THE PREDICTORS OF HEALTH-RELATED QUALITY OF LIFE AMONG ADULT PATIENTS WITH ESOPHAGEAL CANCER AT KENYATTA NATIONAL HOSPITAL

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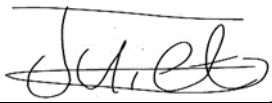
Signature:  Date: 28/11/2023

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DEDICATION

With great pleasure, I dedicate this work to my mother, Kamene Munuve, for her constant love, dedication and selfless support throughout this course.

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Thank you, Almighty God, for granting me perfect health and for the grace to carry out this research.

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ABBREVIATIONS AND ACRONYMS

CCRT	Concurrent Chemotherapy
CT	Computed Tomography
CTC	Cancer Treatment Center
EAC	Esophageal adenocarcinoma
EC	Esophageal cancer
EMEA	European Medicines Agency
EMR	Endoscopic Mucosal Resection
EORTC	European Organization for Research and Treatment of Cancer
EORTC QLQ-C30	European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30
EORTC QLQ-OES18	European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Esophageal Cancer Module
ER	Endoscopic Resection
ESD	Endoscopic Submucosal Dissection
ESCC	Esophageal Squamous Cell Carcinoma
EUS	Endoscopic Ultrasound
FDA	U.S Food and Drug Administration
FDG-PET	18-fluorodeoxyglucose positron emission tomography
HRQoL	Health-Related Quality of Life
KNH	Kenyatta National Hospital
MIE	Minimally invasive esophagectomy
NCDs	Non-Communicable Diseases
ONS	Oral Nutritional Supplements
PS	Performance Status
QOL	Quality of Life
RFA	Radiofrequency Ablation
SR	Surgical Resection

OPERATIONAL DEFINITIONS

Advanced Stage Cancer – "Is used to refer to extensive disease which has spread from the original site of the tumor to the lymph nodes and other sites in the body."

Chemotherapy – "Is the treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing."

Clinical diagnosis of cancer – "used to mean that the diagnosis of cancer was done based on the results of tests performed prior to surgery, such as imaging scans laboratory tests and physical examinations."

Esophageal cancer – "Is cancer that forms in tissues lining the esophagus (the muscular tube through which food passes from the throat to the stomach).

Health-Related Quality of Life – "Represents a broad concept which is based on multiple parameters - physical, psychological with social functioning and well-being that also includes both objective and subjective perspectives related to an individual or group's living conditions."

Histological diagnosis of cancer – "The diagnosis of cancer was done based on what is discovered during surgery."

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ABSTRACT

Background: Esophageal cancer is an aggressive malignancy with an increasing incidence rate and varying degrees of health-related outcomes and overall survival. There is a large and growing number of patients affected globally leading to high mortality rates establishing it as a major public health problem that stirs up a big concern requiring urgent attention. Despite its extremely aggressive nature and poor survival rate, it remains one of the least studied and deadliest cancers in Kenya.

Objective: To evaluate the predictors of health-related quality of life among adult patients with Esophageal cancer at Kenyatta National Hospital.

Methodology: A cross-sectional study was conducted to determine the predictors of Health-Related Quality of Life among 131 patients with esophageal cancer at cancer management units of Kenyatta National Hospital. Simple random sampling was used to select the participants. The Data was collected using a structured questionnaire and Health Related Quality of Life was assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 and, the Quality-of-Life Questionnaire esophageal 18. Data was analyzed using descriptive and inferential statistics at 0.05 level of significance. Statistics and data (STATA) version 13 software was used for data analysis. A bivariable and multivariable regression analysis was done to determine the predictors of Health-Related Quality of Life. Prior to the study, approval was sought from Kenyatta National Hospital Ethics and Research Committee and permission from the Kenyatta National Hospital research office.

Results: The majority of respondents in this study were aged between 51 – 70 years, with an average age of 60.95 ± 12.7 years, and a more significant percentage were males. Concurrent chemoradiotherapy was the most commonly used mode of treatment for esophageal cancer. A combination of Platinum-based and Taxane-based agents was regularly used as the first line while Antimetabolites and immunotherapy were incorporated as the second line. Health Related Quality of Life was sub-optimal with an overall mean score of 45.67%, which was below average. Dysphagia, problem eating, gastrointestinal symptoms, and pain were the most significant predictors of Health-Related Quality of Life.

Conclusion: Gastrointestinal symptoms were the most important predictor of Health-Related Quality of Life.

Recommendation: Prospective studies should be carried out that includes the measurement of Health-related Quality of Life at baseline and after treatment, using validated instruments, such as the European Organization for Research and Treatment of Cancer Quality of Life tool or the Functional Assessment of Cancer Therapy – General in all areas of esophageal cancer management.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Globally, the burden of Cancer is on a drastic rise and the trend is projected to increase. The incidence of Esophageal Cancer (EC) ranks seventh with an overall mortality ranking sixth. One in every 18 cancer deaths in 2020 was due to esophageal cancer (1, 2). This indicates a significantly poor prognosis of EC worldwide, reporting high mortality to incidence ratio of 88.9% (3). The mortality to incidence ratio is even higher in Africa, rated at 97.2% (3).

Histologically, EC is classified into two, esophageal squamous cell carcinoma (ESCC) which is linked to alcohol and tobacco consumption, and esophageal adenocarcinoma (EAC) which is linked to obesity, smoking, and gastroesophageal reflux disease (GERD) (4). The incidence of ESCC in less-developed countries has remained high, especially in the high-risk areas of China, Iran, South Africa, Malawi and Kenya with rates exceeding 100/100,000 new cases per annum, unlike in developed countries like the United States of America (USA) where incidence rates have decreased significantly in the past three decades to about less than 10/100,000 new cases per year (4,5, 6,7,8). On the other hand, recent trends have witnessed an increasing trend of EAC in western countries (2, 5, 9) with overall incidence rates rising steadily as age advances (10). In Africa generally, ESCC is more common (3) but, both types are common in males more than in females. In Kenya, cancer is the second leading cause of Non-Communicable Disease (NCD) deaths. Of all cancers in Kenya, EC is ranked third in incidence and the number one killer (11,12). Among men, prostate, esophageal, and colorectal are the most common cancers and in women, breast, cervical and esophageal cancers are the most common cancers, in that order in terms of incidence (13). The leading cause of cancer death in Kenya is esophageal followed by cervical and breast cancer (13). A study conducted in Kenya in 2017 by Walong et al indicates that Kenya belongs to a high-incidence region known as Africa's esophageal cancer (EC) corridor. Western and Central Kenya has the highest number of cases in the country (14).

The clinical presentation of patients with esophageal cancer can be attributed to the direct effects of tumor growth on local and regional structures. Both ESCC and EAC show similar manifestations, such as difficulties swallowing being the most common symptom. Dysphagia initially occurs upon ingestion of dense solid food and progresses gradually to interference with the consumption of soft foods and ultimately even liquids. Pain is a common symptom even in the

absence of dysphagia, and so is weight loss, which correlates with the occurrence of tumor-related anorexia (15).

The treatment and management of cancer are dynamic and cause massive distress to the patients, because of the associated diseases and treatment-related morbidity. The consequences have an adverse effect on the health-related quality of life of patients. Measuring patients' self-perceived notion of their health-related quality of life (HRQOL), throughout the course of illness, is central to the delivery of comprehensive, patient-centered care (16). With recent advances in patient care, HRQOL is being used at all stages of the patient journey, from diagnosis to treatment response, to long-term survival, unlike historically when only traditional outcomes such as perioperative morbidity and mortality were considered the most important (16).

1.2 Problem Statement

Esophageal cancer is an aggressive malignancy with an increasing incidence rate and varying degrees of health-related outcomes and overall survival, the 5-year survival being stagnant at below 20% hence the need to develop better diagnostics and therapies (17). There is a large and growing number of patients affected globally leading to high mortality rates establishing it as a major public health problem that stirs up a big concern requiring urgent attention (18, 19). Despite its extremely aggressive nature and poor survival rate, it remains one of the least studied and deadliest cancers in Kenya (20). The diagnosis of EC is mostly made in the late stages and only a few public hospitals in Kenya treat patients with this disease (12).

Despite that remarkable efforts and advances in the management and treatment of EC have been made over the years the mortality remains very high (17). This calls for careful consideration when choosing a treatment plan for the patients as well as taking into consideration the current patient parameters with regard to the disease stage and the patient factors before and after commencing the treatment (17). Worse treatment outcome is tied to treatment access, drug therapy problems, screening practices and presence and nature of comorbidities. This disease and associated treatment modalities have deleterious effects on the health-related quality of life. The victims and the care givers also suffer from psychological, social and economic hardships. Survival rate is poor and the progress is agonizing especially because diagnosis is often made late making treatment outcomes disappointingly unfavorable even after surgical resection, radiotherapy or

chemotherapy. These treatment modalities have adverse effects which worsen the situation. This study therefore is crucial to expose the HRQOL of these patients.

1.3 Justification of the study

There are not so many studies conducted in Kenya on Esophageal cancer indicating that this is an under-researched area. EC is among the diseases overwhelming the Kenyan health systems with a significant burden. Previous publications on esophageal cancer have reported on various health metrics including its incidence, mortality, and risk factors but none has looked at the management and the health effects on the quality of life among patients undergoing treatment. This has created a great need to carry out this research study.

Given the reports available on adverse outcomes especially the high mortality rates from EC and the significant burden on health care systems, there is a need to shift focus on the various forms of treatment interventions employed to manage these patients, the procedures, and the HRQOL. This focus is due to the fact that the EC itself as well as the treatments, potentially and adversely impair both the physical, emotional, functional, and physiological health needs of the patients. Therefore, there exists a knowledge gap and this study will go a long way in establishing background information on the current management practices and provide effective interventions that will reduce the debilitating impact of these treatments. The study findings will play an important role in setting a baseline for further research in EC.

1.4 Research Questions

1. What is the health-related quality of life of patients with Esophageal cancer at KNH?
2. What treatment modalities are utilized and how do they impact the health-related quality of life among patients with esophageal cancer at Kenyatta National Hospital (KNH)?
3. What are the predictors of health-related quality of life in patients with Esophageal cancer at KNH?

1.5 Objectives

1.5.1 General objective

To evaluate the predictors of health-related quality of life among adult patients with Esophageal cancer at KNH.

1.5.2 Specific objectives

1. To evaluate the health-related quality of life of adult patients with esophageal cancer at KNH.
2. To examine the management of patients with esophageal cancer at KNH.
3. To analyze the sociodemographic and clinical characteristics of patients with esophageal cancer at KNH.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter comprises a summary of the management of EC and an in-depth review of how these management options impact the HRQOL of EC patients. The factors that predict the HRQOL among EC patients are also described.

2.2 Overview and Staging of EC

According to Global cancer statistics 2018 (GLOBOCAN), Esophageal cancer is one of the most common cancers worldwide with an incidence rate ranking seventh and an overall mortality ranking sixth in terms of cancer-related deaths in the world (21). These statistics are in tandem with the observations made in the National Comprehensive Cancer Network (NCCN) Guidelines as well as an analysis of registries on the trends of esophageal cancer from 48 countries done in 2021 (2, 22).

Significant regional epidemiologic differences have been observed on the incidence and mortality of esophageal cancer (21). The 'Esophageal cancer belt' is a region known to have the highest incidence of EC cases and it spans from northern Iran through the central Asian republics and into northern China. Other high-incidence areas include southern and eastern Africa and northern France (22). The highest EC incidences in Africa, are reported within a region known as the 'Africa's EC corridor' consisting of low-lying countries stretching from Ethiopia and Kenya down to South Africa (14, 23). In Kenya, the regions that represent the highest number of EC cases are the Western and Central Kenya regions (24 - 27).

Esophageal cancers are histologically classified as squamous cell carcinoma (SCC) or adenocarcinoma (Barrett cancer: AEG I), which differ in their pathogenesis, epidemiology, tumor biology, and prognosis (2, 3, 22). Classification based on histologic subtype and molecular features helps to improve early diagnosis and has implications for therapy. SCC is more aggressive with a higher likelihood to localize at or higher than the tracheal bifurcation, tending to metastasize to the lymphatics earlier and is thus associated with poorer prognosis. SCC is associated with a lower socio-economic level, tobacco and alcohol consumption being the major risk factors (22,28). In contrast, EAC, which arises from the metastatic columnar epithelium in the lower third of the esophagus is associated with a high socioeconomic level and cardiovascular risk factors most likely reflecting the rising rates of obesity. Obesity contributes to the development of

gastroesophageal reflux disease (GERD), which is a major underlying cause of esophageal adenocarcinoma (22 – 23, 29). Most reports indicate SCC has a worse survival than EAC.

The tumor (T), node (N), and metastasis (M) staging system used by the American Joint Committee on Cancer (AJCC) is the internationally accepted standard for cancer staging and is a major factor influencing prognosis and treatment decisions (30). Staging recommendations for esophageal and Esophagogastric Junction cancers represented in the Eighth Edition of the AJCC Cancer Staging Manual include clinical staging (cTNM; newly diagnosed, not-yet treated patients), pathologic staging (pTNM; patients undergoing resection without prior treatment), and post neoadjuvant pathologic staging (ypTNM; patients receiving preoperative therapy). Whether EC patients receive preoperative therapy (ypTNM) or not, the survival rates are best correlated with the pTNM stage (22).

Generally, the accuracy of clinical staging has greatly improved with advances in endoscopic techniques and imaging modalities such as endoscopic ultrasound (EUS), Computed Tomography (CT), and 18-fluorodeoxyglucose positron emission tomography (FDG)-PET/CT. For locoregional disease, a combination of CT and EUS works best when doing an initial staging whereas FDG-PET CT is the best for staging distant metastatic disease (22).

Local data in Kenya, as seen at a tertiary care center in Bomet where a retrospective hospital-based review was conducted, indicates increasing trends over time of all pathologically confirmed malignancies between 1999 and 2007 (31). This is strongly seconded in the data that was published by the Nairobi Cancer Registry that reported EC as the most common malignancy amongst men from 2000 to 2002, making 10% of all pathologically confirmed malignancies (32).

Due to the high numbers of patients with an established diagnosis of EC who are received at KNH CTC (KNH oncology registry), with an almost fatal outcome, there is, without doubt, a great need to review and establish the current treatment modalities employed and how they affect the quality of life of these patients and how to improve those treatment strategies.

2.3 Management of Esophageal Cancer

Esophageal cancer has proved to be and still remains one of the most difficult malignancies to treat and this could be an alternative explanation for the high mortality rates experienced. This is observed despite the great efforts projected towards research and even going to the extent of the adoption of new technologies and advances in pioneering new model therapies to fight cancer (21).

Given every tumor is unique, a multidisciplinary approach is necessary for the management of EC, including the overall supportive care which allows patients to tolerate the toxicity of both the disease and the effects of treatment better hence retaining a higher health-related quality of life during treatment (7).

The treatment plan is often determined based on the stage of esophageal cancer thus different treatment options are available for the management of ESCC and EAC. Surgical resection (SR), Radiation therapy (RT), and Chemotherapy have been proved to effectively manage as well as improve the quality of life and survival rates of EC patients (21). However, favorable treatment results are usually observed when patients seek care in the early stages of the disease because earlier detection allows less complicated treatments that better predict prognosis thus ultimately improving their quality of life. Furthermore, therapeutic decisions may have to be tailored in accordance to the location of the individual tumor, nodal distribution, and specific requirements for local control, not overlooking the fact that an individualized therapeutic approach based on patient needs should be prioritized (22, 33).

The standard of practice currently in the management of EC is employing the use of combination treatments rather than intensifying conventional chemotherapy drugs or increasing radiation doses because of toxicity concerns (29). Over time, therapy of EC has evolved to include new chemotherapy regimens, multi-model treatments, and promising new approaches such as immunotherapy.

Palliative care has been employed extensively, especially in advanced tumors where-by definitive treatment is impossible, to bring the tumor growth to a manageable control and increase the survival of these patients without adverse negative effects on their quality of life (43). Dilating balloons or bougies or even the endoscopic placement of self-expanding metal stents (SEMS) is often performed to produce esophageal dilation thus providing temporary relief from tumor obstruction or strictures. This is largely due to very late-stage diagnosis where curative treatment is not possible (4, 6). Endoscopic therapies also play a role in palliative care.

Long-term palliation of anorexia, dysphagia, or malnutrition may be achieved with endoscopic or radiographic-assisted placement of a feeding gastrotomy or jejunostomy tube.

Management of stage 0 and I esophageal cancer

Before commencing treatment, the establishment of the disease stage is confirmed via such means as endoscopic examination, computed tomography (CT) of the neck, chest, and abdomen, and positron-emission tomography (PET).

Minimally invasive Endoscopic Resection (ER) is the preferred treatment modality in patients with stage 0 (T1a) although it is associated with a high risk of development of stenosis after ER, particularly in patients with a poor general health condition. Post-ER histopathologic assessment is of vital importance to determine if any additional treatment is required or not. In patients with stage I (T1b) disease, the selection between surgery and chemoradiotherapy should be made after assessing the patient's surgical tolerability (34-36).

Management for stage II and III esophageal cancer

The first line of therapy entails the administration of preoperative chemotherapy followed by surgical resection after establishing tolerability for surgical operation. Radical resection with or without preoperative chemoradiotherapy may also be considered. For patients unable to tolerate surgery or refuse surgery but are feasible for chemoradiotherapy, definitive chemoradiotherapy (≥ 50 Gy) should be considered. However, those unable to tolerate surgery and chemoradiotherapy is not indicated either, are considered for radiation therapy (those with altered renal function especially the elderly), chemotherapy (those with a history of previous radiation exposure), palliative symptomatic treatment, or palliative chemotherapy (34, 37-38).

Management of stage IV esophageal cancer

Management of stage IV disease entails careful assessment and evaluation of performance status (PS). Those with stage IVa disease with a good PS are suitable candidates for definitive chemoradiotherapy treatment. This may achieve a complete cure although there is a high risk of local residual lesion which may warrant salvage surgery and increases the risk of operation-related death. Patients with stage IVa disease with poor PS are better when placed on palliative symptomatic treatment. Stage IVb esophageal cancer disease which is representative of disease progression beyond local disease usually requires systemic treatment with chemotherapeutic drugs constituting the mainstay of treatment. However, palliative radiotherapy may also need to be considered in patients presenting with evidence of obstruction (34, 39 - 41).

2.3.1 Endoscopic therapy

Several studies have demonstrated that Endoscopic Resection (ER) and endoscopic ablation procedures are effective treatment options for EC management overtaking the use of radical esophagectomy that is now taking a back seat due to its associated high mortality rates and impaired quality of life (42).

ER is used as a diagnostic, screening, and treatment tool as well as for surveillance of EC. It is essential for the accurate treatment of early-stage cancers (cT1a and cT1b ≤2 cm1) because it is more reliable than Endoscopic Ultrasound (EUS) to provide accurate information on the depth of tumor invasion (22, 49). ER is performed by either endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD), followed by radiofrequency ablation (RFA), and this has become the standard treatment for most patients (22). Alternative strategies include cryoablation or photodynamic therapy (PDT) which may be considered. Endoscopic therapies also play a role in palliative care. A meta-analysis study conducted in 2014 to investigate the effectiveness of ESD and EMR in treating superficial esophageal cancer (SEC) concluded that ESD seemed superior to EMR in the treatment of SEC as evidenced by significantly higher en-bloc and curative resection rates and by obviously producing lower local recurrence rate. However, operative time and perforation rate for ESD were significantly higher than those for EMR (42).

2.3.2 Surgery

Surgical resection is a popular treatment modality for locoregional esophageal cancers in patients with no evidence of distant metastases of the disease (43). Improvements in staging techniques, patient selection, post-surgical care, and the availability of competent experienced surgeons have led to a marked reduction in surgical morbidity and mortality in recent years (22). However, surgery is associated with a high recurrence rate of tumor re-growth a few years after resection hence the need to employ combination treatments.

The mainstay of EC treatment with curative intent is esophageal resection (44). Esophagectomy alone is recommended for those with cancer limited to the esophagus. The two most common techniques acceptable for esophagectomy include transthoracic and trans-hiatal approaches. Transthoracic esophagectomy comprises two standard options, the Ivor Lewis esophagectomy (right thoracotomy and laparotomy) which may be used for distal thoracic lesions but inadequate for tumors in the middle esophagus, and McKeown esophagectomy (right thoracotomy followed

by laparotomy and cervical anastomosis) with the advantage of being applicable for tumors in the upper, middle, and lower thoracic esophagus (22, 50). Trans-hiatal esophagectomy (laparotomy and cervical anastomosis) may be used for lesions at any thoracic location; however, trans-hiatal dissection of large, middle esophageal tumors adjacent to the trachea is difficult and maybe hazardous (22).

Minimally invasive esophagectomy (MIE) therapies, which are utilized either by themselves or in combination, together comprising the "hybrid" procedures, are associated with decreased postoperative mortality, shorter recovery times, and increased long-term survival. These less invasive procedures are associated with reported benefits such as less pain and improved short-term complications, with patients reporting a faster return back to their baseline health status (49). It is important to note that most of these findings are supported by findings of select high-volume centers with expertise in esophageal surgery (45-46). However, like in any other procedure, these less invasive procedures are associated with an increased risk of tracheobronchial injury (47-49).

Surgical resection alone or in combination with endoscopic therapies can be considered in patients with high-grade dysplasia (Barrett's esophagus) or intramural squamous or adenocarcinoma of the esophagus (44). However, most of the EC patients present at advanced stage disease, stage III (T3N1-3, T4N0-3), making surgery only inadequate for loco-regional control hence the need to supplement surgery with Neoadjuvant, adjuvant chemotherapy, and chemoradiation protocols (44). This goes a long way in improving the HRQOL by treating the micro-metastatic disease.

2.3.3 Chemotherapy

Current management protocols for EC are based on novel combinations of standard chemotherapy drugs. Chemotherapy comprises cytostatic therapy which is generally directed at cells of fast proliferation and/or targeted therapies which are directed against specific molecules needed for carcinogenesis and tumor growth (43). It is administered prior to surgery to reduce the tumor size and to target micro-metastases to avoid tumor spread. However, chemotherapy is associated with toxicity and the risk of selecting drug-resistant clones and delaying surgical treatment.

5-fluorouracil and cisplatin top the list as the most extensively utilized agents for this disease and are included in most combination chemotherapy regimens. Research findings of a meta-analysis based on 12 randomized trials reported that chemotherapy prior to surgery has been shown to provide an overall and disease-free survival benefit over surgery alone (50).

The first-line (1L) systemic therapy for locally advanced, unresectable, recurrent, or metastatic ESCC is a two-drug cytotoxic combination treatment, consisting of a fluoropyrimidine-based (fluorouracil or capecitabine) and platinum-based (cisplatin or oxaliplatin) combination regimen (22, 50, 72). Generally, Oxaliplatin is preferred over cisplatin due to its lower toxicity. In patients with Human Epidermal Growth Factor Receptor 2 (HER2) overexpression positive adenocarcinoma, trastuzumab should be added to first-line chemotherapy (combination with a fluoropyridine and a platinum agent is preferred [category 1 for cisplatin; category 2A for oxaliplatin]) (22).

For the second-line (2L) and subsequent lines of therapy, the recommended options are docetaxel, paclitaxel, and irinotecan (with or without fluorouracil) together making the category 1 recommendation (50-51). However, for 2L and subsequent therapy, the NCCN guidelines recommend the use of nivolumab, pembrolizumab, and ramucirumab but the selection is dependent upon prior therapy and performance status (22, 53, 71). FOLFIRI is another promising option that can be safely used in the second-line setting if it was not previously used in first-line therapy (22).

Notably, several targeted therapeutic agents have received Food and Drug Administration (FDA) approval for use in advanced esophageal cancer, including; trastuzumab, pembrolizumab/nivolumab, and entrectinib/Larotrectinib (22, 53).

2.3.4. Chemoradiotherapy

The use of a combination of chemotherapy and radiotherapy has increased in the management of esophageal cancer unlike either treatment alone. Several studies have shown better survival outcomes with combined chemoradiation therapy (59, 62,). Chemoradiotherapy should include 50 to 60 Gy of radiotherapy plus concurrent chemotherapy with 5-fluorouracil (5-FU) plus cisplatin. Chemoradiotherapy is now an established alternative to surgical therapy (predominantly in patients with squamous cell carcinoma) (44, 62). Intensifying conventional chemotherapy drugs or increasing radiation doses have not proven successful in the management of EC and combination treatments are becoming the new norm and the standard of practice (54). The aim of combination therapies is to account for tumor cell heterogeneity and the role it plays in drug resistance.

In stage I EC in which the tumor is localized to the esophagus, chemoradiation is the current standard therapy followed by surgery or surgery alone. In advanced tumors (stage IV) where there

is distant metastasis, patients will in addition undergo post-operative radiation therapy (44). On the other hand, for stage III disease, immediate surgery might hold a better outcome over chemotherapy or definitive chemoradiotherapy (51).

Neoadjuvant chemoradiotherapy (nCRT) is another treatment option, but most patients do not respond optimally hence the need to carry out risk stratification and imaging biomarkers in order to improve the treatment outcomes (53). In late and advanced stage disease, concurrent chemoradiotherapy (CCRT) consisting of 5-fluorouracil (5-FU) plus cisplatin and radiation whose efficacy has been demonstrated and promising is commonly performed (55). In patients treated with chemoradiotherapy, a follow-up endoscopy of the upper gastrointestinal tract 4 to 6 weeks after its completion is recommended (56). Preoperative and postoperative CCRT is being utilized to treat lymph nodes or lymphatic tissue and locally invasive tumors.

2.3.5 Supportive Therapy

Supportive care must be multi-disciplinary and should be Integrated from the time of diagnosis so as to improve the patient and family experience, which ultimately leads to better patient reported quality of life. A vast majority of EC patients present with associated malnutrition.

The poor nutritional status is often related to the location of the tumor hence poor feeding, the disease process and presence of cancer cachexia, altered metabolism, and tissue wasting (82). Such patients will more often than not present with dysphagia which is accentuated due to chemotherapy, radiotherapy, or surgical intervention. Malnutrition will definitely affect the quality of life, by far worsen patient's tolerance to chemotherapy, and thus account for the lower survival in this patient population. This therefore demonstrates that proper nutritional assessment and support amongst EC patients might prevent, to a certain extent, the manifestation of malnutrition-related consequences. A whole-course nutritional management plays a big role in improving the quality of life of these patients by reducing the severity of chemoradiotherapy in terms of reducing the severity of radiation esophagitis and radiation skin reactions (82).

Pre-surgical implementation and use of Oral Nutritional Supplements (ONS), and Enteral and Parenteral Nutrition (PN), enriched with immune-modulating nutrients (omega-3 fatty acids) has proven to be an effective method for reducing complications in the post-surgical period in these patients. Additional administration of energy and nutrients via jejunostomy inserted during the surgical procedure among patients who have undergone esophagectomy has proved to be effective.

In those patients who present with severe esophageal obstruction, a long-term palliation of dysphagia is possible through placement of endoscopic lumen enhancement (wire-guided or balloon dilation), or endoscopic/radiographic-assisted insertion of expandable metal or plastic stents. The temporary placement of self-expanding metal stents (SEMS) with concurrent External Beam Radiation Therapy (EBRT) was found to increase survival rates compared with permanent stent placement (83). In cases where endoscopic stenting is not possible especially among patients with unresectable tumor, PEG tubes or feeding gastrotomy or jejunostomy tubes come in handy for nutritional support. Psychosocial support, counselling and pain management important (83).

2.4 Health-Related Quality of Life (HRQoL)

In the past, the traditional end-point of a disease has been determined through the measurement of survival or disease-free survival usually confirmed through clinical and laboratory determination of indicators of illness but valid concerns are emerging with regard to the well-being and quality of life of these patients (57). HRQoL of cancer patients is a major concern by health care practitioners as well as the patients or their caregivers hence assessment of HRQoL is becoming more common. It is particularly important in chronic diseases such as cancer because they describe an individual's subjective perception of both the positive and negative aspects of cancer patient's symptoms in terms of their physical, emotional, social, and cognitive functioning not forgetting disease symptoms and side effects of treatment in a more holistic approach (5).

Many organizations have come up with tools and conceptual models that measure HRQoL of cancer patients (58) which may complicate the measurement, analysis, and conclusions drawn but this study chooses to focus on one of the most widely employed questionnaires for patient-reported outcomes in cancer research, the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ-C30) (59-60). Further, the U.S. Food and Drug Administration (FDA) and European Medicines Agency (EMEA) now recognize the benefits of health-related Quality of Life (QoL) as a basis for approval of new anticancer drugs, and many international research groups include QoL as a significant outcome measure in their clinical trials (67-68). Moreover, a study conducted in Kenya by Davda et al in 2020 concluded that the EORTC Quality of Life Questionnaire (QLQ – C30) is an acceptable, reliable, and valid instrument for measuring the QoL in cancer patients in Kenya and recommends its use in clinical practice (67). Also, the fact that a Kiswahili (one of the two official languages in Kenya) EORTC-translated

version of the questionnaire is available, made it even more attractive a tool for use in this research study.

The EORTC QLQ Core 30 Items (EORTC QLQ-C30), is composed of both multi-item scales and single-item measures. These include five functional scales, three symptom scales, a global health status / QOL scale, and six single items. Each of the multi-item scales includes a different set of items - no item occurs in more than one scale (69). Version 3.0 of the QLQ-C30, the current standard version, has four-point scales coded with response categories from items 1 to 28, namely "Not at all", "A little", "Quite a bit" and "Very much." However, items 29 and 30 have been re-worded as a seven-point scale coded from "very poor" to "excellent". All of the scales and single-item measures range in score from 0 to 100. A high scale score represents a higher response level. Thus, a high score for a functional scale represents a high/healthy level of functioning, a high score for the global health status / QOL represents a high QOL, but a high score for a symptom scale/item represents a high level of symptomatology/problems (69).

The EORTC QLQ Esophageal Cancer Module (EORTC QLQ-OES18) is an esophageal site-specific module designed to gather information about the specific neoplasm as well as treatment-related symptoms and side effects (70). It is recommended for use with the core questionnaire, the QLQ-C30, complementing it in the assessment of QoL in patients with esophageal cancer after demonstrating good psychometric and clinical validity in a multicenter study conducted in 2003 (74). This questionnaire is composed of four scales of disease-related symptoms—reflux, dysphagia, eating, and pain—and other six single scales of treatment-related side effects—choking, dry mouth, taste, cough, trouble with saliva swallowing, and speech. All scores range from 0 to 100, and a higher score means a greater escalation of the problem (65 - 66).

Many studies have evaluated the post-treatment HRQoL and its association with survival. Scarpa et al, 2011, conducted a systematic review to assess the long-term HRQoL of EC patients after esophagectomy looking at the HRQoL changes during the different stages of follow-up after esophageal resection (75). In this analysis, twenty-one studies published between 1995 and 2011 that utilized the Short Form-36 (SF36) or EORTC-QLQ-C30 and OES18 questionnaires were included. The clinical heterogeneity of the studies was the main limitation. The analysis concluded that both short- and long-term generic and disease-specific HRQoL is deeply affected by esophagectomy particularly the impairment of physical function which can involve either the

respiratory system (impaired by the thoracotomy sequelae) or the alimentary tract (affected by accelerated transit and functional sequelae).

A medical center in central Taiwan conducted a study in 2017 to investigate the effects of treatment on the quality of life for patients with ESCC diagnosed at early and late stages, recruiting a homogenous sample of male patients from February 2007 to March 2011 (80). Quality of life scores for 105 ESCC patients was obtained using the EORTC QLQ-C30 and OES18 scales and analysis performed using the multi-variate analysis after stratification by cancer stage. The results indicated that in early-stage patients, Surgery only treatment generally gave better functional and symptom outcomes whereas the use of Concurrent Chemoradiotherapy reduces their HRQoL. In late-stage patients there were no apparent differences in the treatment modalities (80).

Another prospective population-based study by Maryam Derogar set out to clarify whether HRQoL can be restored in 5-year survivors of EC surgery, between 2001 to 2005. The EORTC QLQ-C30 and OES18 questionnaires were used to assess HRQoL of the 153 EC patients at 6 months, 3 years, and 5 years postoperatively. The conclusion was that majority of the EC surgery survivors recovered to levels comparable to those of the background population after 5-years with only a minute number of patients reporting a substantial deterioration of HRQoL after comparing with that of the background population (77).

Noordman and colleagues conducted a large Randomized cross-trial investigating the effect of Neoadjuvant Chemotherapy on the HRQoL in Esophageal or junctional cancers among patients who received neoadjuvant chemoradiotherapy (nCRT) followed by surgery or surgery alone. The study went a step further to examine the effect of nCRT on HRQoL before surgery and the effect of surgery on HRQoL. They included a total of 363 patients who were randomly assigned to nCRT (carboplatin plus paclitaxel with concurrent 41.4-Gy radiotherapy) followed by surgery or surgery alone. HRQOL was measured using the QLQ-C30 and OES18 questionnaires pretreatment and at 3, 6, 9, and 12 months postoperatively. There were no statistically significant differences observed in both treatments, all primary and secondary HRQoL end points declined postoperatively, but most were restored to pretreatment levels within 1 year postoperatively (78).

De Boer et al conducted another randomized trial to assess the 3-year quality of life in patients with EC comparing limited trans-hiatal resection with extended transthoracic resection. A total of 199 patients participated with 96 in the trans-hiatal esophagectomy group and 103 patients allocated to the transthoracic group. Quality of life was assessed using the disease-specific

Rotterdam symptom checklist and the medical outcomes study short form-20 questionnaires at baseline and at 5 weeks; 3, 6, 9, and 12 months; and 1.5, 2, 2.5, and 3 years after surgery. The results conclusion was that there were no significant differences in the quality of life of patients who underwent either trans-hiatal or transthoracic resection. The quality of life declined initially after the operation but was restored within a year in both groups (79).

2.5 Factors that predict the HRQoL among EC patients

Generally, cancer patients undergoing treatment will have continual and dynamic experiences from the treatments, because treatments could have a profound impact on patients' HRQoL and this may be very distressing and disorienting. Thus, the evaluation of the determinants of HRQoL is of absolute importance to address several issues that may affect the decision-making process, identify patient preferences with each treatment of choice, and also serve as a quick reference for their choice of treatment. Due to variations in the HRQoL of patients managed on different treatments, it is important, therefore, to investigate the factors that affect and predict the HRQoL to enable health care providers to plan care services guided by the patient's specific parameters and tailor treatment to the patient's needs and general well-being as well as be more aware of the positioning of follow-up care activities through improved patient-physician communication.

The most important factors that predict the HRQoL among EC patients include; the spread of the tumor through the esophageal wall and the presence of lymph node metastasis. The late presentation which is almost synonymous with advanced disease greatly influences the undesirable outcomes observed amongst EC patients (73).

A Swedish nationwide population-based study investigated the predictors of HRQoL after esophagectomy of cancer between 2001 and 2005 and recruited 586 EC patients undergoing potentially curative esophagectomy (76). The EORTC-QLQ-C30 and OES18 questionnaires were used to assess HRQoL 6 months postoperatively. The findings showed a positive association between the occurrence of comorbidity and poor HRQoL which was expected. Also, the study findings indicated that patients with adenocarcinoma have a decreased risk of poor HRQoL after surgery compared with those with squamous cell carcinoma. An advanced tumor stage was associated with an increased risk of respiratory symptoms and poorer physical function compared with a more distal location. This is possibly explainable by the need for more extensive surgery or by the surgical approach used for upper-third esophageal tumors (76).

Other predictors include; Tumor size, duration of symptoms, nutritional status, treatment modality offered, and post-treatment complications as well as patient's demographic parameters such as age. Several other factors contribute to the deterioration of QoL after receiving any treatment modality for EC including effects caused by the disease parameters in its totality as well as the post-treatment complications. These include, but are not limited to, dysphagia, fatigue, pain, weight loss, appetite loss, trouble coughing, dyspnea, gastrointestinal reactions, reflux, infections, and fever.

Also, a patient's general concern for the future and the family, difficulties to meet basic demands, anxiety, and changes in body image worsen the quality of life of cancer patients. Most of these are actually a direct reflection of the extent of disease at the presentation given that most patients usually seek care in the advanced disease stage. These patients will definitely benefit from unconditional family and social support, economic security, and faith in recovery which dramatically improve their quality of life (67).

In the Esophageal cancer practice guidelines of 2017 by the Japan Cancer Society, habitual alcohol consumption and the smoking habit stand out as the most frequent risk factors predisposing one to develop esophageal SCC, accounting for more than 90% of all cases (34). The mechanism of action for alcohol is that acetaldehyde, its metabolic product, is perceived as a group 1 carcinogen in addition to causing poor dietary intake leading to poor nutritional status and vitamin deficiencies. On the other hand, GERD, which is closely associated with obesity, is a known predisposing factor for the development of EAC due to the persistent inflammation of the lower esophagus causing Barrett's epithelium (34).

2.6 Summary of the review

The timing of the diagnosis of EC is key because it informs the direction to take on matters' treatment, and consequently the patient's health HRQoL due to the disruption that comes with therapy. Due to lack of awareness amongst patients and incompetence of health care workers coupled with poor access to health services and insufficient diagnostic facilities in Kenya, most cancer cases are diagnosed in late stages. This drastically affects the patient's quality of life negatively, especially because the cancer burden is overwhelmingly high and paralyzing.

Risk factors such as ethnicity, environment, behavior, lifestyle including smoking, alcohol drinking, and obesity are emerging strongly as some of the main contributors to the annual increase

in EC incidence. The tumor length has been identified as an independent predictor of long-term survival in patients with EAC, with improved 5-year survival rates for patients with tumor length ≤2 cm compared to those with a tumor length ≥2 cm.

Reports indicate a substantial decrease in HRQoL after esophagectomy within the first 6 months post-surgery with most patients experiencing almost complete recovery after 1 year.

The optimal management of EC is still controversial with no clear-cut treatment modality fit for all. The standard of practice currently in the management of EC is employing the use of combination treatments. The treatment plan is often determined based on the stage of esophageal cancer thus different treatment options are available for the management of ESCC and EAC. Surgical resection (SR), Radiation therapy (RT), Endoscopic therapies, and Chemoradiotherapy have been proved to effectively manage as well as improve the quality of life and survival rates of EC patients. Patients with locoregional EC are generally managed with surgery alone or CRT which have been accepted as reasonable options.

An investigation of the factors that affect and predict the HRQoL among EC patients' is of absolute importance since it enables health care providers to plan care services guided by the patient's specific parameters and tailor treatment to the patient's needs and general well-being. Also, this facilitates awareness creation on the positioning of follow-up care activities through improved patient-physician communication.

2.7 Conceptual Framework

Independent variables **Dependent variable**

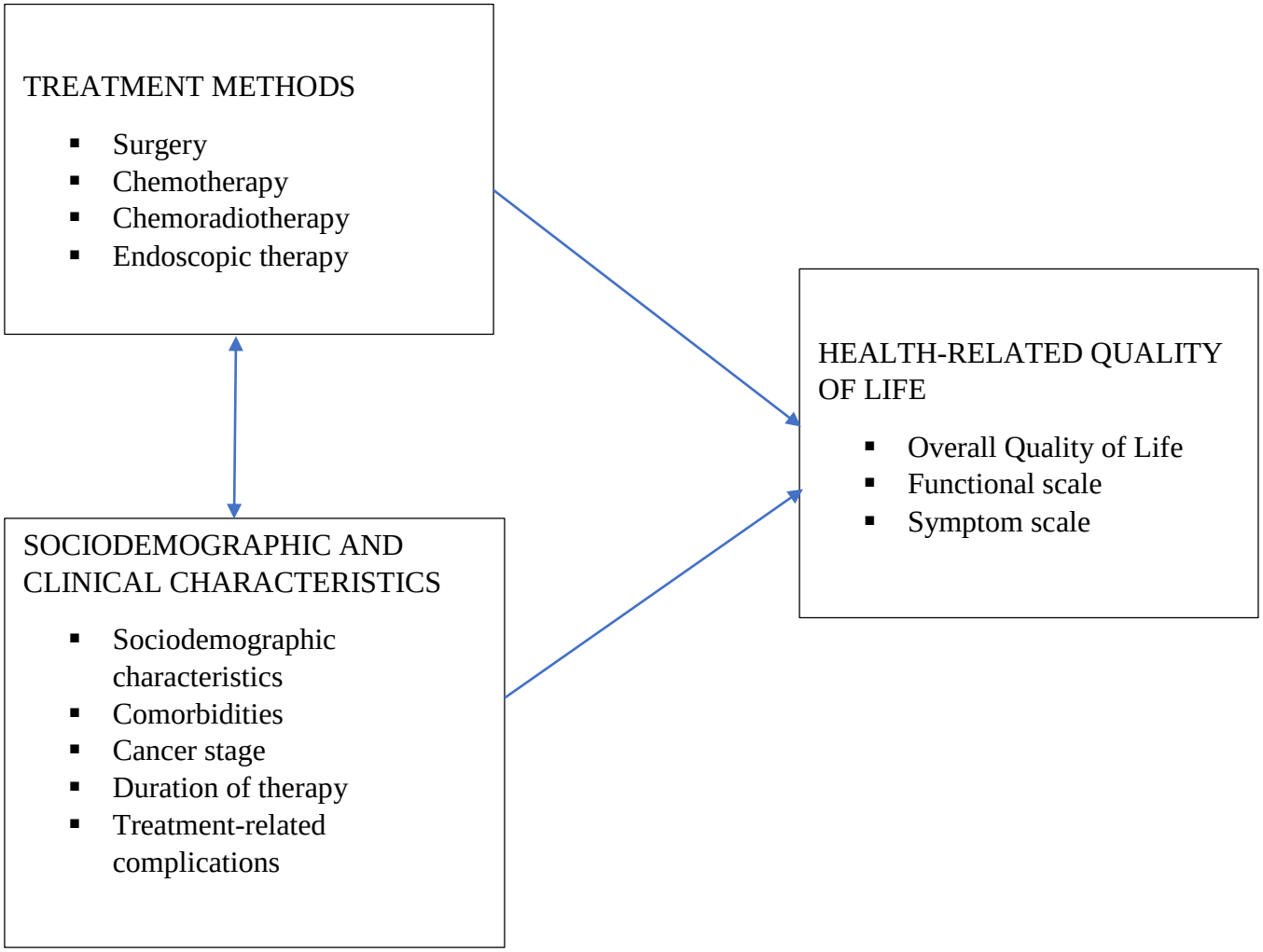

Figure 1: Conceptual framework

The HRQOL is the main outcome variable that will be determined using the European Organization for Research and Treatment of Cancer (EORTC) tools QLQ-C30 and EOS18 by measuring three scales: global health status, functional and symptoms scales which are self-administered questionnaires (45, 69).

The independent variables that have an impact on the HRQOL of esophageal cancer patients may be classified into two, as either predictors of HRQOL or the treatment option. Predictors of

HRQOL include the patients' sociodemographic characteristics such as age, presence of disease comorbidities occurring in conjunction with the tumor, tumor stage especially in the late/advanced stage disease, tumor spread to the esophageal wall, or metastasis to the lymph nodes, the duration of therapy and the presence of treatment-associated complications. The treatment modalities considered to influence the HRQOL of EC patients include Surgery, Chemotherapy, Chemoradiotherapy and endoscopic therapies.

The dependent variables include the symptomatology scores that were determined using the QLQ-EOS18 tool and they include; dysphagia, deglutition, trouble eating, taste different from the usual, coughing, GI symptoms, and pain, amongst others. They were associate with the dependent variables to determine the most significant predictors of HRQoL amongst esophageal cancer patients.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter contains the methodological approach of the study. It highlights the details of the study site and design, the target and study population, eligibility criteria, sampling method, data collection tools, techniques, analysis, and ethical considerations.

3.2 Research Design

The study employed a cross-sectional study design, which allowed for the description of Esophageal cancer treatment modalities as well as the evaluation of the HRQoL of the patients from the patient's perspective over a short period of follow-up. This design was appropriate because it allowed data for both the exposure and outcome variables to be collected at one point in time. Their associations were explored during the analyses.

3.3 Location of the Study

This hospital-based study was carried out at the KNH Cancer Treatment Center (CTC), the In-patient cancer management wards (Ward 42 & 43) & Oncology clinics (Haemato-oncology & Radio-oncology). The facility is the largest public, teaching, and referral hospital in Kenya serving patients from a broad socio-cultural divide within the country and also across East and Central Africa. A multidisciplinary team of professionals from different departments manages the hospital's oncology unit including oncologists, radiologists, hematologists, oncology pharmacists, oncology nurses, nutritionists and pathologists. The hospital's CTC is well-equipped and offers both out-patient and in-patient oncology services and serves a sizeable number of patients on monthly basis.

3.4 Target and Study Population

3.4.1 Target Population

The target population consisted all patients, 18 years of age and above, with a confirmed diagnosis of Esophageal cancer histologically or clinically and are undergoing treatment.

3.4.2 Study population

The study targeted all adult patients, aged 18 years and above, with a histologically or clinically confirmed diagnosis of Esophageal cancer and who have been on treatment for at least 4 weeks.

This included patients diagnosed with esophageal cancer at KNH and/or those referred to the hospital from peripheral facilities with a confirmed diagnosis of esophageal cancer. This age group was considered because data from the KNH Cancer Registry and Literature show that they are the category most at risk of esophageal cancer. The participants were chosen in accordance to the eligibility criteria set for the study.

3.5 Inclusion and exclusion criteria

3.5.1 Inclusion criteria

The study included patients with a histological or clinical diagnosis of esophageal cancer

- Patients aged 18 years and above
- Patients who were on any treatment modality for EC for at least 4 weeks
- Patients who gave Consent to participate in the study

3.5.2 Exclusion criteria

Patients with cognitive impairment and were not able to comprehend the elements of the data collection tools and no treatment assistant, was excluded.

3.6 Sample size and Sampling techniques

3.6.1 Sample size determination

The sample size of the study was determined using the Cochran formula which is employed in descriptive studies for sample size determination.

$$n_0 = \frac{z^2\, p(1-p)}{d^2}$$

Where:

n_0 = the calculated study sample size

z = the standard normal deviate set at 95% confidence interval (Z = 1.96)

p = the estimated prevalence treatment related complications among patients on treatment for EC in Kenya. However, since this was not known, it was taken as 50%.

d = margin of error of the study, which is 0.05.

Therefore, substituting for the values,

$$n_0 = \frac{1.96^2 \times 0.5\,(1-0.5)}{0.05^2}$$

$n_0 = 384.16 \approx 384$ participants

However, since the study population is small, less than 1000, the calculated sample size was corrected using the Cochran correction formula for finite populations.

$$n = \frac{n_0}{1 + n_0/N}$$

Where:

n = adjusted sample size

n_0 = calculated sample size (384 participants)

N = the approximate number of patients on management for EC at KNH. Data from the KNH medical oncology statistics unit indicated that 294 patients with EC were seen over a 12 months period from January to December 2021.

$$n = \frac{384}{1 + 384/294} = 166.5 \approx 167 \text{ participants}$$

To cater for non-response bias, missing records and any other error, an additional 10% was added to the final sample size.

$$N = n + 10\% \times n$$

$N = 167 + 10/100 \times 167 = 183.7 \approx 184$ participants

3.6.2 Sampling Technique

The selection of participants was done using simple random sampling which ensured that all patients had an equal chance of being recruited to participate in the study. A list of patients suffering from EC who were receiving care and treatment at the KNH ward 42 & 43, CTC, the haemato-oncology or radio-oncology clinics was generated. Patients eligible to participate and those who would consent to take part in the study, making the sample frame, would be included in the study.

3.7 Data Collection Technique

The investigator visited the study sites and got permission from the heads of the different departments to access and be assisted by the medical team to obtain any necessary information. The next step was to get a database of all the patients undergoing treatment for EC and come up with a sample frame from which the desired study population was sampled. The screening was done using the eligibility criteria to find out if they qualified to participate. After that, a full disclosure of what the study entails was made and participants allowed to raise any questions and concerns which was addressed by the principal investigator. Eligible patients were then required to sign the consent form. The participants who consented to take part in the study were allocated a unique identification number forming a list of participants from which random selection was done.

The selected participants were ushered into a quiet and private space/room within the facility where the interview and administration of HRQoL questionnaires was conducted. Participants who needed help in filling the questionnaires were offered the necessary assistance to do so. Treatment files and other medical records were reviewed to supplement the information provided by the participants. All files utilized were tagged with a colored sticker to prevent duplication of collected data. The collected data was input in a computer which was password protected and only accessible by the principal investigator. Hard copies of the questionnaires were stored in a safe cabinet under lock and key. This goes a long way in ensuring that the confidentiality of collected patient information is maintained.

3.8 Variables

The independent variables included the treatment strategies employed in the management of the patients taking into consideration treatment modalities such as surgery, chemotherapy, chemoradiotherapy and endoscopic therapies. The predictors of the HRQoL among the patients included; sociodemographic characteristics, comorbidities, tumor stage, the duration of therapy and the presence of treatment-associated complications.

The dependent variable which is the HRQoL of the patients measured three scales: global health status, functional scale and symptoms scale from the patient's view using a researcher administered questionnaire.

3.9 Research Instruments

These instruments included an eligibility screening form to assist come up with study participants, informed consent form for those who met the eligibility criteria, structured questionnaire and HRQoL tools. A well-structured questionnaire was administered by the principal investigator during a scheduled interview with the participant. This allowed for the determination of the patient's sociodemographic characteristics, comorbidities, and treatment-related complications if any. The information obtained was supplemented by the information obtained from the patient's treatment files to build up on the provided patient details.

The HRQoL forms, was attached to the questionnaire which was filled by the patient. These included the EORTC-QLQ-C30 and EORTC-QLQ-C18 forms that are specific to EC. The two tools were appropriate in this study because they have been validated for use in Cancer patients in Kenya. A study by Davda et al concluded that "the tool is an acceptable, reliable, and valid instrument for measuring the QoL in cancer patients in Kenya and recommends its use in clinical practice" (67).

3.10 Pre-test

A pre-test of the questionnaire was carried out at the cancer treatment center (CTC) at KNH where 10% of the study participants were involved. This pre-test allowed for the identification of any inadequacies, discrepancies, and duplications in the questionnaires. Based on the results of the pre-test, the questionnaires were revised and redrafted based on the feedback. The participants involved were not included in the final study.

3.11 Logistical and Ethical Considerations

Ethical approval to conduct the study was sought from the KNH/UON Ethics and Research Committee. Further approval to conduct the study at KNH was sought from the KNH Research and Programs Department as well as the respective departments concerned (The Cancer Treatment Center).

Further, permission to utilize the EORTC-QLQ-C30 and EORTC-QLQ-C18 was sought from the European Organization for Research and Treatment of Cancer.

Oral and written (using the informed consent form) permission was obtained voluntarily from the participants before administration of the questionnaires, after introducing the study and explaining its purpose, risks, and benefits to them. The patients were reassured of the privacy and confidentiality of the information collected from them.

3.12 Validity

To ensure internal validity, well-formulated questionnaires that employed simple and clear language was maintained. The EORTC Quality of Life Questionnaire Core 30 (QLQ-C30), and a disease-specific esophagus questionnaire, the Quality-of-Life Questionnaire esophageal 18 (QLQ-OES18) which have been developed and validated for cancer patients by the European Organization for Research and Treatment of Cancer (EORTC) were administered. This was given power by a study conducted by Davda et al which concluded that "the questionnaires are an acceptable, reliable, and valid instruments for measuring the QoL in cancer patients in Kenya and recommended its use in clinical practice" (67). In addition, a pre-test which was conducted reinforced the data collection tools by highlighting any missing information or errors in the research tools.

Concerning external validity, KNH was the preferred study site offering a good representation of the general population because it is a national referral hospital thus receiving and serving patients from all over the country. This was further strengthened by ensuring a clear inclusion and exclusion criteria on the study population studied.

3.13 Reliability

A pretest was conducted before the commencement of the study to test the data collection tools as described above. This was a good check to ensure reproducibility and that no ambiguities in the responses would be made and thus improving the effectiveness of the tools. Adjustments to the tools were made where necessary.

3.14 Data Analysis

Every participant and the associated treatment file were assigned a unique serial number to avoid duplication during data entry. All items in the questionnaires were assessed and all scores recorded. Data coding where necessary was done and the collected data then entered into a Microsoft Excel

2019 spreadsheet for cleaning and validation before exporting to STATA version 13 for data analysis. Exploratory data analysis was used to analyze the data sets and summarize the main characteristics with descriptive and inferential statistics. Continuous variables were summarized using means and standard deviation or median and interquartile range whereas categorical variables were summarized as percentages and frequencies. A bivariable and multivariable regression analysis was done to determine the predictors of Health-Related Quality of Life among the patient demographics and the management strategies employed.

3.15 Significance, Anticipated output, and Dissemination

This study will serve to expand the body of knowledge and inform key policy decisions at KNH, the major consumer of the findings of this research work, with regard to the management of EC patients. It shall serve as key reference material to provide a quick summary of the available treatment modalities as well as a guide on patient predictors of HRQoL post-treatment. Identification of these predictors early enough may lead to putting measures & control strategies to mitigate the unfavorable effects of the disease. It may also, directly or indirectly, serve as key reference material for the University of Nairobi and other interested Stakeholders. The health care workers, especially those working directly with EC patients, will be at an advantage because the findings of this study will make available the different management strategies employed and how their effects influence the HRQoL of the patients and thus are able to make prior predictions and prepare accordingly to mitigate such effects and advise their patients accordingly.

3.16 Delimitations

The study was conducted at the KNH Cancer Treatment Center (CTC), the In-patient cancer management wards among patients who met the eligibility criteria and have consented to take part in the study.

3.17 Limitations

The study design employed was a cross-sectional study design, whereby the exposure and outcome status were separated by a short period of time, and this, therefore, becomes difficult to establish the causality and temporality of some variables. This was overcome by setting up a well-structured interview with the patient to try to establish the time sequence of events.

The structured questionnaires were prone to both Response bias and non-response bias whereby the respondent may give a response to please the interviewer or fail to respond to particular questions. Responses also may be incomplete or inflexible offering little room for accurate interpretation. This was mitigated by formulating a well-structured questionnaire with questions that are easy to understand and in simple language terms and was interpreted into Kiswahili. Data collection included the review of the patient treatment files which was done manually since KNH has not fully embraced electronic records. These pose great challenges in retrieving the information due to lack of pertinent information or incomplete recording or even poor hand-writing thus compromising data quality and the scope of analysis. This can be overcome by having a well-structured questionnaire that captured the necessary data.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter discusses in detail, the presentation of the findings of the study. Descriptive statistics was used to examine the general distribution of the independent and dependent variables using means and standard deviation for continuous variables and proportions for categorical variables. Associations between subgroups (socio-demographics, clinical and treatment characteristics) and the quality of life were analyzed using linear regression because the HRQoL scores which are the dependent variables were continuous and the independent variables were mixed continuous and categorical data. All data was analyzed using STATA 13.0.

4.2 Sociodemographic characteristic

Table 4.1 presents the descriptive characteristics of the respondents. Overall, there were 131 participants. The ages ranged from 32 to 90 years with an average age of 60.95 ± 12.7 years. More than half (75, 57.25%) of the participants were between 51 and 70 years old. The mean body mass index (BMI) was 20.26 ± 4.38 and a majority (80, 61.07%) were of the male gender. Most of the participants were married (99, 75.57%), unemployed (87, 66.41%), and of a low-income level (75, 57.25%). Approximately one-third of the participants (39, 29.77%) had secondary education. Seventy-eight (59.54%) and 75 (57.25%) participants had no history of smoking or alcohol use respectively.

Table 1: Sociodemographic characteristics (n=131)

Category	Variable	Frequency (n)	Percentage (%)	Mean ± SD
Gender				
	Male	80	61.07	
	Female	51	38.93	
Age				60.95(12.69)
	31 – 50	28	21.37	
	51 – 70	75	57.25	
	>70	28	21.3	
BMI				20.26 (4.38)
	Under-weight	44	33.59	
	Normal-weight	68	51.91	
	Over-weigh	16	12.21	
	Obese	3	2.29	
Marital status				
	Single	13	9.92	
	Married	99	75.57	
	Divorced/separate	3	2.29	
	Widowed	16	12.21	
Highest level of education	None	11	8.40	
	Primary	46	35.11	
	Secondary	39	29.77	
	Tertiary	35	26.72	
Employment status				
	Unemployed	87	66.41	
	Employed	17	12.98	
	Self-employed	20	15.27	
	Retired	7	5.34	
Level of income				
	Low	75	57.25	
	Middle	55	41.98	
	High	1	0.76	
Smoking status				
	Non-smoker	78	59.54	
	Current smoker	8	6.11	
	Previously smoking	45	34.35	
Status of alcohol intake	Non-drinker	75	57.25	
	Current drinker	4	3.05	
	Previously drinking	52	39.69	

4.3 Comorbidities

Most participants (88, 67.18%) had no other illnesses besides esophageal cancer. Of those who had comorbidities, 32 (24.43%) had one comorbidity, while 8 (6.11%), 2 (1.53%), and 1 (0.76%) had two, three, and four comorbidities respectively. The most common comorbidity was hypertension (24, 18.32%) followed by HIV/AIDS (12, 9.16%) as shown in **Table 2.**

Table 2: Comorbidities (n=131)

Comorbidities	Frequency (n)	Percentage (%)
Diabetes	6	4.58
Hypertension	24	18.32
Asthma	1	0.76
Gastritis	6	4.58
Peptic Ulcer Disease (PUD)	1	0.76
Gastro-esophageal Reflux Disease (GERD)	2	1.53
AKI / CKD	4	3.05
HIV/AIDS	12	9.16
Any other disease (specify)	2	1.53

4.4 Distribution of the stages of cancer

There were 7 participants in Stage I, 37 in Stage II, 51 in Stage III, 26 in Stage IV, and 10 patients with a clinical-stage classified as “unknown”. The mean duration of time in months since diagnosis of the disease was 17.1 ± 12.3 months.

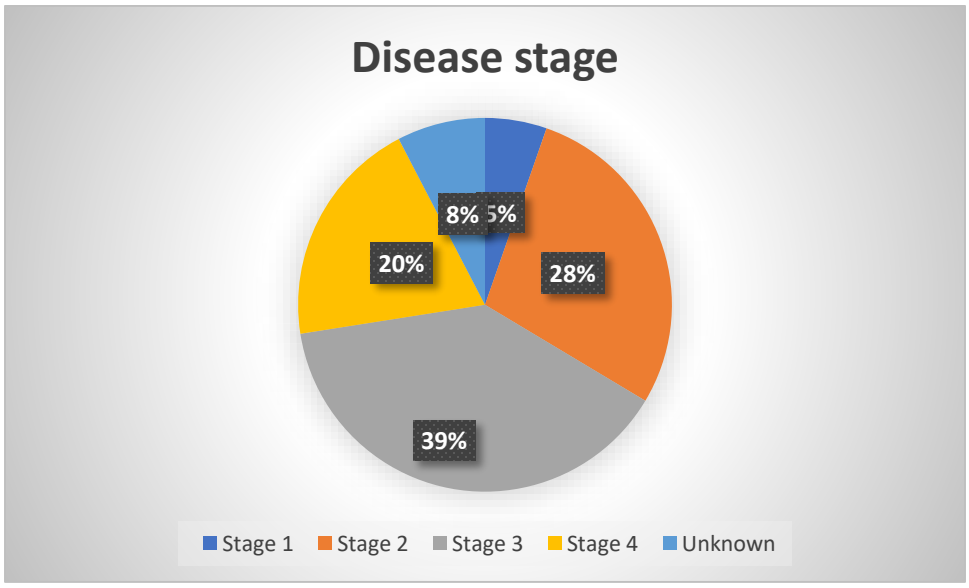

Figure 2: Distribution of the stages of cancer (n=131)

4.5 Treatment options

Treatment data was collected from patient's records focusing on clinical treatment types rather than supportive treatments. Different treatment methods for patients at different cancer stages were used, and most of the patients utilized more than one treatment modality. Most participants' current active treatment was mainly concurrent chemoradiotherapy (CCRT) at 72 (54.96%). Thirty (22.90%) patients were treated with chemotherapy alone and 24 (18.32%) with radiation therapy alone.

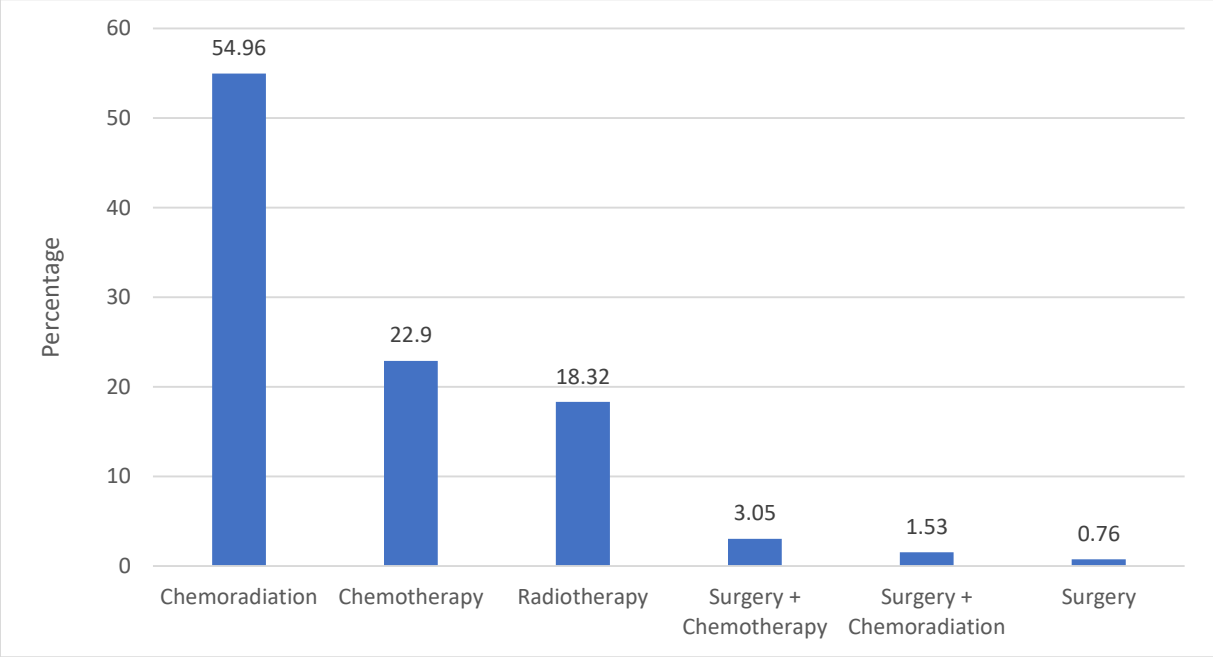

Figure 3: Treatment options (n=131)

4.6 Adverse drug effects experienced since the commencement of treatment

The participants gave their responses involving a brief screen for signs and symptoms in body systems and the results are summarized in **table 3.** With the exception of one participant, all the others (130, 99.24%) had experienced side effects. The most common symptoms were dysphagia (95, 72.52%) followed by loss of appetite (60, 45.80%) and vomiting (56, 42.75). Ninety (68.70%) participants had experienced fatigue and 35 (26.72%) of them suffered from mood swings or depression.

Table 3: Adverse drug effects (n=131)

Body System	Symptom	Frequency (n)	Percentage (%)
Gastrointestinal	Dysphagia	95	72.52
	Appetite loss	60	45.80
	Vomiting	56	42.75
	Constipation	26	19.85
	Diarrhea	20	15.27
	Hematochezia	4	3.05
Generalized body	Fatigue	90	68.70
	Pain	82	62.59
	Weight loss	76	58.02
	Malaise	22	16.79
	Weight gain	7	5.34
Hormonal effects	Mood swings/depression	35	26.72
	Alopecia	6	4.58
	Reduced bone density/fractures	2	1.53
CNS effects	Memory loss	20	15.27
	Seizures	3	2.29
	Peripheral neuropathy	2	1.53
Hematological effects	Anemia	6	4.58
	Neutropenia	5	3.82
	Thrombocytopenia	1	0.76
Others	1 symptom	10	7.63
	2 symptoms	2	1.53
	3 symptoms	1	0.76

4.7 Classes of chemotherapeutic drugs

The most commonly utilized chemotherapy drug classes for the management of esophageal cancer were the platinum-based agents at 108 (82.44%) followed by Taxane-based agents at 104 (79.39%).

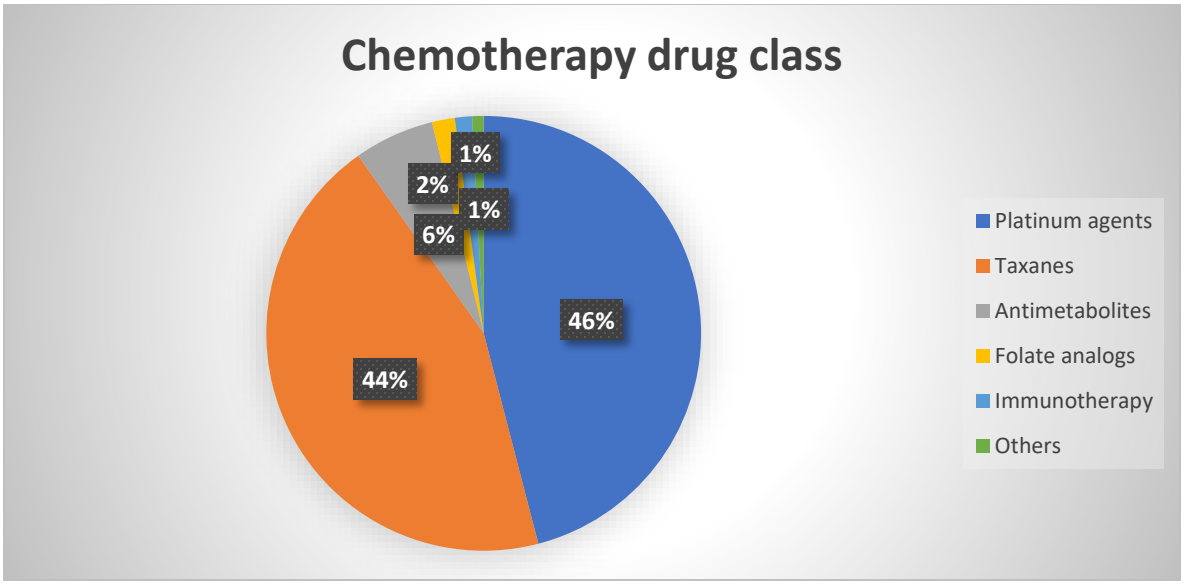

Figure 4: Chemotherapeutic drug classes (n=131)

4.8 Types of chemotherapeutic agents

Paclitaxel (101, 77.10%) and Carboplatin (91, 69.47%) were the most frequently used chemotherapeutic drugs, as shown in **Table 4.**

Table 4: Chemotherapeutic agents used (n = 131)

Drug class	Drug	Frequency (n)	Percentage (%)
Platinum-based	Cisplatin	10	7.63
	Carboplatin	91	69.47
	Oxaliplatin	14	10.69
Taxanes	Paclitaxel	101	77.10
	Docetaxel	5	3.85
Anti-metabolites	Capecitabine	11	8.40
	5-Fluorouracil	4	3.05
Folate analogs	Leucovorin	4	3.05
Immunotherapy	Pembrolizumab	1	0.76
	Nivolumab	3	2.29
Other drugs		3	2.29

4.9 Chemotherapy regimens prescribed

The majority of the participants were treated with dual drug therapy containing a Platinum agent in combination with a Taxane at 101 (77.1%).

Table 5: Chemotherapeutic regimens (n=131)

Regimen	Frequency	%
Platinum + Taxane	101	77.10
Platinum + Taxane + Anti-metabolite + Leucovorin (mFOLFOX-6) or (FLOT)	4	3.05
Platinum + Antimetabolite (CapeOx)	4	3.05
Taxane + Antimetabolite	4	3.05
Platinum + Taxane + Antimetabolite + Immunotherapy	1	0.76
Any other drug regimen	4	3.05

4.10 Health-related Quality of Life scores

Table 6 below gives a summary of the health-related quality of life scores, where a higher score represents a higher ("better") level of functioning or a higher ("worse") level of symptoms. This

Table 6: EORTC QLQ-C30 & QLQ-OES18

EORTC QLQ-C30	
Scale / Item	**Score (%)**
Global health status (QOL)	45.67
Functional scale / Items	
Physical functioning (PF2)	65.00
Role functioning (RF2)	34.75
Emotional functioning (EF)	62.00
Cognitive functioning (CF)	74.67
Social functioning (SF)	45.00
Symptom scale items	
Fatigue (FA)	51.0
Nausea & Vomiting (NV)	67.67
Pain (PA)	52.33
Dyspnea (DY)	75.00
Insomnia (SL)	70.67
Appetite loss (AP)	59.67
Constipation (CO)	73.67
Diarrhea (DI)	87.00
Financial difficulties (FI)	39.00
EORTC QLQ-OES18	
Symptom scale/items	**Score (%)**
Dysphagia	57.67
Deglutition	66.67
Eating	58.67
Dry mouth	72.00
Taste different from usual	69.00
Trouble coughing	65.00
Trouble talking	72.33
GI symptoms	69.50
Pain	62.67

study focused on the EORTC QLQ-OES18 which dwelt on the patient's symptomatology experienced. Thus, a high score for a symptom scale/item represents a high level of symptomatology/problems. The overall quality of life mean score was 45.67% which is below average. In the symptom scale/items, dysphagia had the lowest score at 57.67% followed by problem eating at 58.67%. The highest symptomatology was experienced with patients having trouble talking at 72.33%.

Predictors of Health-related Quality of Life

Linear regression was carried out with the HRQoL variables as the dependent variable against the various independent variables, sociodemographic factors, comorbidities, & clinical characteristics, and treatments used.

4.10.1 Predictors of dysphagia

4.10.1.1 Associations between sociodemographic factors and dysphagia

Dysphagia refers to difficulty experienced during swallowing of foods or liquids, which could arise from the throat or esophagus and may range from mild difficulty to complete and painful blockage. Linear regression was carried out to assess the association between the sociodemographic characteristics with the dependent variable dysphagia. There was a statistically significant positive association between the level of education, with dysphagia ($p = 0.000$). As the education level of the participants increased, dysphagia increased by 0.3.

Table 7: Associations between sociodemographic factors and dysphagia

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Gender	0.0793	-0.2067	0.3654	0.584
Age	-0.0082	-0.0191	0.0028	0.142
Age category	-0.1488	-0.3607	0.0632	0.167
BMI	0.0259	-0.0057	0.0577	0.107
BMI Categories	0.0875	-0.1053	0.2803	0.371
Marital status	0.0608	-0.1218	0.2435	0.511
Level of education	0.2825	0.1430	0.4220	**0.000***
Employment status	0.0680	-0.0815	0.2175	0.370
Income level	0.2377	-0.0324	0.5079	0.084
Cigarette smoking	-0.1167	-0.2645	0.0312	0.121
Drinking alcohol	-0.0550	-0.1988	0.0888	0.451

Key: *- Statistically significant

4.10.1.2 Associations between disease characteristics and dysphagia

Linear regression was carried out to assess the association between the comorbidities and clinical characteristics, with the dysphagia, but no statistically significant associations were observed.

Table 8: Associations between disease characteristics and dysphagia

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	-0.2258	-0.8925	0.4409	0.504
Hypertension	0.1433	-0.2168	0.5034	0.433
Asthma	1.066	-0.5274	2.6594	0.188
Gastritis	0.2353	-0.4313	0.9019	0.486
PUD	0.0583	-1.5459	1.6625	0.943
GERD	0.5665	-0.5679	1.7009	0.325
AKI / CKD	0.3201	-0.4895	1.1297	0.435
HIV/AIDS	0.0986	-0.3852	0.5823	0.688
Duration of morbidity	0.0075	-0.0038	0.0189	0.190
Cancer stage	0.0915	-0.0473	0.2303	0.194
Any other disease	1.0743	-0.0490	2.1975	0.061

4.10.1.3 Associations between treatments utilized and dysphagia

Linear regression was carried out to assess the association between the treatment utilized with dysphagia (**Table 4.9**.). Treatment with Chemoradiation (p = 0.016), use of Taxanes (p = 0.040),

Table 9: Associations between treatments utilized and dysphagia

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	0.1373	-0.1941	0.4687	0.414
Surgery	1.066	-0.5274	2.6594	0.188
Radiation therapy	0.2269	-0.1318	0.5857	0.213
Chemoradiation	-0.3371	-0.6116	-0.0627	**0.016***
Surgery + Chemotherapy	-0.0228	-0.8343	0.7887	0.956
Surgery + Chemoradiation	0.2314	-0.9066	1.3694	0.688
Platinum-based	-0.3071	-0.6649	0.0615	0.103
Taxanes	-0.3561	-0.6956	-0.0165	**0.040***
Antimetabolites	0.0144	-0.4375	0.4663	0.950
Folate analogs	-0.4535	-1.2611	0.3542	0.269
Immunotherapy	0.0626	-0.8707	0.9960	0.895
Other drugs	-0.6166	-1.0572	0.5171	0.284
Platinum + Taxane	-0.4097	-0.7342	-0.0852	**0.014***
mFOLFOX-6 or FLOT	-0.4535	-1.2611	0.3542	0.269
Platinum + Antimetabolite	0.4929	-0.3140	1.2999	0.229
Taxane + Antimetabolite	0.2325	-0.5780	1.0430	0.571
Platinum + Taxane + Antimetabolite + Immunotherapy	-1.2819	-2.8705	0.3066	0.113
Any other drug regimen	-0.0228	-0.8343	0.7887	0.956

Key: *- Statistically significant

and use of a combination of Platinum + Taxane (0.014), were significantly and negatively associated with dysphagia. They decreased the levels of dysphagia by 0.34, 0.36, & 0.41 folds respectively ($p<0.05$).

4.10.1.4: Independent predictors of dysphagia

Generalized linear models were used to determine the independent predictors of dysphagia quality of life domain by entering the factors that were significantly associated with dysphagia quality of life at bivariate level ($p < 0.25$). Multiple Linear regression was carried out and a likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2 (**Table10**). There was a statistically significant positive association between level of education and dysphagia. As the level of education increased, dysphagia increased by 0.28 in bivariable analysis and by 0.32 in multivariate analysis. There was a statistically significant negative association between cigarette smoking, treatment with Chemoradiation, and Platinum + Taxane + Antimetabolite + Immunotherapy. As the level of cigarette smoking and the treatments increased, dysphagia decreased by 0.17, 0.4, and 1.6 respectively, in multivariate analysis.

Table 10: Independent Predictors of Dysphagia

	Bivariate analysis (<0.05)		**Multivariate analysis (<0.05)**	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
Level of education	0.2825 (0.1430, 0.4220)	0.000	0.3228 (0.1902, 0.4555)	0.000
Cigarette smoking	-0.1167 (-0.2645, 0.0312)	0.121	-0.1745 (-0.3089, -0.0402)	0.011
Chemoradiation	-0.3371 (-0.6116, -0.0627)	0.016	-0.4033 (-0.6562, -0.1504)	0.002
Platinum + Taxane + Antimetabolite + Immunotherapy	-1.2819 (-2.8705, 0.3066)	0.113	-1.6377 (-3.0778, -1.1976)	0.026

4.10.2 Predictors of Deglutition

4.10.2.1 Association between sociodemographic factors and deglutition

Deglutition is the act of swallowing, whether foods, beverages, or saliva from the mouth through to the pharynx, and into the esophagus while shutting the epiglottis. Linear regression was carried out to assess the association between the sociodemographic characteristics with deglutition (**Table 11**.). There were no statistically significant associations observed between deglutition and sociodemographic factors.

Table 11: Association between Sociodemographic Factors and Deglutition

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Gender	-0.0303	-0.3101	0.2495	0.831
Age	0.0015	-0.0093	0.0123	0.781
Age category	0.0893	-0.1188	0.2974	0.398
BMI	-0.0207	-0.0518	0.0104	0.190
BMI Categories	-0.1709	-0.3575	0.0157	0.072
Marital status	0.0481	-0.1305	0.2267	0.595
Level of education	0.0556	-0.0886	0.1999	0.447
Employment status	0.0342	-0.1123	0.1806	0.645
Income level	-0.1830	-0.4482	0.0821	0.174
Cigarette smoking	0.0958	-0.0490	0.2407	0.193
Drinking alcohol	0.0553	-0.0853	0.1958	0.438

4.10.2.2 Association between Disease characteristics and Deglutition

Linear regression was carried out to assess the association between the comorbidities and clinical

Table 12: Association between Disease characteristics and Deglutition

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	-0.3173	-0.9677	0.3330	0.336
Hypertension	0.0629	-0.2897	0.4155	0.725
Asthma	-0.9769	-2.5354	0.5816	0.217
Gastritis	-0.754	-1.3934	-0.1146	**0.021***
PUD	0.0308	-1.5370	1.5985	0.969
GERD	-0.4767	-1.5865	0.6330	0.397
AKI / CKD	0.1604	-0.6322	0.9530	0.689
HIV/AIDS	0.2171	-0.2544	0.6886	0.364
Duration of morbidity	0.0012	-0.0099	0.0124	0.826
Cancer stage	-0.0356	-0.1720	0.1008	0.607
Any other disease	-0.2229	-1.3351	0.8893	0.692

characteristics, with deglutition. As can be seen in the Table 12, there was a statistically significant negative association between gastritis and deglutition (p = 0.021). This indicates that gastritis decreased deglutition by 0.75.

4.10.2.3 Association between Treatments and Deglutition

Linear regression was carried out to assess the association between the treatment utilized with deglutition. Treatment using a combination of surgery + chemotherapy was negatively and significantly associated with deglutition (p = 0.029). The use of Surgery + Chemotherapy decreased deglutition symptoms by 0.87. The results are as summarized in **Table 13**. below.

Table 13: Association between Treatments and Deglutition

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	0.0828	-0.2416	0.4072	0.614
Surgery	-0.9769	-2.5354	0.5816	0.217
Radiation therapy	0.1649	-0.1867	0.5165	0.355
Chemoradiation	-0.0247	-0.2989	0.2495	0.859
Surgery + Chemoradiation	0.0310	-1.0818	1.1439	0.956
Surgery + Chemotherapy	-0.8711	-1.6495	-0.0926	**0.029***
Platinum-based	0.0157	-0.3429	0.3743	0.931
Taxanes	-0.1551	-0.4913	0.1812	0.363
Antimetabolites	0.1142	-0.3271	0.5554	0.610
Folate analogs	0.2894	-0.5021	1.0808	0.471
Immunotherapy	-0.1393	-1.0512	0.7725	0.763
Other drugs	0.5388	-0.5701	1.6477	0.338
Platinum + Taxane	-0.0828	-0.4073	0.2416	0.614
mFOLFOX-6 or FLOT	0.2894	-0.5021	1.0808	0.471
Platinum + Antimetabolite	0.2894	-0.5021	1.0808	0.471
Taxane + Antimetabolite	-0.0974	-0.8903	0.6955	0.808
Platinum + Taxane + Antimetabolite + Immunotherapy	0.5346	-1.0304	2.0996	0.500
Any other drug regimen	-0.6132	-1.3990	0.1727	0.125

Key: *- Statistically significant

4.10.2.4: Independent predictors of deglutition

Generalized linear models were used to determine the independent predictors of deglutition quality of life domain by entering the factors that were significantly associated with deglutition quality of life at bivariate level (p < 0.25). Multiple Linear regression was carried out and a likelihood ratio

test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2 (table 4.14.). Treatment with a combination of Surgery + Chemotherapy independently predicted the deglutition symptoms (p = 0.038). This indicates that treatment with Surgery + Chemotherapy decreased deglutition by 0.87 in bivariate analysis and 0.82 in multivariate analysis.

Table 14: Independent predictors of deglutition

	Bivariate analysis (<0.05)		**Multivariate analysis (<0.05)**	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
BMI Categories	-0.1709 (-0.3575, 0.0157)	0.072	-0.1712 (-0.3526, -0.0102)	0.064
Gastritis	-0.7540 (-1.3934, -0.1146)	0.021	-0.6277 (-1.2616, 0.0063)	0.052
Surgery + Chemotherapy	-0.8711 (-1.6495, -0.0926)	0.029	-0.8176 (-1.5891, -0.0461)	0.038
Other drug Regimen	-0.6132 (-1.3990, 0.1727)	0.125	-0.6389 (-1.3968, 0.1190)	0.098

4.10.3 Predictors of problem eating

4.10.3.1 Association between sociodemographic factors and problem eating

Linear regression was carried out to assess the association between the sociodemographic characteristics with problem eating **(Table 15)**. There was a statistically significant negative

Table 15: Association between sociodemographic factors and problem eating

Variable	**β - Coeff**	**95% conf. Interval**		**P-Value**
		Lower	**Upper**	
Gender	-0.1387	-0.4118	0.1345	0.317
Age	-0.0021	-0.0126	0.0085	0.702
Age category	-0.0014	-0.2059	0.2030	0.989
BMI	-0.0297	-0.0599	0.0005	0.054
BMI Categories	-0.2083	-0.3898	-0.0267	**0.025***
Marital status	0.1733	0.0008	0.3459	**0.049***
Level of education	0.0678	-0.0734	0.2090	0.344
Employment status	-0.0290	-0.1725	0.1145	0.690
Income level	-0.1391	-0.3996	0.1214	0.293
Cigarette smoking	0.0741	-0.0682	0.2164	0.305
Drinking alcohol	0.069	-0.0695	0.2054	0.330

Key: *- Statistically significant

association between BMI categories and problem eating (p = 0.025). This means that BMI decreased problem eating by 0.21. There was a statistically significant positive association

between marital status and problem eating (p = 0.049), indicating that marital status increased problem eating by 0.17.

4.10.3.2 Association between Disease characteristics and Problem eating

Linear regression was carried out to assess the association between the disease factors (comorbidities and clinical characteristics) with problem eating (Table 16.). There were no statistically significant associations observed between problem eating quality of life domain and disease factors.

Table 16: Association between disease characteristics and problem eating

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	-0.4259	-1.0611	0.2092	0.187
Hypertension	0.0763	-0.2691	0.4216	0.663
Asthma	-0.4935	-2.0272	1.0401	0.525
Gastritis	0.0544	-0.5850	0.6938	0.867
PUD	0.7661	-0.7642	2.2963	0.324
GERD	0.1373	-0.9528	1.2274	0.804
AKI / CKD	-0.0539	-0.8309	0.7231	0.891
HIV/AIDS	0.3094	-0.1509	0.7697	0.186
Duration of morbidity	-0.0017	-0.0126	0.0093	0.764
Cancer stage	0.0671	-0.0662	0.2004	0.321
Any other disease	-0.1166	-1.2067	0.9736	0.833

4.10.3.3 Association between treatments and problem eating

Linear regression was conducted to determine the association between the treatment utilized with problem eating. There was a statistically significant association between treatment with chemotherapy and problem eating (p = 0.013). This indicates that use of Chemotherapy increased problem eating by 0.40. There was a statistically significant negative association between treatment with Chemoradiation and problem eating meaning that it decreased problem eating by 0.33. The results are as summarized in **Table 17** below.

Table 17: Association between treatments and problem eating

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	0.3950	0.0844	0.7057	**0.013***
Surgery	-0.4935	-2.0272	1.0401	0.525
Radiation therapy	0.3186	-0.0225	0.6597	0.067
Chemoradiation	-0.3295	-0.5920	-0.0669	**0.014***
Surgery + Chemoradiation	-0.6243	-1.7092	0.4606	0.257
Surgery + Chemotherapy	-0.2473	-1.0232	0.5285	0.529
Platinum-based	-0.2893	-0.6370	0.0585	0.102
Taxanes	0.1762	-0.5052	0.1529	0.291
Antimetabolites	-0.1621	-0.5939	0.2697	0.459
Folate analogs	0.3535	-0.4211	1.1281	0.368
Immunotherapy	0.3789	-0.5124	1.2702	0.402
Other drugs	-0.2435	-1.3330	0.8460	0.659
Platinum + Taxane	-0.1754	-0.4921	0.1413	0.275
mFOLFOX-6 or FLOT	0.3535	-0.4211	1.1281	0.368
Platinum + Antimetabolite	-0.5697	-1.3403	0.2010	0.146
Taxane + Antimetabolite	-0.3763	-1.1505	0.3980	0.338
Platinum + Taxane + Antimetabolite + Immunotherapy	1.0986	-.4255	2.6227	0.156
Any other drug regimen	0.2040	-0.5723	0.9802	0.604

Key: *- Statistically significant

4.10.3.4: Independent Predictors of Problem Eating

Generalized linear models were used to determine the independent predictors of problem eating quality of life domain by entering the factors that were significantly associated with problem eating quality of life at bivariate level ($p < 0.25$). Multiple Linear regression was carried out and a

Table 18: Independent Predictors of Problem Eating

	Bivariate analysis (<0.05)		Multivariate analysis (<0.05)	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
BMI categories	-0.2083 (-0.3898, -0.0267)	0.025	-0.2334 (-0.4103, 0.0565)	0.010
Marital status	0.1733 (0.0008, 0.3459)	0.049	0.1835 (0.0164, 0.3506)	0.032
Chemotherapy	0.3950 (0.0844, 0.7057)	0.013	0.4133 (0.1081, 0.7186)	0.008
Radiation therapy	0.3186 (-0.0225,0.6597)	0.067	0.4155 (0.0855, 0.7455)	0.014

likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2 (**Table 18**). There was a statistically significant negative association between BMI categories and problem eating in both the bivariable analysis (p = 0.025) and multivariable analysis (p = 0.010). BMI decreased problem eating by 0.21 and 0.23 in bivariate and multivariate analysis respectively. There was a statistically significant positive association between marital status, treatment with chemotherapy, and radiation therapy, with problem eating. They increased problem eating by 0.18, 0.41, and 0.42 respectively, in multivariate analysis.

4.10.4 Predictors of dry mouth

4.10.4.1 Association between sociodemographic characteristics and dry mouth

Linear regression was carried out to assess the association between the sociodemographic factors, with dry mouth but no statistically significant associations were observed. The findings are summarized as shown below (**Table 19**).

Table 19: Association between Sociodemographic characteristics and dry mouth

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Gender	-0.1228	-0.4074	0.1619	0.395
Age	0.0012	-0.0098	0.0123	0.823
Age category	0.0556	-0.1591	0.2663	0.619
BMI	-0.0103	-0.0421	0.0216	0.525
BMI Categories	-0.1248	-0.3164	0.0667	0.200
Marital status	-0.0848	-0.2666	0.0969	0.358
Level of education	0.0404	-0.1069	0.1877	0.589
Employment status	-0.0132	-0.1627	0.1363	0.862
Income level	0.0917	-0.1802	0.3637	0.506
Cigarette smoking	0.0411	-0.1075	0.1897	0.585
Drinking alcohol	0.1164	-0.0258	0.2586	0.108

4.10.4.2 Association between Disease characteristics and dry mouth

Linear regression was carried out to determine the relationship between disease characteristics (comorbidities and clinical characteristics) with dry mouth. There was a statistically significant positive association between disease characteristics and dry mouth (p = 0.021). Disease characteristics increased dry mouth by 0.94. The results are as summarized in **Table 20.**

Table 20: Association between Disease characteristics and dry mouth

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	0.3427	-0.3204	1.0057	0.309
Hypertension	0.1963	-0.1619	0.5544	0.280
Asthma	-0.8462	-2.4385	0.7462	0.295
Gastritis	-0.5307	-1.1900	0.1287	0.114
PUD	-0.8462	-2.4345	0.7462	0.295
GERD	-0.3450	-1.4785	0.7886	0.548
AKI / CKD	0.9390	0.1467	1.7313	**0.021***
HIV/AIDS	-0.0987	-0.5809	0.3835	0.686
Duration of morbidity	0.0007	-0.0107	0.0120	0.908
Cancer stage	0.0397	-0.0994	0.1789	0.573
Any other disease	-0.3450	-1.4785	0.7886	0.548

Key: *- Statistically significant

4.10.4.3 Association between treatments and dry mouth

Linear regression was carried out to assess the association between the treatments utilized, with dry mouth. There were no statistically significant associations observed between dry mouth and treatments utilized. The results are summarized in **Table 21.** below.

Table 21: Association between treatments and dry mouth

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	0.0782	-0.2527	0.4092	0.641
Surgery	-0.8462	-2.4385	0.7462	0.295
Radiation therapy	0.0942	-0.2652	0.4537	0.605
Chemoradiation	-0.1066	-0.3858	0.1725	0.451
Surgery + Chemoradiation	0.1628	-0.9720	1.2976	0.777
Surgery + Chemotherapy	-0.3504	-1.1574	0.4563	0.392
Platinum-based	-0.1417	-0.5067	0.2233	0.444
Taxanes	-0.1086	-0.4522	0.2350	0.533
Antimetabolites	0.0995	-0.3507	0.5497	0.663
Folate analogs	0.1654	-0.6431	0.9738	0.686
Immunotherapy	-0.1771	-1.1071	0.7529	0.707
Other drugs	-0.3450	-1.4785	0.7886	0.548
Platinum + Taxane	-0.1215	-0.4520	0.2091	0.469
mFOLFOX-6 or FLOT	0.1654	-0.6431	0.9738	0.686
Platinum + Antimetabolite	0.4232	-0.3824	1.2288	0.301
Taxane + Antimetabolite	-0.3504	-1.1571	0.4563	0.392
Platinum + Taxane + Antimetabolite + Immunotherapy	0.1615	-1.4374	1.7605	0.842
Any other drug regimen	-0.3504	-1.1571	0.4563	0.392

4.10.4.4 Independent predictors of dry mouth

Generalized linear models were used to determine the independent predictors of Dry mouth quality of life domain by entering the factors that were significantly associated with Dry mouth quality of life at bivariate level ($p < 0.25$). Multiple Linear regression was carried out and a likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2 (table 4.22).

There was a statistically significant negative and positive association between gastritis ($p = 0.040$) and kidney failure ($p = 0.008$), with dry mouth respectively. Gastritis reduced dry mouth by 0.66 in multivariate analysis whereas Acute/Chronic Kidney Disease increased dry mouth by 0.94 in bivariate analysis and 1.08 in multivariate analysis. The results are summarized in **Table 22.**

Table 22: Independent Predictors of Dry Mouth

	Bivariate analysis		**Multivariate analysis**	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
Gastritis	-0.5307 (-1.1900, 0.1287)	0.114	-0.6552 (-1.3390, -0.0314)	0.040
Acute or chronic kidney failure	0.9390 (0.1467, 1.7313)	0.021	1.0833 (0.2289, 1.8778)	0.008

4.10.5 Predictors of taste different from usual

4.10.5.1 Predictors associated with taste different from usual

Association between sociodemographic characteristics, comorbidities, disease characteristics, and treatment with taste different from the usual were assessed**.** There was a statistically significant positive association between employment status, and taste different from the usual ($p = 0.028$). Employment status increased taste different from usual by 0.18. The findings are as summarized in **Table 23** below.

Table 23: Association between sociodemographic factors and taste different from the usual

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Gender	-0.0801	-0.3894	0.2291	0.609
Age	-0.0005	-0.0124	0.0114	0.934
Age category	-0.0179	-0.2487	0.2130	0.879
BMI	-0.0022	-0.0368	0.0324	0.898
BMI Categories	-0.0807	-0.2893	0.1279	0.445
Marital status	0.0853	-0.1119	0.2826	0.394
Level of education	0.0834	-0.0759	0.2427	0.302
Employment status	0.1793	0.0202	0.3384	**0.028***
Income level	0.0853	-0.2098	0.3804	0.569
Cigarette smoking	0.0849	-0.0758	0.2455	0.298
Drinking alcohol	0.0603	-0.0951	0.2158	0.444

Key: *- Statistically significant

4.10.5.2 Association between disease characteristics and taste different from the usual

Linear regression was carried out to assess the association between comorbidities and clinical characteristics, with dry mouth. There were no statistically significant associations observed between disease characteristics and taste different from the usual. The results are summarized in **Table 24**.

Table 24: Association between disease characteristics and taste different from the usual

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	-0.1027	-0.8246	0.6192	0.779
Hypertension	0.3392	-0.0466	0.7249	0.084
Asthma	-0.9385	-2.6652	0.7883	0.284
Gastritis	-0.2773	-0.9978	0.4432	0.448
PUD	0.0692	-1.6652	1.8037	0.937
GERD	0.0698	-1.1614	1.3010	0.911
AKI / CKD	0.8445	-0.0205	1.7095	0.056
HIV/AIDS	-0.1996	-0.7218	0.3226	0.451
Any other disease	-0.4380	-1.6668	0.7909	0.482
Duration of morbidity	-0.0008	-0.0131	0.0116	0.902
Cancer stage	0.0356	-0.1153	0.1865	0.642

4.10.5.3 Association between treatment and taste different from usual

Linear regression was carried out to determine the relationship between the treatment, and taste different from usual. There was a statistically significant positive association between other drug

classes and taste different from usual (p = 0.010). Other drug classes increased taste different from usual by 1.59. **Table 25** summarizes the findings.

Table 25: Association between treatment and taste different from usual

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	0.0026	-0.3566	0.3619	0.988
Surgery	-0.9385	-2.6652	0.7881	0.284
Radiation therapy	0.0331	-0.3571	0.4233	0.867
Chemoradiation	-0.0942	-0.3971	0.2088	0.540
Surgery + Chemoradiation	0.0698	-1.1614	1.3009	0.911
Surgery + Chemotherapy	0.3287	-0.5468	1.2043	0.459
Platinum-based	-0.0833	-0.4799	0.3132	0.678
Taxanes	-0.1332	-0.5057	0.2393	0.481
Antimetabolites	-0.1630	-0.6508	0.3248	0.510
Folate analogs	-0.4449	-1.3189	0.4291	0.316
Immunotherapy	-0.2708	-1.2789	0.7373	0.596
Other drugs	1.5930	0.3935	2.7925	**0.010***
Platinum + Taxane	-0.1323	-0.4909	0.2262	0.467
mFOLFOX-6 or FLOT	-0.4449	-1.3189	0.4291	0.316
Platinum + Antimetabolite	0.0709	-0.8065	0.9482	0.873
Taxane + Antimetabolite	-0.4449	-1.3189	0.4291	0.316
Platinum + Taxane + Antimetabolite + Immunotherapy	-0.9385	-2.6652	0.7883	0.284
Any other drug regimen	-0.1870	-1.0638	0.6898	0.674

Key: *- Statistically significant

4.10.5.4 Independent predictors of taste different from usual

Generalized linear models were used to determine the independent predictors of taste different from usual quality of life domain by entering the factors that were significantly associated with taste different from usual quality of life at bivariate level (p < 0.25). Multiple Linear regression was carried out and a likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2.

There was a statistically significant positive association between Employment status and other drug classes, with taste different from usual. They increased taste different from usual by 0.18 and 1.59 in bivariate analysis respectively, and by 0.18 and 1.77 in multivariate analysis respectively. The results are summarized in **Table 26** below.

Table 26: Independent predictors of taste different from usual

	Bivariate analysis (<0.05)		Multivariate analysis (<0.05)	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
Employment status	0.1793 (0.0202, 0.3384)	0.028	0.1842 (0.0295, 0.3390)	0.020
Hypertension	0.3392 (-0.0466, 0.7249)	0.084	0.3279 (-0.0442, 0.7000)	0.084
Other drug class	1.5930 (0.3935,2,7925)	0.010	1.7654 (0.5937, 2.9371)	0.003

4.10.6 Predictors of coughing

4.10.6.1 Association between sociodemographic factors and trouble coughing

Coughing is a protective reflex that clears the throat of mucus or foreign irritants through a sudden and forceful hacking sound to release air. The association between sociodemographic factors with coughing was assessed**.** There was a statistically significant negative association between gender (p = 0.014) and coughing, and a statistically significant positive association between marital status (p = 0.060), cigarette smoking (p = 0.031), and drinking alcohol (p = 0.001), with coughing. Gender decreased coughing by 0.42 while marital status, cigarette smoking, and drinking alcohol increased coughing by 0.21, 0.20, and 0.28 respectively. The findings are summarized as shown in the **Table 27**.

Table 27: Association between sociodemographic factors and trouble coughing

Variable	**β - Coeff**	**95% conf. Interval**		**P-Value**
		Lower	**Upper**	
Gender	-0.4282	-0.7673	-0.0891	**0.014***
Age	0.0054	-0.0094	0.0188	0.424
Age category	0.1071	-0.1511	0.3654	0.413
BMI	-0.0115	-0.0503	0.0272	0.557
BMI Categories	-0.1756	-0.4080	0.0569	0.138
Marital status	0.2096	-0.0092	0.4284	**0.060***
Level of education	-0.0128	-0.1921	0.1666	0.888
Employment status	0.1359	-0.0444	0.3169	0.138
Income level	-0.1056	-0.4364	0.2252	0.529
Cigarette smoking	0.1963	0.0186	0.3740	**0.031***
Drinking alcohol	0.2769	0.1090	0.4449	**0.001***

Key: *- Statistically significant

4.10.6.2 Association between disease characteristics and trouble coughing

Linear regression was carried out to assess the association between the comorbidities and clinical characteristics, with trouble coughing. There were no statistically significant associations observed between disease characteristics and trouble coughing. The results are as summarized below in **Table 28.**

Table 28: Association between disease characteristics and trouble coughing

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	-0.048	-0.8578	0.7618	0.907
Hypertension	0.1480	-0.2889	0.5849	0.504
Asthma	-1.0535	-2.9903	0.8826	0.284
Gastritis	-0.048	-0.8578	0.7618	0.907
PUD	-1.0538	-2.9903	0.8826	0.284
GERD	-0.5543	-1.9316	0.8231	0.427
AKI / CKD	0.4685	-0.5121	1.4491	0.346
HIV/AIDS	-0.0504	-0.6372	0.5364	0.865
Any other disease	-0.5543	-1.9316	0.8231	0.427
Duration of morbidity	-0.0044	-0.0182	0.0094	0.529
Cancer stage	0.1470	-0.0205	0.3145	0.085

4.10.6.3 Association between treatments and trouble coughing

Linear regression was carried out to assess the association between treatment, with trouble coughing. There were no statistically significant associations observed between treatments and trouble coughing. The results are as summarized in **Table 29**.

Table 29: Association between treatments and trouble coughing

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	-0.0162	-0.4192	0.3867	0.937
Surgery	-1.0538	-2.9903	0.8826	0.284
Radiation therapy	0.1480	-0.2889	0.5849	0.504
Chemoradiation	-0.1634	-0.5024	0.1757	0.342
Surgery + Chemoradiation	-0.0465	-1.4272	1.3342	0.947
Surgery + Chemotherapy	0.4685	-0.5121	1.4491	0.346
Platinum-based	-0.3663	-0.8067	0.0740	0.102
Taxanes	-0.3622	-0.7759	0.0516	0.086
Antimetabolites	0.2686	-0.2773	0.8146	0.332
Folate analogs	0.4685	-0.5121	1.4491	0.346
Immunotherapy	0.2943	-0.8363	1.4248	0.607

Other drugs	0.4612	-0.9171	1.8396	0.509
Platinum + Taxane	-0.2865	-0.6863	0.1133	0.159
mFOLFOX-6 or FLOT	0.4685	-0.5121	1.4491	0.346
Platinum + Antimetabolite	-0.3051	-1.2876	0.6774	0.540
Taxane + Antimetabolite	-0.0472	-1.0312	0.9367	0.924
Platinum + Taxane + Antimetabolite + Immunotherapy	-0.0462	-1.9912	1.8989	0.963
Any other drug regimen	0.4685	-0.5121	1.4491	0.346

4.10.6.4 Independent predictors of trouble coughing

Generalized linear models were used to determine the independent predictors of taste different from usual quality of life domain by entering the factors that were significantly associated with taste different from usual quality of life at bivariate level ($p < 0.25$). Multiple Linear regression was carried out and a likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2. There was a statistically significant positive association between marital status ($p = 0.016$) and drinking alcohol ($p = 0.027$), with coughing. They increased coughing by 0.26 and 0.22 in multivariate analysis respectively.

Table 30: Independent predictors of trouble coughing

	Bivariate analysis (<0.05)		**Multivariate analysis (<0.05)**	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
Gender	-0.4282 (-0.7673, -0.0891)	0.014	-0.2544 (-0.6515, 0.1428)	0.207
Marital status	0.2096 (-0.0092, 0.4284)	0.060	0.2616 (0.0489, 0.4742)	0.016
Drinking alcohol	0.2769 (0.1090, 0.4449)	0.001	0.2238 (0.0263, 0.4214)	0.027

4.10.7 Predictors of trouble talking

4.10.7.1 Association between sociodemographic factors and trouble talking

The association between sociodemographic characteristics, with trouble talking were assessed**.** There was a statistically significant negative association between gender with trouble talking. Gender reduced trouble talking by 0.40. The findings are as summarized in **Table 31** below.

Table 31: Association between sociodemographic factors and trouble talking

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Gender	-0.3993	-0.6943	-0.1042	**0.008***
Age	0.0029	-0.0088	0.0146	0.622
Age category	0.1071	-0.1181	0.3324	0.348
BMI	-0.0062	-0.0401	0.0277	0.718
BMI Categories	-0.1273	-0.3308	0.0762	0.218
Marital status	-0.0957	-0.2887	0.0972	0.328
Level of education	0.0896	-0.0662	0.2454	0.257
Employment status	0.1242	-0.0331	0.2814	0.121
Income level	0.1045	-0.1842	0.3932	0.475
Cigarette smoking	0.1086	-0.0482	0.2655	0.173
Drinking alcohol	0.0906	-0.0612	0.2423	0.240

Key: *- Statistically significant

4.10.7.2 Association between disease characteristics and trouble talking

The association between disease characteristics (comorbidities and clinical characteristics), with trouble talking were assessed**.** Gastritis and HIV/AIDS had a statistically significant negative association with trouble talking at (p = 0.014) and (p = 0.033) respectively. They decreased trouble talking by 0.87 and 0.55 respectively.

Table 32: Association between disease characteristics and trouble talking

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	0.0013	-0.7057	0.7083	0.997
Hypertension	0.2056	-0.1748	0.5860	0.287
Asthma	-0.8385	-2.5303	0.8534	0.329
Gastritis	-0.872	-1.5625	-0.1815	**0.014***
PUD	-0.8385	-2.5303	0.8534	0.329
GERD	-0.3372	-1.5412	0.8668	0.580
AKI / CKD	0.1732	-0.6853	1.0317	0.690
HIV/AIDS	-0.5490	-1.0524	-0.0457	**0.033***
Any other disease	-0.8450	-2.0414	0.3514	0.165
Duration of morbidity	-0.0046	-0.0166	0.0075	0.454
Cancer stage	0.1006	-0.0463	0.2475	0.178

Key: *- Statistically significant

4.10.7.3 Association between treatments and trouble talking

The association between treatments with trouble talking were assessed**.** There was a statistically significant negative association between treatment with surgery + chemotherapy with trouble talking (p = 0.047). Treatment with Surgery + Chemotherapy decreased trouble-talking by 0.86. The results are as summarized in **Table 33** below.

Table 33: Association between treatments and trouble talking

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	-0.0416	-0.3933	0.3101	0.815
Surgery	-0.8385	-2.5303	0.8534	0.329
Radiation therapy	0.3586	-0.0183	0.7356	0.062
Chemoradiation	-0.1514	-0.4473	0.1445	0.313
Surgery + Chemoradiation	0.6783	-0.5213	1.8779	0.265
Surgery + Chemotherapy	-0.8583	-1.7042	-0.0123	**0.047***
Platinum-based	-0.2564	-0.6423	0.1295	0.191
Taxanes	-0.3048	-0.6663	0.0567	0.098
Antimetabolites	0.1081	-0.3700	0.5861	0.655
Folate analogs	0.1732	-0.6853	1.0317	0.690
Immunotherapy	-0.5104	-1.4945	0.4736	0.307
Other drugs	-0.8450	-2.0414	0.3514	0.165
Platinum + Taxane	-0.2611	-0.6098	0.0877	0.141
mFOLFOX-6 or FLOT	0.1732	-0.6853	1.0317	0.690
Platinum + Antimetabolite	0.1732	-0.6853	1.0317	0.690
Taxane + Antimetabolite	0.4311	-0.4247	1.2869	0.321
Platinum + Taxane + Antimetabolite + Immunotherapy	-0.8385	-2.5305	0.8534	0.329
Any other drug regimen	-0.0846	-0.9436	0.7743	0.846

Key: *- Statistically significant

4.10.7.4 Independent predictors of trouble talking

Generalized linear models were used to determine the independent predictors of taste different from usual quality of life domain by entering the factors that were significantly associated with taste different from usual quality of life at bivariate level (p < 0.25). Multiple Linear regression was carried out and a likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2.

There was a statistically significant negative association between Gender and gastritis with trouble talking. They decreased trouble talking by 0.40 and 0.87 in bivariable analysis, and by 0.35 and 0.93 in multivariable analysis respectively. Treatment with radiation therapy was found to significantly and positively increase trouble talking by 0.36 in bivariate analysis and 0.42 in multivariate analysis. The results are as summarized in **Table 34** below.

Table 34: Independent predictors of trouble talking

	Bivariate analysis (<0.05)		**Multivariate analysis (<0.05)**	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
Gender	-0.3993 (-0.6943, -0.1042)	0.008	-0.3522 (-0.6373, -0.0671)	0.016
Employment status	0.1242 (-0.0331, 0.2814)	0.121	0.1313 (-0.0185, 0.2811)	0.085
Gastritis	-0.872 (-1.5625, -0.1815)	0.014	-0.9295 (-1.5954, -0.2637)	0.007
Radiation therapy	0.3586 (-0.0183, 0.7356)	0.062	0.4172 (0.0575, 0.7769)	0.023

4.10.8 Predictors of gastro-intestinal (GI) symptoms

4.10.8.1 association between sociodemographic characteristics and GI symptoms

The GI symptoms assessed were acid indigestion or heartburn and trouble with acid or bile coming into the mouth. The association between sociodemographic characteristics, with GI symptoms was assessed (Table 35)**.** There was a statistically significant positive association

Table 35: Association between sociodemographic characteristics and GI symptoms

Variable	**β - Coeff**	**95% conf. Interval**		**P-Value**
		Lower	**Upper**	
Gender	-0.1515	-0.5024	0.1994	0.395
Age	-0.0007	-0.0143	0.0129	0.917
Age category	0.0804	-0.1817	0.3424	0.545
BMI	-0.0206	-0.0598	0.0186	0.300
BMI Categories	-0.1368	-0.3732	0.0996	0.254
Marital status	0.2273	0.0061	0.4466	**0.044***
Level of education	0.0191	-0.1627	0.2009	0.836
Employment status	0.0445	-0.1396	0.2286	0.634
Income level	-0.2840	-0.6162	0.0481	0.093
Cigarette smoking	0.0761	-0.1068	0.2590	0.412
Drinking alcohol	0.0616	-0.1152	0.2383	0.492

Key: *- Statistically significant

between Marital status and GI symptoms. Marital status increased GI symptoms by 0.23.

4.10.8.2 Association between Disease characteristics and Gastrointestinal symptoms

The association between disease characteristics with GI symptoms was assessed. There was a statistically significant positive association between Asthma, Gastritis, Peptic Ulcer Disease (PUD), other disease comorbidities, and the duration of morbidity, with GI symptoms. They increased GI symptoms by 2.1, 2.2, 2.1, 1.6, and 0.02 respectively. The findings were summarized in **Table 36.**

Table 36: Association between disease characteristics and gastrointestinal symptoms

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	-0.3487	-1.1671	0.4698	0.401
Hypertension	0.1028	-0.3404	0.5460	0.647
Asthma	2.1	0.1630	4.0370	**0.034***
Gastritis	2.184	1.4568	2.9112	**0.000***
PUD	2.1	0.1630	4.0370	**0.034***
GERD	1.1008	-0.2853	2.4869	0.119
AKI / CKD	0.2156	-0.7809	1.2120	0.669
HIV/AIDS	0.0007	-0.5941	0.5955	0.998
Any other disease	1.6085	0.2376	2.9795	**0.022***
Duration of morbidity	0.0164	0.0027	0.0301	**0.020***
Cancer stage	0.0656	-0.1057	0.2369	0.450

Key: *- Statistically significant

4.10.8.3 Association between Treatments and GI symptoms

The association between treatments with GI symptoms was assessed **(Table 37)**. There was a statistically significant, positive association between treatment with surgery (0.034) and radiation therapy (p = 0.051) and a negative association between treatment with Chemoradiation (p = 0.007), Taxanes (0.013), and combination of Platinum + Taxane (p = 0.004), with GI symptoms. Surgery and Radiation therapy increased GI symptoms by 2.1 and 0.43 respectively, while Chemoradiation, Taxanes, and combination of Platinum + Taxane decreased GI symptoms by 0.46, 0.53, and 0.58 respectively.

Table 37: Association between treatments and GI symptoms

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	0.3683	-0.0349	0.7716	0.073
Surgery	2.1	0.1630	4.0370	**0.034***
Radiation therapy	0.4344	-0.0026	0.8714	**0.051***
Chemoradiation	-0.4612	-0.7965	-0.1258	**0.007***
Surgery + Chemoradiation	-0.4225	-1.8198	0.9749	0.551
Surgery + Chemotherapy	0.2156	-0.7809	1.2120	0.669
Platinum-based	-0.4183	-0.8633	0.0268	0.065
Taxanes	-0.5256	-0.9398	-0.1115	**0.013***
Antimetabolites	0.5339	-0.0136	1.0814	0.056
Folate analogs	0.8602	-0.1256	1.8461	0.087
Immunotherapy	0.7682	-0.3709	1.9074	0.184
Other drugs	0.5930	-0.8024	1.9885	0.402
Platinum + Taxane	-0.5845	-0.9799	-0.1891	**0.004***
mFOLFOX-6 or FLOT	0.8602	-0.1256	1.8461	0.087
Platinum + Antimetabolite	0.6024	-0.3893	1.5940	0.232
Taxane + Antimetabolite	0.0866	-0.9105	1.0837	0.864
Platinum + Taxane + Antimetabolite + Immunotherapy	-0.9231	-2.8878	1.0416	0.354
Any other drug regimen	0.8602	-0.1256	1.8461	0.087

Key: *- Statistically significant

4.10.8.4 Independent predictors of GI symptoms

Generalized linear models were used to determine the independent predictors of taste different from usual quality of life domain by entering the factors that were significantly associated with taste different from usual quality of life at bivariate level ($p < 0.25$). Multiple Linear regression was carried out and a likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2. There was a statistically significant positive association between Gastritis ($p = 0.000$), GERD ($p = 0.001$), Platinum agents ($p = 0.043$) and other drug regimens ($p = 0.035$), with GI symptoms. They increased GI symptoms by 0.29,2.21, 0.79, and 0.92 respectively in multivariate analysis. On the other side, there was a statistically significant negative association between BMI categories ($p = 0.007$) and Taxanes ($p = 0.003$), with GI symptoms. They decreased GI symptoms by 0.14 and 0.53 in bivariable analysis, and by 0.29 and 1.07 in multivariable analysis respectively. The findings are summarized in **Table 38.**

Table 38: Independent predictors of GI symptoms

	Bivariate analysis (<0.05)		Multivariate analysis (<0.05)	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
BMI categories	-0.1368 (-0.3732, 0.0996)	0.254	-0.2869 (-0.4921, -0.0816)	0.007
Gastritis	2.184 (1.4568, 2.9112)	0.000	2.2859 (1.6066, 2.9652)	0.000
GERD	1.1008 (-0.2853, 2.4869)	0.119	2.2055 (0.9421, 3.4689)	0.001
Platinum-based	-0.4183 (-0.8633, 0.0268)	0.065	0.7867 (0.0240, 1.5494)	0.043
Taxanes	-0.5256 (-0.9398, -0.1115)	0.013	-1.0745 (-0.7811, -0.3678)	0.003
Any other Regimen	0.8602 (-0.1256, 1.8461)	0.087	0.9196 (0.0637, 1.7684)	0.035

4.10.9 Predictors associated with pain

4.10.9.1 Association between Sociodemographic characteristics and pain

Pain is an unpleasant sensory and emotional experience associated with, or resembling that associated with actual or potential tissue damage. Linear regression was carried out to assess the association between the sociodemographic characteristics, with pain. There were no statistically significant associations observed between sociodemographic characteristics and pain. The results are summarized in **Table 39** below.

Table 39: Association between sociodemographic characteristics and pain

Variable	**β - Coeff**	**95% conf. Interval**		**P-Value**
		Lower	**Upper**	
Gender	-0.0906	-0.3805	0.1992	0.537
Age	0.0013	-0.0099	0.0125	0.823
Age category	0.0448	-0.1715	0.2612	0.683
BMI	-0.0052	-0.0377	0.0272	0.750
BMI Categories	-0.0617	-0.2574	0.1340	0.534
Marital status	0.1609	-0.0225	0.3442	0.085
Level of education	0.0352	-0.1147	0.1850	0.643
Employment status	0.0905	-0.0607	0.2417	0.238
Income level	-0.2143	-0.4888	0.0602	0.125
Cigarette smoking	0.0419	-0.1092	0.1930	0.584
Drinking alcohol	0.0366	-0.1094	0.1825	0.621

4.10.9.2 Association between disease characteristics and pain

The association between disease characteristics with GI symptoms was assessed. There was a statistically significant positive association between Asthma, Gastritis, Other non-specified

disease comorbidities, and duration of morbidity, with pain. They increased Pain by 1.89, 1.2, 1.14, and 0.02 respectively. The findings are summarized in **Table 40.**

Table 40: Association between Disease characteristics and pain

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Diabetes	-0.3329	-1.0075	0.3416	0.331
Hypertension	0.1288	-0.2364	0.4940	0.486
Asthma	1.8901	0.2976	3.4826	**0.020***
Gastritis	1.2094	0.5660	1.8528	**0.000***
PUD	1.5575	-0.0459	3.1609	0.057
GERD	0.5541	-0.5962	1.7044	0.342
AKI / CKD	0.3024	-0.5186	1.1233	0.467
HIV/AIDS	0.1383	-0.3517	0.6284	0.578
Any other disease	1.1431	0.0061	2.2801	**0.049***
Duration of morbidity	0.0156	0.0043	0.0268	**0.007***
Cancer stage	0.0693	-0.0719	0.2104	0.333

Key: *- Statistically significant

4.10.9.3 Association between treatments and pain

The association between disease characteristics with GI symptoms was assessed. There was a statistically significant positive association between treatment with Surgery (p = 0.020), use of Folate analogs (p = 0.029), and use of mFOLFOX-6/FLOT regimens (p = 0.029), with pain. The treatments increased pain by 1.89, 0.90, and 0.90.

Table 41: Association between Treatments and pain

Variable	β - Coeff	95% conf. Interval		P-Value
		Lower	Upper	
Chemotherapy	-0.0043	-0.3412	0.3325	0.980
Surgery	1.8901	0.2976	3.4826	**0.020***
Radiation therapy	0.1707	-0.1940	0.5353	0.356
Chemoradiation	-0.2042	-0.4865	0.0780	0.155
Surgery + Chemoradiation	-0.1263	-1.2804	1.0278	0.829
Surgery + Chemotherapy	0.3875	-0.4324	1.2073	0.351
Platinum-based	-0.2009	-0.5713	0.1694	0.285
Taxanes	-0.2399	-0.5873	0.1075	0.174
Antimetabolites	0.1407	-0.3168	0.5982	0.544
Folate analogs	0.9032	0.0958	1.7107	**0.029***
Immunotherapy	-0.2398	-1.1851	0.7054	0.617
Other drugs	0.2139	-0.9398	1.3676	0.714
Platinum + Taxane	-0.2927	-0.6256	0.0403	0.084
mFOLFOX-6 or FLOT	0.9032	0.0958	1.7107	**0.029***
Platinum + Antimetabolite	-0.2572	-1.0786	0.5642	0.537
Taxane + Antimetabolite	-0.3861	-1.2060	0.4337	0.353
Platinum + Taxane + Antimetabolite + Immunotherapy	-1.1330	-2.7472	0.4812	0.167
Any other drug regimen	-0.1283	-0.9506	0.6941	0.758

Key: *- Statistically significant

4.10.9.4 Independent predictors of pain

Generalized linear models were used to determine the independent predictors of taste different from usual quality of life domain by entering the factors that were significantly associated with taste different from usual quality of life at bivariate level ($p < 0.25$). Multiple Linear regression was carried out and a likelihood ratio test (LR-Test) run to determine the most parsimonious model by monitoring the changes in the adjusted R^2. There was a statistically significant positive association between Gastritis ($p = 0.002$), PUD ($p = 0.031$), and folate analogs ($p = 0.005$), with pain. They increased pain by 1.21, 1.56, and 0.90 in bivariable analysis, and by 1.02, 1.63, and 1.28 in multivariable analysis, respectively. There was a statistically significant negative association between treatment with Platinum + Taxane + Antimetabolite + Immunotherapy ($p = 0.008$), with pain. It increased pain by 2.35 in multivariate analysis. The findings are summarized in **Table 42.**

Table 42: Independent predictors of pain

	Bivariate analysis (<0.05)		Multivariate analysis (<0.05)	
Variable	**β - Coeff (C.I)**	**P-Value**	**β - Coeff (C.I)**	**P-Value**
Gastritis	1.2094 (0.5660, 1.8528)	0.000	1.0208 (0.3909, 1.6506)	0.002
PUD	1.5575 (-0.0459, 3.1609)	0.057	1.6262 (0.1473, 3.1051)	0.031
Folate analogs	0.9032 (0.0958, 1.7107)	0.029	1.2826 (0.4026, 2.1617)	0.005
Platinum + Taxane + antimetabolite + Immunotherapy	-1.1330 (-2.7472, 0.4812)	0.167	-2.3464 (-4.0400, -1.6128)	0.008

CHAPTER FIVE: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the findings of the study, conclusions, and recommendations.

5.2 Discussion

Most of the participants in this study were aged between 51 – 70 years, and majority were males. These study findings were peculiar and in agreement with the study findings by Chung et al (13) and by Kirtika et al (86). These results indicate that the risk factors for development of EC are more linked to environmental or lifestyle components, as men drink alcohol and smoke more than women in the developing countries. Hormonal factors may not play a role in the causation of esophageal cancer (86). The common symptoms of cancer of the esophagus are dysphagia and weight loss and by the time the patient presents for treatment the tumor is in the advanced stage and the prognosis is very poor.

Approximately one-third of the participants, had secondary education meaning that a majority did not get secondary education. This suggests that they could have lacked awareness of the disease as well as the risk factors associated with esophageal cancer. The majority were not formally employed and are of a low-income level. This suggests that perhaps they accessed only casual labor and other color jobs leaving them with no time and facilitation to access screening services for cancer that are available in select primary health care facilities. Kenya shares many recognized risk factors of EC, which include tobacco smoking, alcohol drinking, scalding hot food or drink, deficiency of micronutrients, food and drink containing carcinogens, and familial history of cancer—especially ESCC (13).

Most cases of EC are diagnosed at an advanced stage which is a common observation in developing countries due to late presentation as was revealed by S.W.O Ogendo, 2001 (74). A study done by Altorki et al also posted similar results (50). In Kenya, most of cancer cases are diagnosed in late stages, and only a few hospitals treat EC patients. This can be explained by the fact that Kenya still lacks the necessary expertise, with limited infrastructure and few oncology specialists, to keep up with the current medical needs of cancer cases in a vast and diverse population.

Different treatment methods for patients at different cancer stages were used, and most of the patients utilized more than one treatment modality. In this study, most participants' current active treatment was mainly concurrent chemoradiotherapy although a significant number were treated

with chemotherapy or radiotherapy alone (62). Most participants were put on a Platinum + Taxane regimen, the most commonly used first-line treatment in KNH (84). The other regimens included mFOLFOX-6, FLOT, CapeOX, Immunotherapy, and Taxane + Antimetabolite. No patient was put on targeted therapy during the period of the study.

Given that the patients were being treated for cancer using cytotoxic drugs which do not discern between normal and neoplastic cells, side-effects were inevitable. The most common symptoms experienced were dysphagia, fatigue, loss of appetite, and vomiting. In addition, EC was associated with the presence of other illnesses. Hypertension was the most common comorbidity followed by HIV/AIDS. This made an impression that the ready availability of screening, diagnosis, and treatment of both hypertension and HIV/AIDS at primary health care centers made participants aware of their health state. Sarfati et al found out that comorbidity may actually result in increased contact with health services leading to more opportunities for screening and early diagnosis; or, conversely, comorbidity may distract either, or both the patient and the health professional, resulting in a delayed diagnosis of cancer (85).

In this study our analysis focused on the EORTC OES-18 HRQoL tool which demonstrated how the patient characteristics affected the symptomatology and presentation of esophageal cancer. The overall quality of life mean score was found to be below average. Dysphagia was the most common symptom item followed by problem eating.

Whereas the level of education caused a clinically significant association in the dysphagia domain of HRQoL, there were no significant differences identified in all the other sociodemographic characteristics evaluated, with dysphagia. Consequently, it was shown that the disease characteristics evaluated, which included the duration of morbidity since diagnosis and the stage of the disease, did not have any statistical relevance with dysphagia. This is the opposite of what is expected. The more advanced the cancer stage the bigger the size of the tumor as well as a high likelihood of metastasis hence, we expect more symptoms of dysphagia (74).

Based on linear regression, the following was observed. BMI, Marital status, and treatment with either chemotherapy or radiation therapy significantly affected problem eating. This hinted at how increasing BMI causes a decrease in physical health thus interfering with eating habits. Also, treatment with chemotherapy or radiotherapy exposes the patient to developing mucositis which

interferes with eating. The care of a patient with esophageal cancer therefore, is interprofessional. The inability to eat affects every organ in the body. At presentation, the majority of patients are severely emaciated. A dietitian should be involved in the care of these patients to ensure they are receiving adequate calories. Since many of these patients are not able to eat, liquid medications should be given instead via the J-tube. Since the patients are weak and frail, consultation with a physical therapist and an occupational therapist is recommended.

The coughing domain of HRQoL was significantly associated with Gender, Cigarette smoking, and alcohol consumption. This agrees with observations by Chung et al on the many recognized risk factors for EC shared between Kenya and China both of which lie in the high incidence corridor (13).

Most participants had gastrointestinal problems which is in line with manifestations of most cancers found along the gastrointestinal tract. The GI symptoms observed were acid indigestion or heartburn and trouble with acid or bile coming into the mouth. There was a statistically significant positive association between Gastritis and GERD, with increased GI symptoms and pain. Treatment with Surgery and Radiation therapy increased GI symptoms, while Chemoradiation, and chemotherapy with Taxanes, or a combination of Platinum + Taxane decreased GI symptoms.

Pain is a common symptom associated with cancer. Asthma, Gastritis, and a longer duration of morbidity, as well as surgical treatment, was significantly associated with increased pain. These affects the daily living activities, causing a dependence on medicinal substances, discomfort and low energy significantly interfering with their capacity to work.

5.3 Conclusion

1. The HRQoL among EC patients was low. There was a significant number of determinants which are both modifiable and non-modifiable including BMI, comorbidities, treatment plans and socioeconomic factors such as cigarette smoking and drinking alcohol.
2. Concurrent chemoradiotherapy was the most preferred mode of treatment for esophageal cancer patients in KNH. Combination of Platinum-based and Taxane-based agents were regularly used as the first-line while Antimetabolites and immunotherapy were incorporated as second line. Treatment with Chemoradiation, and the combination regimen

Platinum + Taxane + Antimetabolite + Immunotherapy were the most significant determinants of dysphagia, GI symptoms, and pain.

3. Dysphagia, Problem eating, GI symptoms, and pain were the most significant predictors of HRQoL among EC patients which is in line with manifestations of most cancers found along the gastrointestinal tract.

5.4 Recommendations

5.4.1 Recommendations for Policy and Practice

1. HRQoL was poor and therefore, sensitization for early diagnosis and treatment of esophageal cancer should be considered in order to improve on HRQoL.
2. Limited knowledge and recognition of EC symptoms by patients and primary health care practitioners leads to delayed diagnosis and poor quality of life. Clinically, it is urgent to train more oncology medical specialists who can diagnose and treat EC. Community health educators in high incidence regions should be trained to disseminate knowledge of EC within their communities, leading to greater awareness of the disease and improvement in quality of life.
3. In the wake of increasing prevalence and cancer mortality in Kenya, and as oncology research takes root in Africa, concerted effort is needed to convince clinicians, educators, and policy makers that HRQoL is at the heart of oncology management and should be incorporated in treatment guidelines for EC.

5.4.2 Recommendations for Further Research

1. Finally, there is a need for more prospective, high-quality studies which include the measurement of HRQoL at baseline and after treatment, using validated instruments, such as the EORTC QLQ or the FACT-G, in all areas of esophageal cancer management including contemporary practice.
2. A study to assess the true survival pattern of EC patients following discharge and the most prevalent treatment associated side effects and predictors of survival is required.

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APPENDICES

APPENDIX 1: ELIGIBILITY CRITERIA

Based on the inclusion and exclusion criteria, all participants enrolled into the study must meet the eligibility criteria as detailed in the form below.

Study Information

Title	The Management and Predictors of Health-Related Quality of Life among adult patients with Esophageal Cancer at Kenyata National Hospital
KNH-UoN ERC Number	P752 / 09 / 2022
Principal Investigator	Dr. Juliet Mutiki Kamene

Subject information

Subject name / ID	

Inclusion / Exclusion criteria

Inclusion criteria	**Yes**	**No**
The study will include patients with a histological or clinical diagnosis of esophageal cancer		
Patients aged 18 years and above		
Patients who have been on any treatment modality for EC for at least 4 weeks		
Patients who will consent to participate in the study		
Exclusion criteria	**Yes**	**No**
Patients with cognitive impairment and are not able to comprehend the elements of the data collection tools and there is no treatment assistant		

Statement of eligibility

This subject is ELIGIBLE ☐ / NOT ELIGIBLE ☐ to participate in this study

Reason:

_____

_____

Name	
Signature	Date

APPENDIX 2: PATIENT INFORMATION AND CONSENT FORM

Title of study	The Management and Predictors of Health-Related Quality of Life among adult patients with Esophageal Cancer at Kenyata National Hospital
Principal investigator	Dr. Juliet Mutiki Kamene P.O BOX 421 – 90200, Kitui, Kenya Phone number: 0713940172 Email: julietmutiki@gmail.com
Supervisors	Dr. Peter N. Karimi Dr. Charles G. Githinji
Institution (s)	Department Pharmacy, University of Nairobi Kenyatta National Hospital
Ethical approval	Kenyatta National Hospital / University of Nairobi Ethical and Research Committee P.O Box 20723-00100, Nairobi, Kenya Tel. 2726300/2716450 Email: uonknh-erc@uonbi.ac.ke

My name is Juliet Mutiki, a third-year postgraduate student at the university of Nairobi, School of pharmacy. I am conducting a research study on the topic above and I would like to give you details pertaining the study. The reason for this consent form is to provide you with comprehensive information that will enable you to make an informed decision on whether or not, to participate in the study.

I will provide you with information with regard to; The intended purpose of the research study, the possible risks and benefits, your rights as a volunteer, what happens if you choose to participate, and any other thing that you may need clarification. Please, feel free to engage and ask any question within these subject matters. Once all your queries are satisfactorily responded to, you may decide to take part in this study or not. If your response gives a go ahead to participate, then I will ask you to note down your name and input your signature on this form.

This study has been approved by the by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee.

Before we go any further, it is important to understand that the following general principles:

Your decision to participate in this study is strictly voluntary

You are free to withdraw from the study at any time without necessarily providing a reason for your withdrawal. You will not suffer any injustice or loss of benefit as a result.

Your refusal to participate will not affect your ability to access and benefit from services at this health facility or others.

You have the right to both privacy and confidentiality.

What is this study about?

This study concerns patients diagnosed with esophageal cancer who have been started on treatment. The researcher will take a deeper look into the management of esophageal cancer as well as determine the predictors of Health-Related Quality of Life among these patients post initiation of treatment. Those participating in this study will be asked questions pertaining their sociodemographic characteristics, disease characteristics, the treatment options they have been put on, any unwarranted effects they are experiencing as a result of the treatments and how this has affected their quality of life in terms of physical ability, social and emotional functioning. The findings of this study will make available the different management strategies employed and how their effects influence the HRQOL of the patients and thus are able to make prior predictions and prepare accordingly to mitigate such effects and advise their patients accordingly.

Risks or harms associated with this study

This is a cross-sectional study meaning that no interventions that shall be provided such as extra medications or procedures and therefore it poses no harm at all to the participants. Also, there are no cost implications that shall be incurred by the study participants.

Benefits

The findings of this study are expected to enlighten both the patients and the health care professionals about the management of esophageal cancer and what to expect in the course of managing the disease under different parameters. The study will contribute to building the body of knowledge of esophageal cancer.

What happens if you choose to participate

On agreeing to take part in this study, the researcher will offer a safe and private space where they will conduct an interview on you to engage further on your disease. Your medical file shall also be accessed so as to retrieve more details on the disease, especially information that is not readily available from the patient such as diagnostic work-ups.

Please note that there will be no payments or reimbursements in form of money, gifts or incentives upon participating in the study.

Questions

All participants are free to ask all relevant queries on their participation in this study. Any questions that arise at any given time that have not been addressed by the researcher can be

channeled via a phone text message or by sending an email though the contact details provided above, to either the researcher, my supervisors or the KNH-UON ethics committee.

If you are in agreement, please sign the participants consent form below.

Participants Consent Declaration

I have read this research information and consent form. the researcher has adequately responded to all my questions and all is understandable to me. I am aware that my participation is purely voluntary and I can withdraw from the study at any time without feeling pressured. All the benefits and risks associated with this study have been put to my knowledge and I understand that all efforts will be put to ensure that my personal information is maintained confidential.

I agree to participate in the study

YES ☐ NO ☐

Participant's name_____Date_____

Signature_____ Study Number_____

Researcher's Statement

I, the researcher, confirm that I have put my participant to knowledge on all the relevant details of this research study. The participant has understood and has given informed consent without being coursed to do so.

Name of Researcher Dr. JULIET MUTIKI KAMENE

Date_____

Signature_____ Contact 0713 940 172

APPENDIX 3: MAELEZO KUHUSU KUSHIRIKI UTAFITI

Kichwa cha utafiti	Matibabu na uchambuzi wa hali ya Maisha ya kiafya ya watu wazima wanougua saratani ya kipasa chakula katika hospitali ya kitaifa ya Kenyatta: utafiti wa maelezo wa sehemu nzima
Mtafiti mkuu	Dkt. Juliet Mutiki Kamene Nambari ya posta 421-90200, Kitui Kenya Nambari ya simu: 0713940172 Barua pepe: julietmutiki@gmail.com
Wasimamizi	Dkt. Peter N. Karimi Dkt. Githinji
Taasisi	Idara ya dawa na mazoezi ya Apoteket, Shule ya Pharmacia, Chuo kikuu cha Nairobi Nambari ya posta 30197-00100, Nairobi, Kenya
Idhini ya kimaadili	Hospitali ya kitaifa ya Kenyatta / Chuo kikuu cha Nairobi Kamati ya maadili na utafiti Nambari ya posta 20723-00100, Nairobi, Kenya Nambari ya simu: 2726300/2716450 Barua pepe: uonknh_erc@uonbi.ac.ke

Jina langu ni Juliet Mutiki, mwanafunzi wa uzamili wa mwaka wa tatu katika chuo kikuu cha Nairobi, shule ya Pharmacia. Ninafanya utafiti kwa mada ilioorodheshwa hapo juu na ningependa kukuelimisha kwa kina kuhusu utafiti huu. Sababu kuu ya karatasi hili ni kuwezesha kukupa wewe habari itakayo kusaidia kuamua iwapo utashiriki kwenye utafiti huu au la.

Nataka nikupe Habari kuhusu matakwa haya; Sababu kuu inayokusudiwa kuafiki kupitia utafiti huu, hatari na faida ya kushiriki, haki zako kwa kujitolea kwako, yatakayofanyika iwapo utaamua kushiriki na jambo ingine lolote utakalo hitaji ufafanuzi. Una huru wa kuniuliza swali lolote kuhusu matakwa haya pia jambo jengine litakalotokezea wakati wowote ule. Wakati maswali yako yote yamejibiwa na ukaridhika, uko huru kuchagua ikiwa utashiriki au kutoshiriki katika utafiti huu. Iwapo utakubali kushiriki katika utafiti huu, nitakuomba uandike jina yako na kisha utie sahihi kwenye karatasi hii.

Utafiti huu umepewa idhini ya kuendelea na kamati ya Kamati ya Maadili na Utafiti ya Hospitali ya Kitaifa ya Kenyatta ikishirikiana na Chuo Kikuu cha Nairobi.

Kabla ya kuendelea Zaidi yah apo, ni muhimu kuelewa kanuni za jumla ambazo zinatumika kwa washiriki katika utafiti wa matibabu;

Kushiriki kwako kwa utafiti huu ni kwa hiari yako.

Unaweza kujiondoa wakati wowote bila kushurutishwa kutoa maelezo ya kufanya hivyo. Hautakosa manufaa au kudhulumiwa.

Kutoshiriki kwako katika utafiti huu hakutaadhiri huduma unazopaswa kupata kwa hospitali hii au ingine iwayo.

Una haki ya faragha na usiri.

FOMU YA RIDHAA

Taarifa ya mshiriki

Nimesoma maelezo ya utafiti na ridhaa hii na maswali niliyokua nayo nikajibiwa kikamilifu. Nimeelezwa kwa kina kuwa kushiriki utafiti huu ni kwa hiari yangu na iwapo ningependa kujitoa kwenye utafiti ninaweza kufanya hivyo bila ya dhuluma. Nimeelezwa manufaa na hasara inayoambatana na utafiti huu na Nimefahamishwa kwamba juhudi zote zitafanywa kuweka habari zote kunihusu siri.

Nimekubali kushiriki utafiti huu

NDIO: ☐ LA: ☐

Jina la mshiriki_____ Tarehe_____

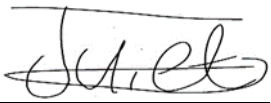
Sahihi_____Nambari ya utafiti_____

Andiko la mtafiti mkuu

Mimi, kama mtafiti mkuu, nadhibitisha ya kwamba nimemueleza habari zote anazopaswa kujua kuhusu utafiti huu na amepeana ridhaa yake kwa hiari yake.

Jina la mtafiti mkuu: Dr. JULIET MUTIKI KAMENE

Tarehe:_____

Sahihi  Nambari ya simu 0713 940 172

APPENDIX 3: STRUCTURED QUESTIONNAIRE

PATIENT BIODATA

Patient serial number_____ Study number_____

Date of enrollment_____

SOCIODEMOGRAPHIC CHARACTERISTICS

Gender: Male (1) [ ] emale (2) [ ]

Age (years) _____

<30 [0] 50 [1] 51-70 [2] >70 [3]

Weight (Kgs) _____

Height (cm) _____

BMI (Kg/M²) _____

Weight categories

Under-weight [0] Normal-weight [1] Over-weight [2] Obese [3]

Marital status

Single [0] Married [1] Divorced/Separated [2] Widowed [3]

Highest level of education

None [0] Primary [1] Secondary [2] Tertiary [3]

Employment status

Unemployed [0] Employed [1] Self-employed [2] Retired [3]

What is your level of income?

Low [0] Middle [1] High [2]

History of smoking cigarettes?

Non-smoker [0] Current smoker [1] Previously smoking [2]

History of drinking alcohol?

Non-drinker [0] Current drinker [1] Previously drinking [2]

COMORBIDITIES

Do you suffer any other illness apart from the current disease (comorbidity)?

YES 1 NO 0

If yes, please tick all that apply in the table below;

No.	Comorbidity	Present	Absent
	Diabetes mellitus	1	0
	Hypertension	1	0
	History of Myocardial Infarction	1	0
	Peripheral Vascular Disease	1	0
	Congestive Heart Failure	1	0
	Asthma	1	0
	Chronic Obstructive Pulmonary Disease	1	0
	Bronchitis	1	0
	Gastritis	1	0
	Peptic Ulcer Disease	1	0
	Gastro-esophageal Reflux Disease	1	0
	Acute or Chronic Kidney Failure	1	0
	HIV/AIDS	1	0
	Localized Solid Tumor (apart from Esophageal)	1	0
	Lymphoma	1	0
	Leukemia	1	0
	Any other disease (specify)	1	0

Number of comorbidities _____

DISEASE CHARACTERISTICS

Duration of morbidity since diagnosis----------

Stage of the disease?

Stage I 0 Stage II 1 Stage III 2 Stage IV 3 Missing 4

What was the tumor staging (TNM Classification)

Primary Tumor	Lymph Node	Metastasis
T1 – T2a _____	Nx _____	Mx _____
T2b – T2c _____	N0 _____	M0 _____
T3a _____	N1 _____	M1 _____

T3b – T4 _____		

What treatment options have been used to manage the patient?

No.	Treatment modality	Tick if Present	Absent
	Chemotherapy	1	0
	Surgery	1	0
	Radiation therapy	1	0
	Chemoradiation	1	0
	Endoscopic therapies	1	0
	Surgery + Chemoradiation	1	0
	Surgery + Chemotherapy	1	0
	Surgery + Radiotherapy	1	0

Have you experienced any adverse effects from the time the treatment was commenced? If yes, which ones (please tick all that apply). YES 1 NO 0

System	Symptom	Tick if present (1)	Absent (0)
Gastrointestinal	Nausea	1	0
	Vomiting	1	0
	Dysphagia	1	0
	Diarrhea	1	0
	Hematochezia	1	0
	Constipation	1	0
	Appetite Loss	1	0
Generalized body	Fatigue	1	0
	Pain	1	0
	Malaise	1	0
	Weight loss	1	0
	Weight gain	1	0
Hormonal effects	Mood swings or Depression	1	0
	Alopecia	1	0
	Reduced bone density or fractures	1	0
		1	0
CNS	Memory loss	1	0
	Seizures	1	0
	Peripheral neuropathy	1	0
Others	Anemia	1	0
	Neutropenia	1	0
	Thrombopenia	1	0

	Any other	1	0

Which chemotherapeutic drugs have you been managed on?

No.	Class	Specific medication	Yes (Tick if used)	No (Tick if not used)
	Platinum-based	Cisplatin	1	0
		Carboplatin	1	0
		Oxaliplatin	1	0
	Taxanes	Paclitaxel	1	0
		Docetaxel	1	0
	Antimetabolite	Capecitabine	1	0
		5-Fluorouracil	1	0
	Anthracycline	Epirubicin	1	0
	Folate analogues	Leucovorin	1	0
	Targeted therapy	Trastuzumab	1	0
		Ramucirumab	1	0
	Immunotherapy	Pembrolizumab	1	0
		Nivolumab	1	0
	Other drugs		1	0

Chemotherapeutic drug categories

No.	Drug category	Yes (Tick if used)	No (Tick if not used)
	Platinum compound	1	0
	Taxanes	1	0
	Anti-metabolites	1	0
	Anthracyclines	1	0
	Folate analogs	1	0
	Targeted therapy	1	0
	Immunotherapy	1	0
	Other drug category	1	0

Chemotherapy drug Regimens

No.	Regimen	Yes	No
	Platinum + Taxane	1	0
	Platinum + Taxane + Antimetabolite + Leucovorin	1	0
	Platinum + Antimetabolite ± Leucovorin	1	0
	Taxane + Antimetabolite	1	0
	Platinum + Taxane + Antimetabolite + targeted therapy	1	0

	Platinum + Taxane + Antimetabolite + Immunotherapy	1	0
	Platinum + Taxane + targeted therapy	1	0
	Any other regimen	1	0

APPENDIX 4A: EORTC-QLQ-C30 version 3 (English Version)

EORTC QLQ-C30 (version 3)

We are interested in some things about you and your health. Please answer all of the questions yourself by circling the number that best applies to you. There are no "right" or "wrong" answers. The information that you provide will remain strictly confidential.

Please fill in your initials: _____

Your birthdate (Day, Month, Year): _____

Today's date (Day, Month, Year): _____

	Not at All	**A Little**	**Quite a Bit**	**Very Much**
Do you have any trouble doing strenuous activities, like carrying a heavy shopping bag or a suitcase?	1	2	3	4
Do you have any trouble taking a long walk?	1	2	3	4
Do you have any trouble taking a short walk outside of the house?	1	2	3	4
Do you need to stay in bed or a chair during the day?	1	2	3	4
Do you need help with eating, dressing, washing yourself or using the toilet?	1	2	3	4

During the past week:	**Not at All**	**A Little**	**Quite a Bit**	**Very Much**
Were you limited in doing either your work or other daily activities?	1	2	3	4
Were you limited in pursuing your hobbies or other leisure time activities?	1	2	3	4
Were you short of breath?	1	2	3	4
Have you had pain?	1	2	3	4

Did you need to rest?	1	2	3	4
Have you had trouble sleeping?	1	2	3	4
Have you felt weak?	1	2	3	4
Have you lacked appetite?	1	2	3	4
Have you felt nauseated?	1	2	3	4
Have you vomited?	1	2	3	4
Have you been constipated?	1	2	3	4

During the past week:	**Not at All**	**A Little**	**Quite a Bit**	**Very Much**
17. Have you had diarrhea?	1	2	3	4
18. Were you tired?	1	2	3	4
19. Did pain interfere with your daily activities?	1	2	3	4
20. Have you had difficulty in concentrating on things, like reading a newspaper or watching television?	1	2	3	4
21. Did you feel tense?	1	2	3	4
22. Did you worry?	1	2	3	4
23. Did you feel irritable?	1	2	3	4
24. Did you feel depressed?	1	2	3	4
25. Have you had difficulty remembering things?	1	2	3	4
26. Has your physical condition or medical treatment interfered with your <u>family</u> life?	1	2	3	4
27. Has your physical condition or medical treatment				

interfered with your social activities?	1	2	3	4
28. Has your physical condition or medical treatment caused you financial difficulties?	1	2	3	4

For the following questions please circle the number between 1 and 7 that best applies to you

29. How would you rate your overall health during the past week?

	2	3	4	5	6	7
Very poor						Excellent

30. How would you rate your overall quality of life during the past week?

	2	3	4	5	6	7
Very poor						Excellent

APPENDIX 4B: EORTC-QLQ-C30 version 3 (Kiswahili Version)

Kiswahili

EORTC QLQ-C30 (toleo la 3)

Tunapenda kujua mambo kadhaa kukuhusu wewe na afya yako. Tafadhali jibu maswali yote wewe mwenyewe kwa kuzungushia duara kwenye nambari inayokueleleza zaidi wewe. Hakuna jibu "zuri" au "baya". Taarifa utakazotoa zitabaki kuwa siri.

Tafadhali jaza herufi za kifupi cha majina yako:

Tarehe ya kuzaliwa (Siku, Mwezi, Mwaka):

Tarehe ya leo (Siku, Mwezi, Mwaka):

	Hapana	Kidogo tu	Kiasi	Sana
Unapata shida yoyote unapofanya kazi ngumu, kama vile kubeba mifuko mikubwa ya kununulia vitu au sanduku?	1	2	3	4
Una tatizo lolote unapotembea umbali mrefu?	1	2	3	4
Unapata shida yoyote utembeapo umbali mfupi nje ya nyumba?	1	2	3	4
Unahitaji kupumzika kitandani au kwenye kiti wakati wa mchana?	1	2	3	4
Unahitaji msaada wakati wa kula, kuvaa, kuoga au kwenda msalani?	1	2	3	4

Katika kipindi cha wiki moja iliyopita:	**Hapana**	**Kidogo tu**	**Kiasi**	**Sana**
Umekuwa ukishindwa kufanya kazi zako au shughuli za kila siku ipasavyo?	1	2	3	4
Umekuwa ukishindwa kuendelea kufanya mambo yako unayoyapenda au shughuli zako za wakati wa mapumziko?	1	2	3	4
Ulishindwa kupumua vizuri?	1	2	3	4
Ulikuwa na maumivu?	1	2	3	4
Ulihitaji mapumziko?	1	2	3	4

Umekuwa na matatizo ya kupata usingizi?	1	2	3	4
Umejisikia dhaifu?	1	2	3	4
Umekosa hamu ya chakula?	1	2	3	4
Umesikia kichefuchefu?	1	2	3	4
Ulitapika?	1	2	3	4
Umekuwa na tatizo la kufunga choo?	1	2	3	4
Katika kipindi cha wiki moja iliyopita:	Hapana	Kidogo tu	Kiasi	Sana
Umeharisha?	1	2	3	4
Umejisikia mchovu?	1	2	3	4
Maumivu yaliingilia shughuli zako za kila siku?	1	2	3	4
Umekuwa na shida ya kuwa makini na vitu? Kwa mfano kusoma gazeti au kuangalia televisheni kwa umakini?	1	2	3	4
Umekuwa ukijisikia hali ya kukasirika kwa upesi?	1	2	3	4
Umekuwa na wasiwasi?	1	2	3	4
Ulijisikia kukasirika?	1	2	3	4
Umejisikia kuvunjika moyo?	1	2	3	4
Umekuwa ukipoteza kumbukumbu ya mambo yaliyopita, pia kusahau kufanya mambo unayotakiwa kufanya?	1	2	3	4
Hali yako ya kiafya au matibabu vimeingilia maisha yako ya kifamilia?	1	2	3	4
Hali yako ya kiafya au matibabu vimeingilia maisha yako ya kijamii?	1	2	3	4
Hali yako ya kiafya au matibabu vimekusababishia matatizo ya kifedha?	1	2	3	4

Kwa maswali yafuatayo tafadhali zungushia duara kwenye namba kati ya 1 mpaka 7 ambayo inakueleleza zaidi wewe

Unaweza kuitathmini vipi hali yako ya kiafya katika kipindi cha wiki moja iliyopita?

1 2 3 4 5 6 7

Mbaya sana Nzuri sana

Kwa ujumla unaweza kutathmini vipi hali yako ya maisha au mwenendo wa maisha yako katika kipindi cha wiki moja iliyopita?

1 2 3 4 5 6 7

Mbaya sana Nzuri sana

APPENDIX 5A: EORTC-QLQ-OES18 (English Version)

ENGLISH

EORTC QLQ – OES18

Patients sometimes report that they have the following symptoms or problems. Please indicate the extent to which you have experienced these symptoms or problems during the past week. Please answer by circling the number that best applies to you.

During the past week:	**Not at all**	**A little**	**Quite a bit**	**Very much**
Could you eat solid food?	1	2	3	4
Could you eat liquidised or soft food?	1	2	3	4
Could you drink liquids?	1	2	3	4
Have you had trouble with swallowing your saliva?	1	2	3	4
Have you choked when swallowing?	1	2	3	4
Have you had trouble enjoying your meals?	1	2	3	4
Have you felt full up too quickly?	1	2	3	4
Have you had trouble with eating?	1	2	3	4
Have you had trouble with eating in front of other people?	1	2	3	4
Have you had a dry mouth?	1	2	3	4
Did food and drink taste different from usual?	1	2	3	4
Have you had trouble with coughing?	1	2	3	4
Have you had trouble with talking?	1	2	3	4
Have you had acid indigestion or heartburn?	1	2	3	4
Have you had trouble with acid or bile coming into your mouth?	1	2	3	4
Have you had pain when you eat?	1	2	3	4

Have you had pain in your chest?	1	2	3	4
Have you had pain in your stomach?	1	2	3	4

APPENDIX 4B: EORTC-QLQ-OES18 (Kiswahili Version)

SWAHILI

EORTC QLQ – OES18

Wagonjwa wakati mwingine huelezea kwamba wana dalili au matatizo yafuatayo. Tafadhali onyesha ni kwa kiwango gani umekuwa ukipata dalili au matatizo katika kipindi cha wiki moja iliyopita. Tafadhali jibu kwa kuzungushia duara nambari ambayo ni bora zaidi kwako.

Katika kipindi cha wiki moja iliyopita:	**Hapana**	**Kidogo**	**Kiasi**	**Sana**
Je, ungeweza kula chakula kigumu?	1	2	3	4
Je, ungeweza kula chakula kiowevu (majimaji) au laini?	1	2	3	4
Je, ungeweza kunywa vinywaji?	1	2	3	4
Je, umekuwa na tatizo lolote na kumeza mate yako?	1	2	3	4
Je, umenyongwa wakati wa kumeza?	1	2	3	4
Je, umekuwa na tatizo lolote la kufurahia vyakula vyako?	1	2	3	4
Je, umehisi kushiba kwa haraka sana?	1	2	3	4
Je, umekuwa na tatizo lolote na kukula?	1	2	3	4
Je, umekuwa na tatizo lolote na kukula mbele ya watu wengine?	1	2	3	4
Je umeshawahi kukaukiwa mate mdomoni?	1	2	3	4
Je chakula na kinywaji vimekua na ladha tofauti kuliko ulivyozoea?	1	2	3	4
Je, umekuwa na tatizo lolote na kukohoa?	1	2	3	4
Je, umekuwa na tatizo lolote na kuongea?	1	2	3	4
Je, umekuwa na maumivu ya kiasidi tumboni kutokana na chakula kutosagika (vimbiwa) au kiungulia (mchomeko moyoni)?	1	2	3	4

Je, umekuwa na tatizo lolote la asidi au nyongo (kiowevu kichungu cha kuyeyusha chakula tumboni) kuja mdomoni mwako?	1	2	3	4
Je, umekuwa na uchungu unapokula?	1	2	3	4
Je, umekuwa na uchungu kifuani mwako?	1	2	3	4
Je, umekuwa na uchungu tumboni mwako?	1	2	3	4

APPENDIX 5: Permission to conduct study in KNH

KNH/R&P/FORM/01

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
   JULIET MUTIKI KAMENE
2. Email address: juliet.mutiki@students.uonbi.ac.ke Tel No. 0713 940172
3. Contact person (if different from PI)
4. Email address: Tel No.
5. Study Title
   THE MANAGEMENT AND PREDICTORS OF HEALTH-RELATED QUALITY OF LIFE AMONG ADULT PATIENTS WITH ESOPHAGEAL CANCER AT KENYATTA NATIONAL HOSPITAL
6. Department where the study will be conducted KNH CANCER TREATMENT CENTER (CTC) & ONCOLOGY WARD AND CLINICS
   (Please attach copy of Abstract)
7. Endorsed by KNH Head of Department where study will be conducted.
   Name: for DR MAGESO C. Signature Date 02/02/2023
8. KNH UoN Ethics Research Committee approved study number P752/09/2022
   (Please attach copy of ERC approval)
9. I JULIET MUTIKI KAMENE commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Medical Research.
   Signature Date 01/02/2023
10. Study Registration number (Dept/Number/Year) CTC /172/202
    (To be completed by Medical Research Department)
11. Research and Program Stamp

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of Medical Research and investigators **must commit** to share results with the hospital.

APPENDIX 6: KNH-UON ERC Approval

Access to medical records. To pay 1500/=

SER0257

Ukr – 48424
1507

UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
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Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

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Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

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

Ref: KNH-ERC/A/32

23rd January, 2023

KENYATTA NATIONAL HOSPITAL APPROVED 23 JAN 2023

Juliet Mutiki Kamene
Reg. No. U56/38905/2020
Dept. of Pharmacy
Faculty of Health Sciences
University of Nairobi

Dear Juliet,

RESEARCH PROPOSAL: THE MANAGEMENT AND PREDICTORS OF HEALTH-RELATED QUALITY OF LIFE AMONG ADULT PATIENTS WITH ESOPHAGEAL CANCER AT KENYATTA NATIONAL HOSPITAL (P752/09/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P752/09/2022.** The approval period is 23rd January 2023 – 22nd January 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.

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 Pharmacy, UoN
Supervisors: Dr. Peter N. Karimi, Dept. of Pharmacy, UoN
Dr. Charles G. Githinji, Dept. of Physiology and Anatomy, UoN

THE MANAGEMENT AND PREDICTORS OF HEALTH-RELATED QUALITY OF LIFE AMONG ADULT PATIENTS WITH ESOPHAGEAL CANCER AT KENYATTA NATIONAL HOSPITAL

ORIGINALITY REPORT

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