SURVIVAL OUTCOME AND TREATMENT PATTERNS IN NON-METASTATIC ESOPHAGEAL CANCER PATIENTS WHO UNDERWENT CURETIVE INTENT TREATMENT AT TIKUR ANBESA SPECIALIZED HOSPITAL, ETHIOPIA; A 3-YEAR RETROSPECTIVE STUDY

Advisor: Damena Teshome (MD, clinical oncologist and assistant professor)

Investigator: Woinshet Zegeye (MD, 4th year clinical oncology resident)

Addis Ababa, Ethiopia
December, 2025

Name of investigator	Dr Woinshet Zegeye
Full title of the research project	Survival outcome and Treatment patterns in non-metastatic esophageal cancer patients who underwent curative intent treatment at Tikur Anbesa Specialized Hospital, Ethiopia, a 3-year retrospective study.
Duration of the project	7 months
Study Area	Black Lion Hospital
Total Cost of the project	31,479 Birr
Source(s) of Funding	Tikur Anbesa Specialized Hospital
Address of investigator	Phone no: +251933526527
	Email: dwoinz@gmail.com
Name of Advisor(s)	Dr Damena Teshome (MD, consultant oncologist, Assistant professor of oncology)

ABSTRACT

Background: Esophageal cancer is among the leading causes of cancer-related morbidity and mortality worldwide, with particularly high prevalence in East Africa. Due to the non-symptomatic nature of the disease at an early stage, patients usually present at an advanced stage, where they are either treated with multimodality therapy with curative intent or just palliation of the symptoms once the disease is metastatic. In Ethiopia, most patients are diagnosed at advanced stages, with a substantial proportion being non-metastatic cases that remain eligible for curative treatment. These patients may therefore undergo curative-intent therapies, including surgery, chemoradiotherapy, radiotherapy, or a combination of these modalities. However, local data on treatment patterns and survival outcomes for these patients are lacking.

Objective: To evaluate the survival outcome and treatment patterns of non-metastatic esophageal cancer patients treated with curative intent treatment at Tikur Anbesa Specialized Hospital, Ethiopia, between 2022 and 2025.

Methods: A retrospective study was conducted by reviewing the medical records of patients diagnosed with non-metastatic esophageal cancer at TASH during the study period. Data on demographic characteristics, clinical characteristics, treatment modalities and follow-up outcomes were extracted. Statistical analysis included descriptive summaries of treatment patterns, Kaplan–Meier survival estimates, and the log rank- test and Cox proportional hazards mode were used to identify predictors of survival outcome.

Result: One hundred nineteen patients who underwent curative intent treatment for esophageal cancer at TASH over 3 years were included. The mean age was 51.9 years (SD: 12). Most study participants were females 65(54.6%) and most of the patients 41(34.5%) were from the Oromia region. As per the treatment patterns 57(47.9%) received surgery alone 19(16%) received CMT…(surgery with NAT/adjuvant therapy) and 43(36.1%) received definitive RT/CRT. Of those who received CMT, 6 (5%) received surgery and CRT,5 (4.2%) received surgery and RT, and 8 (6.8%) received surgery and chemotherapy. The median survival was 17 months, 95%CI (14.8, 19.1) The one-year, two-year, and three-year survival rates were 67.8%, 36.6%, and 14.5%, respectively. In the multivariable Cox proportional hazards model, patients who developed treatment-related or postoperative complications had a significantly higher hazard of death compared with those without complications (HR = 5.97; 95% CI: 2.85–12.5; $p < 0.001$).

Conclusion: In Ethiopia, the treatment pattern of non-metastatic esophageal cancer is heterogeneous and not in line with the standard treatment recommendation. And the median survival and the 3-year survival rate are low. Treatment related Complications are a significant determinant of poor survival.

Key Words: Non-metastatic esophageal cancer, treatment patterns, Curative treatment, Survival outcomes, retrospective study, Ethiopia.

Advisor's Approval Sheet

This is to certify that the thesis entitled " **Survival outcome and Treatment patterns of non-metastatic esophageal cancer treated with curative intent: A three-year retrospective study at a tertiary hospital in Ethiopia"** is submitted in partial fulfillment of the requirements for the Specialization Certificate in clinical oncology to the department of clinical oncology, Addis Ababa University college of health science and has been carried out by Dr Woinshet Zegeye under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the Thesis to the Department.

Name of Advisor **Signature** **Date**

Dr Damena Teshome (Consultant Oncologist)

Acknowledgement

First and foremost, I give all praise and thanks to God. Secondly, I would like to express my sincere gratitude to my advisor, Dr. Damena Teshome, for his unreserved support and mentorship throughout this proposal development.

Table of Contents

List of Figures

List of Tables

Abbreviations and acronyms

AC- Adenocarcinoma

ADSC -Adenosquamous carcinoma

AE- Adverse events

AJCC -American Joint Committee on Cancer

CCRT- Concurrent Chemo-radiation

CT- Chemotherapy

CA-cancer

DFS- Disease-free survival

ECOG – Eastern Cooperative Oncology Group

GEJ-Gastro esophageal junction

GLOBOCAN- Global Cancer Network

LINAC- Linear Accelerator

NAT- Neo-adjuvant therapy

NACT-neoadjuvant chemotherapy

NACRT-neoadjuvant chemooradiotherapy

SCC-Squamous cell carcinoma

TASH-Tikur Anbesa Specialized Hospital

1. Introduction

1.1. Background

Esophageal cancer is an aggressive malignancy that arises from the epithelial lining of the esophagus, the muscular conduit connecting the pharynx and stomach, which facilitates deglutition. It develops when normal esophageal epithelial cells undergo dysplastic transformation, leading to uncontrolled proliferation and tumor formation (1).

Esophageal cancer is the 11th most common cancer in the world, with an estimated 511,054 new cases and the 7th leading cause of cancer-related mortality in the world, with 445,391 deaths reported as per GLOBOCON 2022 (2). However, there is significant geographic variation in its epidemiology, with the highest prevalence in the so-called “esophageal cancer belt,” which includes East Africa, Central Asia, and parts of China (2).

Based on the seventh edition of the American Joint Committee on Cancer (AJCC) classification for staging, esophageal cancer is categorized into three stages: localized, regional, and distant (4, 5). Localized cancer includes stage I and some stage II tumors, and the cancer grows only in the esophagus. Regional means that the cancer has spread to the nearby lymph nodes or tissues. Stages III and IVA are regional diseases. Distant disease includes all stage IVB cancers and indicates that the cancer has spread to other organs away from the first tumor (4, 5). Patients at localized and regional disease stages are candidates for curative intent treatment. In Ethiopia, most patients presented with advanced disease belonging to either stage III or IV. However, a substantial proportion still presents with non-metastatic disease ,for which curative treatment is possible (6, 11). Despite this, there is limited local evidence describing how these patients are managed and their outcomes. Tikur Anbesa Specialized Hospital is the largest referral and teaching hospital in Ethiopia, and serves as a central cancer treatment centre. Therefore; Studying treatment patterns and outcomes at this hospital provides valuable insight into real-world management practices and their effectiveness in the Ethiopian context.

1.2. Statement of the problem

Esophageal cancer is one of the most common cancers in Ethiopia, with an increasing incidence reported in recent years (20). In 2022, around 1,494 new esophageal cases were estimated, and 1422 patients died of the disease in the same year (3). The incidence has a wide geographical variation in different regional states.with a higher incidence rate reported in Somalia and Oromia regions (11, 20).

The overall esophageal cancer survival rate is low because it is often diagnosed late due to an asymptomatic presentation. Survival outcomes are primarily determined by the stage of disease at diagnosis; however, the choice of treatment modality also plays a crucial role in influencing patient survival (6,11).

Esophageal cancer poses a significant public health challenge, with a high mortality-to-incidence ratio (2). It is one of the top ten causes of cancer-related mortality worldwide (2). Even in high-income countries with advances in multimodality therapy, including surgery, radiotherapy, immunotherapy, chemotherapy and the combination of these, survival remains poor (16). Survival in low- and middle-income countries remains worse due to late presentation, limited access to diagnostic and treatment facilities, and inconsistent adherence to standard treatment guidelines (22). In Ethiopia, survival in the range of months has been reported in studies which include all stages of disease (6,11). But, data focusing on non-metastatic cases treatment patterns as well as survival outcomes are scarce. Few studies emphasise the role of multidisciplinary care and on the management of non-metastatic unresectable disease, which basically is treated with combined modality treatment, and their survival outcome is also unknown. Thus, our study will address this issue by assessing treatment patterns, survival outcomes, and factors affecting survival.

1.3. Justification of the study

In Ethiopia, most patients present at the locally advanced stage, where multimodality treatments are required; however, data regarding the utilization of these therapies in the

non-metastatic setup are scarce. Most of the local data in esophageal cancer patients is from data that also include metastatic diseases; which reported poor utilization of multimodality treatment and poor survival (6,23). However, data on the proportion of patients receiving curative-intent treatment, such as surgery, chemoradiotherapy, radiotherapy, or combined-modality therapy, in non-metastatic esophageal cancer patients are scarce. Besides, there is no documented data on the survival of non-metastatic esophageal cancer patients treated with curative intent radiation therapy or chemoradiotherapy and factors affecting their survival outcome. This lack of context-specific evidence hinders efforts to optimize care, allocate resources effectively, and improve patient prognosis. Furthermore, studies conducted in our setup were carried out before the introduction of the radiotherapy LINAC machine. However, no survival outcomes have been reported for non-metastatic patients treated with radiotherapy since then. This further underscores the importance of our study. Thus, this study will evaluate survival outcomes and factors affecting the survival outcomes and treatment patterns of non-metastatic esophageal cancer patients treated with Radiotherapy as well as surgery at Tikur Anbesa Specialized Hospital in the years 2022 to 2025.

1.3 Significance of the study

This study has paramount importance in the realm of healthcare for several reasons:

Epidemiological Insight: Non-metastatic esophageal cancer is under-studied in many low-resource settings, including Ethiopia. This research will fill a critical knowledge gap by providing epidemiological data specific to the Ethiopian context.

Clinical significance: This study will provide real-world evidence on treatment patterns and survival outcomes among patients treated with curative intent at Ethiopia's main national referral and teaching hospital. Thus, this will offer insights into the effectiveness of current treatment protocols and the potential need for adjustments. The study also provides insights into how local practices align with or differ from global standards. Enabling oncologists and surgeons to refine patient selection, optimize multimodal strategies, and improve follow-up protocols.

Healthcare Policy and Planning: The findings can inform healthcare policymakers and

planners about the current state of survival for non-metastatic esophageal cancer. This can lead to more effective resource allocation; emphasis given to increasing the number of radiotherapy machines, increasing the availability of advanced imaging and enhanced training programs for healthcare professionals, including radiation oncologists, physicists and cardio-thoracic surgeons and the development of protocols to improve patient outcomes.

Baseline Data for Future Research:

This study will provide baseline data for future research. Comparative studies and longitudinal research can build upon these findings to track progress and the impact of interventions over time.

2. Literature Review

2.1. Introduction to Esophageal Cancer

Esophageal cancer is a highly lethal malignancy and represents a significant public health challenge worldwide. It ranks among the top ten causes of cancer-related deaths (2). It is the leading cause of cancer-related mortality due to its subtle disease course and poor prognosis (8). Underlying this cancer type, there are two distinct diseases: esophageal adenocarcinoma and esophageal squamous cell carcinoma, which have different histology, etiologies, biological characteristics and geographic distributions (9).

2.2. Epidemiology

According to GLOBOCAN 2022, there were an estimated 511,054 new cases of esophageal cancer and 445,391 deaths globally, highlighting its high mortality-to-incidence ratio (2). Marked geographic variation exists, with the highest incidence occurring across the 'esophageal cancer belt', specifically in East and South African countries, as well as in Asia (2). SCC is more common in Asia and Africa, while AC predominates in Western countries. In Africa, esophageal cancer is disproportionately common along the "esophageal cancer belt," extending through East and Southern Africa. Here, SCC is the overwhelmingly dominant histological type. Risk factors also differ from those in high-income countries and include tobacco use, alcohol use, combined tobacco and alcohol use, exposure to

polycyclic aromatic hydrocarbons, consumption of hot food and beverages, and poor oral health (9).

Ethiopia is one of the countries along the esophageal cancer belt (9). Esophageal cancer is the 10th leading cause of cancer death in Ethiopia (3). As in other African countries, SCC predominates, and patients often present with advanced disease. More than 80% of patients are diagnosed at stage III or IV, and very few are eligible for curative surgery (6, 11). Studies done in Ethiopia showed poor prognosis, with most patients surviving only a few months after diagnosis if untreated (11). And a median survival of only six months was reported in those receiving treatment for all stages of disease (11). However, systematic data on survival outcomes of non-metastatic esophageal cancer patients remain scarce.

2.3 Factors That Affect Survival Outcomes

The stage of the disease at presentation determines survival. Patients at the advanced stage upon presentation have poor survival compared to those with early-stage disease (26). A study in China showed that patients who are treated with definitive CRT for stage III and IV disease have poorer survival than patients with stage I and II disease (27). Late-stage presentation is also associated with decreased survival in patients undergoing esophagectomy (29). Additionally, patients with highly differentiated tumors, such as those with well-differentiated and moderately differentiated tumors, have better survival rates compared to those with poorly differentiated tumors (26). Studies also highlight the location of the tumor within the esophagus as associated with treatment outcome. Tumors located in the middle and upper esophagus have worse survival than those located in the lower esophagus (26, 28). This might be attributed partly to tumor histology and treatment modality. Adenocarcinoma is predominantly found in the lower esophagus; although not universally accepted, it has a slightly better prognosis than squamous histology. Complete Surgical resection, which is not feasible for tumors located in the upper esophagus, is linked to better survival than non-surgical treatments (16). The Presence of comorbid conditions and poor performance status is also associated with treatment outcome. Studies showed esophageal cancer patients with comorbid illness and

poor performance status have lower survival after radical treatment (23, 25, 27). Socio-demographic factors also play a crucial role in determining treatment outcomes for esophageal cancer. Numerous studies have explored the impact of variables such as age, gender, socioeconomic status, and ethnicity on patient response to radical treatment. Studies suggest that Patients aged over fifty-five years old had a 2.4 times significantly higher risk of death compared to those aged less than fifty-five years old. This is likely due to age-related decline in organ function and the immune system, making them more susceptible to treatment complications and mortality (29, 30). Similarly, male sex has also been linked to decreased survival in radically treated esophageal cancer patients (30). Socioeconomic disparities can influence access to optimal treatment options. Several studies have also demonstrated that treatment interruptions during radiotherapy for esophageal cancer are linked to reduced survival and higher rates of local recurrence. Evidence from one study indicated that interruptions exceeding three days were significantly associated with poorer overall survival (31). In contrast, a study from China reported that overall treatment duration did not influence survival outcomes; however, shorter treatment times conferred a survival advantage in patients with early-stage disease. This is due to in advanced stage tumor burden and performance status may dominate (32). Moreover, in surgically treated esophageal cancer patients, postoperative complications are significant predictors of poor survival. A study conducted in our setting reported that complications such as cervical anastomotic leak and postoperative sepsis were associated with a higher risk of postoperative mortality (23, 29). However, local data on factors affecting survival in patients undergoing combined modality therapy are scarce.

2.4. Treatment Patterns

The standard treatment for non-metastatic esophageal cancer depends on the stage of the disease and the location of the lesion on the esophagus. For non-metastatic, resectable disease, surgery remains the cornerstone of treatment. Very early mucosal disease (Tis–T1a) is effectively treated with endoscopic resection, while submucosal or higher-risk lesions generally require esophagectomy with lymphadenectomy (24). Surgery alone was associated with significantly better overall survival than other treatment modalities for patients with stage I disease and was associated with significantly worse overall survival in

patients with stage III cancer (13). Thus, Patients with clinical stage I disease can be treated with esophagectomy, without preoperative therapy. But multimodality treatment is the recommended approach for patients with stage II–III esophageal cancer, as this has demonstrated improved survival compared to surgery alone (12, 24). The landmark CROSS trial demonstrated that neoadjuvant chemoradiotherapy followed by surgery significantly improved median overall survival compared to surgery alone (49 months vs 24 months), with a 10-year survival rate of 38% vs 25% (12). A recent study has also shown the non-inferiority of NA chemotherapy compared with neoadjuvant CRT for esophageal and GEJ adenocarcinoma (17). For patients with locally advanced, unresectable disease, definitive chemoradiotherapy is the standard of care, as demonstrated by the RTOG 85-01 study (15). Radiotherapy alone offers inferior outcomes in this study. In case of very locally advanced disease (cT4b), the proper management is more challenging. Even though palliative care is the safe option, multi-modality therapy with curative intent, like neoadjuvant chemotherapy with conversion surgery, may be worthwhile; however, it should be suggested on a case-by-case basis (14). Thus, modern treatment strategies emphasize combined modality approaches, tailored to disease stage and patient condition. However, real-world data in South Asia showed a considerable number of patients undergo a single modality of treatment because of the fear that multimodality treatment may not be tolerated by the generally frail patients with esophageal cancer and also because of their advanced age at diagnosis with inadequate nutritional support (18). A study from Uganda also showed that most patients received treatment with single-modality therapy only because they presented at a late stage (19). In Ethiopia, few studies address the treatment pattern of esophageal cancer. In a study that included all stages of disease, chemotherapy was the most commonly prescribed therapy in 70.1% of patients, followed by palliative radiotherapy (15.6%) and surgery (14.4%). In contrast to the recommendation, almost all patients who received treatment received monotherapy rather than the recommended multimodality treatment (6). Another study, conducted on the surgical side and involving 34 (27.9%), 63 (51.6%), and 20 (16.4%) patients in stages II, III, and IV, respectively, found that only 8% of the patients received chemotherapy. All the others were treated with surgery alone (29), indicated poor utilization of multimodality therapy against the standard. In contrast, a study conducted in the US for locally advanced, surgically resectable patients found that NA

treatment was administered to 72% of the patients (30). However, local data regarding treatment patterns, which include patients treated with definitive chemoradiotherapy, are scarce.

2.5. Survival outcome

Survival outcomes for esophageal cancer remain poor worldwide, but it largely depends on the stage of the disease at presentation. The Stage of cancer at diagnosis determines the modality of treatment, which in turn also determines the treatment outcome (25). In the cross trial, for resectable patients who received NACRT, a median survival of over 4 years was achieved (12). Another study examining the role of CRT for unresectable disease found a 5-year overall survival rate of only 26%, with a median survival of 14 months (21). In contrast, real-world data from various parts of the world have revealed lower survival and local control rates than those reported in the above landmark studies. In the Netherlands, a national study of patients treated with curative intent found that a considerable number of patients with non-metastatic EC or GEJC experienced recurrence within 2 years. But Resected patients had a higher DFS and OS compared to patients receiving definitive CRT. In patients treated with definitive CRT, the median survival was 20.9 months, while those treated with NACRT and surgery had a median survival of around 36 months (16). The survival of patients in middle- and lower-income countries are even lower which is due to the limited health care resources in low- and lower-middle-income settings which may in turn lead to delayed presentation, advanced disease at diagnosis, and restricted treatment options (22). A study of South Asians with non-metastatic esophageal cancer who are treated with definitive CRT showed 32% 3-year survival (18). One meta-analysis in Africa also reported a median survival of around 9 months in CRT patients, but better outcomes in those who underwent esophagectomy (22). In Ethiopia, patients who underwent surgery for esophageal cancer had low 5-year survival rates. With a median OS of 17 months and a 5-year OS of 13 % (23). In another study, which included all stages of the disease, a median survival of only 4 to 6 months was observed (6, 11). But data regarding the survival outcome of non-metastatic esophageal cancer patients treated with chemoradiotherapy or radiotherapy is scarce. Given Tikur Anbesa hospital‘s role as the country’s leading cancer referral center and one of the few centers with radiotherapy

machines available, a systematic study of treatment patterns and their impact on the survival outcomes will provide much-needed evidence to inform clinical practice and policy.

2.6. Rationale for the Study

In summary, esophageal cancer is a significant health problem globally and in Ethiopia. While clinical trials in high-income countries have defined effective treatments, their applicability in LMICs is constrained by limited resources. Ethiopian patients frequently present with advanced disease and face barriers to optimal care. Yet, comprehensive data on treatment patterns and survival outcomes of non-metastatic esophageal cancer patients treated with curative intent, as well as on factors affecting their survival at Tikur Anbesa hospital, are lacking. This study will address this gap by systematically analyzing the survival outcomes of patients treated between 2022 and 2025, thereby generating evidence to guide improvements in cancer care in Ethiopia.

Conceptual Framework

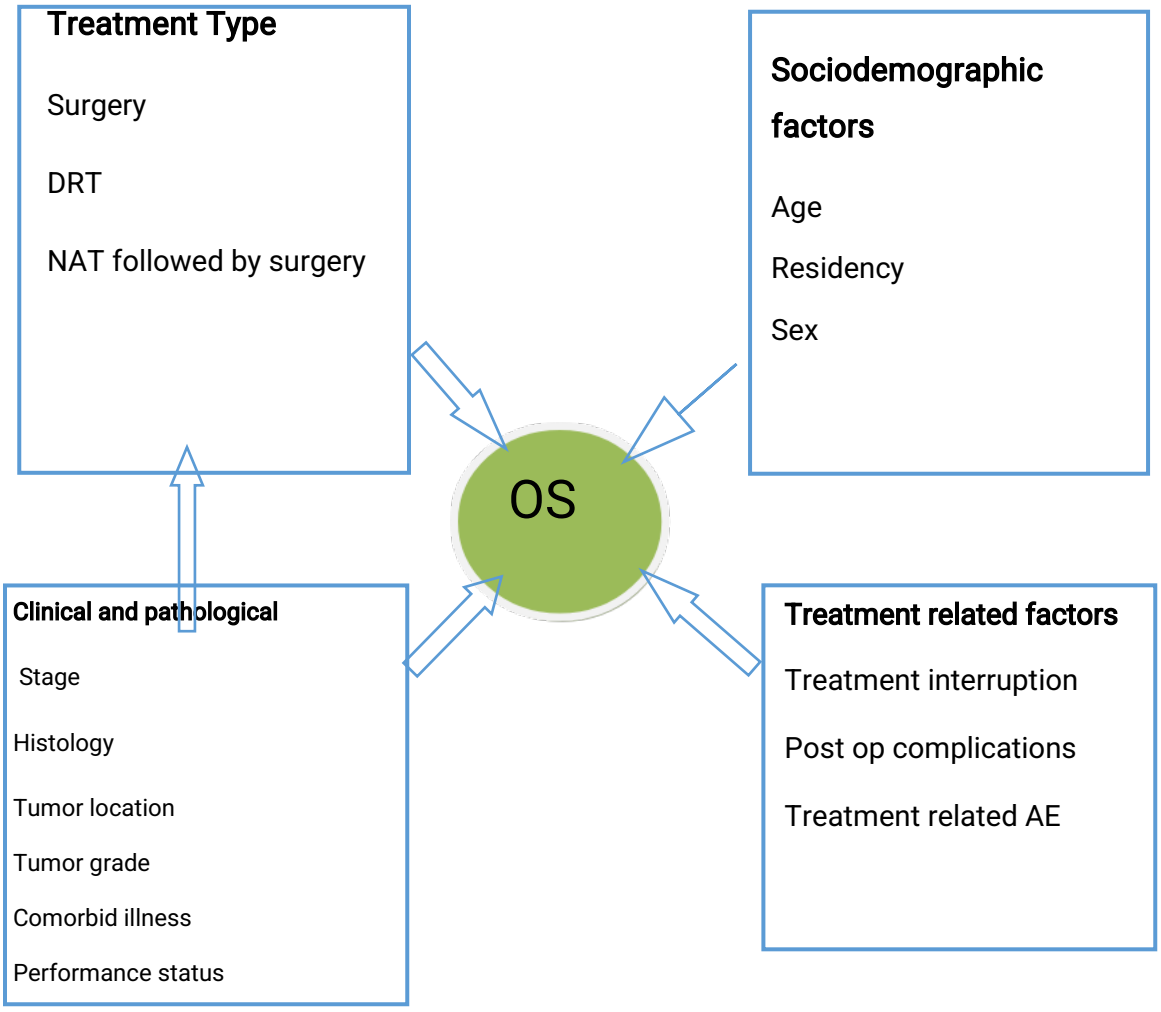

Figure 1: Researcher developed conceptual framework indicating possible relationship between Dependent and independent variables

3. Objectives

3.1 General Objectives

- To assess the survival outcome and treatment patterns of non-metastatic esophageal cancer patients treated with curative intent at, Tikur Anbesa Specialized Hospital,Ethiopia, between January 2022 and April 2025.

3.2 Specific Objectives

- To describe the survival outcome of non-metastatic esophageal cancer patients treated at Tikur Anbesa Hospital during the study period.
- To identify the various treatment modalities given to non-metastatic esophageal cancer patients.
- To identify factors that affect the survival of non-metastatic esophageal cancer patients.

4. Methodology

4.1. Study Period and Area

4.1.1 Study Area

This study was conducted at Tikur Anbesa Specialized Hospital, Addis Ababa University, Oncology and Cardiothoracic Surgery Department. Addis Ababa is the capital city of Ethiopia. Tikur Anbesa Hospital is one of Ethiopia's leading tertiary care centers, serving as a national referral hospital for complex cases and providing specialized care to patients from across the country, with a population of over 120 million. The Hospital provides health services to approximately 25,000 inpatients and 400,000 outpatients each year, with a bed capacity of 700. The hospital provide radiotherapy, chemotherapy, endoscopy and cardio-thoracic surgery service for esophageal cancer patients. At present, the majority esophageal cancer cases are diagnosed and treated within cardio-thoracic and adult Oncology units.

4.1.2 Study period

The study was conducted from October 2025 to December 2025.

4.2. Study design

A retrospective study was employed.

4.3. Population

4.3.1 Source population:

All esophageal cancer patients treated at Tikur Anbesa Hospital between January 2022 and April 2025.

4.3.2 Study population

All selected non-metastatic esophageal cancer patients who fulfil the inclusion criteria.

4.4. Inclusion and Exclusion criteria

4.4.1 Inclusion criteria

Patient Age ≥18 years at diagnosis.

Histologically confirmed esophageal carcinoma.

SCC or AC histology.

Clinical or pathological staging performed and recorded (AJCC 8th ed).

4.4.2 Exclusion criteria

Stage 0 or high-grade dysplasia.

History of another concurrent primary malignancy.

Patients with insufficient data regarding histology, cancer stage, and treatment modality.

4.5. Sample size and Sampling technique

All patients who met the inclusion criteria during the study period were included using a census sampling method

4.6. Study Variables

4.6.1. Outcome Variables

Survival rate (OS)

4.6.2. Independent Variables

Socio-demographic Characteristics

- Age
- Sex
- Residence

Types of treatment received

- Surgery
- Definitive CRT…
- NAT… followed by surgery

Clinicopathologic factors

- Stage at diagnosis
- Grade of the tumor
- Histological subtype
- Presence of comorbidity
- Performance status
- Tumor location within the esophagus

Treatment related factors

- Treatment interruption
- Post op complications
- RT related AE

4.7. Data Management

4.7.1 Data collection

Patient data was collected retrospectively from medical records using data extraction tools, and information on the patient's current status was obtained from the system or via a phone call. Before beginning the actual study.

4.7.2 Data entry

Collected data was entered into an Excel document

4.7.3 Data cleaning

The data was cleaned by checking for missing values, outliers and inconsistencies. An incomplete record was reviewed, and any missing critical information was addressed or excluded as per the exclusion criteria

4.8. Statistical analysis

Data was analyzed using SPSS statistical software. Descriptive statistics was utilized to summarize the demographic and clinical characteristics of the patients, including age, stage at diagnosis, and treatment patterns. Kaplan–Meier curves was generated to display survival distributions across treatment groups. The Log-rank test was used to compare survival curves between treatment modalities. Additionally, Cox proportional hazards regression models was used to identify factors associated with survival outcomes, adjusting for potential confounders.

The log–rank test was used to assess the association between each independent variable and each outcome variable. Variables with p-value < 0.25 were included in the multivariable Cox analysis. A multivariate Cox regression analysis was performed, including all candidate variables, to identify independent predictors of survival. A p-value < 0.05 was considered statistically significant in the multivariate model. Hazard ratios (HR) with 95% confidence intervals were reported.

4.9. Operational Definitions

Survival (OS)

Definition: Overall survival: The duration of time from the date of diagnosis to the date of death from any cause or the last date of follow-up if the patient is still alive.

Measurement: Recorded in months, using patient follow-up records, from the initial diagnosis date to either the date of death or the end of the study period on November 30, 2025.

Treatment Pattern:

Definition: The specific regimen or combination of therapeutic interventions administered to patients with non-metastatic esophageal cancer. This includes surgery, radiation therapy, chemotherapy, or a combination of these treatments, as documented in patient medical records, including the types of treatments, their duration, and the sequencing of therapies administered from January 1, 2022, to April 30, 2025.

Stages of esophageal cancer:

Definition:

Stage 0 (carcinoma in situ): The tumor is only within the epithelium of the inner lining (mucosa) of the esophagus. It is also known as high-grade dysplasia, which is a precancerous lesion.

Stage I: Tumor limited to the mucosa, submucosa, or muscularis propria (T1–T2), with no regional lymph node involvement (N0) and no distant metastasis (M0).

Stage II: Tumor invading the muscularis propria or adventitia (T2–T3) without or with limited nodal involvement (N0–N1), and no distant metastasis (M0).

Stage III: Locally advanced tumor (T3–T4a) and/or significant regional lymph node involvement (N1–N3), without distant metastasis (M0).

Stage IVA: Tumor invading adjacent structures (T4b) or extensive regional nodal disease (N3), without distant metastasis (M0).

Stage IVB: The cancer has spread to other parts of the body, such as to the lungs, liver or stomach. This is also called metastatic esophageal cancer. It is any grade.

Patient Demographics:

Definition: Characteristics of the patient population, including age, sex, ethnicity, residence, religion and socioeconomic status.

Measurement: Collected from patient records at the time of diagnosis and during treatment.

Clinical Characteristics:

Definition: Medical conditions and features of the disease in patients, such as tumor stage, grade, histology, and presence of comorbidities.

Measurement: Extracted from patient medical records and diagnostic reports.

Factors Associated with Treatment Outcomes:

Definition: Variables that may influence the effectiveness of treatment and survival rates, including patient age, performance status, tumor stage, treatment type, and comorbid conditions.

Measurement: Analyzed using patient medical records, treatment data, and statistical methods to identify significant predictors of outcomes.

Performance Status:

Definition: Performance status refers to a patient's overall well-being and ability to perform daily activities. It is a crucial prognostic factor in cancer treatment, influencing treatment decisions and outcomes.

Measurement: Performance status will be assessed using the Eastern Cooperative Oncology Group (ECOG) Performance Status Scale, which is a standardized measure. The ECOG scale ranges from 0 to 5, with 0 indicating good performance and 5 indicating poor performance.

ECOG 0: Fully active, able to carry on all pre-disease performance without restriction.

ECOG 1: Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g., light housework, office work.

ECOG 2: Ambulatory and capable of all self-care but unable to carry out any work activities; up and about more than 50% of waking hours.

ECOG 3: Capable of only limited self-care; confined to bed or chair more than 50% of waking hours.

ECOG 4: Completely disabled; cannot carry on any self-care; totally confined to bed or chair.

ECOG 5: Dead.

4.10. Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board of Tikur Anbesa Specialized and Referral Hospital. Permission will then be sought from the school administration, through the Academic Provost, to carry out the study. Each patient’s information will be collected using a structured checklist. Informed consent will be obtained from those who require a phone call. The collected information will be used solely for this study and will be kept confidential.

4.11. Dissemination of Results

The findings of this study will be communicated to the Department of Clinical Oncology and Public Health at TASH as part of the requirements for a specialty certificate in Clinical Oncology. Efforts will be made to publish the results in peer-reviewed journals and present them at scientific conferences.

5. Result

5.1. Socio-demographic characteristics of the study participants

Of the 205 reviewed charts, 119 eligible esophageal cancer patients were included in the study. The rest were excluded due to the exclusion criteria; no proper biopsy report, other diagnoses like hypopharyngeal cancer and another active concomitant malignancy.

The mean age of patients was 51.9 years (SD: 12). Most study participants were females 65, (54.6%), and most of the patients 41 (34.5%) were from the Oromia region.36 (27.7%) and 7 (5.9 %) had a history of alcohol intake, smoking, respectively. Comorbid diseases were present in 13 (10.9%) participants. The most common coexisting conditions were Diabetes, hypertension, and retroviral disease

Table 1: Frequency distribution of Socio-demographic characteristics of patients with non -metastatic esophageal cancer at TASH, Addis Ababa, Ethiopia 2025

Variables	Category	Frequency(n=58)	Percentage (%)
Age group	≤40	23	19.3
	41-60	76	63.9
	>60	20	16.8
Sex	Male	54	45.4
	Female	65	54.6

Region	Addis Ababa	10	8.4
	Oromia	41	34.5
	Gurage	13	10.9
	Somalia	6	5
	Afar	2	1.7
	Amhara	20	16.8
	Tigria	3	2.5
	Other*	24	20.2
Residence	Urban	55	46.2
	Rural	40	33.6
	Undocumented	24	20.2
Comorbidity of patient	None	106	89.1
	HTN	5	4.1
	RVI	4	3.4
	Multiple comorbidity	4	3.4
Habit of cigarate smoking	No	112	94.1
	Yes	7	5.9
Habit of alcohol intake	Yes	36	27.7
	No	83	72.3

5.2. Clinical characteristics of the study participants

The current study showed squamous cell carcinoma was the most common histological type of esophageal cancer, 108 (90.8%). followed by ADC… (8.4%) and ADSC (0.8%). At the time of diagnosis, 2(1.7%) ,44(37%), 34(28.5%) and 39(32.8%) patients were in stages I, II, III and IVa respectively. With regard to tumour differentiation, 39 (32.8%) were well differentiated ,26(21.8%)were moderately differentiated, 10(8.4%) were poorly differentiated, and 44(37%) were unknown. As per the tumor location in the esophagus; most 60(50.4%) were located in the distal thoracic esophagus and 27 (22.7%) were located in the mid esophagus and 12(10.1%) were located in the cervical esophagus.

Table 2: Frequency Distribution of clinical and pathological characteristics of of patients with non -metastatic esophageal cancer at TASH, Addis Ababa, Ethiopia 2025

Variables	Category	Frequency(n=58)	Percentage (%)
Histology	SCC	108	90.8
	ADC	10	8.4
	ADSC	1	0.8
Stage at presentation	Stage I	2	1.7
	Stage II	44	37
	Stage III	34	28.5
	Stage Iva	39	32.8
Tumor location	Cervical esophagus	12	10.1
	Upper thoracic	9	7.6
	Mid thoracic	27	22.7
	Lower thoracic	60	50.4
	GEJ	11	9.2

Tumor differentiation	Well differentiated	39	32.8
	Moderate differentiated	26	21.8
	Poorly differentiated	10	8.4
	Undocumented	44	37
ECOG	1	113	95
	2	6	5

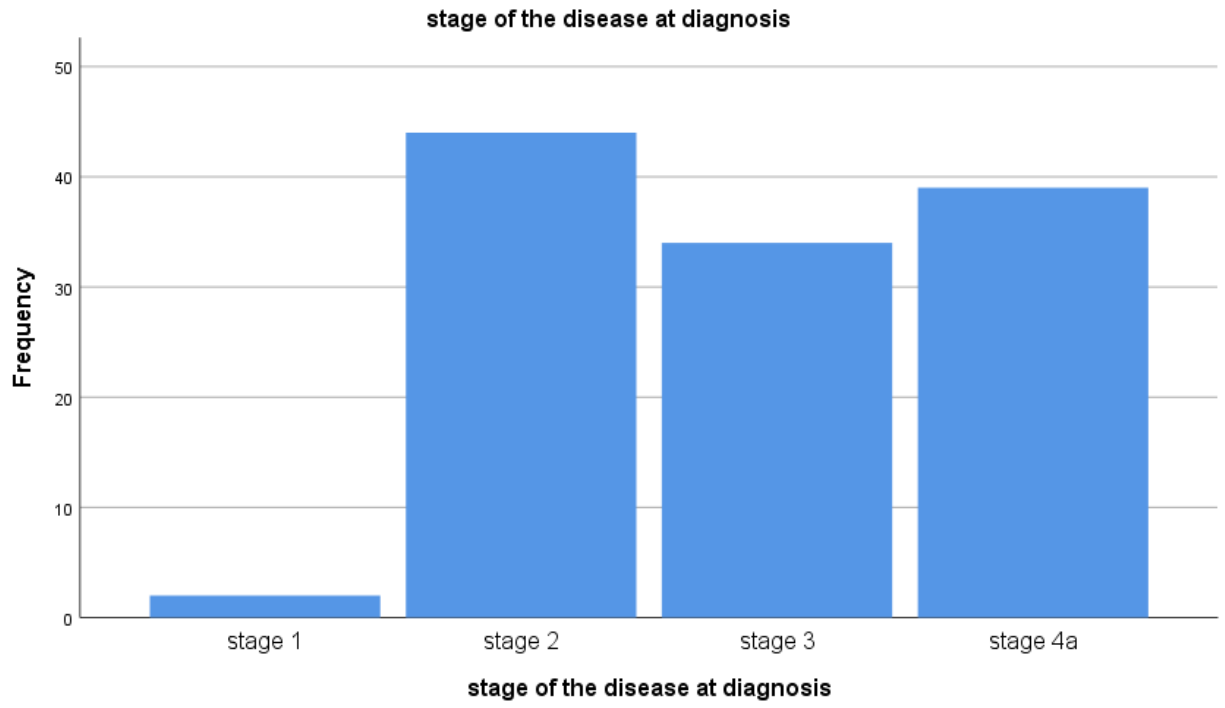

Figure 2: Graphical representation of the clinical stage of adult patients diagnosed with non- metastatic esophageal cancer on follow-up at Tikur Anbesa Specialized Hospital (TASH), Addis Ababa, Ethiopia, 2025.

5.3 Treatment patterns of patients:

Out of the 119 participants, 57 (47.9%) received surgery alone, 19 (16%) received CMT

surgery with NAT/adjuvant therapy, and 43 (36.1%)received definitive RT/CRT. Of those who received CMT 6(5%) received surgery and CRT,5(4.2%) received surgery and RT and 8(6.8%) received surgery and chemo.

Among those who underwent surgical treatment as the primary modality, more than half , 39(52%), underwent Transhiatal esophagectomy, followed by Mckeown 12 (16%) and Ivor lewis in 11(14.6%). Negative surgical margin was achieved in 43(56.6%) surgically treated patients, while the rest had either a close or a positive margin, 33(43%). Lymph node harvesting was performed in most cases, and the median number of LN dissected was 6 (IQR 3-9). LVSI was seen in 27(35%) patients but for the rest of surgically treated patents LVSI is not seen 39(50%) or not documented 10(14.5%) similarly, PNI… was seen in 20(26%) patients but it was not identified in 45(59%) patients and not documented in 11(14.5%) patients.

On the other hand, among patients who are treated with definitive RT, 19 (44%) received CCRT, 16(37%) received sequential chemo followed by RT, and 8(18.6%) received RT alone. The median dose of RT was 50.4Gy (IQR 45-55.8), and the median OTT is 43(IQR 35-49). And around 74.4% of the patients had RT interruption of more than 3 days, with a median of 6 interrupted days, (IQR 3-14). Eighty-eight percent (38) of the patients completed their planned radiotherapy protocol, while 12% defaulted during radiation because of toxicities, worsening of symptoms or personal reasons. Of those who received CRT; the commonest chemotherapy regimen in 12 (63 %) used was (carboplatin (AUC 2)/paclitaxel 50 mg/kg) in a weekly schedule. A median of 4 (IQR 3-4) cycle chemotherapy was used concurrently with radiation.

Table 3: Treatment patterns of adult non-metastatic esophageal cancer patients on follow-up at TASH, Addis Ababa, Ethiopia, 2025. 57 (47.9%) surgery alone, 43(36.1%) definitive RT, 19 (16%) CMT.

Variables	Category	Frequency(n=58)	Percentage (%)
DRT	RT	8	6.7
	CRT	13	10.9

	Chemo followed by RT	15	12.6
	RT followed by chemo	1	0.8
	Chemo followed by CRT	6	5
CMT	Surgery followed by CRT	5	4.2
	Surgery followed by chemo	4	3.4
	Surgery followed by RT	5	4.2
	CRT followed by surgery	1	0.8
	Chemo followed by surgery	4	3.4
Surgery alone	Surgery alone	57	47.9
Type of surgery	Transhiatal esophagectomy	42	55.3
	Iver lewis esophagectomy	11	14.5
	Mc kewns esophagectomy	12	15.7
	Sweet esophagectomy	7	9.2
	Undocumented	4	5.3
Surgical margin	R0	43	56.6
	close	10	13.2
	R1	21	27.6
	R2	1	1.3
	Undocumented	1	1.3

PNI	yes	20	26.3
	No	45	59.2
	Undocumented	11	14.5
LVI	Yes	27	35.5
	No	39	51.3
	undocumented	10	13.2
N0 of LN dissected	0 to 9	61	80.3
	10 to 14	12	15.8
	15 and above	3	3.9
Pathologic stage	Stage I	1	1.3
	Stage II	40	52.6
	Stage III	33	43.4
	Stage IVa	2	2.6

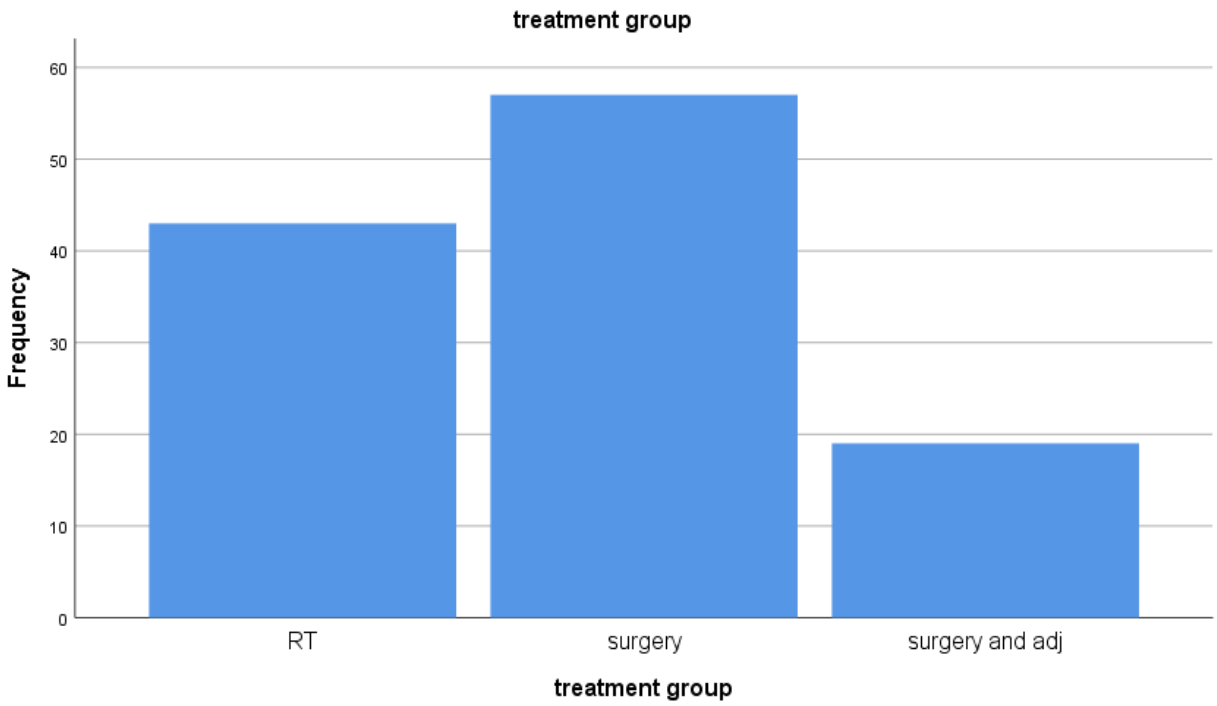

Figure 3: Distribution of treatment modalities among patients with non-metastatic esophageal cancer at Tikur Anbesa Specialized Hospital (TASH), Addis Ababa, Ethiopia, 2025.

5.4 Survival analysis

The median survival time was 17 months (95%CI: 14.8, 19.1). The overall survival rate showed a decline starting from the early months, as shown by the Kaplan-Meier curve (Fig. 4). The one-year, two-year, and three-year survival rates were 67.8%, 36.6%, and 14.5%, respectively. The median survival of patients who are treated with surgery with or without perioperative therapy was 20 months with 95% CI (15, 24.9), while for those treated with DRT, it was 16 months with 95% CI (13.8, 18.1) (fig 3)

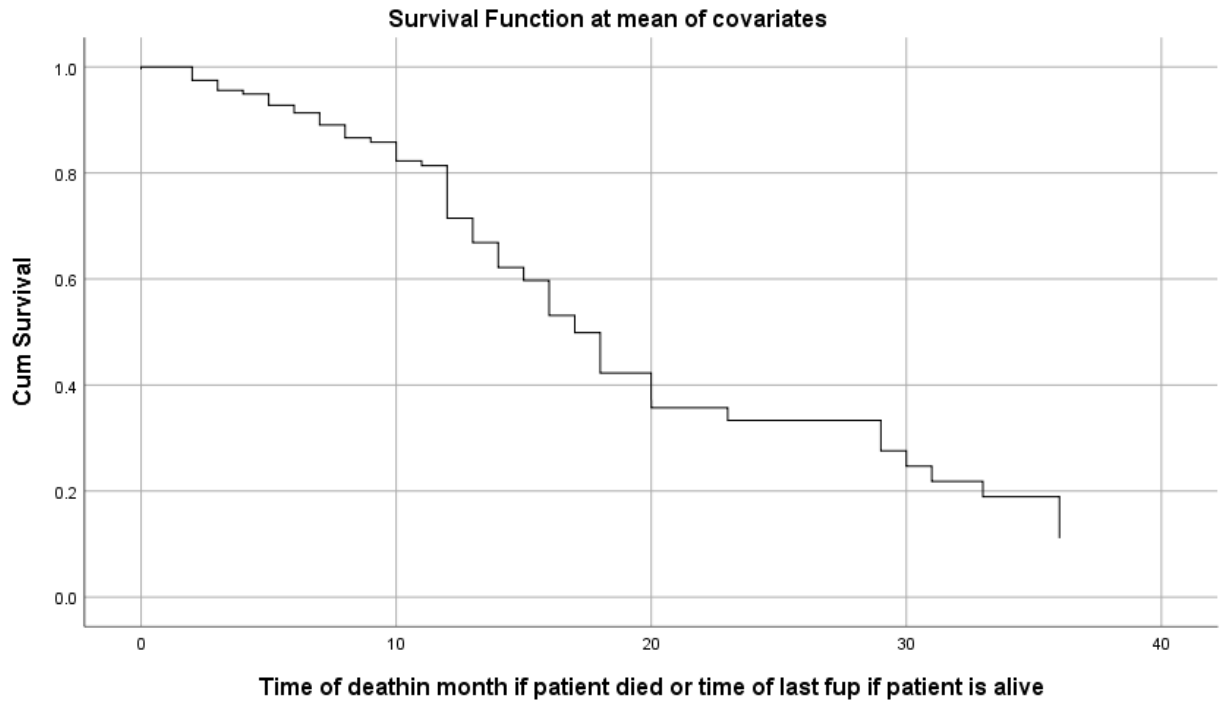

Figure 4:. Cumulative overall survival probability of the total non-metastatic esophageal cancer patients treated with curative intent

5.5 Determinants of non-metastatic esophageal cancer survival outcomes

This study examined the association between various factors and survival outcomes (survival vs. death) in patients with non-metastatic esophageal cancer. At univariate Cox regression analysis, Age, sex, surgical treatment, Stage at presentation, complication during treatment/post op complication and nodal stage were identified as candidates for a multivariable Cox regression model, with a p-value less than 0.25.

In the multivariable Cox regression model, only complications during treatment/post-op complications were significantly associated with survival outcomes. 19(16%) patients had complication during treatment.

Accordingly, Patients with complications during treatment or post op complications had a 5.97 times higher risk of death than those without complications (HR = 5.96, 95% CI 2.85–12.5, p <0.001).

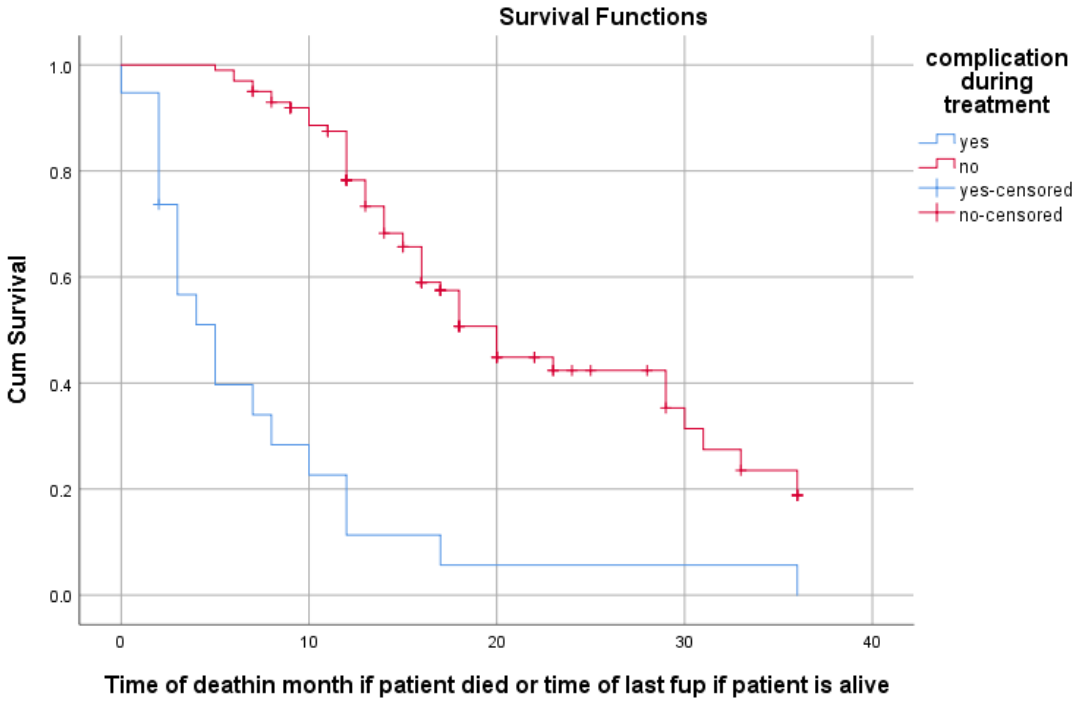

Figure 5: Survival comparison between patients with and without treatment-related complications, showing a significantly higher hazard of death in the complication group (HR = 5.96; 95% CI: 2.85–12.5; p < 0.001).

Table 4;Equality test table

	Chi-square	dif	sig
Sex	5.39	1	0.02
Age	8.2	2	0.016
Surgery vs RT	1.42	1	0.23
Stage	1.588	1	0.2
Treatment complication	46.5	1	<0.001
Node positive	9.28	4	0.05

6. Discussion

The mean age of participants in this cohort was 51.9 years (SD ±12), which is comparable to local studies reporting a mean age of 51.4 years but lower than figures reported from Western populations (11,16). Females accounted for the majority of cases 65 (54.6%), consistent with local reports showing female predominance, whereas Western studies commonly report male predominance (16,34). A significant proportion of patients originated from the Oromia region 41 (34.5%), aligning with local data that consistently demonstrate a higher incidence of esophageal cancer in this region (6,11). This has been partly attributed to cultural practices such as hot food consumption, though further genetic and environmental studies are needed.

In this retrospective cohort of non-metastatic esophageal cancer patients treated with curative intent, we found that 64% underwent surgery and 36% underwent definitive RT/CRT. Of those who received surgery 16% received neoadjuvant or adjuvant therapy. while 84% underwent surgery alone. The proportion of patients receiving surgery vs definitive RT is similar to studies done in Netherland in which most of the patients received surgery (79%) compared to definitive RT (21%), but the pattern of neoadjuvant therapy utilization is different. In our study only 16 % received NA or adjuvant therapy while in the Netherland's study 93% received NA therapy (16). This is also in contrast to the landmark studies, which confirm the superiority of NAT followed by surgery compared to surgery alone for resectable disease (12). Hence, not align with the recommended therapy in non-metastatic esophageal cancer, which mainly is multimodality therapy such as NACRT followed by surgery (24). Some of the reasons for the poor utilization of multimodality therapy in our set up as well as in low and middle-income countries, are because of the fear that multimodality treatment may not be tolerated by the generally frail patients of esophageal cancer with inadequate nutritional support and also because of their advanced age at diagnosis, late presentation and resource constraints (18,19).

Among patients who underwent surgery in our cohort, transhiatal esophagectomy was the most frequently performed procedure (52%), a finding comparable to reports from studies conducted in Addis Ababa, where this approach was similarly predominant (23,29). The median lymph node yield in our study was six, which is below the minimum recommended in the literature and current guidelines, where dissection of at least 15 lymph nodes has been associated with improved survival outcomes (36). Additionally, positive surgical margins were observed in 43% of surgically treated patients, a proportion considerably higher than that reported in Western studies, where positive margin rates of approximately 10% have been documented (36). This higher rate of margin positivity in our setting may be attributed to limited utilization of multimodality treatment strategies, which are known to improve margin-negative resections, as well as the higher stage of disease at presentation, both of which reduce the likelihood of achieving negative surgical margins (37).

With regard to those patients treated with definitive RT, 44% received CCRT, 37% received sequential chemotherapy followed by RT and 18.6% received RT alone. This is in contrast

to the recommended treatment for unresectable esophageal cancer, which mainly is definitive CRT, as the land mark RTOG 85-11 study has demonstrated superior survival compared to RT alone (15). But, adherence to a uniform treatment protocol using concurrent chemoradiation is difficult in clinical practice, especially in resource-constrained settings and due to the fear that most patients may not tolerate combined modality therapy, hence only RT or sequential therapy is administered (18). In this study, the median dose of radiotherapy delivered was 50.4 Gy, consistent with the standard guideline recommendation for the definitive dose of radiation therapy (38).The median overall treatment time (OTT) in our cohort was 43 days (IQR 35–49), similar to a study from China that reported a median OTT of 43 days (IQR 40–47) (32). However, this duration exceeds the recommended 5-week course of RT according to the RTOG 85-11 study (15,38). Notably,74.4 % of those patients who are treated with DRT had RT interruption of more than 3 days,which as reported in previous studies, is associated with poorer overall survival (39). Besides, in our study 12% of the patients who received definitive RT didn't complete their treatment because of toxicities, worsening of symptoms or personal reason. Regarding the type of concurrent chemotherapy used, the most commonly used concurrent regimen was carboplatin/paclitaxel, aligning with guideline recommendations. Nevertheless, the median number of chemotherapy cycles was 4, which is shorter than the 5-week schedule used in the CROSS study, where patients received weekly carboplatin/paclitaxel alongside RT (12,38).

With regard to the survival outcome, our study showed a median survival time of 17 months, and the one-year, two-year, and three-year survival rates were 67.8%, 36.6%, and 14.5%, respectively.This median survival aligns with local data, which also reported a 17-month survival time in patients treated with radical surgery. However, the survival rates differ: our one- and two-year rates are higher than those in the local data (53% and 30.6%, respectively), while the three-year survival is lower. This discrepancy is likely because our study also included patients treated with definitive radiotherapy (DRT).

While the above figure represents both groups of patients, patients treated with surgery and DRT, the median survival of patients who are treated with surgery with or without perioperative therapy was 20 months with 95% CI (15, 24.9) and 16 months with 95% CI

(13.8, 18.1) for those treated with DRT. These are lower than the studies done in the west where the median reported OS was 40.5 months for resected patients and 20.9 months for those patients treated with DRT (16).Indicating that Patients in resource-limited settings continue to face disproportionately lower survival rate, likely attributable to challenges such as limited access to guideline-based treatments and socioeconomic constraints. Thus, Efforts should focus on strengthening oncology care systems, including multidisciplinary care, access to guideline-based treatments, and addressing socioeconomic barriers to improve survival outcomes in resource-limited settings.

Finally, in our study, we found that treatment complications or post-op complications significantly affected patient's survival, regardless of whether patients were treated with surgery or DRT. Patients with post complication such as anastomotic leak or post op sepsis and patients with sever leukopenia and associated sepsis or mucosities during DRT had 5.97 higher risk of death than those without complications (HR = 5.97; 95% CI: 2.85–12.5; $p < 0.001$).This is in line with local data that reported esophageal ca patients with post op surgical complications had 5 times higher risk of death compared to those without complications (AOR=5.436, 95%CI: 1.105, 6.744) (29). Another local study also reported cervical anastomotic leak (AHR = 3.29, 95 % CI: 1.44–7.52), and sepsis (AHR = 3.70, 95 % CI: 1.46–9.38) were significantly associated with increased mortality in patients with esophageal cancer who were surgically treated (23). This observation underscores the importance of proactive treatment related complications care and monitoring to identify and manage complications effectively.

7. Strength and limitation of the study

7.1. Strength

Comprehensive review of medical records, allowing for a detailed analysis of patient demographics, treatment patterns, management strategies, and outcomes.

The combination of both retrospective and cross-checking via phone also enhances the The study included both treatment groups, hence giving a full picture of the survival outcome of non-metastatic esophageal cancer patients, which is the first type in this institution, so it will be a baseline for decision making and future studies

7.2. Limitations

The retrospective nature of the study may introduce biases due to incomplete medical records,especially with regard to patient follow up

The sample size is relatively small, which is a challenge for extensive analyses.

The findings may not fully represent the broader population of esophageal cancer patients in Ethiopia, as the data is limited to a single centre.

8. Conclusions and recommendations

8.1 Conclusion

This study provides valuable insights into the treatment pattern and survival outcome of non-metastatic esophageal cancer in Ethiopia, with broader implications for similar settings worldwide. The observed survival rate is significantly lower than the global average, highlighting the urgent need for improved healthcare access, early intervention strategies, and enhanced multidisciplinary care. Future research should focus on understanding the pathogenesis of non-metastatic esophageal cancer in diverse populations, the long-term outcomes of patients, and the effectiveness of multidisciplinary care and multimodality treatment.

8.2 Recommendation

Recommendations to Healthcare Professionals/Departments/Hospitals

- Improve early detection by increasing awareness of esophageal cancer symptoms
- Ensure timely and appropriate patient referral for biopsy, imaging, and advanced treatment.
- Enhance multidisciplinary team coordination for effective treatment planning and followup care.
- Maintain standardized documentation and patient record-keeping for better continuity of care.
- Optimize pathology reporting using standardized formats to improve diagnostic accuracy

Recommendations to Policymakers/Ministry of Health (MOH)

- Increase the availability of radiotherapy machines, chemotherapy facilities and health care professionals, including clinical oncologists and cardiothoracic surgeons, to reduce treatment delays.
- Develop and implement community-based health education programs, especially in some areas of Oromia where the reported incidence is high, to raise awareness about esophageal cancer and promote early diagnosis.

Recommendations to Researchers and Academic Institutions:

- Focus on longitudinal research to track survival and recurrence patterns in resource-limited settings.
- Develop evidence-based guidelines to inform clinical practice and policy-making for esophageal cancer

9. References

1.WHO Classification of Tumours Editorial Board. Digestive system tumours. 5th ed. Lyon, France: International Agency for Research on Cancer; 2019

2. Filho, A.M, Laversanne, M, Ferlay, J,.et al. (2025). The GLOBOCAN 2022 cancer estimates

3. Global Cancer Observatory, 2022. Ethiopia fact sheet. International Agency for Research on Cancer.

4. Talsma K, van Hagen P, Grotenhuis BA, et al. (2012). Comparison of the 6th and 7th editions of the UICC-AJCC TNM classification for esophageal cancer. Ann Surg Oncol, 19(7):2142–2148.

5. Rice, T.W, Patil, D.T. and Blackstone, E.H., 2017. 8th edition AJCC/UICC staging of cancers of the esophagus and esophagogastric junction: application to clinical practice. Annals of Cardiothoracic Surgery, 6(2), pp.119–130.

6. Wondimagegnehu, A, Hirpa, S, Abaya, S.W, et al. (2020). Oesophageal cancer magnitude and presentation in Ethiopia 2012-2017. PLoS ONE, 15(12), p.e0242807.

7. Kapoor R, Bansal A, Kumar S,et al.(2016). Factors Influencing Compliance to Radical Treatment of Middle Thoracic Esophageal Cancer: An Audit from a Regional Cancer Centre. Indian J Palliat Care. 2016 Jul-Sep;22(3):288-94.

8. Sakin, A, Urun, Y.Y, Sahin, S, et al (2019). Factors affecting survival in esophageal squamous cell carcinoma: Single-center experience. Northern Clinics of Istanbul, 7(3), pp.267-274.

9. Jain, S. and Dhingra, S., 2017. Pathology of esophageal cancer and Barrett's esophagus. Annals of Cardiothoracic Surgery, 6(2), pp.99–109.

10. Simba, H, Kuivaniemi, H, Abnet, et al (2023). Environmental and life-style risk factors for esophageal squamous cell carcinoma in Africa: a systematic review and meta-analysis. BMC Public Health, 23(1), p.1782.

11. Hassen, H.Y., Teka, M.A. and Addisse, A., 2021. Survival status of esophageal cancer patients and its determinants in Ethiopia: a facility based retrospective cohort study. Frontiers in Oncology, 10, p.594342.

12. van Hagen, P, Hulshof, M.C, van Lanschot, J.J, et al. (2012). Preoperative chemoradiotherapy for esophageal or junctional cancer. New England Journal of Medicine, 366(22), pp.2074–2084.

13. Chen, H.S, Hung, W.H., Ko, J.L,et al. (2016). Impact of treatment modalities on survival of patients with locoregional esophageal squamous-cell carcinoma in Taiwan. Medicine (Baltimore), 95(10), p.e3018.

14. Bandidwattanawong, C., 2024. Multi-disciplinary management of esophageal carcinoma: Current practices and future directions. Critical Reviews in Oncology/Hematology, 197, p.104315.

15. Cooper, J.S., Guo, M.D., Herskovic, et al. (1999) .Chemoradiotherapy of locally advanced esophageal cancer: long-term follow-up of a prospective randomized trial (RTOG 85-01). JAMA, 281(17), pp.1623–1627.

16. Marieke Pape, Pauline A.J. Vissers, Laurens Beerepoot, et al (2021). Disease-free and overall survival in nonmetastatic esophageal or gastroesophageal junctional cancer after treatment with curative intent: A nationwide population-based study. Journal of Clinical Oncology, 39(3_suppl), p.246.

17. Hoeppner, J. et al., 2024. Perioperative chemotherapy or preoperative chemoradiotherapy in esophageal cancer. New England Journal of Medicine.

18. Chauhan, R., Trivedi, V., Rani, R. and Singh, U., 2022. Patterns of treatment and outcome in patients with unresectable or inoperable esophageal cancer: A real world data. medRxiv, 2022.01.26.22269828.

19. Siraji, O, Yusuf, M, Thompson, C.L, et al (2023). Clinicopathological characteristics and treatment outcomes of oesophageal cancer patients in Uganda. ecancer, 17, p.1576.

20. Hamid, M. D., Tola, M. A., Desalegn, H., et al (2025). Clinical, pathologic, and endoscopic characteristics of esophageal cancer patients at St. Paul´s Hospital Millennium Medical College (SPHMMC), Addis Ababa, Ethiopia: A five year retrospective review. Ethiopian Medical Journal, 63(1), 310–316.

21. Cox, S., Powell, C., Carter, B., et al. (2016) 'Role of nutritional status and intervention in oesophageal cancer treated with definitive chemoradiotherapy: outcomes from SCOPE1', British Journal of Cancer, 115, pp. 172–177.

22. Asombang, A.W, Chishinga, N, Nkhoma, A, et al (2019). Systematic review and meta-analysis of esophageal cancer in Africa: Epidemiology, risk factors, management and outcomes. World Journal of Gastroenterology, 25(31), pp.4512–4533.

23. Senbeta, M.B, Abiy, S, Samuel, H , et al .(2025). Esophageal cancer surgery in Ethiopia: postoperative mortality and long-term survival. Surgical Practice and Science, 22, p.100288.

24. National Cancer Institute (NCI), 2025. Esophageal cancer treatment. Professional version.

25. Degu, A, Karimi, P.N, Opanga, S.A, et al. (2022). Determinants of survival outcomes among esophageal cancer patients at a national referral hospital in Kenya. Chronic Diseases and Translational Medicine, 9(1), pp.20–28.

26. Rui, W, Li, C, Da, Q, et al .(2024). Analysis of the influencing factors in the long-term survival of esophageal cancer. Frontiers in Oncology, 13, p.1274014.

27. Nam, S.Y, Jeon, S.W, Lee, S.J, et al (2020). Clinical factors to predict the response to concurrent chemoradiotherapy and survival in esophageal cancer patients. Gut and Liver, 14(4), pp.450–458.

28. Ren, Z.T, Kang, M, Zhu, L.Y. and Li, P., 2024. Long-term survival and risk factors in esophageal squamous cell carcinoma: A Kaplan-Meier and Cox regression study. World Journal of Gastrointestinal Surgery, 16(12), pp.3772–3779.

29. Desalegn, 2024. Determinants of surgical management outcome for esophageal cancer patients treated at Tikur Anbessa Specialized Hospital, Minilik II Hospital and St. Peter Hospital, Addis Ababa, Ethiopia: A multi-centre study.

30. Abou Chaar, M.K, Godin, A, Harmsen, W.S, et al.(2023). Determinants of long-term survival decades after esophagectomy for esophageal cancer. Annals of Thoracic Surgery, 116(5), pp.1036–1044.

31. Mou, Y, Liang, P, Cheng, X, et al.(2024). Influence of radiotherapy interruption on esophageal cancer with intensity-modulated radiotherapy: a retrospective study. BMC Cancer, 24(1), p.646.

32. Xiang, G, Wang, X, Zhang, C, et al. (2025). Impact of treatment time and waiting time on outcome for esophageal squamous cell carcinoma receiving definitive chemoradiotherapy. Radiation Oncology, 20(1), p.111.

33. Kimura, Y., Gakuhara, A. and Fukuda, S. et al.(2025). Nutritional management during chemotherapy and chemoradiotherapy for advanced esophageal cancer. Esophagus, 22, pp.279–288.

34. Mulisa G, Abebe T, Gutema B,et al(2024).Exploring Oesophageal Cancer in Ethiopia: Elevated Incidence in Females and Younger Cases. Cancer Rep (Hoboken). 2024 Dec;7(12):e70048.

35.Yeung JC, Bains MS, Barbetta A.,et al (2020)"How Many Nodes Need to be Removed to Make Esophagectomy an Adequate Cancer Operation, and Does the Number Change When a Patient has Chemoradiotherapy Before Surgery?" Ann Surg Oncol. 2020 Apr;27(4):1227-1232.

36. Mulligan ED, Dunne B, Griffin M.,et al (2004) Margin involvement and outcome in oesophageal carcinoma: a 10-year experience in a specialist unit Eur J Surg Oncol. 2004 Apr;30(3):313-7.

37. Jeffrey Javidfar Paul J Speicher Matthew G Hartwig Impact of Positive Margins on Survival in

Patients Undergoing Esophagogastrectomy for Esophageal Cancer. Ann Thorac Surg. 2016 Mar;101(3):1060-7.

38. NCCN esophageal and GEJ cancer version 4, 2025

39. Mou Y, Liang P, Cheng X.,et al (2024) Influence of radiotherapy interruption on esophageal cancer with intensity-modulated radiotherapy: a retrospective study. BMC Cancer. 2024 May 27;24(1):646.

10. Annexes

10.1 Annex I: Information Sheet

Research Title: Survival outcome and Treatment patterns in non-metastatic esophageal cancer patients who underwent curative intent treatment at Tikur Anbesa Specialized Hospital, Ethiopia, a 3-year retrospective study

Principal Investigator (PI): Woinshet Zegeye (MD, Oncology Resident)

Phone: +251-933-526-527

Email: dwoin@gmail.com

Advisor: Dr. Damena Teshome (MD, consultant oncologist, Assistant professor of clinical oncology)

Sponsor: Black Lion Hospital

10.2 Annex II: Data Collection Format

Baseline characteristics

1. Date of diagnosis_____

2. Date of start of treatment_____

3. Date of data collection_____

4. Date of last follow up_____

5. Age

6. Sex

7. Comorbidities

    A. Diabetes mellitus

    B. Hypertension

    C. Chronic renal failure

    D. Liver cirrhosis

    E. Heart disease (specify IHD, VHD…)

    F. Cerebrovascular disease

    G. Other_____

8. Family history of esophageal cancer

   A. Yes

   B. No

   C. Unknown

9. Past history of other malignancy

   A. Yes

   B. No

10. If yes specify the type and duration of diagnosis since esophageal ca Dx

   I. Type _____

   II. Duration_____

11. Performance status

12. Smoking history

   A. Current smoker (quantify years of smoking) _____

   B. Ex-smoker

   C. Non-smoker

13. Drinking

   A. Heavy alcohol drinking (drinking > 40 grams a day or >270 g/wk of alcohol for > 10 years)

   B. Non-heavy drinking

   C. Unknown

   14. Tumor location at primary diagnosis

A. Cervical thoracal esophagus

B. Proximal thoracal esophagus

C. Mid thoracal esophagus

D. Distal thoracal esophagus

E. Gastroesophageal junction

F. Unknown esophagus

15. Tumor histology at primary diagnosis

A. SCC

B. ADC

C. ADS

D. Other_____

16. Tumor differentiation at primary diagnosis

A. Well differentiated (grade 1)

B. Moderate differentiated (grade 2)

C. Poorly/undifferentiated (grade 3)

D. Unknown

17. cT stage at primary diagnosis,

18. cN stage at primary diagnosis,

19.clinical stage of the disease

Type of treatment

20.Treatment modality initially planned_____

21.Treatment modality deliver/received (actually delivered)

A. Definitive concurrent chemo-radiotherapy (CCRT) alone
B. Neoadjuvent chemotherapy followed by Definitive concurrent chemo-radiotherapy (CCRT)
C. Definitive concurrent chemo-radiotherapy(CCRT) followed by adjuvant chemotherapy
D. Definitive Radiotherapy(RT) alone
E. Neoadjuvent chemotherapy followed by Definitive radiotherapy(RT)
F. Definitive radiotherapy(RT) followed by adjuvant chemotherapy
G. Endoscopic resection(ER)
H. Surgery (esophagectomy) only
I. Surgery with combined therapy

22.For those patients treated with surgery with or without neoadjuvant or adjuvant treatment (select type of surgery)

A. Ivor-Lewis esophagogastrectomy
B. McKeown (three-incision) esophagogastrectomy
C. Trans-hiatal esophagogastrectomy
D. left thoraco-abdominal esophago-gastrectomy
E. Other_____

23. Surgical resection status

A. R0

B. R1

C. R2

D. Unknown

24. Number of LN dissected_____

25.pathologic stage

26.is there LVI

A. Yes

B. NO

C. Unknown

27. is there PNI

A. Yes

B. No

C. Unknown

28. For those patients treated with surgery with neoadjuvant or adjuvant treatment (select type of combined treatment)

A. Preoperative chemotherapy followed by esophagectomy

B. Preoperative CCRT followed by esophagectomy;

C. Esophagectomy followed by chemotherapy

D. Esophagectomy followed by chemoradiotherapy

E. Esophagectomy followed by radiotherapy

F. Other(specify)_____

29. For those patients who had palliative treatment for dysphagia (select the type) before or while on primary treatment

A. Esophageal stent

B. Percutaneous gastrostomy

C. Other(specify)_____

30. For those patients who received any form of RT, write the following

A. Total prescribed RT dose and Fraction number_____

B. Actual total dose and fraction patient received_____

C. OTT(days)_____

31. For those patients who received neoadj/adjuvent chemotherapy(specify)

I. Type of chemo_____

II. Dose _____

III. Number of Cycle_____

32. For those patients who received any form of CCRT (specify)

I. Type of chemo_____

II. Dose _____

III. Schedule _____

IV. Number of Cycle_____

33. If there is an RT interruption

I. Total days of interruption_____

II. The reason for interruption_____

34. For those patients who received combined treatment (write the gap or duration elapsed between the end of 1st Rx and start of subsequent Rx (in days)

_____

35. Serious complications developed during treatment

A. Yes

B. No

C. Unknown

36. If yes,

I. During which treatment type the patient develop this complication

II. Type of complication_____

III. What was done during that time_____

IV. Patient condition after _____

37. Tumor response after treatment (3 months)

A. CR

B. PR

C. PD

D. SD

E. Other

38.Tumor response after treatment (6months)

A. CR

B. PR

C. PD

D. SD

E. Other

39. For those Patients who developed a recurrence/progressive disease (write the duration) in days

I. Since diagnosis_____

II. Since completion of treatment_____

40. For those Patients who developed a recurrence

A. Local recurrence

B. Surgical wound recurrence

C. Regional recurrence_____

D. Distant metastasis_____

41. For those Patients developed a progression

A. Local

B. Regional _____

C. Distant metastasis_____

D. Other_____

42. Patient died

A. Yes

B. No

43.Reason/cause of death_____

44. Duration the patient died (in months)

I. After Diagnosis_____

II. After treatment completion_____

10.3 Annex III: Assurance of Investigator

I the undersigned resident agree to accept all responsibilities for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Research and Publication Directorate and /or Department of clinical Oncology of TASH

Name of the Resident: Dr. Woinshet Zegeye

Signature: _____

Date: _____

Approval of Advisors

Name of Clinical Advisor: Dr. Damena Teshome

Signature: _____

Date: _____