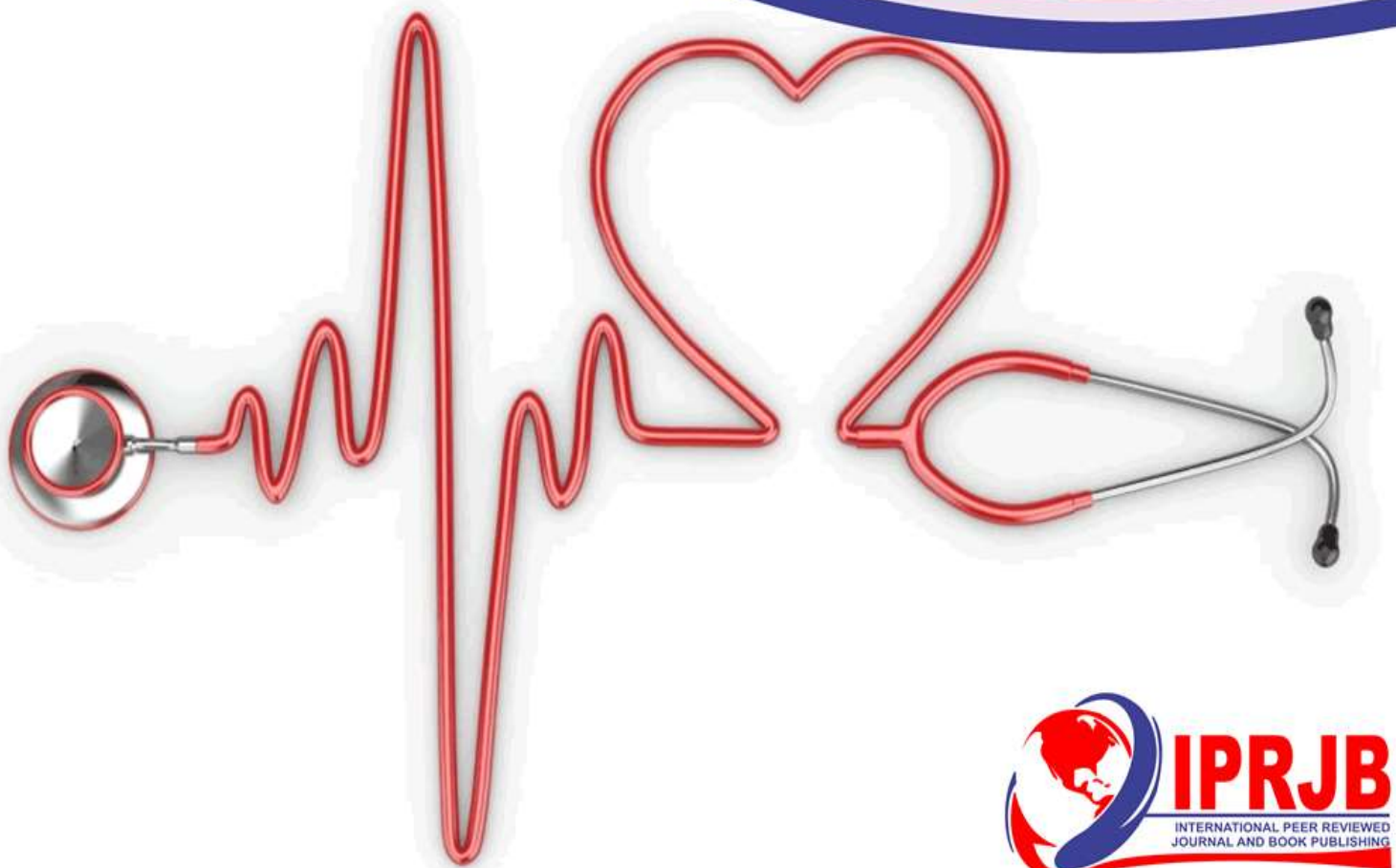


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Abstract

Purpose: The study objectives were: to determine the demographic and clinical characteristics of patients treated for EC in Eldoret and to determine the change in health-related quality of life of patients treated for EC.

Methodology: A longitudinal study was conducted at three cancer centers in Eldoret, Kenya. Participants were interviewed at enrollment (pre-treatment) and three months post-treatment. The study included patients aged 18 and above with histologically confirmed esophageal cancer. Consecutive sampling method was used to enroll study participants until a predetermined sample size of 59 was achieved. Independent variables considered were patient characteristics (demographic and clinical), and baseline HRQoL while the dependent variable was 3 months post-treatment HRQoL. Patients' characteristic data was analyzed using descriptive statistics (frequencies and percentages); change in HRQoL was calculated using the analysis of variance (ANOVA) test and the results were presented using tables.

Findings: At baseline, 59 patients (68% female, mean age 56.3 years) were enrolled. The most common complaints were dysphagia (100%) and weight loss (74.6%). The baseline mean HRQoL score was 107.1, indicating a compromised quality of life at the start of treatment. After treatment, patients receiving chemotherapy plus surgery showed improved HRQoL, while radiotherapy alone was associated with deterioration. The differences were statistically significant (p-values: 0.04 and 0.0092, respectively). Multivariate regression revealed that only baseline HRQoL was significantly associated with post-treatment HRQoL (p=0.0065). This study sheds light on the underexplored aspect of HRQoL in Kenyan esophageal cancer patients. The findings emphasize the impact of treatment modalities on HRQoL, with chemotherapy plus surgery showing better outcomes. The study underscores the importance of considering patients' baseline HRQoL in assessing post-treatment outcomes. Addressing these factors can inform targeted interventions to improve the overall well-being of esophageal cancer patients in Kenya. Further research with larger, more diverse samples is warranted to enhance the generalizability of these findings.

Unique Contribution to Theory Practice and Policy: This study highly recommends community sensitization and awareness of esophageal cancer to the at-risk population groups, further research on HRQoL as a prognostic marker for patients with esophageal cancer and more high-quality studies on HRQoL with large sample sizes are needed to determine the association between characteristics of the patients and health-related quality of life.

Keywords: Esophageal Cancer, Health-Related Quality of Life, FACT-E, Dysphagia

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INTRODUCTION

Esophageal cancer stands as a significant global health concern, with a noteworthy increase in both incidence and mortality rates over the past years (Huang & Yu, 2018). This malignancy, accounting for 511054 new cancer cases and 445391 cancer-related deaths in 2021, remains a pressing issue worldwide (Ferlay et al., 2021). Its prevalence is notably higher in developing regions of Asia and Africa (Ferlay et al., 2021), particularly in Southern and Eastern Africa, where it comprises 5.5% of all gastrointestinal tract cancers (Herszényi & Tulassay, 2010). In Kenya, esophageal cancer has emerged as the third most frequent cancer in both genders, with a substantial impact on morbidity and mortality, making it a significant public health challenge (WHO, 2019). Esophageal cancer has shown alarming prevalence, constituting the majority of malignancies, and remains the most common cancer affecting both men and women in Western Kenya (Parker et al., 2010) and Uasin Gishu County (Chesumbai, 2024).

Despite global advancements in the treatment of esophageal cancer, significant gaps remain in the literature concerning health-related quality of life (HRQoL) outcomes, particularly in developing countries such as Kenya. While esophageal cancer is one of the most common and deadly cancers worldwide, its impact is disproportionately felt in low- and middle-income regions, where it constitutes a significant health burden (Ferlay et al., 2021). In Kenya, esophageal cancer is among the first most frequent cancers, (WHO, 2019; Parker et al., 2010), however, there is a paucity of research focused on the HRQoL of esophageal cancer patients where most studies concentrate on survival rates and treatment efficacy (Zeng et al., 2015).

Furthermore, while some studies have begun to address the importance of HRQoL as a critical outcome measure in cancer treatment (Sunde et al., 2019; van den Boorn et al., 2020), where in a meta-analysis revealed short-term HRQoL discrepancies among esophageal cancer patients who underwent definitive chemoradiotherapy (dCRT), neoadjuvant chemoradiotherapy (nC(R)T), or surgery alone ($p < 0.001$) (van den Boorn et al., 2020). However, there remains a significant gap in understanding how different treatment modalities impact the HRQoL of esophageal cancer patients in African contexts. Despite these findings, specific data on Kenyan patients is limited, underscoring the need for localized studies to inform healthcare strategies effectively.

Additionally, baseline HRQoL has been identified as a significant predictor of post-treatment outcomes (Biniam Kidane et al., 2018a), yet its role is often under-examined in regional studies. This oversight suggests a need for comprehensive assessments that include baseline HRQoL in evaluating treatment success and guiding patient care in Kenya. Thus, this study aims to fill these critical gaps by evaluating the demographic and clinical characteristics of esophageal cancer patients in Eldoret, Kenya, and examining changes in their HRQoL from pre-treatment to three months post-treatment.

METHODOLOGY

Design

This was a longitudinal study where the participants were interviewed twice: once during enrollment (before initiating treatment) and a second time when they presented for their clinic follow up visit (three months post treatment), when the active treatment was already given upfront. A phone call follow-up was made for those study participants who did not turn up as expected for the follow-up visits and for the follow-up interview. The patients that were not reachable with a phone call during the day within the working hours for the first time were

called for the second time and a third time at odd hours; past 5.00 PM and over the weekends. If the patients were still not yet reachable, the next of kin was called. Thereafter, the patients that were not yet reachable in the above-mentioned different times were declared lost to follow-up. At no time was the data collected from the next of kin, they were only used to confirm whether the patient was alive or dead and if dead, to specify when death occurred.

Setting

This study was conducted at Moi Teaching and Referral Hospital, Alexandria Cancer Center and palliative care hospital (Eldoret branch) and Equra Health Kenya. The three hospitals are in Uasin Gishu County within Eldoret town, 310 Kilometers Northwest of Nairobi. Their catchment area is mostly the western region of Kenya, Uganda and Southern Sudan with a population of approximately 24 Million. The region has different tribes with different cultures.

Moi Teaching and Referral Hospital is located along Nandi road. It was started in 1916 with a bed capacity of 60 to cater for the Africans health needs. It later served as a District Hospital before attaining referral status. However, it has grown with a bed capacity of 991. It is currently the second National Referral Hospital in Kenya after Kenyatta National Hospital (KNH) providing wide range of health services including out-Patient (an average of 1500 patients per day), in-Patient (an average of 1200 at any given time) and specialized care (including oncology services). Academic Model Providing Access to Healthcare (AMPATH)-Oncology in MTRH evolved from an existing HIV program to meet the cancer care needs of western Kenya. However, the current AMPATH-Oncology is divided into three major organizational structures: Screening & Prevention; Diagnosis & Treatment; and Palliative Care.

Alexandria Cancer Center hospital and Palliative Care Hospital was one of the biggest private hospital offering oncology services started in the year 2016 after operating as a clinic since the year 2015. It is located along Lumumba Avenue Opposite Moi University School of Dentistry, off Uganda Road. It serves both out-patients and in-patients having a bed capacity of 50. It provides comprehensive healthcare through promotion, treatment, curative and palliative care services (mainly oncology) while embracing research, innovation and collaboration in patients' care. It was not providing radiotherapy services too during the study period.

Equra Health Kenya is located in Eldoret hospital along Uganda road. This Comprehensive Cancer Centre was opened for oncology consultation, chemotherapy services in August 2016, and started providing comprehensive radiotherapy, a first hospital in Western Kenya in 2017. This hospital can attend up to 60 patients per day giving them advanced radiotherapy services using linear accelerator and brachytherapy. This was the only hospital offering radiotherapy during the study period.

Participants had the freedom to be enrolled and seek health care in any of the hospitals and therefore, patients could be enrolled in more than one hospital because of the inter-relationship between the three hospitals but could be enrolled in the study only once.

Population

The study population was all patients with esophageal cancer that were being initiated treatment (chemotherapy, radiotherapy, surgery or any combination of these treatments) in the three cancer centers; MTRH, Alexandria Cancer Center and Palliative Care Hospital (ACCPCH) and Equra Health Kenya that met the eligibility criteria. The patients had to be histologically-confirmed for esophageal cancer or esophago-gastric junction cancer and treated

with chemotherapy, radiotherapy, surgery or any combination of the named treatments. In addition, the patients had to be of 18 years and above. However, patients with cognitive impairment resulting in memory loss and those with concurrent malignancies were excluded.

Data Collection and Sources

The data collection tool was administered by the interviewer to ensure completeness of the questionnaires. Socio-demographic characteristics (age, gender, area of residence, ethnicity, level of education and marital status) were collected from the patients themselves while clinical characteristics of the study participants (signs and symptoms, histological type, anatomical location of the tumor, tumor stage and treatment assigned) were collected from the patients records. This data was collected using a structured questionnaire with a unique study identity number. However, the HRQoL was assessed using previously validated FACT-E. The first part (FACT-G) consisted of 27 items divided among 4 subscales: physical well-being, functional well-being, social/family well-being and emotional well-being while the second part (additional concerns, specific to patients with esophageal cancer) included eating, appetite, swallowing, pain, talking/communicating, mouth dryness, breathing difficulty, coughing, and weight loss.

Data Management

Data was treated and analyzed as one sample because of the inter-relationship between the three study sites. It was cleaned using Microsoft excel while analysis was done using R-3.6.1 for windows software. Socio-demographics and clinical characteristics were analyzed using descriptive statistics by use of frequencies, percentages, means and standard deviations. For the health-related quality of life, the FACT-G scoring guide was used to identify those items that must be reversed scored before being added to obtain subscale totals. Negatively stated items were reversed scored by subtracting the response from “4”. After reversing proper items, all subscale items were summed to a total, which was the subscale score, the higher the score the better the quality of life. In case of any missed items, subscale scores were prorated by multiplying the sum of the subscale by the number of items in the subscale, then divided by the number of items answered as shown in the formula below:

Prorated subscale score = [Sum of item scores] x [N of items in subscale] ÷ [N of items answered].

Prorating by subscale in this way was acceptable as long as more than 50% of the items were answered (e.g., a minimum of 4 of 7 items, 4 of 6 items). The total score was then calculated as the sum of the un-weighted subscale scores. The FACT scale is considered to be an acceptable indicator of patient quality of life as long as overall item response rate was greater than 80% (e.g., at least 22 of 27 FACT-G items completed). A total score was only calculated if all of the component subscales had valid scores. For the additional esophageal cancer concerns, the procedure for scoring was the same as described above. Again, over 50% of the items (e.g., 9 of 17 items) were to be completed in order for the subscale score to be valid. Change of the HRQoL status from baseline to post-treatment HRQoL status was assessed using one way ANOVA test with a post-hoc turkey’s test to compare different treatment modalities. For the multivariate analysis to examine the significance in the change of quality-of-life scores as a function of age, baseline quality of life scores and stage IV, a multivariate logistic regression model was constructed.

Ethical Consideration

The study protocol was approved by all relevant authorities: Institutional Research Ethics Committee (IREC) review board and NACOSTI. Administrative permission and institutional consent were sought from the three study sites. In addition, license to use the translated Kiswahili FACT-G was granted by FACIT organization. A written informed consent was voluntarily obtained from all participants prior enrolment in to the study and the right to withdraw at any point during the study was clearly explained. Everyone who met the eligibility criteria was given an equal opportunity to participate in the study; the information obtained was treated with confidentiality and only used for the purposes of this study. Personal details including name, national identity number, mobile numbers and next of kin were not entered in the database for any research purposes. After the interview, the questionnaires were kept in lockable rooms/cabinets and only handled by the principal investigator and the research assistant who was well trained for the purposes of this research. After entry, data was stored in a password-secured laptop.

RESULTS

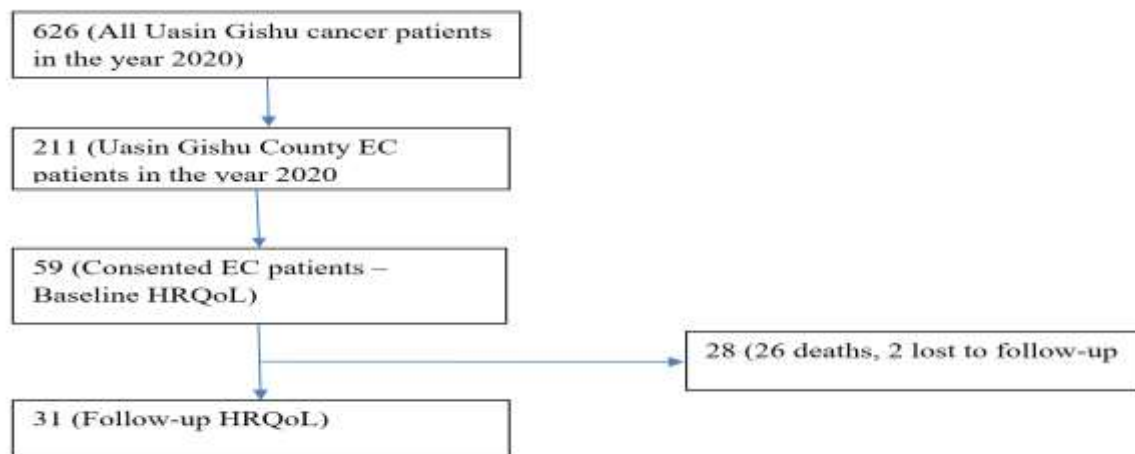


Figure 1: Consort Diagram

Table 1: Baseline Characteristics of Esophageal Cancer Patients

Characteristic	n(%)
Sex	
Male	19(32)
Female	40(68)
Age (years)	
Mean age (57.5 years \pm 13.0)	
\leq 40	7(11.9)
41-50	8(13.6)
51-50	16(27.1)
61-70	22(37.3)
\geq 70	6(10.2)
Ethnicity	
Kalenjin	24(41)
Luhya	13(22)
Luo	10(17)
Kisii	7(12)
Kikuyu	5(8)
Marital status	
Married	41(70)
Divorced/separated	5(8)
Widow/widower	4(7)
Single	9(15)
Level of education	
Primary and below	32(54)
Secondary	19(32)
Tertiary	8(14)
Area of residence	
Rural	53(89.8)
Sub-urban	5(8.5)
Urban	1(1.7)
Main complaints	
Dysphagia	59 (100)
Weight loss	44 (74.6)
Pain while swallowing	24 (40.7)
Cough	13 (22)
Histological type of cancer	
Squamous cell carcinoma	49(83)
Adenocarcinoma	10(17)
Anatomical site of the tumor	
Upper third	10(17)
Mid third	23(39)
Lower third	20(34)
Esophago-gastric junction	6(10)
Cancer stage	
Stage II	1(1.7)
Stage III	26(44.1)
Stage IV	26(44.1)
Stage V	6(10.2)
Grade of the tumor	
Well differentiated	5(8.5)
Moderately differentiated	36(61.0)
Poorly differentiated	12(20.3)
Undifferentiated	3(5.1)
Unknown	3(5.1)
Treatment given	
Chemo-radiotherapy	34(57.6)
Chemotherapy	19(32.2)
Radiotherapy	3(5.1)
Chemotherapy;Surgery	1(1.7)
Radiotherapy;Surgery	1(1.7)
Surgery	1(1.7)

Table 2: Baseline HRQoL Mean Scores

Scale	Baseline mean score
Physical well-being (PWB)	
I have a lack of energy	1.0
I have nausea	2.7
Because of my physical condition, I have trouble meeting the needs of my family	1.4
I have pain	2.0
I am bothered by side effects of treatment	3.9
I feel ill	2.0
I am forced to spend time in bed	3.0
Total PWB sub-scale	16.0
Social/family well-being (SWB)	
I feel close to my friends	3.0
I get emotional support from my family	4.0
I get support from my friends	3.4
My family has accepted my illness	3.8
I am satisfied with family communication about my illness	3.8
I feel close to my partner (or the person who is my main support)	3.8
I am satisfied with my sex life	2.3
Total SWB sub-scale	24.1
Emotional well-being (EWB)	
I feel sad	2.6
I am satisfied with how I am coping with my illness	2.5
I am losing hope in the fight against my illness	3.3
I feel nervous	3.1
I worry about dying	3.5
I worry that my condition will get worse	3.2
Total EWB sub-scale	18.2
Functional well-being (FWB)	
I am able to work (include work at home)	1.1
My work (include work at home) is fulfilling	1.2
I am able to enjoy life	1.6
I have accepted my illness	3.5
I am sleeping well	2.8
I am enjoying the things I usually do for fun	1.7
I am content with the quality of my life right now	1.8
Total FWB sub-scale	13.6
Total FACT-G score	71.9
Esophageal cancer concerns	
I am able to eat the foods that I like	0.9
My mouth is dry	2.0
I have trouble breathing	3.4
My voice has its usual quality and strength	2.1
I am able to eat as much food as I want	0.6
I am able to communicate with others	3.7
I can swallow naturally and easily	1.5
I have difficulty swallowing solid foods	0.5
I have difficulty swallowing soft or mashed foods	1.8
I have difficulty swallowing liquids	3.0
I have pain in my chest when I swallow	1.9
I choke while I swallow	1.9
I am able to enjoy meals with family or friends	1.4
I have a good appetite	2.8
I wake at night because of coughing	3.0
I have pain in my stomach area	2.9
I am losing weight	0.7
Total esophageal cancer concerns	35.2
FACT-E scores	
FACT-G	71.9
Esophageal cancer concerns	35.2
Total FACT-E	107.1

Table 3: Comparison between Baseline (BL) and Follow-Up (FU) Mean Scores in Different Treatment Modalities

Sub-scale	Treatment											
	Chemo-radiotherapy		Chemotherapy		Radiotherapy		Chemotherapy-surgery		Radiotherapy surgery		Surgery	
	BL mean	FU mean	BL mean	FU mean	BL mean	FU mean	BL mean	FU mean	BL mean	FU mean	BL mean	FU mean
physical well-being	18.2	17.8	12.9	21.1	14.0	5.7	9.0	24.0	13.0	died	23.0	26.0
Social well-being	25.1	24.5	22.1	25.5	24.0	20.0	28.0	28.0	19.8	died	28.0	28.0
Emotional well-being	19.1	19.5	16.3	20.3	20.3	4.0	15.0	24.0	17.0	died	20.0	24.0
Functional well-being	14.6	13.6	11.8	18.1	13.5	4.3	9.0	23.0	7.0	died	27.0	25.0
Total FACT-G	77.0	75.4	63.1	85.0	71.8	34.0	61.0	99.0	56.8	-	98.0	103.0
EC concerns	36.0	49.3	32.7	54.4	40.3	24.3	27.0	66.0	42.0	-	35.0	65.0
Total FACT-E	113.0	124.7	95.8	139.4	112.1	58.3	88.0	165.0	98.8	-	133.0	168.0

Table 4: ANOVA Test Findings

Chemo-radiotherapy being the reference treatment method, esophageal cancer patients treated with a combined therapy of chemotherapy and surgery improved their quality of life (P= 0.04) while those treated with radiotherapy alone deteriorated their quality of life (P=0.0092).

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	4.211	7.546	0.558	0.582
Chemotherapy	17.599	14.543	1.210	0.237
Chemotherapy;Surgery	72.789	33.747	2.157	0.040
Radiotherapy	-57.544	20.435	-2.816	0.009
Surgery	30.789	33.747	0.912	0.370

Table 5: Turkey's differences (post-hoc) test findings

There were statistically significant differences in post-treatment HRQoL found between treatment groups; between radiotherapy and chemotherapy (P=0.02), and between radiotherapy and the combined chemotherapy plus surgery (P=0.02).

	Difference	Lower CI	Upper CI	p-value
Chemotherapy-Chemo-radiotherapy	17.60	-24.99	60.19	0.75
Chemotherapy;Surgery-Chemo-radiotherapy	72.79	-26.04	171.62	0.23
Radiotherapy-Chemo-radiotherapy	-57.54	-117.39	2.30	0.06
Surgery-Chemo-radiotherapy	30.79	-68.04	129.62	0.89
Chemotherapy;Surgery-Chemotherapy	55.19	-47.79	158.17	0.53
Radiotherapy-Chemotherapy	-75.14	-141.61	-8.67	0.02
Surgery-Chemotherapy	13.19	-89.79	116.17	1.00
Radiotherapy-Chemotherapy;Surgery	-130.33	-241.56	-19.11	0.02
Surgery-Chemotherapy;Surgery	-42.00	-178.23	94.23	0.89
Surgery-Radiotherapy	88.33	-22.89	199.56	0.17

Table 6: Multivariate Regression for the Change in Quality of Life

Only baseline quality of life has been suggested to be significantly associated with the change in the quality of life (P= 0.0064564) as shown in the table below.

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	143.190	46.484	3.080	0.005
age	-0.665	0.514	-1.295	0.209
Stage IV	-19.773	15.572	-1.270	0.217
Unknown stage	-29.443	19.211	-1.533	0.140
FACT_E_BL	-0.772	0.256	-3.009	0.006
Chemotherapy	26.721	15.916	1.679	0.107
Chemotherapy;Surgery	27.676	33.567	0.824	0.419
Radiotherapy	-64.153	19.099	-3.359	0.003

Discussion

This study being among the first to be done in Kenya looking at the changes in health related quality of life of patients with EC will provide foundation data for similar studies. The baseline quality of life sub-scale mean score for all the 59 patients treated for esophageal cancer was slightly above average demonstrating that by the time patients were presenting for treatment, the esophageal cancer disease itself had already compromised the patients' quality of life. Results from this study shows all sub-scale mean-scores of esophageal cancer patients deteriorated after being treated with radiotherapy alone while physical, social and functional well-being deteriorated following chemo-radiotherapy. This agrees with a study done in UK on patient-reported outcomes of localized esophageal cancer treated with definitive chemo-radiotherapy which had a significant deleterious effect on many domain of HRQoL (Rees et al., 2015). Three months post treatment, in comparison with chemo-radiotherapy, esophageal cancer patients treated with both chemotherapy and surgery had a better quality of life (P= 0.04) while radiotherapy alone was associated with significantly impaired patients' health-

related quality of life ($P=0.0092$). Post-hoc turkey's test identified that the most significant differences in treatment were between Radiotherapy and Chemotherapy ($P=0.02$); and between Radiotherapy and the combined Chemotherapy plus surgery ($P=0.02$). This is in agreement with a study done in china where surgery with adjuvant chemotherapy was equally associated with better HRQoL (Liu et al., 2020) and radiotherapy alone had been associated with poor results (Oh et al., 2016). In addition, systematic review findings also found much benefits of chemotherapy plus surgery (B Kidane et al., 2015). Similarly, in Netherlands, short-term HRQoL differences are seen between curative treatments in esophageal cancer, however, contrary to our findings, better HRQoL is seen with neoadjuvant chemo-radiotherapy plus surgery compared to definitive chemo-radiotherapy (Boorn et al., 2020). Deterioration of HRQoL has been demonstrated in Sweden after multimodal treatment for cancer of the esophagus contrary to our findings in patients that were treated with chemo-radiotherapy (Sunde et al., 2019) and radiotherapy alone has been suggested to be an effective technique for the elderly EC patients in China (Zhou et al., 2018). After adjustment for age, stage and treatment in a multivariate analysis, only baseline quality of life demonstrated to be significantly associated with high follow-up health related quality of life in our study ($P=0.0065$). However, stage of the esophageal cancer had been previously associated with HRQoL in other studies (Biniam Kidane et al., 2018b).

This study had a number of limitations. First, the use of a non-probabilistic (convenience/purposive) sampling and a small sample size may have limited the power of the observations and increased the possibility of selection bias thereby reducing the generalizability of our findings. Secondly, HRQoL is not equally applicable to all patients because of factors that affect individual patients such as specific chemotherapy treatment, type (external beam radiotherapy versus brachytherapy) and amount of radiotherapy given. Finally, other co-morbidities affecting the patients and biological or behavioral differences are also likely to affect the HRQoL.

In conclusion, this study provides valuable insights into the dynamic landscape of esophageal cancer treatment outcomes, with a particular focus on the often-neglected dimension of health-related quality of life (HRQoL). The prevalence of esophageal cancer in Kenya, especially in Western regions, underscores the urgent need for a comprehensive understanding of the disease's impact on patients' well-being. Our findings reveal that despite the grim baseline HRQoL scores, certain treatment modalities, such as chemo-radiotherapy and surgery, show promise in enhancing patients' post-treatment HRQoL. Notably, the detrimental effects associated with radiotherapy alone highlight the need for a nuanced approach to treatment decisions, considering not only efficacy but also the potential impact on patients' overall quality of life. Moreover, the multivariate regression analysis underscores the pivotal role of baseline HRQoL as a significant predictor of post-treatment outcomes, urging clinicians to integrate holistic assessments into treatment planning. These findings pave the way for future studies to delve deeper into the nuanced factors affecting HRQoL in diverse populations, ultimately guiding tailored interventions to improve the comprehensive care of esophageal cancer patients.

Implications of the Study

Firstly, esophageal cancer is a pressing health issue in Kenya, particularly in regions like Eldoret. This study contributes valuable local data on esophageal cancer patients' demographic characteristics, clinical presentation, and treatment outcomes. Such data is crucial for

developing targeted healthcare strategies and interventions specific to the local context. Secondly, unlike many previous studies that primarily focus on survival rates and treatment efficacy, this study prioritizes HRQoL as a key outcome measure. By evaluating changes in HRQoL from pre-treatment to post-treatment stages, the study sheds light on how different treatment modalities impact patients' well-being. Thirdly, this focus is essential for holistic patient care and improving overall treatment outcomes. The findings highlight that chemotherapy combined with surgery tends to result in better HRQoL outcomes compared to radiotherapy alone. This insight is crucial for guiding treatment decisions and optimizing patient care pathways in similar healthcare settings where resources and treatment options may be limited. Fourthly, the study underscores the importance of integrating HRQoL assessments into routine clinical practice. By identifying factors such as baseline HRQoL scores that significantly influence post-treatment outcomes, clinicians can better tailor treatment plans and supportive care interventions to improve patients' quality of life.

Finally, through its findings and recommendations, the study advocates for increased community awareness and education about esophageal cancer. This can lead to earlier detection, timely interventions, and improved patient outcomes by promoting health-seeking behavior and reducing stigma associated with cancer.

Declaration of conflict of interest: No conflict of interest among the authors

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