41.9% (n=44) having a protein intake greater than or equal to 0.8 g/kg body weight

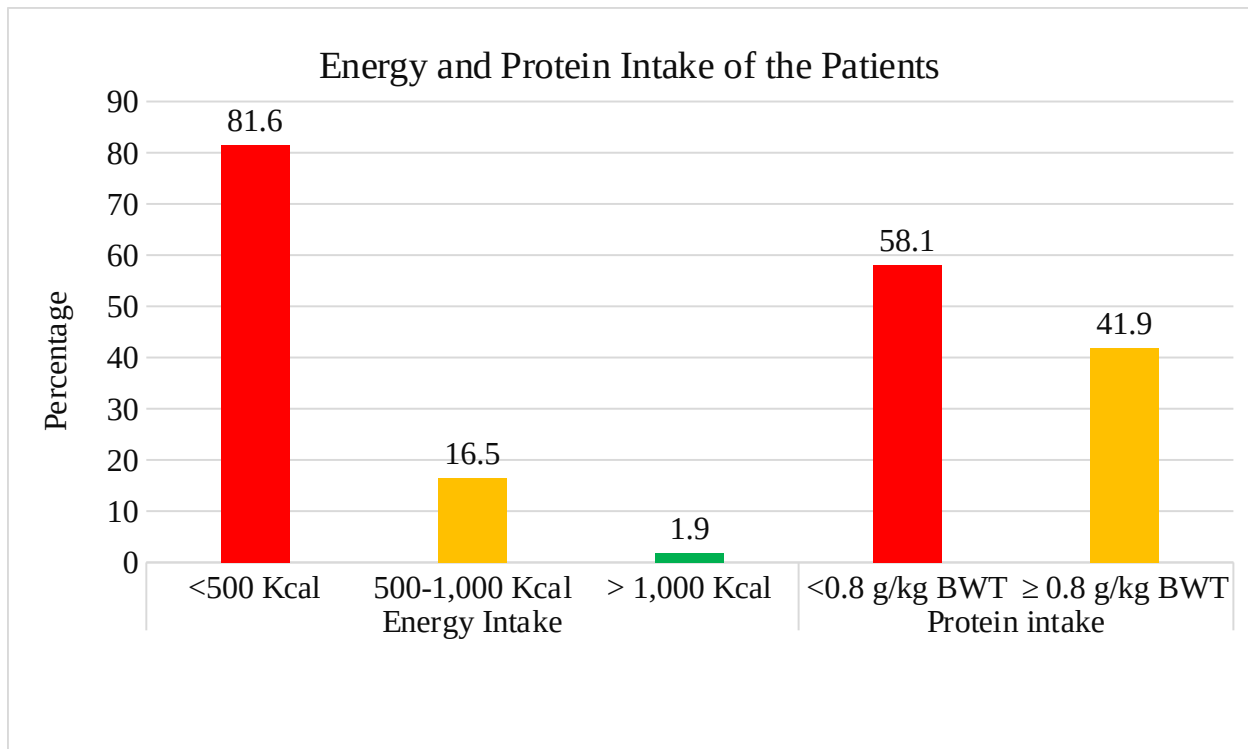


Figure 4.1: Energy and Protein intake

4.3 Nutritional status of esophageal, head and neck cancer patients at Kenyatta National Hospital

4.3.1 Weight changes of the Patients

This included weigh a month ago and six months ago as per the PG-SGA tool. The Mean $\pm$ SD of the patient's weight during the first contact during the study was 49.3 ± 11.1 kilograms, with a minimum and maximum weight of 29.0 kilograms and 86 kilograms respectively. In one month ago before the first contact with the patient, the Mean $\pm$ SD of the patients' weight was 50.5 ± 11.1 kilograms, with minimum and maximum weights of 27.5 kilograms and 86.0 kilograms. Notably, six months ago, the Mean $\pm$ SD weight was 52.1 ± 16.7 kilograms with maximum weight of 83.0 kilograms. Figure 4.2 shows that in the past one month, 58.3% (n=60) of the patients experienced

weight loss while 35.9% (n=37) experienced weight gain. In the last six months to the study, 69.9% (n=72) experienced weight loss while 30.1% (n=31) experienced weight gain. Therefore, there is significant decrease in weight from the time of diagnosis to the current weight.

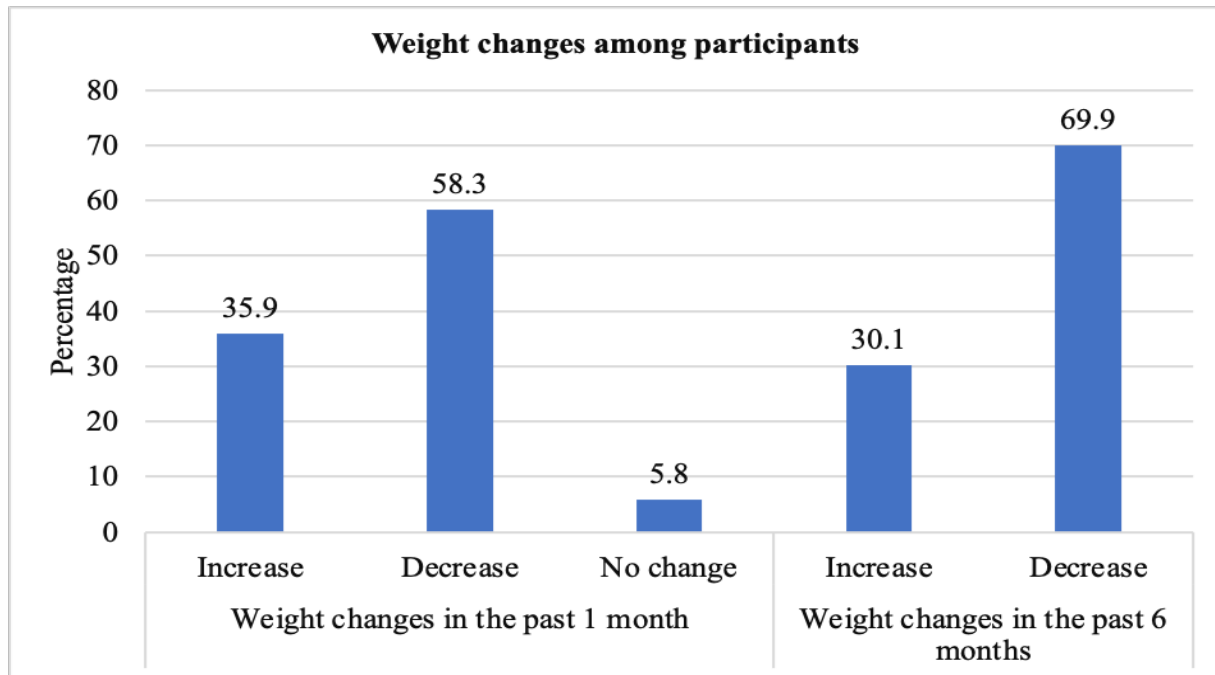


Figure 4.2: Weight Changes among the Study Patients

4.3.2 Body Mass Index Status and Weight Changes in the Last Four Weeks

The nutritional status determined using body mass index showed that 56.3% (n=58) of the patients were underweight, 40.8% (n=42) had a normal BMI and a few 2.9% (n=3) were overweight. The mean BMI was 18.03 ± 3.39 kg/m² with minimum and maximum BMI of 14.02 kg/m² and 28.52 kg/m². The second weight taken after four weeks during the study indicated that more than half of the study patients 51.5% (n=53) experienced a decrease in weight, 22.3% (n=23) patients had a weight increase while 26.2% (n=27) patients' weight remained unchanged. The results are as summarized in Figure 4.3

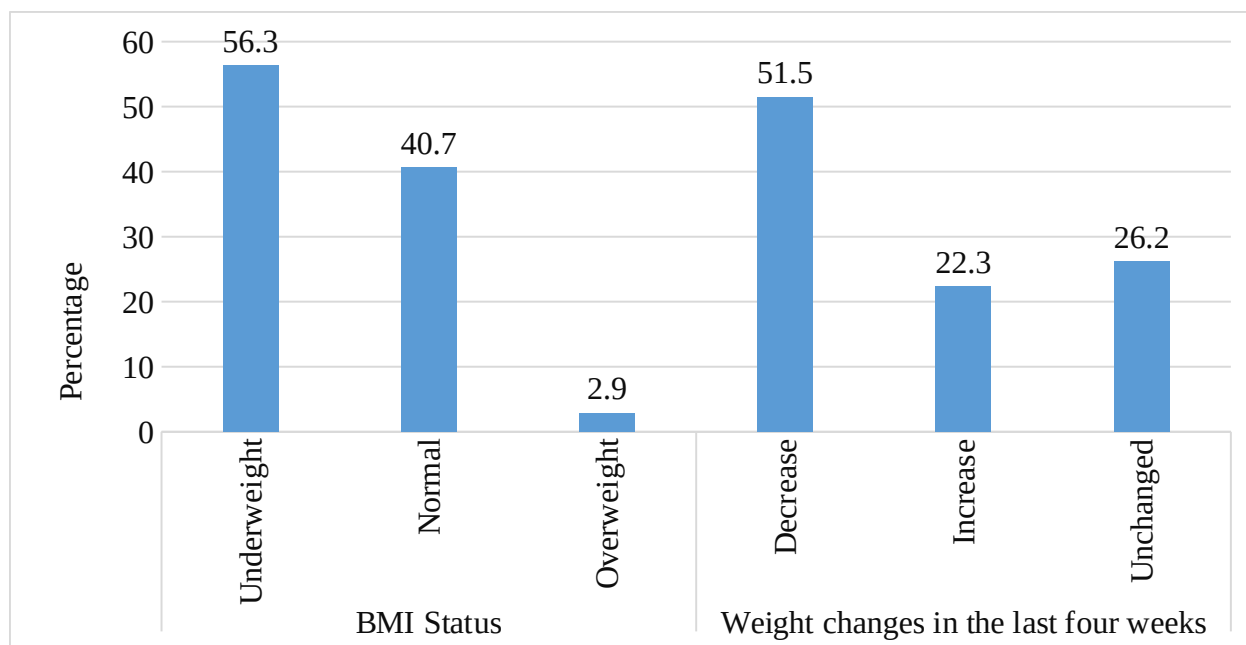


Figure 4.3: Body Mass Index (BMI) status and Changes in body weight

4.3.3 Biochemical Nutritional Status Assessment

The results detailed in Table 4.3 shows that more than half of the patient (61.9%, n=65) had normal serum albumin levels, 26.7% (n=28) were mildly undernourished, 10.5% (n=11) moderately undernourished while 1.0% (n=1) were severely undernourished. On serum pre-albumin, 61.0% (n=64) patients had normal levels, 27.6% (n=29) mildly undernourished, 9.5% (n=10) moderately undernourished and 1.9% (n=2) patients were severely undernourished. For Ferritin, more than half of the study patients, (61.0%, n=64) had normal levels, 31.4% (n=33) were mildly undernourished and 7.6% (n=8) had iron deficiency (moderately undernourished). In terms of haemoglobin, 49.5% (n=52) patients had normal levels (>130 g/L and >120g/L in men and women respectively), 40.0% (n=42) were mildly undernourished and 10.5% (n=11) were moderately undernourished. For totals lymphocyte levels, 47.6% (n=50) study patients were normal (>1800/mm³), 38.1% (n=40) were mildly undernourished, 10.5% (n=11) moderately undernourished while 3.8% (n=4) were severely undernourished (<900/mm³).

Table 4.3: Biochemical Nutrition Status Assessment

Parameter	Categories	n	%
Serum albumin	Normal (35–50 g/L)	65	61.9
	Mildly undernourished (28 – < 35 g/L.)	28	26.7
	Moderately undernourished (21 – < 28 g/L.)	11	10.5
	Severely undernourished (<21 g/L.)	1	1
Serum pre-albumin	Normal (20–40 mg/dL)	64	61
	Mildly undernourished (17 – < 20 mg/dL)	29	27.6
	Moderately undernourished (10 – < 17 mg/dL)	10	9.5
	Severely undernourished (< 10 mg/dL)	2	1.9
Ferritin	Normal (>100 µg/L (Iron deficiency))	64	61
	Mildly undernourished	33	31.4
	Moderately undernourished (<100 µg/L (Iron deficiency))	8	7.6
Haemoglobin	Normal (>130 g/L in men and >120 g/L in women)	52	49.5
	Mildly undernourished	42	40
	Moderately undernourished (<130 g/L in men and <120 g/L in women)	11	10.5
Total lymphocyte	Normal (>1800/mm ³)	50	47.6
	Mildly undernourished (1500–1800/mm ³)	40	38.1
	Moderately undernourished (: 900 – < 1500/mm ³)	11	10.5
	Severely undernourished (<900 mm ³)	4	3.8

4.3.4 Changes in Dietary Intake

Figure 4.3 shows that in the last month, the patient's food intake as compared to normal intake remained unchanged (33.0%, n=34), 21.4% (n=22) patients were having more food than usual and 45.6% (n=47) were having less food than usual.

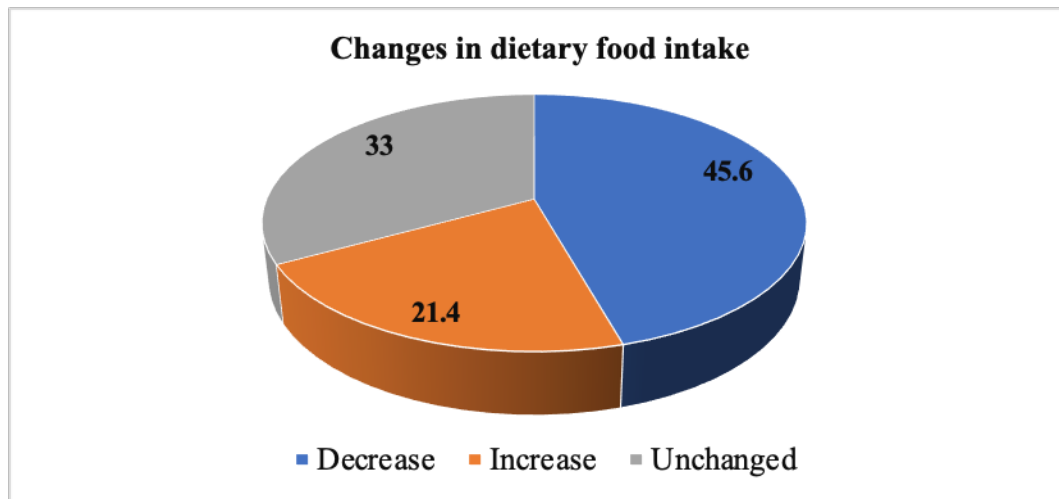


Figure 4.4: Changes in Dietary Intake

4.3.5 Food modification

At the time of survey, more than half of the patients (52.4%, n=54) were only taking fluids, 30.1% (n=31) patients were taking little solid food, 15.5% (n=16) patients were taking normal food but less than normal intake, 1.0% (n=1) patient was taking only nutritional supplements and very little of anything each as summarized in Table 4.4.

Table 4.4: Diet Modification

	Frequency	Percent
Normal food but less than normal intake	16	15.5
Little solid food	31	30.1
Only liquids	54	52.4
Only nutritional supplements	1	1
Very little of anything	1	1
Total	103	100

4.3.6 Nutrition Impact Symptoms

The presence of nutrition impact symptoms (NIS), which evaluates potential barriers to adequate food intake such as anorexia, refusal to eat, nausea, constipation, mouth sores, pain, and vomiting is one of the prognostic indicators of specific malnutrition for cancer patients. These obstacles are primarily caused by tumor-related factors, such as location, staging, and type of treatment. From the findings, 19.4% (n=20) patients in Stage A (None or significant recent improvement) had no nutritional impact symptoms, 66.0% (n=68) and 14.6% (n=15) were in Stage B and Stage C respectively and they experienced nutrition impact symptoms as shown in Table 4.5.

Table 4.5: Nutrition Impact Symptoms (NIS)

Stage	n	%
Stage A - None or significant recent improvement	20	19.4
Stage B - Presence of NIS	68	66
Stage C - Presence of NIS	15	14.6
Total	103	100

The symptoms that prevented the study patients from taking enough food has been summarized as shown in Figure 4.5.

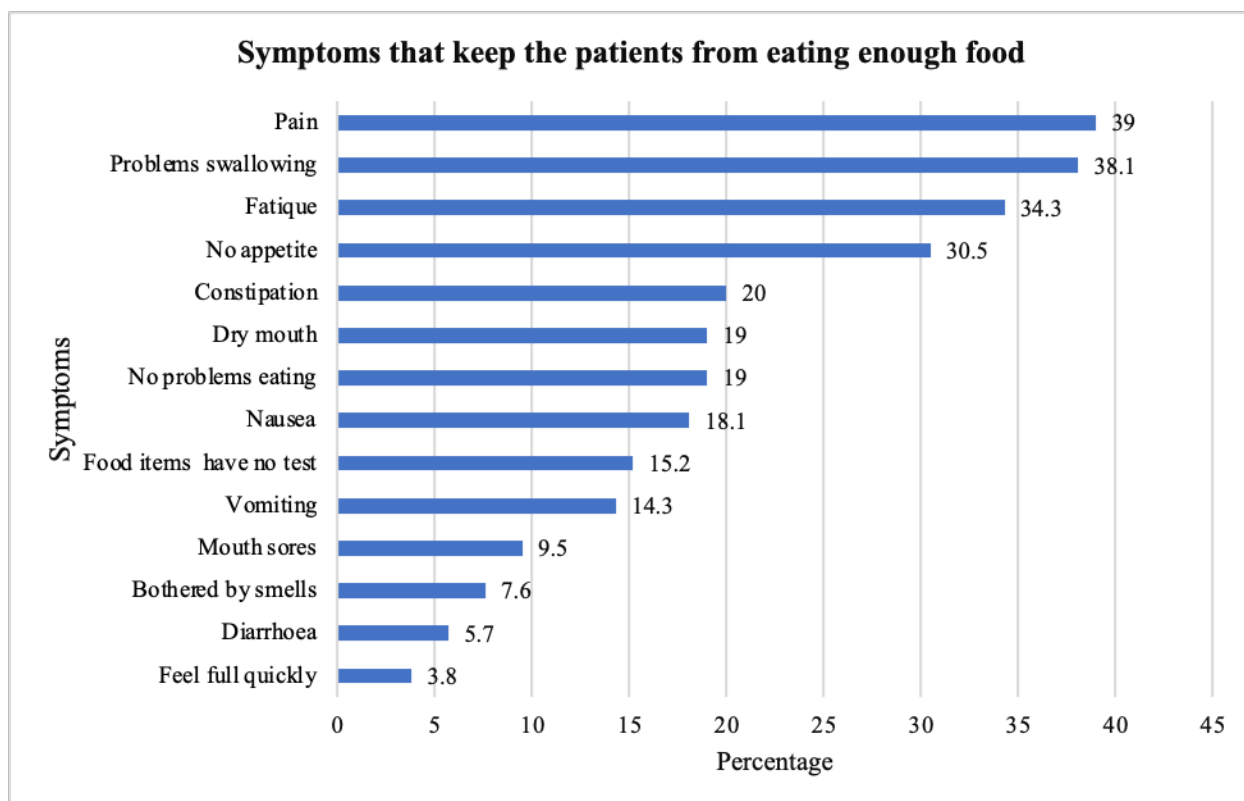


Figure 4.1: Nutrition Impact Symptoms

4.3.7 Assessment of Functional Status

This is also referred to as a patient's performance status, or ECOG. Functional status is a standard criterion for assessing how cancer affects a patient's capacity for everyday functioning. It characterizes the degree to which a patient is able to take care of themselves, go about their everyday lives, and move around physically (walking, working, etc.). It evaluates a patient's prognosis, examines the efficacy of various therapy, and classifies patients according on their functional impairment. From the study findings, one month before study data collection, 9.7% (n=10) of the patients' activities and function rate were normal with no limitations, 49.5% (n=51) patients reported not my personal self, but able to be up and about with fairly normal activities. About 10% (n=10) were not feeling up to most things, but in bed or chair less than half of the day, 9.7% (n=10) patients were able to do little activity and spend most of the day in bed or chair and 11.7% (n=12) patients were pretty much bedridden, rarely out of bed. The data is summarized in Table 4.6

Table 4.6: Activities and Function Affected

Activities and Functions	n	%
Normal with no limitations	10	9.7
Not my personal self, but able to be up and about with fairly normal activities	51	49.5
Not feeling up to most things, but in bed or chair less than half of the day	10	9.7
Able to do little activity and spend most of the day in bed or chair	20	19.4
Pretty much bedridden, rarely out of bed	12	11.7
Total	103	100

From the findings in Table 4.7, 36.9% (n=38) patients had no deficit or significant recent improvement (ECOG 1) in terms of functioning, 42.7% (n=44) patients experienced moderate deficit (ECOG 2) and 20.4% (n=21) patients experienced severe deficit.

Table 4.7: Patients' Functioning

Stage	n	%
ECOG 1 – No deficit or significant recent improvement	38	36.9
ECOG 2 – Moderate deficit	44	42.7
ECOG 3 – Severe deficit	21	20.4
Total	103	100

4.3.8 Co-morbidities

From the findings in Table 4.8, all the study patients (n=103), were suffering from cancer, those that had AIDs (n=4), Pulmonary or Cardiac cachexia (n=3), and patients whose age was greater than 65 years at n=26. The association Between Presence of Comorbidity and Patients' BMI was analyzed. The Pearson correlation coefficient, r , was 2.095, and this was statistically insignificant at the level $P=0.351$. Therefore, presence of other comorbidities did not determine patient's body mass index (BMI). Thus, fail to reject the hypothesis that there was no difference in the association between presence of other comorbidities and body mass index (BMI).

Table 4.8: Correlation Between Presence of Comorbidities and BMI

Chi-Square Tests			
	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	2.095 ^a	2	.351
Likelihood Ratio	2.935	2	.230
Linear-by-Linear Association	.046	1	.831
N of Valid Cases	103		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .90.

4.3.9 Metabolic Demand

In terms of fever, the majority of the study patients, (98.1%, n=101) did not have fever and only 2 (1.9%) patients whose fever was in range between 37.2 and 38.3°C, category low. Notably, the 1.9% (n=2) patients had the fever for a period of less than 72 hours. Further, 42.7% (n=44) did not use corticosteroids, 38.8% (n=40) patients were on low dosage of corticosteroids (less than 10mg prednisone equivalents/day), 18.4% (n=19) patients were on moderate dosage of between 10 and 30 mg prednisone equivalents/day. Taking prednisone may significantly increase your appetite, which could result in an unexpected weight gain. None was put on high dosage of prednisone therefore the side effects were not significant. The data is detailed in Table 4.9.

Table 4. 9: Metabolic Demand

Stress	Level	None (0) n (%)	Low (1) n (%)	Moderate (2) n (%)	High (3) n (%)
Fever	None: No fever Low: >37.2 °C and <38.3 °C Moderate: >38.3 °C and <38.8 °C High: >38.8 °C	101(98.1)	2(1.9)	0	0
Fever Duration	None: No fever Low: <72 hours Moderate: 72 hours High: >72 hours	101(98.1)	2(1.9)	0	0
Corticosteroids	None: No corticosteroids Low dose: <10mg prednisone equivalents/day Moderate dose: >10 and <30mg prednisone equivalents/day High dose: >30mg prednisone equivalents/day	44(42.7)	40(38.8)	19(18.4)	0

4.3.10 Physical examination

The physical exam included the evaluation of the three aspects of the patient's body composition: Muscle status, Fat, and Fluid status, to assess the degree of deficit for or presence of fluids. From the findings detailed in Table 4.10, 31.1% (n=32) patients had no abnormalities in their muscle status, 23.3% (n=24) patients were in a mild status, 22.3% (n=23) patients were in a moderate status, and 23.3% (n=24) patients were in a severe status. In terms of fat store status, 33.0% (n=34)

recorded no abnormality, 22.3% (n=23) patients were in a mild status, 22.3% (n=23) patients were in a moderate status, and 21.4% (n=22) patients were in a severe status. On scoring of the patient's fluid status, the majority of the patients, (96.1%, n=99) had no abnormalities, 1.0% (n=1) patient fluid status was mild, 1.0% (n=1) patient's fluid status was moderate and 1.9% (n=2) patient's fluid status was severe.

Table 4.10: Muscle Status and Score

Body component	Categories	No Abnormality (0) n (%)	Mild (+1) n (%)	Moderate (+2) n (%)	Severe (+3) n (%)
Muscle Status	Temple (Temporalis muscle)	41(39.8)	24(23.3)	18(17.5)	20(19.4)
	Clavicles (Pectoralis and Deltoids)	36(35.0)	26(25.2)	20(19.4)	21(20.4)
	Shoulders (Deltoids)	33(32.0)	27(26.2)	22(21.4)	21(20.4)
	Interosseous muscles	34(33.0)	27(26.2)	21(20.4)	21(20.4)
	Scapula (Latissimus dorsi, Trapezius, Deltoids)	33(32.0)	28(27.2)	21(20.4)	21(20.4)
	Thigh (Quadriceps)	35(34.0)	22(21.4)	25(24.3)	21(20.4)
	Calf (Gastrocnemius)	35(34.0)	22(21.4)	24(23.3)	22(21.4)
	Global Muscle Status Rating	32(31.1)	24(23.3)	23(22.3)	24(23.3)
Fat Store	Orbital fat pads	49(47.6)	13(12.6)	20(19.4)	21(20.4)
	Triceps skin fold	38(36.9)	20(19.4)	23(22.3)	22(21.4)
	Fat overlying lower limbs	36(35.0)	21(20.4)	22(21.4)	24(23.3)
	Total fat store score	34(33.0)	23(22.3)	23(22.3)	22(21.4)
Fluid status	Ankle odema	100(97.1)	0	0	3(2.9)
	Sacral odema	100(97.1)	0	1(1.0)	2(1.9)
	Ascites	100(97.1)	0	1(1.0)	2(1.9)
	Fluid Status Score	99(96.1)	1(1.0)	1(1.0)	2(1.9)

Further, for the overall point score for physical examination of the patient's body composition, 32.0% (n=33) patients had no deficit score, 24.3% (n=25) had mild deficit score, 23.3% (n=24) had

moderate deficit score and 20.4% (n=21) patients had severe deficit score as indicated in Table 4.11.

Table 4.11: Overall Point Score for Physical Examination

	n	%
No deficit score - 0 points	33	32
Mild deficit score - 1 point	25	24.3
Moderate deficit score - 2 points	24	23.3
Severe deficit score - 3 points	21	20.4
Total	103	100

4.3.11 Malnutrition status as predicted by PG-SGA Summary

The study revealed significant variations in the nutritional status of these patients as assessed by the PG-SGA as summarized in Table 4.12. It was observed that 35 patients (34.0%) were well-nourished (Category A), 47 patients (45.6%) were moderately malnourished (Category B), and 21 patients (20.4%) were severely malnourished (Category C) when examining weight changes. In terms of nutrient intake, 43 patients (41.7%) were categorized as well-nourished, while 41 patients (39.8%) were moderately malnourished, and 19 patients (18.4%) were severely malnourished. These results suggest that while a significant number of patients had adequate nutrient intake, a considerable number were either moderately or severely malnourished. The impact of nutrition-related symptoms on the patients was notable, with only 20 patients (19.4%) being well-nourished. The majority, 68 patients (66.0%), were moderately malnourished, and 15 patients (14.6%) were severely malnourished. Regarding functional status, 38 patients (36.9%) were well-nourished, 44 patients (42.7%) were moderately malnourished, and 21 patients (20.4%) were severely malnourished. This indicates that a significant proportion of the patients had moderate to severe malnutrition impacting their functional capacity. Lastly, the physical examination results showed

that 26 patients (25.2%) were well-nourished, 50 patients (48.6%) were moderately malnourished, and 27 patients (26.2%) were severely malnourished.

Table 4.12: Overall PGSGA Malnutrition prediction

	Well nourished (Category A) n (%)	Moderately malnourished (Category B) n (%)	Severely malnourished (Category C) n (%)
PGSGA weight changes	35 (34.0)	47 (45.6)	21 (20.4)
PGSGA nutrient intake	43 (41.7)	41 (39.8)	19 (18.4)
PGSGA nutrition impact symptoms	20 (19.4)	68 (66.0)	15 (14.6)
PGSGA functioning	38 (36.9)	44 (42.7)	21 (20.4)
PGSGA physical exam	26 (25.2)	50 (48.6)	27 (26.2)

4.4 Association between energy intake and nutritional status outcome of patients diagnosed with esophageal, head and neck cancer at Kenyatta National Hospital

The Pearson correlation coefficient, r , was 0.196, and this was statistically significant at the level $p=0.047$ as indicated in Table 4.13. This indicated that the patient's nutritional status significantly improved as the amount of energy intake increased. Thus, we reject the null hypothesis that there was no association between energy intake and nutritional status outcome of patients diagnosed with esophageal, head and neck cancer utilizing a gastrostomy tube at Kenyatta National Hospital and conclude the alternative hypothesis that there is an association between energy intake and nutritional status outcome of the patients.

Table 4.13: Correlation between Patient's Body Mass Index (BMI) and amount of Kilocalories Consumed

		BMI	Kilocalories
BMI	Pearson Correlation	1	.196*
	Sig. (2-tailed)		0.047
	N	103	103

Kilocalories	Pearson Correlation	.196*	1
	Sig. (2-tailed)	0.047	
	N	103	103

*. Correlation is significant at the 0.05 level (2-tailed).

4.5 Relationship between food modification and nutritional status of esophageal, head and neck cancer patients at Kenyatta National Hospital

An independent sample t-test was performed to check for the difference in means of the BMI between the patients who consumed a modified diet and those who consumed a normal diet. There was a significant difference in BMI scores for the modified diet group ($M = 16.1$, $SD = 1.68$) and the not modified diet group ($M = 20.7$, $SD = 2.10$); $t(101) = -10.32$, $p < 0.001$. This shows that the mean BMI of the group with diet modification (16.1 kg/m^2) was significantly lower than the mean BMI of the group without diet modification (20.7 kg/m^2).

Table 4.14: T-test between Food Modification and Nutritional Status

	Diet modification		t	df	sig
	Modified (n=87)	Not modified (n=16)			
Nutritional status indicator (BMI)	16.1 ± 1.68	20.7 ± 2.10	8.95	101	0.000

Pearson correlation coefficient was computed to assess the relationship between food modification and BMI. There was a strong, positive significant relationship between food modification and BMI, $r(101) = .694$, $p < .001$ and therefore we reject the null hypothesis there is no relationship between food modification and nutritional status of esophageal, head and neck cancer patients utilizing a gastrostomy tube at Kenyatta National Hospital and conclude the alternative.

Table 4.15: Correlation between Food Modification and Nutritional Status

Food Modification	Pearson Correlation Sig. (2-tailed) n	Food Modification	BMI
		1	.694**
		103	103
BMI	Pearson Correlation	.694**	1

Sig. (2-tailed)	0.00	
n	103	103

**** Correlation is significant at the 0.01 level (2-tailed).**

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This section interprets the study’s findings, linking them to the study objective variables and existing literature. This chapter examines implications and compares results with studies done by other researchers.

5.1 Demographic, cancer diagnosis and treatment characteristics of the patients

5.1.1 Demographic characteristics of the patients

The demographic profile of the study patients provides valuable insights into the population affected by esophageal, head, and neck cancers at Kenyatta National Hospital (KNH) in Nairobi, Kenya. The data indicates a higher prevalence of these cancers among male patients compared to female patients. The findings are similar to those of a study by Abdihamid *et al.*, (2024) conducted in the Northern Kenya region at the Garissa Regional Cancer Center. The National Cancer Institute (NCI) reports that the gender disparities in the distribution of esophageal, head, and neck cancers among patients may be due to long-term alcohol consumption and tobacco (NCI, 2021a). These global trends also show that males generally exhibit a higher incidence of these types of cancers due to increased exposure to these risk factors (Di Credico *et al.*, 2020; Zhang *et al.*, 2015).

The mean and standard deviation of the age of the patients implies that the majority of the patients were middle-aged or older adults. Majority of the patients in the current study were over 50 years old, which is consistent with the findings of Wang *et al.*, (2020) who reported that 90.6% of the esophageal cancer cases in their study were aged 50–69 years. The high incidence and prevalence

of these types of cancers among these age group may be attributed to the epidemiology of esophageal, head, and neck cancers that typically affect older adults (NCI, 2021b). Some studies have also attributed the occurrence of these cancers at this age with the delayed diagnosis, cumulative exposure to risk factors and weakened immune system (Wang *et al.*, 2022; Iwatsubo *et al.*, 2019; He *et al.*, 2022).

The marital status of the patients shows that a significant proportion were married. This statistic is important for understanding the potential support systems available to the patients for improving their quality of life. Married individuals experience better emotional and practical support during their illness that can influence their overall health outcomes (Thomas *et al.*, 2017). A study by Ai *et al.*, (2021) reported that having a loving and caring partner for patients diagnosed with cancer is associated with an increased release of oxytocin, which can inhibit cancer cell growth through both indirect and direct mechanisms. Another study by Krajc *et al.*, (2023) exhibited that married cancer patients are more likely to receive chemotherapy and have higher survival rates compared to their unmarried counterparts. The proportion who were widowed, divorced, separated and single might face challenges in accessing health services and care due to potentially reduced support networks.

Majority of the study patients were predominantly Christians. The role that religious beliefs play in providing psychological and social support systems for cancer patients cannot be underscored (Kretzler *et al.*, 2022; Kretzler *et al.*, 2021). Cancer patients experience varying degrees of depression, anxiety, and fear from the time of diagnosis until their treatment (Velasco-Durantez *et al.*, 2024). Religion and spirituality influence how well individuals cope with their diagnosis, health-seeking behaviours, coping mechanisms and adherence to treatment protocols (Bany Hamdan *et al.*, 2020). The educational attainment among the patients was varied with the majority having attained only primary education while smaller proportions ~~had~~having attained secondary

and tertiary education. Education level can significantly affect a patient's ability to understand and manage their illness, adhere to treatment regimens, and navigate the healthcare system. A study by Liu *et al.*, (2024) showed that the education level of cancer patients was a significant prognostic factor. Less than basic educational levels have been associated with reduced health literacy which negatively impact health outcomes and increase disease-related mortalities (Shahid *et al.*, 2022). A study by Gupta *et al.*, 2023 associated lower educational attainment with higher cancer-specific mortality.

The employment status reveals that an overwhelming majority of the patients were unemployed. Most cancer patients have lower chances of working compared with the general population until five years after diagnosis (Brink *et al.*, 2024). Unemployment among cancer patients is associated with lack of a health care insurance coverage and directly influences financial stability (Nakaganda *et al.*, 2021). This poses barriers in access to health care, nutritional support, and other necessities during treatment as the cancer patients may not be able to take advantage of public benefits (Santos Salas *et al.*, 2024). The geographic distribution of the patients shows a higher prevalence of esophageal, head, and neck cancers in the Central region of Kenya, with Murang'a and Kiambu counties accounting for a significant proportion of the cases. The other regions in descending order of prevalence were Eastern, North Eastern, Rift Valley and Western respectively. This distribution may reflect regional differences in risk factors such as diet, tobacco and alcohol use, and socioeconomic conditions. The finding may also be due to the close proximity of these counties to the Kenyatta National Hospital where the study was conducted. The hospital receives referrals from the neighbouring counties since it serves as the regional cancer treatment center for the Central region.

5.1.2 Cancer diagnosis and treatment characteristics of the patients

This cancer diagnosis statistics shows there was a high prevalence of esophageal cancer within the study group. This is consistent with the 2022 GLOBOCAN report, which showed there is high incidence of esophageal cancer in Kenya ranking second most prevalent among males and third among females (GLOBOCAN, 2022). It also ranks third in cancer mortality cases in Kenya. There was also a significant proportion of head and neck cancer patients ~~and this underscores the need for specialized nutritional interventions for these patients given the impact of these cancers on oral intake and nutritional status~~ (Martinovic *et al.*, 2023)).

Most of the patients in the study were diagnosed with cancer less than a year ago before the study and this indicates that they were relatively recent diagnoses. This may be attributed to the efforts that the Kenyan Government have put in place through the Ministry of Health and other key partners in cancer identification, diagnosis, treatment, prevention and control (Kenya News Agency, 2023). The government launched the Kenya National Cancer Control Strategy (2023–2027) whose main goal is to reduce premature mortality from cancer in Kenya by a third by the year 2028 (KNCCS, 2023). Majority of the patients had been receiving cancer treatment for less than a year and this aligns with the duration since diagnosis. These statistics also show that majority of patients are within the early phase of their cancer treatment journey. ~~Early identification and treatment of cancer is a critical factor for lowering treatment morbidity, improve the quality of life and improve the nutritional status of cancer patients~~ (Whitaker, 2020).

The study found that there was almost an equal number of patients receiving radiotherapy, chemotherapy and chemo-radiotherapy treatment methods. These are the major cancer treatment options available in Kenya. There was a high percentage of ~~patients' patients~~ with prophylactic gastrostomy tube compared to the reactive gastrostomy tubes. Prophylactic gastrostomy tube is

typically placed to prevent anticipated nutritional deficits due to the expected impact of treatment on swallowing and oral intake while reactive gastrostomy, on the other hand, [reactivegastrostomy](#) tube is placed in response to existing nutritional deficits (Dragan *et al.*, 2022). The placements of these tubes suggest a proactive approach by the KNH Cancer Treatment Centre in maintaining the nutritional status of the patients which is crucial for improving treatment outcomes and quality of life. A systematic review by McClelland *et al.*, (2018) showed that prophylactic gastrostomy tube reduced the number of malnourished patients and improved their quality of life at 6 months.

5.2 Energy and Protein intake of the patients

Nearly half of the patients consumed less food than usual, highlighting significant challenges in maintaining adequate nutrition. Treatment modalities such as chemotherapy and radiation therapy can severely affect the ability to eat, leading to decreased appetite, nausea, vomiting, and mucositis (Anderson *et al.*, 2021). Complications related to the gastrostomy tube itself, such as blockages, infections, or displacement, could impede proper nutrient delivery (Blumenstein *et al.*, 2014). Additionally, the cancer patients experience psychological challenges such as anxiety and depression, which may significantly diminish appetite and motivation to maintain food intake (Hariyanto & Kurniawan, 2021). A study by Arends (2018) showed that patients in more advanced cancer stages may experience greater difficulty in maintaining nutritional intake due to the overall decline in health and increased catabolic state.

The study findings showed that most of the cancer patients consumed a fluid diet only for nutrients and energy. This was due to the restrictions of oral dietary intake and inability of their bodies to tolerate a normal diet because of the swallowing difficulties they experienced and thus needed a modified diet (Martinovic *et al.*, 2023). Relying solely on fluid diet for esophageal, head and neck cancer patients poses a significant risk for malnutrition since they may not provide the necessary

macro and micronutrients required for maintaining body functions, promoting recovery, and supporting overall health (Lyu *et al.*, 2019). The monotony of a liquid diet might also affect compliance with nutritional recommendations. Limited solid food intake can lead to gaps in nutrition, especially in terms of proteins, fibers, vitamins, and minerals that are typically obtained from a varied diet (Movahed *et al.*, 2020).

The findings indicate a severe calorie deficiency among the majority of patients which can have severe implications on the nutritional status of the patients, overall health and recovery from the disease. These patients are unable to meet the National Health Service (NHS) recommendation of a daily calorie intake of 2,500 Kcals and 2,000 kcals for males and females respectively (NHS, 2023). These findings are closely supported by the ESPEN guidelines on nutrition in cancer patients which state that 60% of the daily energy needs cannot be covered by their digestive tract for most of them (Arends *et al.*, 2017). The insufficient calorie intake also strongly supports the findings on the high prevalence of undernutrition among these patients (Arends, 2023). Malnourished patients may have lower tolerance to cancer treatments such as chemotherapy and radiotherapy, leading to more severe side effects and possibly requiring dose reductions or treatment delays (Bossi *et al.*, 2022). Additionally, chronic low-calorie intake can result in muscle wasting (cachexia), which is common in cancer patients and negatively impacts physical strength and quality of life (Bianchini *et al.*, 2024)

5.3 Nutritional Status Indicators of the patients

5.3.1 Weight changes of the Patients

The data for weight changes shows a clear and progressive decline in body weight over the six-month period. These findings highlight a critical issue of weight loss which is common in cancer

patients due to various factors including the disease itself, treatment side effects, and inadequate nutritional intake. Patients undergoing chemo radiation therapy experience the highest risk of severe weight loss more so among patients with cancer in the larynx and oral cavity (Huang *et al.*, 2022; Nazari *et al.*, 2021). The weight loss may also be associated by other factors such as tube dislodgement, infections, and patient non-compliance can impede their effectiveness (Vujasinovic *et al.*, 2022). Additionally, the type and volume of nutritional formula provided through the tube may not always meet the caloric and protein needs of the patients, leading to continued weight loss (Ravasco, 2019). Psychological stress, depression, and anxiety associated with a cancer diagnosis and its treatment can also reduce appetite and motivation to maintain adequate nutrition, contributing to further weight loss (Vahid *et al.*, 2023). Weight reduction poses significant risks to the health of individuals undergoing treatment for head and neck cancer. Patients experiencing a loss of more than 10% of their initial body weight are deemed susceptible to malnutrition, while a weight loss surpassing 20% could lead to heightened rates of illness and death (Redwan *et al.*, 2024).

5.3.2 Body Mass Index of the Patients

Majority of the patients in the study were classified as underweight, an indicative of severe malnutrition, which is a common complication in patients with esophageal, head, and neck cancers. The mean BMI of 18.03 ± 3.39 kg/m² reflects the overall tendency towards undernutrition in the study population. A National Population Based Study in Korea by Kim *et al.*, (2022) also reported similar findings. The cancers often impair the ability to swallow food and consume adequate foods, leading to weight loss. Tumor presence in the esophagus can cause mechanical obstruction in the passage of food, cause pain, and reduce appetite (Chiu *et al.*, 2022). The initial treatment stages, aggressive nature of cancer cells and their active competition for the nutrients also influence the

nutritional status of cancer patients. The significant proportion of the patients who had a normal BMI suggests that a substantial portion of patients maintained a relatively stable nutritional status, potentially due to effective nutritional interventions, such as the use of gastrostomy tubes.

5.3.3 Biochemical Nutritional Status Assessment of the patients

The overall findings of the study on the biochemical parameters indicate that while a substantial proportion of patients maintain normal levels of key nutritional markers, a significant number experience various degrees of malnutrition. The findings for serum albumin levels suggest that while most patients are maintaining adequate protein levels, however, a substantial proportion still experience varying degrees of malnutrition, which could affect their overall prognosis and recovery. The close similarity was also observed in the distribution of pre-albumin levels underscores the reliability of these markers in reflecting the nutritional status of these patients. A recent study by Tang *et al.*, 2024 reported that low serum albumin levels are a predictor of higher cancer mortality rates.

The results for ferritin levels indicate the presence of iron deficiency. There was also a high prevalence of low hemoglobin levels predicted by the hemoglobin levels. These findings highlight a risk of anemia, which is common in cancer patients due to the disease itself, treatments, and nutritional deficiencies. A deficiency of nutrients essential for proper erythropoiesis arises among patients with head and neck tumors, due to the gradual onset of dysphagia and odynophagia, which compels changes in the type, form, and quantity of food they consume (Krawczyk *et al.*, 2021). The presence of these nutrition deficits further complicates the management of cancer. There was also a significant portion of patients with a low total lymphocyte count, which suggests a compromised immune function. This greatly affects the ability of the body to fight infections and respond to cancer treatment.

5.3.4 Nutrition Impact Symptoms of the patients

The study found presence of NIS among majority of the cancer patients in stages B and C which are a significant factor affecting their nutritional status. The symptoms which include pain, problems in swallowing, fatigue, no appetite, constipation, dry mouth, nausea, vomiting and among others which pose substantial barriers to adequate food intake. Farhangfar *et al.*, (2014) reported similar findings in their population-based study. The cancer patients likely experience severe difficulty swallowing due to the anatomical and functional impairments caused by their cancers and this limits their ability to consume solid foods (Silva *et al.*, 2023). Cancer patients might also experience anorexia or early satiety due to the disease itself or as side effects of treatments (Yeom & Yu, 2022). These symptoms result in reduced food intake despite the ability to consume a variety of foods. Patients in stage A reported absence of NIS since they were well nourished and thus have been able to maintain adequate nutritional intake despite their condition. This may also be understood in the line that they were in the early phases of their cancer diagnosis where the tumor's impact on the body is minimal or those who have received effective symptom management and nutritional support.

The substantial proportion of NIS among patients in malnutrition stage B highlights the commonality of nutrition-related issues among patients with esophageal, head, and neck cancers. The symptoms in this stage may be associated with the tumor's direct effects on the gastrointestinal tract and oral cavity, making it challenging to consume and absorb nutrients efficiently (Kenny *et al.*, 2022). The severe NIS among patients in stage C of malnutrition are indicative of advanced disease stages or significant complications from treatment. This may be associated with late cancer diagnosis or prolonged stay without cancer treatment can lead to cumulative nutritional deficits due to side effects like mucositis, dysphagia, and gastrointestinal complications (Wang *et al.*, 2024).

Patients in this stage are at the highest risk of malnutrition, given the extreme barriers to adequate nutrition. The severity of their symptoms can lead to a cycle of poor nutritional intake, weight loss, and further decline in their overall health status. ~~This stage emphasizes the critical need for intensive nutritional interventions and possibly alternative feeding methods, such as parenteral nutrition, to ensure these patients receive the necessary nutrients to support their treatment (Cotogni *et al.*, 2023).~~

5.3.5 Functional Status and Performance Outcomes of the patients

A very small proportion of the patients maintained normal activity levels without any limitations. This indicates a small proportion of patients who either have early-stage disease, are responding exceptionally well to treatment, or have inherently robust physical and psychological resilience. Maintaining normal functionality suggests effective management of symptoms and possibly a less aggressive disease course. More than a half of the patients reported that they experience mild to moderate limitations in engaging in normal activities. A study by Shahidi *et al.* (2014) similarly found that over 40% of patients experienced changes following their diagnosis. This shows that despite the disease and its treatment having some impact, these patients can maintain their independence and daily routines to some extent but not fully.

The impacts on the ability to perform daily tasks may be due to treatment side effects such as fatigue, pain, or nutritional deficits (Milliron *et al.*, 2022). These patients are likely to benefit from supportive care strategies that allow them to manage symptoms and maintain activity levels. However, they require more intensive symptom management and potentially nutritional support to improve their functional status. About 21% experienced severe limitations to a point, they were bedridden. They were able to do little activity and spent most of the day in bed or a chair. These patients were at advanced cancer stages which caused significant deterioration in quality of life

(Seol *et al.*, 2021). This status reflects a considerable decline in the ability to perform daily activities, indicating advanced disease progression, severe treatment side effects, or inadequate symptom management. These patients are at a higher risk for complications such as pressure sores, muscle wasting, and social isolation, necessitating comprehensive palliative care (Guyer *et al.*, 2020).

5.3.6 Physical examination of the patients

The study found that a third of the patients did not have any abnormalities in their muscle status, which implies that they maintained their muscle mass despite their cancer diagnosis and treatment. However, the majority of the patients exhibited some degree of muscle abnormalities from mild to severe status. Sarcopenia is common among cancer patients due to the disease and its treatments. A study by Zwart *et al.*, (2019) used neck-computed tomography scans to study sarcopenia among head and neck cancer patients and determined the prevalence to be between 35.5–54.5%. This muscle deterioration can lead to reduced strength, increased fatigue, and lower quality of life, impacting the patients' ability to perform daily activities and their overall prognosis.

The findings for fat stores status were almost similar to the muscle status results. This finding is similar to that of Ferrão *et al.*, (2020) who reported that head and neck cancer patients experience a significant depletion of lean body mass, fat-free mass, and skeletal muscle, accompanied by body fat mass, while undergoing (chemo)radiotherapy. Fat loss in cancer patients can be attributed to factors such as metabolic changes, reduced appetite, and increased energy expenditure due to the tumor's metabolic demands. Severe fat depletion can lead to cachexia characterized by significant weight loss, muscle atrophy, fatigue, and loss of appetite, which further complicates the management and treatment of cancer (Porter & Ukwas, 2023). The overall fluid status of the patients presents a more positive picture, with the majority showing no abnormalities. This can be

related to the fact that majority of them depended on a liquid diet only at the time of this study. This implies that most patients are well-managed in terms of hydration, which is crucial for maintaining cellular function, nutrient transport, and overall metabolic balance (Hwa & Kull, 2020).

5.3.7 Malnutrition status among the patients as predicted by PG-SGA Summary

The PG-SGA results reflect the multifaceted nature of malnutrition among esophageal, head, and neck cancer patients utilizing gastrostomy tubes. Despite efforts to provide adequate nutrient intake through tube feeding, a substantial proportion of patients still experience malnutrition, which significantly impacts their nutritional status, symptom burden, functional capacity, and physical well-being.

5.4 Association between energy intake and nutritional status outcome of the patients

The study found that the patient's nutritional status improved as the amount of energy intake increases. These findings are similarly related to a study by Kipouros *et al.*, (2023) who found that patients meeting at least the minimum ESPEN-recommended intakes for energy who lost weight had a lower % weight loss than those not meeting them. The ESPEN guidelines on nutrition in patients with cancer recommended that the energy intake should range between 25 and 30 kcal/kg/d and protein intake >1 g/kg/d (Hsieh *et al.*, 2020). A study by Kim (2019) suggests that the nutritional status of a cancer patients is influenced by the quality of life, because weight loss and decreased appetite are significantly related to the quality of life. The poor quality of life in cancer patients is not solved simply by improving the nutritional status. However, this is contrary to the findings of Muscaritoli *et al.*, (2019) who reported oral nutritional support or dietary counseling were shown to improve energy intake and body weight among cancer patients who were malnourished or at risk of malnutrition. These conflicting results show that there is need for further longitudinal research to better understand the relationship.

5.5 Relationship between food modification and nutritional status of the patients

The study found a strong positive significant relationship between food modification and nutritional status of the patients. Several methods can be used to provide nutritional care to the esophageal cancer patient, such as diet modification, oral supplementation, and enteral or parenteral nutrition (Martinovic *et al.*, 2023). The enteral route is preferred due to preservation of gut integrity, reduced risk of complications, and less expense. Despite food modification being recommended to boost food intake and nutritional status, it has several challenges which makes feeding difficult. Despite modified diets being easier to consume for patients with dysphagia, they often lead to inadequate caloric and protein intake, contributing to lower BMI and poorer overall nutritional status. A study by Nugent *et al.*, (2013) reported that the duration of PEG significantly increases the duration of feeding and therefore some patients may not get adequate feeds. The study emphasizes on the importance of tailored nutritional interventions and support for cancer patients. A study by Arends *et al.*, (2017) suggests that early nutritional support, including high-protein supplements and tailored feeding regimens, can mitigate weight loss and improve outcomes.

CHAPTER SIX CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This last chapter summarizes the investigation's findings, emphasizing the thesis' theoretical contribution and outlining the main problems that it raised. The researcher's recommendations and the possibility for more investigation are outlined in the chapter's conclusion.

6.1 Conclusions

6.1.1 Demographic, cancer diagnosis and treatment characteristics of the patients

The study concludes that there was a higher prevalence of esophageal, head, and neck cancer among male patients compared to female patients. A significant majority were aged above 50 years, indicating that these cancers are more common in older adults. It is contrary to findings of other related studies that the current study found a significant number of patients aged below 50 years. Most patients were married suggesting that marital status may influence the support systems available to patients. There was generally low educational attainment among the patient population and this could affect their health literacy and understanding of disease management. A substantial proportion of patients had only attained primary school education with very few who had progressed to secondary or tertiary education. The vast majority of the patients were unemployed highlighting a significant economic burden and lack of income. This economic vulnerability could exacerbate their health conditions and limit access to adequate nutrition and healthcare. Central Kenya region had the highest number of patients, with notable contributions from Murang'a and Kiambu counties. This geographic concentration may point to regional risk factors or disparities in healthcare access.

The study also concludes that esophageal cancer was more common among the studied population, potentially indicating a need for targeted interventions and resources for esophageal cancer patients. The findings also suggest that most of the patients were relatively recent cancer patients,

which may have implications for their nutritional status and overall health as they adjust to their diagnosis and begin treatment. A significant portion of the study population is in the early stages of their treatment regimen, which can be a critical period for nutritional management and support. This is based on the finding that majority of patients were diagnosed with cancer and have been receiving treatment for less than a year. The study concludes early intervention for the cancer patients with gastrostomy tubes is common practice. Due to the diversity in treatment modalities, the study concludes that the nutritional needs and side effects management strategies may vary widely among the patients, requiring personalized nutrition plans.

6.1.2 Energy and Protein intake of the patients

A significant majority (81.6%) of the patients consumed less than 500 Kcal daily, which is substantially below the ESPEN recommendations for cancer patients. ESPEN guidelines suggest that cancer patients should have an energy intake of around 25-30 Kcal/kg/day to maintain body weight and support metabolic needs. This indicates a high risk of undernutrition and energy deficiency among the patients. Protein intake was suboptimal. While 41.9% of patients met the minimum protein intake recommendation of 0.8 g/kg BW, 58.1% fell short of this target. ESPEN guidelines recommend an even higher protein intake for cancer patients, around 1.0-1.5 g/kg BW/day, to prevent muscle wasting and support healing and treatment outcomes (Arends *et al.*, 2017). Therefore, a large proportion of patients were at risk of sarcopenia and cachexia.

6.1.3 Nutritional Status Indicators of the patients

~~The patients experienced significant and Due to the~~ progressive weight loss ~~from diagnosis to the~~
~~current period, with a high prevalence of weight loss observed over the past month and six months.~~
~~There was high prevalence of underweight among the patients attributable to the cancer itself,~~
~~treatment side effects or difficulties in food intake even with the use of gastrostomy tubes. This~~this

demonstrates the critical need for enhanced nutritional support and continuous monitoring to improve patient outcomes. The study also concludes that, a substantial portion of the cancer patients still suffers from various degrees of malnutrition as evidenced by some with low biochemical markers despite the patients having gastrostomy tubes which helps maintain normal nutritional status markers in a majority of cancer patients. The study concludes that immediate attention and targeted nutritional interventions are needed to address the severe nutrient deficiencies, symptoms and improve patient outcomes as most of the patients did not meet their caloric needs, leading to potential adverse outcomes on their overall health and recovery. The study also concludes that while fluid status is generally well-maintained in cancer patients utilizing gastrostomy tubes, there are significant issues with muscle wasting and loss of fat stores, reflecting a high prevalence of malnutrition.

6.1.4 Association between energy intake and nutritional status outcome

Based on these findings, it can be concluded that as the amount of energy intake increases, there is a significant improvement in the patient's nutritional status. This implies that maintaining or increasing energy intake could be beneficial for improving nutritional status in similar patient populations.

6.1.5 Relationship between food modification and nutritional status

The study concludes that there is a significant disparity in BMI between those on modified diets and those on normal diets and this implies that there is need for enhanced nutritional interventions.

6.1.6 Hypotheses Testing

The researcher rejects the two hypotheses in this study which states: -

- There is no association between energy intake and nutritional status outcome among head and neck cancer patients utilizing gastrotomy tube in Kenyatta National Hospital and;

- There is no relationship between food modification and nutritional status among head and neck cancer patients utilizing gastrostomy tube in Kenyatta National Hospital.

6.2 Recommendations

Based on the study findings, the researcher makes the following recommendations

6.2.2 Recommendations for practice

Policymakers

Policymakers play a critical role in shaping national strategies for cancer prevention, early detection, and treatment. The study findings recommend targeted awareness and screening programs, especially for men, given the high prevalence of esophageal, head, and neck cancers among male patients. By prioritizing these initiatives, policymakers can potentially reduce cancer incidences through earlier detection. In addition, regional health strategies are essential, as the concentration of cases in certain areas highlights the need for diagnostic and treatment facilities in these regions to reduce healthcare access disparities. Economic support programs are also crucial; introducing medical assistance and economic relief for unemployed cancer patients would help alleviate financial burdens and improve adherence to treatment. Furthermore, increased funding for cancer care, including subsidies for nutritional support and free or reduced-cost screenings, especially in resource-limited settings, would enhance the quality of care, enabling more equitable access to treatment and support for vulnerable populations.

Registered Nutritionists/Dietitians

Registered nutritionists and dietitians play a crucial role in developing and implementing effective, individualized nutritional plans for cancer patients. Older adults are particularly

vulnerable to malnutrition and complications; therefore, specialized age-sensitive nutrition support is essential. Dietitians can create nutrient-dense meal plans for this demographic, helping mitigate the risks associated with cancer and age-related nutritional deficiencies. Personalized dietary plans for patients, tailored to their cancer type, treatment stage, and nutritional status, ensure each patient receives appropriate support. This is especially critical for patients who rely on gastrostomy tubes, where nutritional counseling can optimize caloric and protein intake to reduce malnutrition risks. Collaborating closely with oncologists can further align nutritional interventions with cancer treatments, enhancing outcomes and addressing complications from therapy. Nutritionists thus play a vital role in minimizing malnutrition and promoting overall patient resilience.

Learning institutions

These institutions play a pivotal role in advancing knowledge and professional training in cancer care. Training programs that include specialized curricula on cancer nutrition, especially for patients with complex needs like those on gastrostomy tubes, prepare healthcare professionals for the specific challenges of cancer patient care. Additionally, community health education programs that incorporate cancer awareness and nutritional guidance in local languages can equip students to create accessible resources for patients with lower levels of formal education, improving health literacy. Promoting research on cancer nutrition and modified diets within these institutions provides students with practical skills for tackling real-world healthcare challenges, fostering a generation of professionals equipped to innovate and improve cancer care practices.

Hospitals and healthcare institutions

These institutions are on the front lines of cancer care and are positioned to implement patient-centered care plans. Personalized plans based on individual patient needs, especially those involving nutrition and gastrostomy tube feeding, ensure consistent, quality support. Providing support services, such as patient education, counseling, and support groups in simple, accessible language, enhances patient understanding and compliance with treatment plans, which is critical for overall recovery and psychological well-being. In high-prevalence regions, healthcare facilities would benefit from better diagnostic and treatment capabilities, including community-based nutritional programs. Such resources would enhance the ability to meet local needs, ultimately leading to better health outcomes for patients in these regions.

The Ministry of Health

Ministry of health plays a central role in implementing comprehensive, multidisciplinary cancer care across the country. Strengthening a multidisciplinary approach—where nutritionists, oncologists, and primary care providers collaborate—ensures holistic and integrated support for cancer patients. Additionally, promoting early diagnosis and comprehensive nutritional counseling can mitigate the risk of malnutrition, which is especially critical for patients dependent on gastrostomy tubes. Advocacy for increased resource allocation and funding for cancer care, with a focus on underserved populations, could support establishing regional centers, provide economic support, and improve accessibility. These initiatives would help create a healthcare environment where the complex needs of cancer patients are met, enhancing overall healthcare equity and quality of life.

6.2.3 Recommendations for further research

Encourage ongoing research and data collection on the nutritional status of cancer patients. Continuous research can help identify emerging trends, effectiveness of interventions, and areas

needing improvement, thereby informing policy and practice. Future research and clinical practice should focus on optimizing modified diets by making it nutrient dense through inclusion of all macronutrients and high amounts of essential vitamins, minerals to ensure they meet the nutritional needs of cancer patients, thereby improving their overall outcomes and quality of life.

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APPENDICES

APPENDIX I: INFORMED CONSENT

(To be administered in English or any other appropriate language e.g., Kiswahili translation)

Title of Study: *“Nutrition status outcomes of esophageal, head and neck cancer patients with gastrostomy tube.”*

Postgraduate student

Elizabeth Ndunge Kasimu

Tel: 0724444461

Email: Elizabethndungek@gmail.com

Introduction:

I want to let you know about a study that the aforementioned Principal Investigator is now doing. The information provided in this consent form is intended to assist you make a decision regarding whether or not to participate in the study. Please feel free to ask any concerns you may have regarding the aim of the study, what will happen if you engage in the research, the potential risks and rewards, your rights as a volunteer, and anything else that is unclear about the study or this form. You can choose whether or not to participate in the study once we have satisfactorily addressed all of your inquiries. This procedure is referred to as "informed consent." Once you recognize and consent to participate in the study. Please sign your name below on this form. You need to be aware of the fundamental rules that all volunteers in medical research must follow:

- i) Your participation in the study is completely voluntary
- ii) are free to leave at any moment without having to give a reason.
- iii) Your right to get services at this medical facility or other facilities won't be affected if you decline to participate in the research. You will receive a copy of this document for your files.

Could I go on? YES / NO

The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol number _____ has approved this study.

WHAT IS THIS STUDY ABOUT?

The researcher previously mentioned is speaking with people about their opinions relating nutrition challenges as they undergo treatment. 85 people will be randomly selected to participate in this study. I need your permission to think about having you take part in this research.

IF YOU CHOOSE TO TAKE PART IN THIS RESEARCH STUDY, WHAT WILL HAPPEN?

The following things will occur if you consent to take part in this study:

A qualified interviewer will speak with you in a quiet setting where you feel at ease answering questions.

About 30 minutes will pass throughout the interview.

The interview will touch on issues including your background, and screen your nutritional status

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Risks related to psychology, society, emotions, and physical health could be introduced through medical study. There should always be an effort made to reduce the hazards.

Loss of privacy is one danger associated with participating in the study.

Everything you tell us will be kept as private as possible.

We shall save all of our paper documents in a secured file cabinet and use a code number to uniquely identifies you in a passwordprotected computer database. There is still a chance that someone could learn that you participated in this study and use that information to find out more about you because no mechanism for maintaining your confidentiality can be completely safe.

You can feel awkward throughout the interview when you have to respond to inquiries.

If you have any questions, please ask. You can skip them if you don't wish to respond.

You have the option to decline the interview and any questions that are posed.

Additionally, all interviewers and research personnel are experts who have received specialized training for these interviews.

Recalling earlier incidents might be distressing as well.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

The information you provide will help in better improving nutrition care for patients receiving treatment in Kenyatta National Hospital

WILL BEING IN THIS STUDY COST YOU ANYTHING?

Participating in this study will require you to volunteer. Time required of you to participate will be about 30 minutes and there will be no costs attached to your involvement.

WILL YOU GET REFUND FOR ANY MONEY SPENT AS PART OF THIS STUDY?

You will not be refunded any money for participating in the study

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in

this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential. By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study: Yes No

I agree to have (define specimen) preserved for later study: Yes No

I agree to provide contact information for follow-up: Yes No

Patient printed code: _____

Patient signature / Thumb stamp _____ **Date** _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name: _____ **Date:** _____

Signature _____

Role in the study: _____ *[i.e. study staff who explained informed consent form.]*

Witness Printed Code *(If witness is necessary, A witness is a person mutually acceptable to both the researcher and participant)*

Code _____ **Contact information** _____

Signature /Thumb stamp: _____ **Date;** _____

If at any point you have questions about the study or concerns about your participation in this interview now or in the future, please contact:

Elizabeth Ndunge Kasimu

Tel: 0724444461

Email: Elizabethndungek@gmail.com

APPENDIX II: DATA COLLECTION TOOLS

Questionnaire

Socio Demographic characteristics

1. Which County do you come from?

2. Gender of the patient
 - Male
 - Female
3. Patient age _____ years
4. Marital status of the patient
 - Single
 - Married
 - Widowed
 - Divorced/Separated
5. Religious belief of the patient
 - Christian
 - Muslim
 - Hindu
 - Others (specify)_____
6. Education level of the patient
 - Less than basic education
 - Basic education
 - Intermediate education
 - Advanced education
7. Employment status of the patient
 - Employed
 - Self-employed
 - Unemployed
8. Monthly income range of the patient
 - < Ksh 5,000
 - Ksh 5001-10,000
 - Ksh10,001-15,000
 - Above Ksh 15,000

Cancer Diagnosis and Treatment History

9. When was the patient diagnosed of cancer?
 - Less than 1 year
 - 1-2 years
 - 2-3 years
 - 3-4 years
 - 4-5 years
 - above 5 years

10. For how long has the patient been on treatment of cancer?

Less than 1 year

1-2 years

2-3 years

3-4 years

4-5 years

above 5 years

11. Type of gastrostomy tube

prophylactic

reactive

12. Type of treatment

Radiotherapy

Chemotherapy

Chemoradiotherapy

Scored Patient Generated Subjective Global Assessment

1. a. Current and recent weight of the patient

Current weight of the patient _____ kg

Current height of the patient _____ cm

Previous weight of the patient

One month ago	_____ kg
Six months ago	_____ kg

b. During the last two weeks the weight of the patient has

Decreased (0)

Not changed

Increased

2. Food intake

In the last one month the patient food intake as compared to normal intake is

Unchanged

More than usual

Less than usual

The patient is currently taking?

Normal food but less than normal amount

Little solid food

Only liquids

Only nutritional supplements

Very little of anything

Only tube feedings or only nutrition by vein

3. **Symptoms:** The patient has had the following problems that kept him/her from eating enough food during the past two weeks

no problems eating₍₀₎

dry mouth

no appetite, just did not feel like eating

bothered by smells

nausea

feel full quickly

constipation

fatigue

mouth sores

pain; where? _____

things taste funny or have no test

Other _____

problems swallowing

Examples: depression, money or dental problems

vomiting

diarrhoea

4. **Activities and Function:** Over the past one month the general activity rate has been?

☐ normal with no limitations₍₀₎

☐ not my personal self, but able to be up and about with fairly normal activities₍₁₎

☐ not feeling up to most things, but in bed or chair less than half the day₍₂₎

☐ able to do little activity and spend most of the day in bed or chair₍₃₎

☐ pretty much bed ridden, rarely out of bed₍₃₎

PG-SGA Scoring Guideline

Worksheet 1: Scoring weight loss

To determine the weight loss, use 1 month weight data if available. Use 6-month data only if there is no 1 month data. Use points below to score weight change and add on extra point if patient has lost weight during the past 2 weeks. Enter total point in Box 1 of PG-SGA.

Weight loss in 1 month	Points	Weight loss in 6 months
10% or greater	4	20% or greater
5-9.9%	3	10-19.9%
3-4.9%	2	6-9.9%
2-2.9%	1	2-5.9%
0-1.9%	0	0-1.9%

Numerical score from worksheet 1

Worksheet 2: Which of the following other diseases/conditions does the patient suffer from?

Cancer	pulmonary or cardiac cachexia
AIDS	chronic renal insufficiency
presence of decubitis, open wound or fistula	presence of trauma age greater than 65

Worksheet 3: Metabolic demand

Score for metabolic stress is determined by a number of variables known to increase protein and caloric needs. Note: Score fever intensity or duration, whichever is greater. The score is additive so that a patient who has fever of 38.8°C (3 points) for < 72 hrs. (1 point) and who is on 10 mg prednisone chronically (2 points) would have an additive score for this section of 5 points.

Stress	None (0)	Low (1)	Moderate (2)	High (3)
Fever	No fever	>37.2 and <38.3	>38.3 and <38.8	>38.8°C
Fever duration	No fever	<72 hours	72 hours	>72 hours
Corticosteroids	No corticosteroids	Low dose (<10 mg prednisone equivalents/day)	Moderate dose (>10 and <30mg prednisone equivalents/day)	High dose (>30 mg prednisone equivalents/day)

Worksheet 4: Physical exam

Exam includes a subjective evaluation of 3 aspects of body composition, fat, muscle and fluid. Since this is subjective, each aspect of the exam is rated for degree. Muscle deficit/loss impacts point score more than fat deficit/loss. Definition of categories 0=no abnormality, 1+=mild, 2+ moderate, 3+ severe. Rating in these categories is not additive but are used to clinically assess the degree of deficit for (or presence of excess fluids)

Muscle Status

Temples (temporalis muscle)
Clavicles (pectoralis and deltoids)
Shoulders (deltoids)
Interosseous muscles
Scapula (latissimus dorsi, trapezius, deltoids)
Thigh (quadriceps)
Calf (gastrocnemius)
Global muscle status rating

Fat stores

Orbital fat pads
Triceps skin fold
Fat overlying lower ribs

Fluid status

Ankle oedema
Sacral oedema
ascites

Point score for physical exam is determined by the overall subjective rating of the total body deficit

No deficit score = 0 points

Mild deficit score = 1 point

Moderate deficit score = 2 points

Severe deficit score = 3 points

Worksheet 5: PG-SGA Global Assessment Categories

	Stage A	Stage B	Stage C
Category	Well-nourished	Moderate/ suspected malnutrition	Severely malnourished
Weight	No weight loss or recent non fluid weight gain	< 5% loss in 1 month <10% in 6 months or progressive weight loss	> 5% loss in 1 month >10% in 6 months or progressive weight loss
Nutrient intake	No deficit or significant recent improvement	Definite decrease in intake	Severe deficit in intake
Nutrition Impact Symptoms	None or significant recent improvement allowing adequate intake	Presence of NIS	Presence of NIS
Functioning	No deficit or significant recent improvement	Moderate deficit	Severs deficit
Physical exam	No deficit or chronic deficit but with recent clinical improvement	Evidence of mild to moderate loss of muscle mass and or muscle tone on palpation and or loss of SQ fat	Obvious signs of malnutrition (e.g severe loss of muscle, fat and possible edema)

Biochemical nutrition status assessment

Parameter	Level	Category			
		Normal	Mildly undernourished	Moderately undernourished	Severely undernourished
Serum albumin	- Normal: 35–50 g/L - Mildly undernourished: 28 – < 35 g/L. - Moderately undernourished: 21 – < 28 g/L. - Severely undernourished: <21 g/L.				
Serum pre-albumin	- Normal: 20–40 mg/dL - Mildly undernourished: 17 – < 20 mg/dL - Moderately undernourished: 10 – < 17 mg/dL - Severely undernourished: < 10 mg/dL				
Ferritin	<100 µg/L (Iron deficiency)				
Haemoglobin	<130 g/L in men and was <120 g/L in women.				
Total lymphocyte	- Normal: >1800/mm³ - Mild malnutrition: 1500 – 1800/mm³ - Moderate malnutrition: 900 – < 1500/mm³ - Severe malnutrition: <900/mm³				

24-hour dietary recall

Note to enumerator: Explain to the respondent to describe everything that the patient ate or drank the previous day since morning whether at home or away from home. Record the amount on the 24-hour recall sheet using household equipment. Probe until the respondent says nothing else. If the respondent mentions mixed dishes such as porridge, *githeri* probe what ingredients were in that mixed dish.

Meal time	Type of meal	Description/ ingredients	Amount served (Household measure)	Amount consumed (Household measure)	Net grams served	Net grams consumed
Breakfast						
Morning snack						
Lunch						
Evening snack						
Supper/ dinner						
Late night snack						

APPENDIX III: MMUST SCHOOL OF POSTGRADUATE STUDIES APPROVAL



MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

Tel: 056-30870
Fax: 056-30153
E-mail: directordps@mmust.ac.ke
Website: www.mmust.ac.ke

P.O Box 190
Kakamega – 50100
Kenya

Directorate of Postgraduate Studies

Ref: MMU/COR: 509099

4th September 2023

Elizabeth Ndunge Kasimu
HMD/G/14-70035/2021,
P.O. Box 190-50100,
KAKAMEGA.

Dear Ms. Ndunge

RE: APPROVAL OF PROPOSAL

I am pleased to inform you that the Directorate of Postgraduate Studies has considered and approved your Masters Proposal entitled: *"Nutrition Care Outcomes of Esophageal, Head and Neck Cancer Patients Utilizing Gastrostomy Tube at Kenyatta National Hospital: Nairobi, Kenya"* and appointed the following as supervisors:

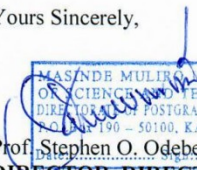
1. Prof. Gordon Nguka - MMUST
2. Dr. Rose Shikuri - MMUST

You are required to submit through your supervisor(s) progress reports every three months to the Director Postgraduate Studies. Such reports should be copied to the following: Chairman, School of Public Health, Biomedical Sciences and Technology Graduate Studies Committee and Chairman, Nutritional Sciences Department. Kindly adhere to research ethics consideration in conducting research

It is the policy and regulations of the University that you observe a deadline of three years from the date of registration to complete your Master's thesis. Do not hesitate to consult this office in case of any problem encountered in the course of your work.

We wish you the best in your research and hope the study will make original contribution to knowledge.

Yours Sincerely,



Prof. Stephen O. Odebero, PhD, FIEEP
DIRECTOR, DIRECTORATE OF POSTGRADUATE STUDIES

APPENDIX IV: KNH-UON ETHICAL APPROVAL

	
UNIVERSITY OF NAIROBI FACULTY OF HEALTH SCIENCES P O BOX 19676 Code 00202 Telegrams: varsity Tel: (254-020) 2726300 Ext 44355	KENYATTA NATIONAL HOSPITAL P O BOX 20723 Code 00202 Tel: 726300-9 Fax: 725272 Telegrams: MEDSUP, Nairobi
KNH-UON ERC Email: uonknh_erc@uonbi.ac.ke Website: http://www.erc.uonbi.ac.ke Facebook: https://www.facebook.com/uonknh.erc Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC	
Ref: KNH-ERC/A/126	23 rd March, 2023
Elizabeth Ndunge Kasimu Reg. No. HMD/G/14-70035/2021 Dept. of Nutrition Science School of Public Health Biomedical Science & Technology <u>Masinde Muliro University of Science & Technology</u>  Dear Elizabeth, RESEARCH PROPOSAL: NUTRITION STATUS OUTCOMES OF ESOPHAGEAL, HEAD AND NECK CANCER PATIENTS UTILIZING GASTROSTOMY TUBE AT KENYATTA NATIONAL HOSPITAL: NAIROBI, KENYA (P794/10/2022) This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is P794/10/2022. The approval period is 23rd March 2023 – 22nd March 2024. This approval is subject to compliance with the following requirements; i. Only approved documents including (informed consents, study instruments, MTA) will be used. ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC. iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification. iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours. v. Clearance for export of biological specimens must be obtained from relevant institutions. vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal. vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC. Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed. Protect to discover	

Yours sincerely,



DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH-UoN ERC

c.c. The Dean, Faculty of Health Sciences, UoN
 The Senior Director, CS, KNH
 The Assistant Director, Health Information Dept., KNH
 The Chairperson, KNH- UoN ERC
 The Chair, Dept. of Nutrition Sciences, Masinde Muliro University of Science & Technology
Supervisors: Prof. Gordon Nguka ,Dept. of Nutrition Sciences, Masinde Muliro University of Science & Technology
 Dr. Rose Shikuri, Dept. of Nutrition Sciences, Masinde Muliro University of Science & Technology

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APPENDIX V: NACOSTI RESEARCH PERMIT

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 937399	Date of Issue: 29/April/2023
RESEARCH LICENSE	
	
This is to Certify that Miss.. Elizabeth Ndunge Kasimu of Masinde Muliro University of Science and Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: NUTRITION STATUS OUTCOMES OF ESOPHAGEAL, HEAD AND NECK CANCER PATIENTS UTILIZING GASTROSTOMY TUBE AT KENYATTA NATIONAL HOSPITAL: NAIROBI, KENYA. for the period ending : 29/April/2024.	
License No: NACOSTI/P/23/25076	
937399	
Applicant Identification Number	Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
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APPROVED POLICY BRIEF

A policy brief was development using the findings in this study and approval given.



KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi
Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com
knhresearch@knh.or.ke



KNH Funded Research Policy Brief – Final Report form
Names of Principal Investigator: Elizabeth Ndunge Kasimu
Phone: +254724444461
Email: elizabethndungek@gmail.com
Names of other Investigators: Prof. Gordon Nguka and Dr. Rose Shikuri

Good policy brief
Dr. Ngumbau

Nutrition status outcomes of esophageal, head and neck cancer patients utilizing gastrostomy tube at KNH, Nairobi, Kenya from 2023 to 2024

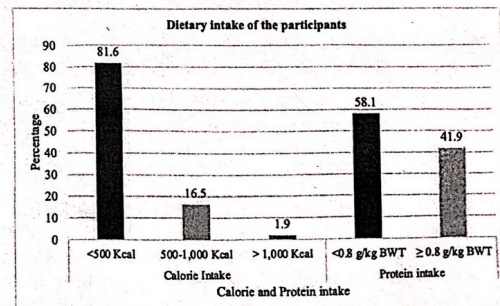
Introduction- Esophageal, head, and neck cancers present significant challenges in maintaining adequate nutrition due to the difficulties in swallowing and effects during treatment. Malnutrition in these patients can lead to ineffective treatment, increased risk of death, and decreased quality of life.

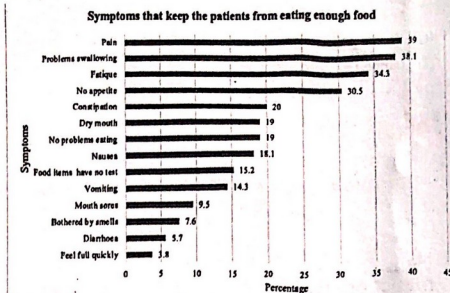
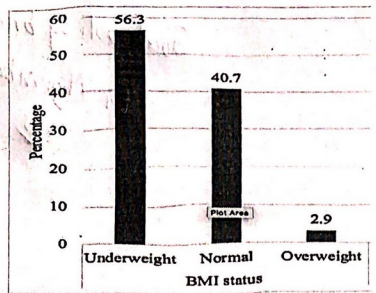
Methods- The study design was descriptive institutional-based cross-sectional with an analytical component and a sample size of 103 respondents. Nutrition data was collected using Patient Generated Subjective Global Assessment (PG-SGA) tool, with energy intake from 24-hour recall. Protein intake adequacy was assessed using biochemical markers. Socio-demographics, anthropometrics, biochemical parameters, and muscle status were recorded via a questionnaire.

Results- The results showed a significant prevalence of undernutrition among the patients with marked declines in weight, BMI, biochemical markers, protein intake and caloric intake. The Socio-demographic analysis revealed that Central region had the highest number of patients 54.4% (n=56) having esophageal, head and neck cancer. In terms of muscle status, 31.1% had no abnormalities, 23.3% had mild, 22.3% moderate, and 23.3% had severe muscle wasting. Therefore, there is need to establish a multidisciplinary nutritional support and monitoring program specifically tailored for esophageal, head, and neck cancer patients utilizing gastrostomy tubes. This will be crucial in improving the nutritional status, treatment outcomes, and overall quality of life for the patients, thereby addressing the critical issue of malnutrition among this vulnerable population.

Key Findings

Majority of the patients 81.6% consumed less food than usual, highlighting significant challenges in maintaining adequate nutrition, while more than half 56.3% were underweight as determined by BMI. Nutrition impact symptoms (NIS) are one of the prognostic indicators related to specific malnutrition for cancer patients. The presence of NIS was utilized to evaluate potential barriers to adequate food intake, such as anorexia, refusal to eat, nausea, constipation, mouth sores, pain, and vomiting.





Policy Recommendations:

- i. KNH should develop and implement a policy for regular, Comprehensive and systemic Nutritional Screening and Assessment Programs for all esophageal, head, and neck cancer patients at the time of diagnosis and throughout treatment.
- ii. Create standardized protocols for the use of gastrostomy tubes, including guidelines for enteral feeding regimens, monitoring, and troubleshooting. Standardized care improves consistency, safety, and effectiveness of nutritional support, reducing complications and improving nutritional status outcomes.
- iii. Advocate for the inclusion of nutritional care as a critical component of cancer treatment protocols at both institutional and national health policy levels. Institutional and governmental support is essential for implementing and sustaining comprehensive nutritional care programs in cancer treatment.
- iv. Develop integrated cancer care approach through encouraging a multidisciplinary approach which consists of oncologists, nutritionists, and primary care providers and ultimately develop comprehensive care plans.
- v. Increase funding and resources for nutrition support services, easier access to prophylactic gastrostomy tubes effective in managing dysphagia within cancer treatment centers.

Conclusions

The prevalence of malnutrition among esophageal, head and cancer among patients using gastrostomy tubes was high as evidenced by the low BMI, notable weight loss and muscle wasting. The cancer patients experienced substantial challenges in maintaining adequate dietary intake. The use of gastrostomy tubes which is intended to be beneficial to them did not mitigate these feeding challenges. The patients experienced severe nutrition impact symptoms related to cancer treatment which require effective management to improve patients' nutritional intake and overall quality of life. The patients also experienced poor biochemical parameters which indicate systemic nutritional deficiencies and the need for targeted nutritional interventions.

Investigator: Elizabeth Ndunge Kasimu

Signature

Date: 2/06/2024

KNH, HoD: Name

Signature

Date: 2/06/2024