ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF ANESTHESIA

SURVIVAL STATUS AND PREDICTORS OF POSTOPERATIVE MORTALITY IN PATIENTS WHO UNDERWENT ESOPHAGEAL SURGERIES FOR ESOPHAGEAL MALIGNANCIES AT SELECTED GOVERNMENTAL HOSPITALS ETHIOPIA, ADDIS ABABA

PRINCIPAL INVESTIGATOR

MINTESINOT BIRHANU……. BSc in Anesthesia

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES, DEPARTMENT OF ANESTHESIA FOR PARTIAL FULFILLMENT OF DEGREE OF MASTER OF SCIENCE (MSC) IN ANESTHESIA.

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A RETROSPECTIVE COHORT STUDY OF SURVIVAL STATUS AND PREDICTORS OF POSTOPERATIVE MORTALITY IN PATIENTS WHO UNDERWENT ESOPHAGEAL SURGERIES FOR ESOPHAGEAL MALIGNANCIES AT SELECTED GOVERNMENTAL HOSPITALS ETHIOPIA, ADDIS ABABA

PRINCIPAL INVESTIGATOR

MINTESINOT BIRHANU……. BSc in Anesthesia

ADVISORS:

SILESHI ABIY (BSc., MSc in Anesthesia)

HIRBO SAMUEL (BSc, MSC in Anesthesia)

JUNE, 2024 G.C.

ADDIS ABABA, ETHIOPIA

APPROVAL BY THE BOARD OF EXAMINATION

This is to certify that the thesis prepared by Mintesinot Birhanu entitled: *Survival Status and Predictors Of Postoperative Mortality in Patients Who Underwent Esophageal Surgeries for Esophageal Malignancies at Selected Governmental Hospitals Ethiopia, Addis Ababa: A Retrospective Cohort Study* submitted in partial fulfillment of Degree of Master of Science in Anesthesia is approved by the board of examiners as satisfying the recognized criteria for quality and uniqueness in its existing form.

EXTERNAL EXAMINER:

NAME	SIGNATURE	DATE

INTERNAL EXAMINER:

NAME	SIGNATURE	DATE

RESEARCH ADVISORS:

1. Mr. Sileshi Abiy (BSc. , MSc. In Anesthesia)		
NAME	SIGNATURE	DATE
2. Mr. Hirbo Samuel (BSc., MSc. In Anesthesia)		
NAME	SIGNATURE	DATE

STATEMENT OF DECLARATION

I, Mintesinot Birhanu, hereby declare that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis, and completion of this thesis. This thesis has not contained any plagiarized material; all scholarly sources consulted or referenced are included in the thesis. This thesis is submitted in partial fulfillment of the requirement for a graduate degree from the Addis Ababa University College of Health Sciences, Department of Anesthesia. The thesis is deposited in the Addis Ababa University Digital Library and is made available to the local, national, and international scientific community. I also declare that the intellectual content of this thesis is the product of my work, except to the extent that assistance from others in the project's design and conception or style, presentation, and linguistic expression is acknowledged. This thesis contains no material that has been accepted by any other institution for the award of any academic degree, diploma, or certificate, in English or any other language. Brief quotations from this thesis may be used without special permission provided that accurate and complete acknowledgement of the source is made. Requests for permission for extended quotations from, or reproduction of, this thesis in whole or in part may be granted by all advisors of the thesis when in his or her judgment the proposed use of the material is in the interest of scholarship and publication. In all other instances, however, permission must be obtained from the author of the thesis.

PRINCIPAL INVESTIGATOR:

Mr. Mintesinot Birhanu _____ _____ _____

NAME SIGNATURE DATE

RESEARCH ADVISORS:

1. Mr. Sileshi Abiy (BSc. , MSc. In Anesthesia) _____ _____

NAME SIGNATURE DATE

2. Mr. Hirbo Samuel (BSc., MSc. In Anesthesia) _____ _____

NAME SIGNATURE DATE

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ACRONYMS

AACR	Addis Ababa City Cancer Registry
AAPHEMD	Addis Ababa Public Health and Emergency Management Directorate
ASA	American Society of Anesthesiology
BMI	Body Mass Index
CAD	Coronary artery disease
CHF	Congestive heart failure
COPD	Chronic obstructive pulmonary disease
ESCC	Esophageal Small Cell Carcinoma
FEV1	Forced expiratory volume in 1 second
HAP	Hospital Acquired Pneumonia
LSTs	Large-sized tumors
MIICSH	Menilik II Comprehensive Specialized Hospital
MIE	Minimally Invasive Esophagectomy
PVD	Peripheral vascular disease
RAR	Risk-adjusted rate
RERCO	Research Ethical Review Committee Office
SPSH	Saint Peter Specialized Hospital
SPHMMC	Saint Paul Hospital Millenium Medical College
SSTs	Small-sized tumors
STS	Society of Thoracic Surgeons

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ABSTRACT

INTRODUCTION: Cancer is still the leading cause of death worldwide, and esophageal cancer is the sixth leading cause of cancer-related deaths. For individuals with esophageal cancer, esophagectomy is the only treatment option available and it has a high risk of both death and morbidity. Moreover, despite advances in preoperative optimization, surgery, and anesthesia techniques, as well as the introduction of neoadjuvant therapy, the mortality and morbidity associated with esophagectomy persist to be high.

OBJECTIVE: To assess the Survival status and predictors of postoperative mortality in patients who underwent esophageal surgeries for esophageal malignancies at selected governmental hospitals from 2018-2023 GC Ethiopia, Addis Ababa

METHODS: A Retrospective Cohort study was conducted. After the acquisition of data from the chart review, Data was analyzed using R version 4.3.3. Descriptive statistics for categorical variables were reported as frequency and percentages. Kaplan Meier curve and log-rank test were used to estimate the survival curve and the difference in survival among groups within each covariate respectively. After esophageal surgery, the impact of each covariate on the time to death was assessed using the Cox proportional hazard model.

RESULTS: 246 patients who underwent esophageal surgeries for esophageal malignancy at 4 governmental hospitals in Addis Ababa were included over 5 years. The mean age of the patients was 52.1 years. 127(51.6%) had a T4 stage Cancer, 166(67.5%) had a tumor size <3.3cm, and Squamous cell carcinoma accounted for 207(84.1%) cases, Epidural Analgesia was the most commonly used analgesic technique 45(18.3%). 30-day mortality was 8.5%, The overall 1,2,3,4 and 5-year survival rate were 49.8%, 30.2%, 15.4%, 15.4%, and 10.3% respectively. The median Survival time was 12 months. ASA score of > III. (AHR = 1.93, 95%CI 1.10-3.38), Hospital Acquired Pneumonia (AHR = 1.95, 95%CI: 1.06-3.59). Hypertension (AHR = 2.22, 95%CI: 1.04-4.73), Cervical anastomotic Leak (AHR = 2.17, 95%CI: 1.00-4.67), and sepsis (AHR = 3.69, 95%CI: 1.49– 9.11). were identified as an independent predictor of postoperative mortality in the multivariate Cox regression model.

CONCLUSION: In Ethiopia, patients who underwent esophageal surgeries for esophageal malignancy have a low 5-year survival rate. Patients who develop complications in the postoperative period are more likely to die compared to their counterparts Thus screening, prevention, and early management of postoperative complications is recommended to improve survival rate.

KEYWORDS: Esophageal Cancer, Esophageal Surgery, Ethiopia, Survival Status

INTRODUCTION

1.1. Background of the study

Cancer is a leading cause of death in both more and less economically developed countries; the burden is expected to grow worldwide due to the growth and aging of the population, particularly in less developed countries, in which about 82% of the world's population resides[1].

Esophageal cancer is the sixth major cause of cancer-related deaths and remains the seventh most commonly diagnosed cancer worldwide[2]. Despite recent breakthroughs in other therapeutic modalities, surgical excision remains the sole curative option for patients with esophageal cancer and is frequently done in conjunction with neoadjuvant chemotherapy or chemoradiotherapy[3]. Esophageal cancer (EC) has a dismal prognosis, especially in Africa.

The incidence of esophageal cancer varies more than 21-fold around the globe. Eastern Asia has the largest regional incidence, owing to China's massive load, followed by Southern Africa, Eastern Africa, Northern Europe, and South-Central Asia. In contrast, Western Africa has the lowest rate. Men and women had the highest occurrence rates in Cape Verde and Malawi, respectively. Esophageal cancer is the top cause of cancer death in Bangladeshi men and women, as well as in Malawian males. Esophageal cancer is three to four times as likely in men than in women[4]. In an Ethiopian study that used GLOBOCAN data to examine the incidence and mortality of several forms of cancer, esophageal cancer was the third most frequent type of cancer [5]. According to a study conducted in Addis Ababa using data from the Addis Ababa City Cancer Registry (AACCR), esophageal cancer was the tenth most prevalent cancer type among residents[6].

Geographic variation in esophageal cancer incidence differs significantly between the two most common histologic subtypes (squamous cell carcinoma [SCC] and adenocarcinoma [AC]), which have very different etiologies. In certain high-risk areas of Asia (e.g., China), the incidence of esophageal SCC is broadly declining and may have been preceded by economic gains and dietary improvements, whereas in several high-income countries (e.g., the United States, Australia, France, and the United Kingdom), the reductions are thought to be primarily due to decreases in cigarette smoking. In Western settings, heavy drinking and smoking, as well as their synergistic effects, are the major risk factors for SCC [4].

However, in lower-income countries, such as parts of Asia and Sub-Saharan Africa, the major risk factors for SCC—which typically accounts for more than 90% of all esophageal cancer cases—have yet to be identified, though dietary components (e.g., nutritional deficiencies, nitrosamines) have been suspected risk factors for SCC include betel quid chewing in the Indian subcontinent and consumption of pickled vegetables (e.g., in China) and very hot food (e.g., in Uruguay, Iran, and Tanzania) [4].

When performing an esophagectomy, there are several surgical approaches to choose from. These are broadly classified as open, hybrid, and minimally invasive techniques. and these techniques can be utilized in a "two-incision" (abdominal and thoracic) Ivor-Lewis esophagectomy, a three-incision McKeown (abdominal, thoracic, and cervical) esophagectomy, and a "two-incision" (abdominal and cervical) TransHiatal esophagectomy, in addition, the Left thoracoabdominal approach can only be performed using the open approach[7].

Minimally invasive esophagectomy is associated with a lower rate of pulmonary infection shorter length of stay, lower pain score, and less vocal cord paralysis compared to open esophagectomy. However, minimally invasive esophagectomy requires a longer operation time and has also a high technical complexity compared to open or hybrid esophagectomy[8].

The hybrid esophagectomy is also a better option compared to open esophagectomy it showed a significantly lower rate of major complications especially pulmonary complications compared to open esophagectomy [9].

More recently robotic-assisted minimally invasive procedures have been proposed to optimize patient outcomes, surgeon ergonomics, and earlier postoperative recovery thus, have had an increase in adoption globally. however, this approach has been associated with increased operative time and healthcare costs [8].

Regardless of approach, an esophageal resection is a major surgical undertaking, often taking hours to complete and requiring a significant period of single lung ventilation. Post-operative complications are common, occurring in roughly half of all patients. These are most commonly respiratory and affect 20% to 40% of all patients. Anastomotic leak, which can occur in 10% to 20% of cases, is perhaps the most feared due to the high mortality rate [10].

Despite advances in operative technique standardization, preoperative risk assessment, and postoperative intensive care management, surgical therapy for esophageal carcinoma remains a high-risk surgical procedure, with reported postoperative mortality rates ranging from 3% to 25% [11]. Risk stratification in the selection of patients for surgery, as well as the surgical procedure chosen, are thus critical considerations [12].

Identification of preoperative and postoperative factors associated with an increased incidence of postoperative complications and accurate prediction of surgical mortality is important not only for the appropriate selection of candidates for esophagectomy but also for the evaluation of quality of care and policy decisions[13].

1.2. Statement of the problem

At Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa, Ethiopia, esophageal cancer continues to rank ninth among patients with cancer. [14] and the 8th cause of death from cancer among males[15]. Estimates of Cancer Incidence in Ethiopia in 2015 Using Population-Based Registry Data Esophageal cancer was ranked 11th across 5 regions in Ethiopia in both male and female [16].

In patients with potentially resectable esophageal cancer, esophagectomy remains the mainstay of treatment [17]. Current esophagectomy methods include seven approaches possible; Ivor-Lewis, McKeown, TransHiatal, left transthoracic or thoracoabdominal approach with cervical anastomosis, and minimally invasive versions of the above-mentioned approaches except for Left thoracoabdominal approach, MIE can also be performed robotically.

Due to the technical challenges and Higher cost of MIE open esophagectomy and hybrid esophagectomy are most commonly performed especially in resource-limited areas and they are associated with a high risk of operative mortality, which has not been adequately mitigated by advances in anesthetic techniques, critical care skills, and general supportive measures that have reduced morbidity and mortality after other types of major surgery.

Mortality rates after esophagectomy vary across different parts of the world and are generally low in developed countries like Hongkong (7.8%), USA (6.0%), UK (4.8%), Netherlands (3.5%), and high in Countries located in Africa like Ethiopia (28%), Sudan (27.8%) [18] and South Africa (11.8%) [19].

The overall survival rates reported in esophagectomy patients include; 76.6% in 3 years in a study conducted in Egypt [20], 30% in 3 years in a study done in South Africa[21], 64% in 1 year, and 40% in 2 years in a study done in Sudan [22], 13.2% in 5 years in another study done in South Africa[19], 52% in 2 years and 70.6% in 1 year in Sudan[18].

Despite this fact, little has been done to investigate the factors that could help predict operative mortality and time to death and thus improve patient selection. Assessing the time to death and postoperative mortality following esophageal resection surgery will provide insights to determine how surgery, preoperative comorbidities, and postoperative complications impact the long-term survival of patients with esophageal cancer.

This research aims to understand the impact of esophageal surgery on the survival status of patients with esophageal cancer and the effects of preoperative comorbidities and functional capacity, intraoperative anesthesia techniques and surgical events, and postoperative pain management and postoperative adverse events on postoperative mortality after esophageal resection.

The findings of this study will assist medical professionals in identifying patients with comorbidities that affect the likelihood of postoperative survival and the duration until death, as well as patients in understanding the prognosis of their disease after surgery and in choosing a more effective course of treatment.

1.3. Significance of the Study

In Ethiopia Surgery is an independent predictor of survival among esophageal cancer patients and people who underwent any kind of esophageal surgery had a death rate that was 30% lower than that of people who did not [23]. However, the survival status of those who underwent esophageal surgeries and predictors that affect postoperative mortality after the surgery has not been studied.

The results of the study will reveal the effects of esophageal resection on long-term survival in patients with esophageal Cancer and will provide new insights into the effects of preoperative and intraoperative patient characteristics and events as well as postoperative complications on the survival status of patients following esophageal surgeries.

Through this research health care institutions will further realize the optimization of preoperative Status as a preventive method to decrease adverse outcomes following esophageal surgeries

This study will also help anesthesiologists/anesthetists and thoracic surgeons in the identification of preoperative factors associated with an increased risk of operative mortality and will help them avoid intraoperative and postoperative events with significant association with operative mortality in high-risk clients.

By offering evidence-based anesthesia, this study also contributes to clinical practice, teaching, and research in anesthesia. The findings can also be used by healthcare professionals to prioritize interventions, predict patient survival rates, and make scientifically supported choices about patients with esophageal cancer who are scheduled for esophageal resection. They can also be used to direct the national cancer control program and help plan mechanisms for better cancer control and prevention initiatives.

The findings of the study will contribute to better patient selection and preoperative patient optimization by identifying factors that lead to decreased survival after esophageal surgery. It can also support the decisions of hospital management and the health care system. In such a way strategies will be devised and implemented to decrease operative mortality and associated postoperative complications following esophagectomy. Moreover, the study can serve as input for future studies on related topics.

LITERATURE REVIEW

2.1. Survival Status of patients who underwent esophagectomy for esophageal malignancies

Different studies have been conducted in developed as well as in developing countries to determine the incidence of Postoperative mortality in patients who underwent esophagectomy for esophageal malignancies.

In a study conducted in Sao Paulo, Brazil, medical cards of patients admitted to an oncology referral center between 2009 and 2012 were reviewed retrospectively. They were divided into 444 squamous cell carcinoma patients and 105 adenocarcinoma patients based on histological diagnosis, and their demographic, pathological, and clinical characteristics were analyzed and compared to clinical stage and overall survival. Overall survival curves for squamous cell carcinoma and esophageal adenocarcinoma did not differ. After five years, squamous cell carcinoma had a survival rate of 22.8% compared to 20.2% for adenocarcinoma. After five years, the survival rate for squamous cell carcinoma was 56.6% and 58% for adenocarcinoma when only patients treated with curative intent resection were considered [24].

Similarly, A study at the Second Affiliated Hospital of Chongqing Medical University in Chongqing, China, looked into Following surgery, 1,553 patients had esophageal squamous cell cancer. A family history of esophageal cancer is present in 31% of these patients. This study examined the following factors: lymphadenopathy, adjuvant therapy, stage of cancer, family history of esophageal cancer, tumor size, age, location, histologic type, and grade of differentiation. For all patients having an esophagectomy, the overall 3- and 5-year postoperative survival rates were 43.7% and 26.2%, respectively. [25].

A five-year retrospective cohort study of 134 patients with definite esophageal cancer who were hospitalized at the Tawhid hospital in Sanandaj, Kurdistan province, western Iran. Kaplan-Meier and Cox regression were used to examine patient survival times. In total, 127 men (55.1%) were included. Adenocarcinoma (AC) affected 23 patients (18.1%), while squamous cell carcinoma (SCC) affected 94 patients (74.0%). (SCC). Overall, one-year, two-year, and three-year survival rates for patients who underwent surgery were 53.2%, 30.6%, and 21.3%, respectively [26].

In a study conducted at South Africa's Baragwanath Hospital, 265 patients were included over 3 years; 21% had disease confined to the esophagus and were treated with esophagectomy; 23% had

local spread and were treated with extra-esophageal bypass (and 51% had advanced disease). 5% of the patients died before receiving any treatment. Thirty percent of patients treated with esophagectomy survived for three years. [21].

in a South African prospective cohort study the long-term outcomes of standard esophagectomy techniques were studied in 127 patients with esophageal squamous cell carcinoma. In 93 patients, a near-total esophagectomy with a cervical anastomosis was performed, and 34 patients had an esophagogastrostomy with an intrathoracic anastomosis. A curative esophagectomy was performed on 108 patients, while a palliative resection was performed on 19 others. Radiotherapy to the tumor bed was administered to 80 patients. Patients with tumor invasion beyond the esophageal wall (T3) and negative nodes had a 20% 5-year survival rate. There were 15 hospital deaths, and the overall 5-year survival rate, including perioperative deaths, was 13.2% [19].

A study at Maputo Hospital in South Africa identified 522 consecutive patient instances of esophageal cancer. The patients were divided into 230 (44.1%) men and 291 (55.7%) women, with a median age of 56.1 years. The position of the tumors varied among the patients: 196 (37.5%) had an unknown tumor site, 113 (21.6%) had a tumor in the lower third of the esophagus, 154 (29.5%) in the middle, and 50 (9.6%) in the upper third. Squamous cell carcinoma was present in 94.4% of patients with recorded histology (74.9% of the sample). Surgical intervention was available in 32 individuals (6.1%). Only in these 32 surgical patients was disease stage documented; There were, correspondingly, 28.1%, 53.1%, and 18.8% with stage I, II, and III disease. It seems that the malignancies in the remaining patient cases were clinically Advanced. The follow-up time was 1.6 months on average. The median survival time for all patients was 3.5 months; for patients treated with curative intent (either surgery alone or with neoadjuvant chemotherapy based on stage), it was 8.7 months [27].

In a retrospective review of the National Cancer Institute Database (NCI) at Cairo University, Egypt. Surgery was performed on 71.7% of male esophagectomy patients compared to 28.3% of female cases (p=0.093). All surgical cases involved gastric pull-ups. 2.2% had R1 present. The tumor's maximum (LN) size was 1 (1-2cm), its smallest surgical margin was 3 (2-4), and its median size was 4.3 cm (IQR;3-5.6 cm). 30-day perioperative mortality was 6.5%. 3 years Overall Survival among esophagectomy patients was 79.6% [20].

In a study carried out on a hundred consecutive individuals who had esophagectomy procedures performed at Khartoum's Shaab Hospital between June 2003 and August 2007. There was an equal sex ratio and a mean age of 55 ± 14 years. Stage III and IV locally progressed and/or metastatic disease was detected in 55% of individuals. Sixty-seven percent of the patients had a two-stage Lewis Tanner-type resection, twenty-seven percent had a three-stage McKeon operation resection, and six percent had a total gastrectomy with distal esophagectomy and Roux-en-Y reconstruction. The 30-day mortality rate following surgery was 10%. The total 5-year survival was 21% (n = 16) among the 75 patients who could be located, the 10-year survival was 8% (n = 6), the 1-year survival was 70.6%, and the 2-year survival was 52%. [18].

2.2. Predictors of Postoperative Mortality Among Patients who underwent esophagectomy for esophageal malignancies

In a study conducted in Berlin, Germany clinicopathologic data of all consecutive patients treated with curative resection for gastric and esophageal cancer between 2005 and 2012 at the Charite'-Universitatsmedizin, Campus Virchow-Klinikum were gathered and examined. Anastomotic Leak (P = .001, HR=2.29,95% CI (1.43–3.69)), ASA physical status IV (P < .0001, HR=1.88,95% CI (1.37–2.57)), advanced UICC stage III (P < .0001), and poorly differentiated carcinoma (G3; P = .04) remained significant predictors of Operative Survival in multivariate cox regression analysis [28].

Patients who had esophagectomy between 1993 and 2019 participated in a retrospective cohort research at the Amsterdam University Medical Center. The study employed multilevel logistic and Cox regression models to evaluate predictors of anastomotic leakage and survival. Additionally, an operation year-level random effects model was examined to account for unmeasured factors during the operation year. The long-term survival in this study was not significantly impacted by anastomotic leakage (HR: 0.994; 95% CI: 0.849-1.176; P =.994) [29].

In a retrospective observational study conducted at the Department of Cardiothoracic Surgery at Rigs Hospitalet, Copenhagen University Hospital, Denmark, 133 patients undergoing open surgical resection for esophageal SCC, between February 2010 and December 2015, were consecutively included. Cox regression analysis revealed that postoperative complications were associated with an increased mortality risk with an adjusted hazard ratio (HR) of 2.02 (95% CI: 1.1–3.7, P=0.025), specifically sepsis/septic shock (HR=3.84,95%CI (1.69–8.75), p<0.001) and

anastomotic leakage (HR=2.37, 95% CI (1.17–4.81), P=0.016) significantly reduced long-term survival [30].

A retrospective study conducted in Japan examined the long-term outcomes of patients who encountered complications and those who did not,70 patients with esophageal cancer who underwent salvage esophagectomy after definitive chemoradiotherapy were included. Using a Cox regression analysis, the relationship between morbidity and overall survival (OS) was assessed. To identify the risk factors for pulmonary complications, a logistic regression analysis was carried out. Development of postoperative pulmonary complications (HR=0.220, 95%CI (0.107-0.445) p<0.001) was independently associated with poor prognosis in patients who underwent salvage esophagectomy after definitive chemoradiotherapy. The survival rate of patients with pulmonary problems was considerably lower. Anastomotic leakage and radiation dosage did not affect long-term results (HR=0.661,95%CI (0.323-1.533) p= 0.312) [31].

In a different study done at Yokohama City University in Japan, 122 individuals who had esophageal cancer between 2008 and 2018 got curative surgery. The patients were divided into two groups: (i) the pneumonia group, which included those who had postoperative pneumonia, and (ii) the non-pneumonia group, which included those who did not. Postoperative pneumonia was a substantial independent risk factor for Overall Survival, according to a multivariate analysis. Compared to individuals without pneumonia, those with pneumonia had a decreased overall survival rate. (95%CI) =1.00-2.31, p=0.048; Hazard ratio (HR)=1.52 [32].

A retrospective study was conducted at Keio University Hospital in Tokyo, Japan, on patients with esophageal cancer who had esophagectomy with thoracotomy and laparotomy, with R0 or R1 resection, between January 1997 and December 2012. 284 patients out of 402 who could be monitored for more than five years were examined. ASA physical status (P = 0.039, HR = 1.877, 95%CI = 1.032-3.413, ASA3 compared to ASA 1/2,), pneumonia (P = 0.039, HR = 1.456, 95%CI = 1.020–2.079), age category (P = 0.042), and pathological N-stage (P < 0.001) were the independent prognostic factors, according to multivariate analysis that included pertinent prognostic factors established by univariate analysis and pneumonia [33].

In research carried out at Japan's Shizuoka General Hospital Between January 2007 and June 2016, 378 consecutive patients with thoracic esophageal cancer or esophagogastric junction cancer that

had esophagectomy with gastric conduit reconstruction were included. For 301 patients, ASA-PS status information was gathered. A surgeon reevaluated each patient's prior classifications using the upgraded standard in 2014 after the ASA-PS was modified, concealing the prior diagnoses. ASA-PS class was an independent predictive predictor for overall survival, according to multivariate Cox Regression analysis (HR=3.259, 95%CI = 1.588–6.685, p<0.001). that is, ASAIII in contrast to I and II [34].

In a study conducted in Taiyuan, China, 982 ESCC patients who had undergone esophagectomy between August 2010 and December 2015 were included and followed for six years. The Cox proportional hazards regression model was applied to discover independent prognostic factors. Compared with individuals with normal blood pressure, all patients with hypertension and newly diagnosed hypertension were reported to have lower overall and ESCC-specific survival results ($p < 0.05$). After adjusted in multivariate Cox regression analysis, hypertension (HR: 1.343, 95% CI: 1.064, 1.695; HR: 1.315, 95% CI: 1.039, 1.664) and newly diagnosed hypertension (HR: 1.414, 95% CI: 1.095, 1.826; HR: 1.420, 95% CI: 1.098, 1.836) were inversely associated with overall and ESCC-specific survival outcome, respectively The AJCC TNM staging's prognostic accuracy of the 5-year survival rate increased by 3.9% with the inclusion of tumor size. [35].

According to a study conducted in China. Tumor size, lymphadenopathy, grade of differentiation, stage of cancer, and family history of esophageal cancer were identified as significant prognostic factors by univariate Analysis. Tumor size, grade of differentiation, stage of cancer, and family history of esophageal cancer were found to be independent prognostic factors in multivariate analysis. The study also discovered that patients with mid and upper-segment esophageal squamous cell carcinoma, smaller tumor size, an earlier stage of cancer, and poor tumor cell differentiation had a significantly higher rate of positive family history than the other groups [25].

In a study conducted in Tianjin City, China The study included 387 individuals with Esophageal Small Cell Carcinoma (ESCC) who underwent curative resection. With an ideal cut-off point for tumor size, the patients were divided into small-sized tumors (SSTs) and large-sized tumors (LSTs). The log-rank test and Kaplan-Meier survival curve were utilized to assess the predictive significance of tumor size. The log-rank test and Kaplan-Meier survival curve were utilized to assess the predictive significance of tumor size. For multivariate analysis, a Cox regression model

was used. Based on the ideal cut-off point of 3.5 cm, 228 and 159 patients, respectively, had LSTs (≥ 3.5 cm) and SSTs (< 3.5 cm). Compared to individuals with SSTs, those with LSTs had considerably worse prognoses (23.9% vs. 43.2%, P < 0.001). Tumor size, histological type, invasion depth, and lymph node metastasis were found to be independent determinants of overall survival by multivariate analysis. [36].

Patients with primary ESCC who underwent radical esophagectomy participated in a retrospective cohort study between July 1, 2015, and July 31, 2021, in Fuzhou, China. Based on the ideal cut-off value of five points, the patients were split into low (n = 300) and high (n = 52) ACCI groups. The multivariate Cox regression results indicated that the Operative Survival had a significant relationship with the ACCI (HR = 1.63, 95%CI: 1.04–2.56), tumor size, tumor size (<3.3cm,>3.3cm) (HR = 1.67, 95%CI: 1.05–2.66), pTNM (II vs. I, HR = 4.74, 95%CI: 1.82–12.32; III vs. I, HR = 6.08, 95%CI: 2.37–15.60), and postoperative chemotherapy (HR = 0.60, 95%CI: 0.40–0.91). [37].

263 cases that had been treated at the Aga Khan University Hospital in Karachi, Pakistan, were reviewed retrospectively. The Cox proportional hazard model and the Kaplan–Meier method were used to analyze the data. In 81% of the cases, squamous cell carcinoma was identified, while adenocarcinoma was the second most prevalent kind. The presence or absence of obstruction, histology (squamous cell versus adenocarcinoma), serum albumin >2.5 mg/dl at diagnosis, low platelet count, and age at diagnosis were the variables affecting overall survival rate, according to univariate analysis. A multivariate analysis revealed that the following variables were independent predictors for survival: the presence or lack of obstruction [relative risk (RR) = 5.4; P = 0.025]; high (>150 × 109 /l) versus low platelet count at diagnosis; squamous cell carcinoma; against adenocarcinoma (RR = 2.8; P = 0.006) [38].

In a retrospective study conducted on esophageal cancer patients admitted to Tawhid Hospital located in western Iran Gender was not significantly associated with survival (Log-rank =0.480). Location of the tumor (log rank=0.014), histological type (log-rank ≤0.001), and grade of the tumor (log-rank =0.008) significantly influenced the survival rate variation [26].

In a study conducted in South Africa to evaluate the long-term outcome of esophageal resection for esophageal cancer. Survival was adversely affected by incomplete excision of macroscopic

tumor ($P < 0.001$), positive regional lymph nodes ($P < 0.05$), and distant lymphatic metastases ($P < 0.02$). Survival in patients undergoing curative esophagectomy with residual microscopic tumor, however, was significantly improved by irradiation of the tumor bed ($P < 0.01$) [19].

In a retrospective study of a patient cohort at Cape Town, South Africa's Groote Schuur Hospital. There were 1868 patient records available. Squamous cell carcinoma was the most common histology. regarding race ($P < 0.001$), performance status ($P < 0.001$), weight loss ($P = 0.001$), and past tuberculosis diagnosis ($P = 0.007$), there were notable differences ($P < 0.05$) in the patient's survival. Tumor parameters such as histological type, tumor size, and place were found to be strongly linked with the likelihood of survival. In patients with esophageal cancer, factors such as gender, smoking status, previous cancer experience, and pain from the tumor had no significant relationship with prognosis. [39].

At the Tikur Anbessa Specialized Central Referral Hospital in Addis Ababa, Ethiopia, a retrospective hospital-based longitudinal case series analysis was conducted. Over a six-year period, from November 2006 to November 2011, all patients were admitted with esophageal cancer and underwent trans hiatal esophagectomy surgery. Out of the 156 patients who had surgery for potential THE, 139 (89.1%) were deemed appropriate for the intended operation. The mean age of participants was 54.9 +/- 11.8 years, with a male-to-female ratio of 1:1.72. the presence of Grade III Dysphagia ($P<0.003$), Prolonged Hospital Stay ($P<0.01$), Intraoperative Transfusion of 2 Units of Blood ($P<0.001$), Estimated Blood loss (733.38+/- 380) ($P<0.000$), Intraoperative Complication ($P<0.018$) and Postoperative complications ($P<0.000$) were associated with increased risk of Mortality [40].

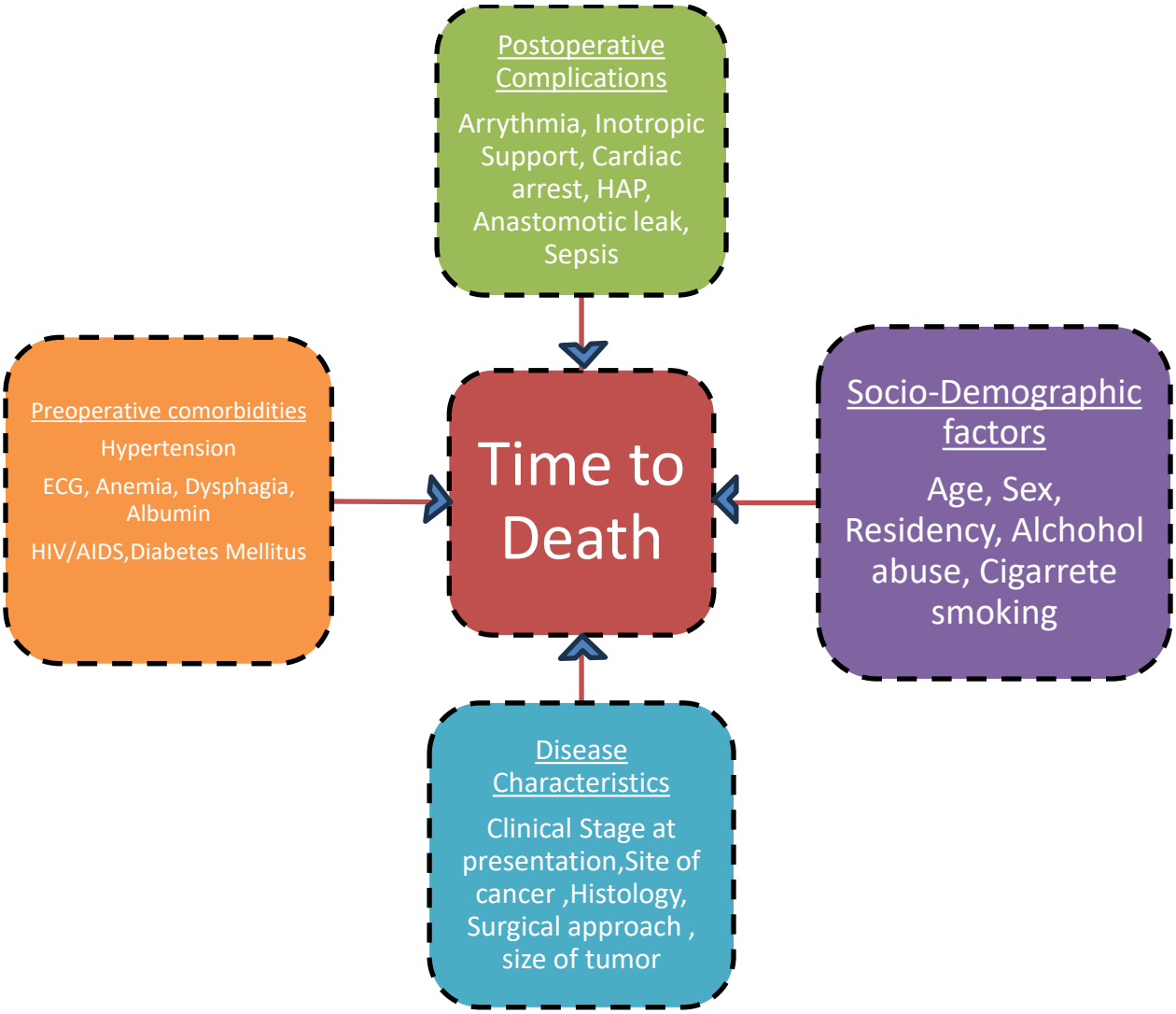

Figure 1: Conceptual Framework showing the factors affecting time to death following esophageal surgery in patients with esophageal cancer adopted from [5][10][17][22][31][41]

OBJECTIVE OF THE STUDY

3.1. General Objective

To assess the survival status and predictors of postoperative mortality in patients who underwent esophageal surgeries for esophageal malignancies at selected governmental hospitals from 2018-2022 GC Ethiopia, Addis Ababa

3.2. Specific Objective

To determine the time to death of patients who underwent esophageal surgeries for esophageal malignancies at selected governmental hospitals from 2018-2022 Ethiopia, Addis Ababa

To Identify the predictors of postoperative mortality in patients who underwent esophageal surgeries for esophageal malignancies at selected governmental hospitals from 2018-2022 Ethiopia, Addis Ababa

METHODOLOGY

4.1. Study Area and Period

The study was conducted in Addis Ababa the capital city of Ethiopia. In Addis Ababa city administration, a total of 13 hospitals are found. 4 governmental hospitals were selected for this study using the Purposive sampling technique. This method was selected to achieve the aims and objectives of the study because esophageal surgery is only performed at these 4 hospitals, to effectively evaluate patients diagnosed with esophageal cancer Particularly to focus on the subpopulation who underwent esophageal surgery to gather in-depth information from those particular groups while minimizing excessive cost and time. The 4 selected hospitals are Tikur Anbessa Specialized Hospital, Menelik II Hospital, Saint Paul Millenium Medical College, and Saint Peter Specialized Hospital.

Tikur Anbessa Specialized Hospital which is also known as Black Lion Specialized Hospital was established in 1972 E.C. It is the largest specialist hospital in Ethiopia and is now the main teaching hospital for clinical and preclinical training of many disciplines. The hospital is staffed by many health professionals from various disciplines. It has a total of 800 Beds and has about 17 operation theatres.

Menelik II Hospital is one of the well-known and oldest public hospitals in Addis Ababa. Today the hospital is operated by the Ethiopian Ministry of Health. The hospital surgery department provides all general, thoracic, urological, gynecological, orthopedics, and ophthalmic surgeries, and now 135 beds 8 operation rooms are available, and one PACU.

St. Peter's Specialized Hospital was established in 1953 EC. The hospital serves as a Specialized Hospital with more than 300 beds and provides different inpatient and outpatient services including counseling, HIV testing, and ART. It is administered under the Federal Ministry of Health of Ethiopia (FMOH). It is the first national hospital that started MDR-TB treatment in Ethiopia in April 2009. It was a center of excellence and training during the scaling up of MDR-TB treatment initiation centers in the country. This hospital is a referral hospital that receives patients from all parts of the country

SPHMMC was established in 1961 E.C. and is one of the biggest tertiary referral government hospitals. The hospital has a total of about 654 beds. Through its different ambulatory clinics and

wads, it provides ambulatory and in-hospital care for patients coming from different corners of the country.

Reviewing the medical records of esophageal cancer patients who underwent esophageal surgery from January 1, 2018, to December 30, 2022, and were admitted to the four designated governmental hospitals, was the method used to collect data between March 27 and April 20, 2024. The starting point for the follow-up was the time at which esophageal surgery was performed and the endpoint was December 30, 2023, which is the last day of the follow-up period, the date of death, the date of loss to follow-up, or the day of last contact.

4.2. Study Design

A Retrospective Cohort Study was Conducted by reviewing the medical charts of patients who had esophagectomy for esophageal malignancies at 4 selected governmental hospitals. This study design was selected to efficiently study the survival status of esophageal cancer patients who underwent esophageal surgery since exposure to esophageal surgery is a rare occurrence, in addition since temporality is clearly defined in a cohort study a time-to-event analysis was possible, furthermore, multiple exposures as well as outcomes can be measured at baseline allowing to include multiple predictors of operative mortality after esophageal surgery. In addition, the time and cost-effectiveness of the study design was also considered.

4.3. Source and Study Population

4.3.1. Source Population

All patients with esophageal malignancy who underwent esophageal surgery at the 4 selected governmental hospitals

4.3.2. Study Population

All patients who had esophageal Surgery for esophageal malignancy at the 4 selected governmental hospitals and were admitted to the surgical ward between 2018-2022 and who fulfill the eligibility criteria

4.4. Inclusion and Exclusion Criteria

4.4.1. Inclusion Criteria:

All patients who had esophageal Resection for esophageal malignancy between 2018-2022 and who fulfill the eligibility criteria

4.4.2. Exclusion Criteria:

esophageal cancer patients' cards with incomplete personal information such as age, sex, date of first diagnosis, and type of treatment received during data collection will be excluded from the study.

4.5. Sample Size Determination

For the first objective, the Sample size was determined using the equation for a single population proportion

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

where:

n= sample size

p=proportion of Operative mortality among esophageal cancer patients is 10% (from a study conducted at Shaab Hospital in Khartoum, Sudan**)**[18]

d= margin of error 5%

Z= confidence interval 95%

When substituting values in the formula $n = \frac{1.96^2 10\%(1-10\%)}{0.05^2}$= 140

Final sample size 140+ Incomplete/ lost Charts (10%) = 154

Using a formula for Cox proportional hazard regression with two covariates for epidemiological study design, the sample size for the second objective(predictors) was calculated; by considering Tumor Size as the major predictor variable based on a study done in China [36]. The sample size was calculated by using R version 4.3.3, Using the "powerSurvEpi" package and "sszeEpi" function utilizing the equation below.

$$n = \frac{(Z1-\propto/2+Z1-\beta)^2}{[log(\theta)]^2 p(1-p)\varphi(1-\rho^2)}$$

Where:

n= sample size

Za = the 100a-th percentile of the standard normal distribution

φ = is the proportion of subjects who died of the disease of interest = 0.239

ρ = corr (X_1, X_2) = (P_1-P_0) $\times \sqrt{\frac{q(1-q)}{p(1-p)}}$, and P = Pr($X_1$=1), q = ($X_2$ = 1), P_0 = Pr (X_1 = 1|X_2 = 0), and P_1 = Pr (X_1 = 1|X_2 = 1).

X_1 = the number of subjects that died and survived has to be a binary variable taking two possible values: Zero and one

X_2 = the number of subjects in the covariate tumor size (small size tumor (159) vs large size tumor (228)) in the previous study this covariate can be binary or continuous.

θ = exp(β1) i.e. Hazard ratio which is found to be 1.7 for LSTs

P= proportion of subjects taking the value of 1 in the previous study it was those who had Large sized tumor 0.5891

Z α/2: 95% confidence interval (0.05)

Zβ: 90% power

When substituting values the output was 413 and after adding a 10% non-response rate n= 458

The independent variable Tumor size resulted in the largest sample size [36] than the sample size obtained using the single population proportion formula. As a result, the study's final sample size was determined to be the largest sample size (N= 458).

408 patients were diagnosed with esophageal cancer and underwent esophageal surgery at the 4 selected governmental hospitals between January 1st, 2018 to December 30th, 2022 and only 246 clients' Medical Charts could be found as a result all 246 patients who fulfilled the eligibility criteria were included in the study.

4.6 Sampling Technique and Procedure

First, the total number of patients who underwent esophageal resection between January 1st, 2018 to December 30th, 2022 was identified from the medical Log book at Each hospital's Operation Theatre. Afterward, the Medical Records of those patients were acquired and information was

collected. Finally, the selected medical charts were followed for a minimum of 30 days and a maximum of 6 years after esophagectomy. Out of 408 patients who had esophageal surgery, 25 patients were excluded from the study because of incomplete information and 5 patients had a different diagnosis the rest i.e. 132 medical records could not be found. Thus only 246 patients were included in the study.

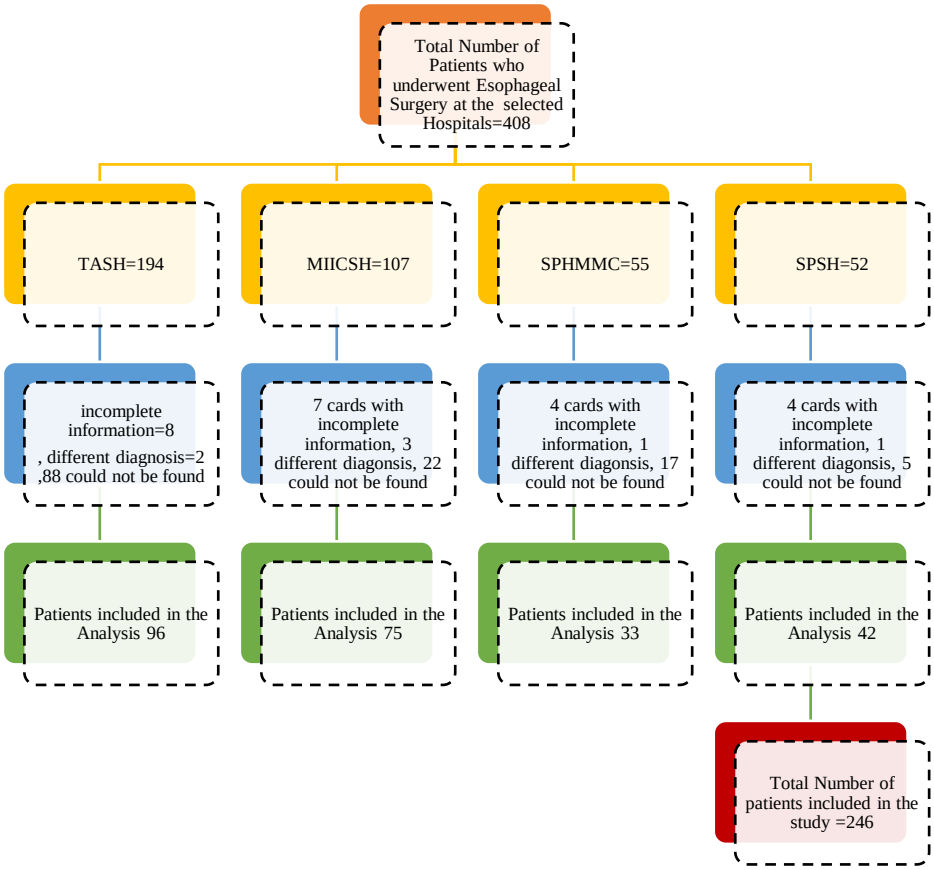

Figure 2: The number of participants at each hospital and total number of participants included in the study

4.7. Variables

4.7.1. Dependent Variables

Time to death after esophagectomy

4.7.2. Independent Variables

Socio-demographic variables (Age, gender, residency), ASA Class, Functional Capacity, History of Alcohol Abuse, Clinical Stage at presentation, site of Cancer, Histology of Cancer, Surgical approach, Preoperative Comorbidities, Postoperative complications.

4.8. Data Collection and Instruments

The data was collected by 2 selected and trained Anesthesiology Professional I clinicians by reviewing the chart and Cardiothoracic surgical registry using a pretested structured data extraction form (checklist) which incorporated the following variables medical registration number of patients, date of admission, age, gender, ASA Class, metabolic equivalent, Disease Characteristics, Preoperative Comorbidities, postoperative complications. The final status of the patients was identified by looking for the Death Certificate and Death Summary on the medical Records When the death certificate could not be found, a phone call was made to the patients or attendants to assess the event status, During the phone interview additional data was gathered that was not available from the patient chart or medical register. At the end of data collection, the patient's charts were returned to their original place. A one-day training covering the goal of the study, the content of the questionnaire, and field methods was given to data collectors.

4.9. Data Quality and Control

To ensure the quality of data, a pretest of the data collection was carried out on 5% of the samples which were not included in the main study. Data was checked for completeness, accuracy, and clarity on the day of collection by the principal investigator. Data clean-up and crosschecking were done before analysis.

4.10. Data Analysis

After the data was acquired by reviewing the medical records of clients who underwent esophageal surgery by using the Google Forms online platform the data was Exported coded into numerical Variables and analyzed by using R Version 4.3.3 and RStudio Build 735. Categorical variables were summarized using frequency distribution and continuous variables were expressed in terms of dispersion and mean.

The dependent variable was dichotomized into death and censored. The Kaplan-Meier technique was used to create a survival table that revealed the likelihood of survival following successful surgery at different time points. In addition, the Kaplan-Meier Curve was generated to Visually assess the survival probabilities, and the log-rank test was used to test the null hypothesis of no difference in survival between 2 groups within each covariate. Cox regression was performed to find out predictors of survival time. Variables (Predictors) that fulfill the assumption of

proportional Hazards and have a significant impact on time to death (i.e. Schonfeld test) were considered for bivariate Cox regression.

In addition, the linearity assumption was tested for continuous variables using martingale residuals, and the deviance residual plots were used to assess for Outliers in addition to the proportional hazard's assumption were considered for bivariate Cox regression.

Bivariate Cox regression was carried out using each predictor variable and the time-to-death variable and those independent variables which turned out to have an impact on time-to-death on the bivariable Cox regression at a p-value of less than or equal to 0.25 were included in the multivariable analysis.

Multivariable Cox regression was performed at a 0.05 level of significance to determine the net effect of each Predictor variable on time to death. Overall model fitness was checked using the C-Index C = 1 means a perfect prediction accuracy, while C = 0.5 means a random prediction [42], furthermore, the likelihood ratio test, Wald test, and log-rank test were used to assess model fitness.

To double-check the model fitness Stepwise Akaike information criterion metric was used to identify the Cox proportional hazards model that best fits the data set after computing the AIC the model with the lowest AIC value was selected this model included most of the variables included in the multivariate cox regression model obtained by manually entering covariates with p value less than 0.25 in the bivariate model however since the stepwise AIC model included some variables which did not fulfill the cox proportional hazards assumption the initial model was used for final analysis.

These models' outcomes were presented as hazard ratios (HRs) with a 95% confidence interval, and statistically significant factors were found using P-values.

4.11. Operational Definitions

Operative mortality: all deaths in the hospital and deaths that occurred during the study period in patients who had been discharged.

Censored: Individuals who dropped from the follow-up before the event, possess insufficient details regarding the date of death, who passed away from recognized causes unrelated to esophageal cancer or surgery, who do not have phone numbers on file and whose condition is not

known at the time of data collection, were censored to the last follow-up date. Patients who survived until the last follow-up date were censored to December 30, 2023.

Event: Death of patients after esophageal Surgery

Start and end date of follow-up: -The starting date of follow-up was the date at which esophageal surgery was performed (January 1st, 2018 to December 30th, 2022). The end date was the date at which the patient's final status on the follow-up is determined, this may be anything from censorship to death or the end of the study which is December 30th, 2023.

Follow-up period: The time from the beginning of the study period to an event, end of the study, or loss of contact or withdrawal from the study.

Survival time: The difference between the last date of contact and the date at which a participant had esophageal surgery

Survival status: The status of the patient's survival outcome (death) or censored.

Time to death: The Time from esophageal Surgery to death of the participant

Incomplete data: When one of the independent variables was not registered.

postoperative mortality: defined as death within 30 days of esophagectomy or death during the hospitalization in which the primary surgical procedure was performed.

4.12. Ethical Considerations

Letter of permission was obtained from Addis Ababa University College of Health Sciences, Ethical Review Board for TASH and Addis Ababa Public Health and Emergency Management Directorate(AAPHEMD) for MIICSH and Research and Evidence Generation Directorate The Research Ethical Review Committee Office (RERCO) of SPSH and SPHMMC-IRB for SPHMMC to conduct data collection at each respective hospitals for ethical approval before data collection and then it was submitted to Directors of the Medical Record Room.

The Information Acquired was used only for study purposes and the privacy of every patient's information was kept confidential. To keep confidentiality data was collected using the Google Forms online system and once data was collected and submitted it could only be accessed by the

principal investigator's email address and password. After the entry of data into statistical software, The Primary investigator and advisors were the only ones with access to the password-protected data. After completion of the research, records were returned to their original place. The data was collected by 2 selected and trained Anesthesiology Professional I Clinicians.

4.13. Result Dissemination Plan

After the finalization of the study, the result will be submitted to TASH and the Department of Anesthesia and MIICSH, SPCSH, and SPMMC Department of Anesthesia. Efforts will be made to publish the findings of the study and disseminate them through different journals and scientific publications. The findings will further be disseminated to administrative bodies of the hospital and policymakers at the national level through presentations and discussions.

RESULTS

5.1. Sociodemographic And Behavioral Characteristics of Study Participants

246 patients underwent esophageal surgery majority of patients came from a rural area 164 (66.7%). The mean age of patients was 52.1 years (SD: 10.82), and 154 (62.6%) were females. More than half (61.4%) were from the Oromia region. 12(4.9%) had a history of alcohol Intake and Cigarette smoking.

Table 1: sociodemographic and behavioral characteristics of patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
Age(in Years) Mean-SD	52.1	10.815
Sex		
Male	92	37.4
Female	154	62.6
Residency		
Urban	82	33.3
Rural	164	66.7
Region		
Oromia	151	61.4
Amhara	22	8.9
SNNPR	37	15
Tigray	0	0
Somali	2	0.8
Afar	2	0.8
DireDawa	3	1.2
Addis Ababa	29	11.8
History of Alcohol Intake		
Yes	12	4.9
No	234	95.1
History of Cigarette Smoking		
Yes	12	4.9
No	234	95.1

5.2. Physical And Functional Status of Patients Before Surgery

205(83.3%) of patients had ASA physical status classification score of more than 3 similarly a large number of patients 236 (95.9%) had a functional capacity of more than 4 metabolic equivalents.

Table 2: physical and functional status of patients of patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
ASA PS Class		
>III	205	83.3
<III	41	16.7
Functional Capacity		
<4METs	10	4.1
>4METs	236	95.9

5.3. Tumor Characteristics of Esophageal Cancer

127(51.6%) of patients had a T4 esophageal cancer before the surgery and the majority of patients had a tumor size of less than 3.3cm 166(67.5%) the most common Anatomical site of the tumor was the Lower third region 152 (61.8%) and Squamous Cell carcinoma accounted for 207(84.1%) of cases.

Table 3: clinical stage, length of tumor, histologic types, and anatomic location of esophageal cancer in patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
Clinical Stage (T stage) at Presentation		
T1	5	2
T2	16	6.5
T3	98	39.8
T4	127	51.6
Site of Cancer		
Upper Third	4	1.6
Middle Third	41	16.7
Lower Third	152	61.8
Gastroesophageal Junction	49	19.9
Histology of Esophageal Cancer		
Adenocarcinoma	39	15.9
Squamous Cell Carcinoma	207	84.1
Size of Tumor		
<3.3cm	166	67.5
>3.3cm	80	32.5

5.4. Surgical Approach and Non-Surgical Treatments Provided for The Patients

Trans-Hiatal (Orringer) Approach was the most commonly used technique for esophagectomy 85(34.6%) and only 8(3.3%) patients received chemotherapy or radiotherapy before surgery.

Table 4: surgical approach and non-surgical treatments for patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
Surgical Approach		
Ivor Lewis	35	14.2
Trans Hiatal (Orringer)	85	34.6
Left Thoracoabdominal (Sweet)	41	16.7
Three Hole (McKeown)	22	8.9
Feeding Tube	63	25.6
Induction Therapy		
None	238	96.7
Chemo/Radiotherapy	8	3.3

5.5. Preoperative Comorbidities

Cardiovascular diseases accounted for the majority of comorbidities in the preoperative period 20(8.1%) of patients had Hypertension and 9(3.7%) were taking calcium channel Blockers. 62(25.2%) of patients had an abnormal ECG finding and on Echocardiography 52 (21.1%), 5(2%), 6(2.4%), 7(2.8%) had a Grade I diastolic dysfunction, Pulmonary Hypertension, Pericardial Effusion and Valvular Heart Disease Respectively. A small number of patients had pulmonary complications in the preoperative Period.

3(1.2%) and 9(3.7%) had Diabetes Mellitus and HIV/AIDS respectively. 15(6.1%) patients complained of cough during the preoperative period in addition 3(1.2%) patients had an elevated serum creatinine level conversely 42 (17.1%) patients had a decreased serum potassium Level.

Table 5: preoperative comorbidities of patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
CARDIOVASCULAR		
Hypertension		
Yes	20	8.1
No	226	91.9
Calcium Channel Blocker use		
Yes	9	3.7
No	237	96.3
ECG		
Abnormal	62	25.2
Normal	184	74.8
Preoperative HGB/HCT, anemia		
Low	59	24
Normal	187	76
Echocardiography		
Normal	194	78.9
Grade I Diastolic Dysfunction	52	21.1
Valvular Heart Disease		
Yes	7	2.8
No	239	97.2
Other		
Diabetes		
Yes	3	1.2
No	243	98.8
HIV/AIDS, Retroviral Infection		
Yes	9	3.7
No	237	96.3
Cough		
Yes	15	6.1
No	231	93.9
Renal Function (Serum Creatinine)		
High	3	1.2
Normal	243	98.8
Serum Potassium Level		
Normal	204	82.9
Low	42	17.1

5.6. Preoperative Nutritional Status

A large number of patients presented with grade IV dysphagia 100 (40.7%) and 26(10%) had a weight loss of more than 10% body weight in the previous six months during preoperative evaluation subsequently 85(34.6%) and 30(12.2%) had an associated Hypoalbuminemia and History of Vomiting Respectively.

Table 6: Preoperative Nutritional Status of Patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
Dysphagia Grade		
I	2	0.8
II	21	8.5
III	42	17.1
IV	100	40.7
V	45	18.3
VI	36	14.6
Weight loss during the previous 6 months		
<10% of Body Weight	219	89
>10% of Body Weight	26	10
Serum Albumin		
>3.5mg/dl	161	65.4
<3.5mg/dl	85	34.6
Vomiting		
Yes	30	12.2
No	216	87.8

5.7. Postoperative Complications

Complications classified as other complications were the most common in the postoperative period these include ICU Admission 54(22%), Septic Shock 20(8.1%), Reoperation 24(9.8%), Renal Failure 10(4.1%) and Tracheostomy 2(0.8%).

Followed by Pulmonary Complications including Hospital Acquired Pneumonia, Pneumothorax 10(4.1%), Pleural Effusion 9(3.7%), and Aspiration Pneumonia 5(2%). Surgical complications such as Cervical Anastomotic Leak 20(8.1%), Feeding Tube Complication 4(1.6%), Chylothorax 4(1.6%) and Wound Dehiscence 2(0.8%).

From cardiovascular complications, Inotropic support 16(6.5%) accounted for the large majority of complications in the postop period followed by Cardiac arrest 6(2.4%).

Infections complications were the rarest in the postoperative period wound infection and Empyema accounted for 11(4.5%) and 9(3.7%) of cases.

Table 7: postoperative complications of patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
CARDIOVASCULAR		
Inotropic Support		
Yes	16	6.5
No	230	93.5
Cardiac Arrest		
Yes	6	2.4
No	240	97.6
PULMONARY		
Hospital Acquired Pneumonia		
Yes	29	11.8
No	217	88.2
Aspiration Pneumonia		
Yes	5	2
No	241	98
Pneumothorax		
Yes	10	4.1
No	236	95.9
Pleural Effusion		
Yes	9	3.7
No	237	96.3
SURGICAL		
Cervical Anastomotic Leak		
Yes	20	8.1
No	226	91.9
Feeding Tube complication		
Yes	4	1.6
No	242	98.4
Chylothorax		
Yes	4	1.6
No	242	98.4
INFECTIOUS		
Wound Infection		
Yes	11	4.5
No	235	95.5
OTHER COMPLICATIONS		
Septic Shock		
Yes	20	8.1
No	226	91.9

Renal Failure		
Yes	10	4.1
No	236	95.9
Reoperation		
Yes	24	9.8
No	222	90.2
ICU Admission		
Yes	54	22
No	192	78
Intraoperative Blood Loss		
<1000ml	235	95.5
>1000ml	11	4.5
MORTALITY		
Death within 30 Days		
Yes	21	8.5
No	225	91.5

11(4.5%) of patients had a blood loss of more than 1000 ml during Surgery. the 30-day mortality was 8.5%.

5.8. Postoperative Analgesia

Epidural Analgesia 45(18.3%) was the most used pain management technique followed by PVB, ESPB, Rectus Sheath, Subcostal and Surgical site LA infiltration which accounted for 18(7.3%), 10(4.1%), 3(1.2%), 3(1.2%) and 2(0.8%) respectively.

Table 8: types of postoperative analgesia provided for patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022

Variables	Frequency	Percentage
Epidural Analgesia		
Yes	45	18.3
No	201	81.7
Erector Spinae Plane Block		
Yes	10	4.1
No	236	95.9
Paravertebral Block		
Yes	18	7.3
No	228	92.7
Rectus Sheath Block		
Yes	3	1.2
No	243	98.8
Subcostal Block		
Yes	3	1.2
No	243	98.8
Surgical Site LA Infiltration		
Yes	2	0.8
No	244	99.2

5.9. Survival Rate of Esophageal Cancer Patients Who Underwent Esophageal Surgeries

The Overall 1,2-,3-,4- and 5-year survival Rate was 49.8%, 30.2%, 15.4%, 15.4% and 10.3% respectively. And the median survival time was 12 months. A total of 95 patients died during the 1940 person-month follow-up period, resulting in an incidence rate of 48.9 per 1000 person-months.

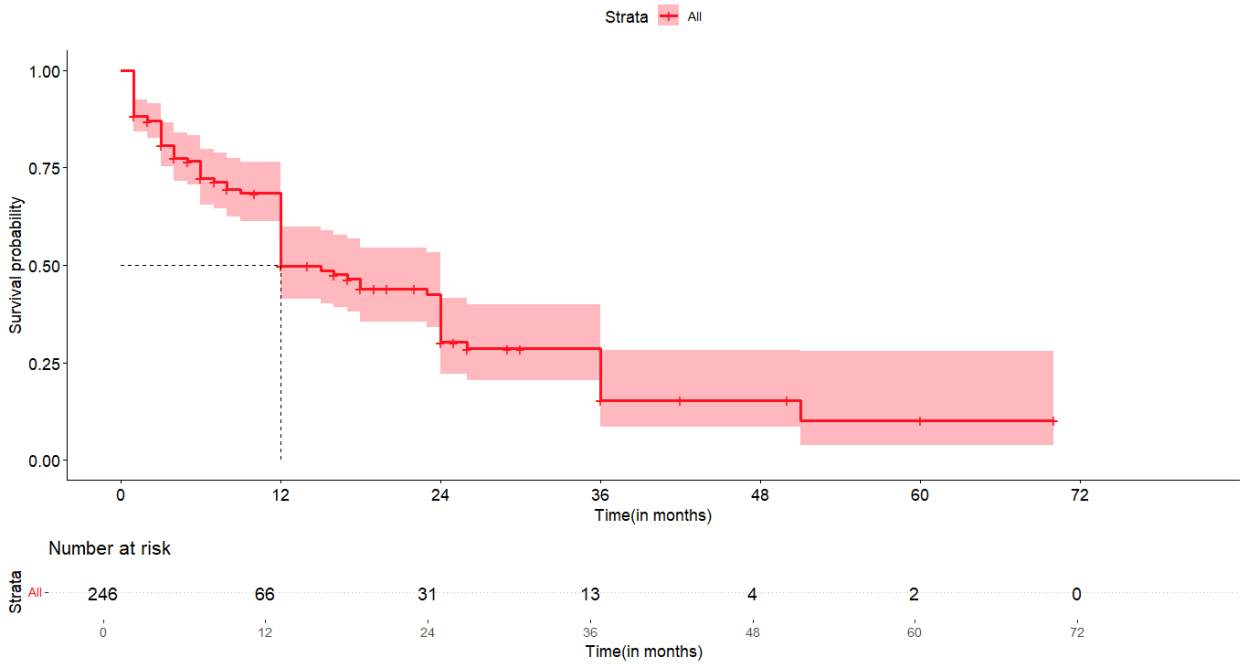

Figure 3: Kaplan-Meier curve of the overall survival pattern of patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected governmental hospitals, Addis Ababa, Ethiopia, 2018-2022 GC

5.10. Variation In Survival Rates Among Groups

There was a difference in survival between groups in the covariates, Tracheostomy, Chylothorax, Induction Therapy, Postoperative Cardiac Arrest, Postoperative MI, Postoperative Hospital Acquired Pneumonia, Pulmonary Embolism, Postoperative Renal Failure, Postoperative Inotropic Support, Reoperation, Anasarca, Postoperative Anastomotic Leak, ASA Physical Status Classification, Hypertension, Systemic Sepsis and Length of Tumor.

Individuals with ASA Physical status score of less than 3 and who had Hypertension during the preoperative period had poor survival ((log-rank, P=0.0019, P=0.0044 Respectively)

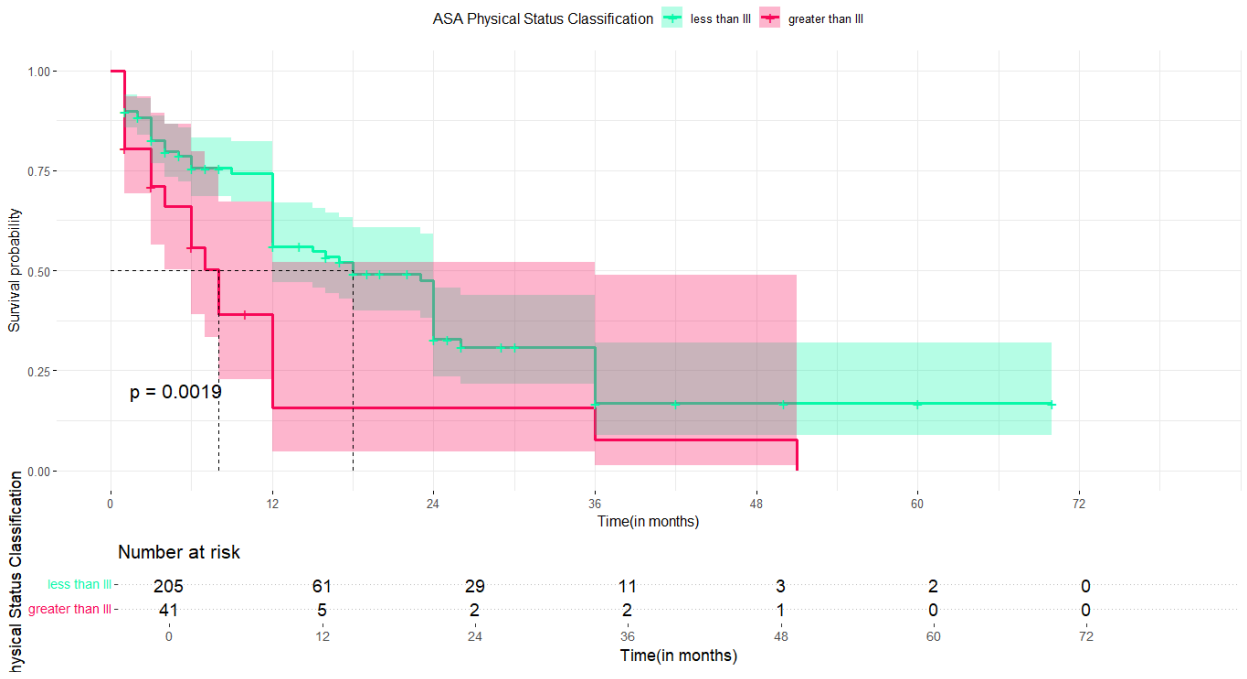

Figure 4: The difference in overall survival based on ASA PS Classification in patients who underwent esophageal surgeries for esophageal malignancy, Addis Ababa, Ethiopia (Log-rank test, p=0.0019)

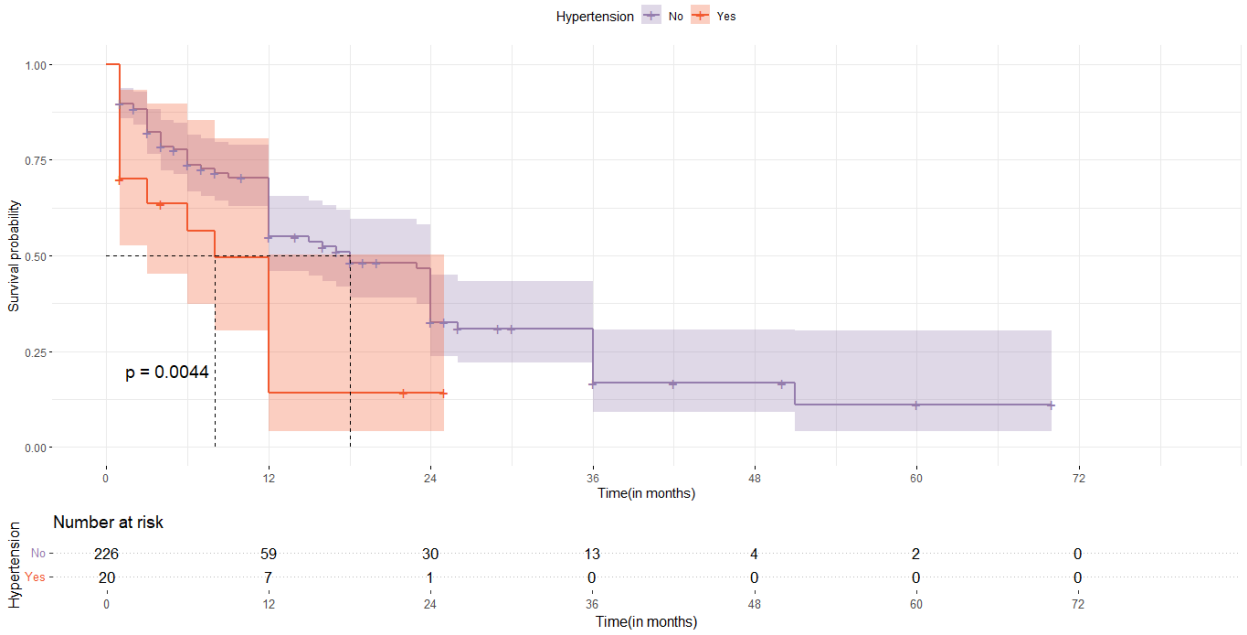

Figure 5: The variation in overall survival based on the presence or absence of Hypertension in patients who underwent esophageal surgeries for esophageal malignancy, Addis Ababa, Ethiopia (Log-rank test, p=0.0044)

Patients who had cardiac arrest, MI, HAP, PE, Renal Failure, Reoperation, Anasarca, Inotropic support, anastomotic leak, Systemic Sepsis, and Chylothorax had a lower survival rate compared

to their counterparts (log-rank, P=0.0001, P=0.0062, P<0.0001, P=0.00011, P<0.0001, P=0.00017, P=0.0018, P<0.0001, P<0.0001, P<0.0001, P<0.0001)

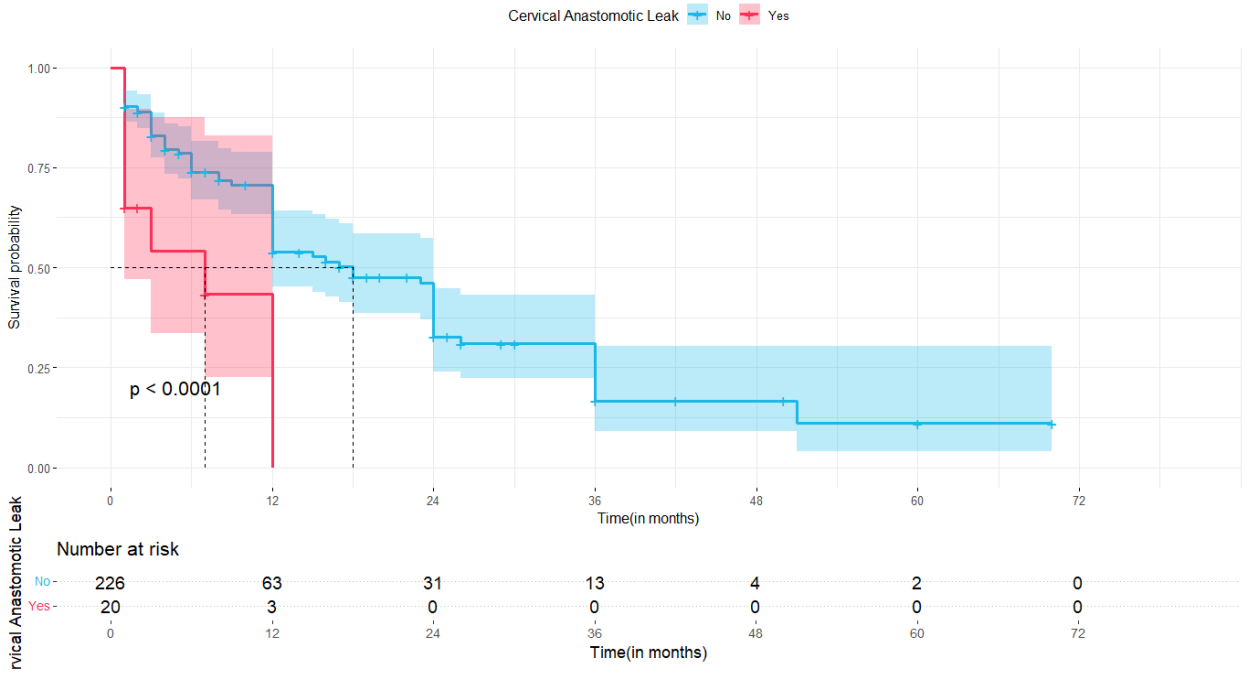

Figure 6: The variation in overall survival based on Postoperative Cervical Anastomotic Leak in patients who underwent esophageal surgeries for esophageal malignancy, Addis Ababa, Ethiopia (Log-rank test, p<0.0001)

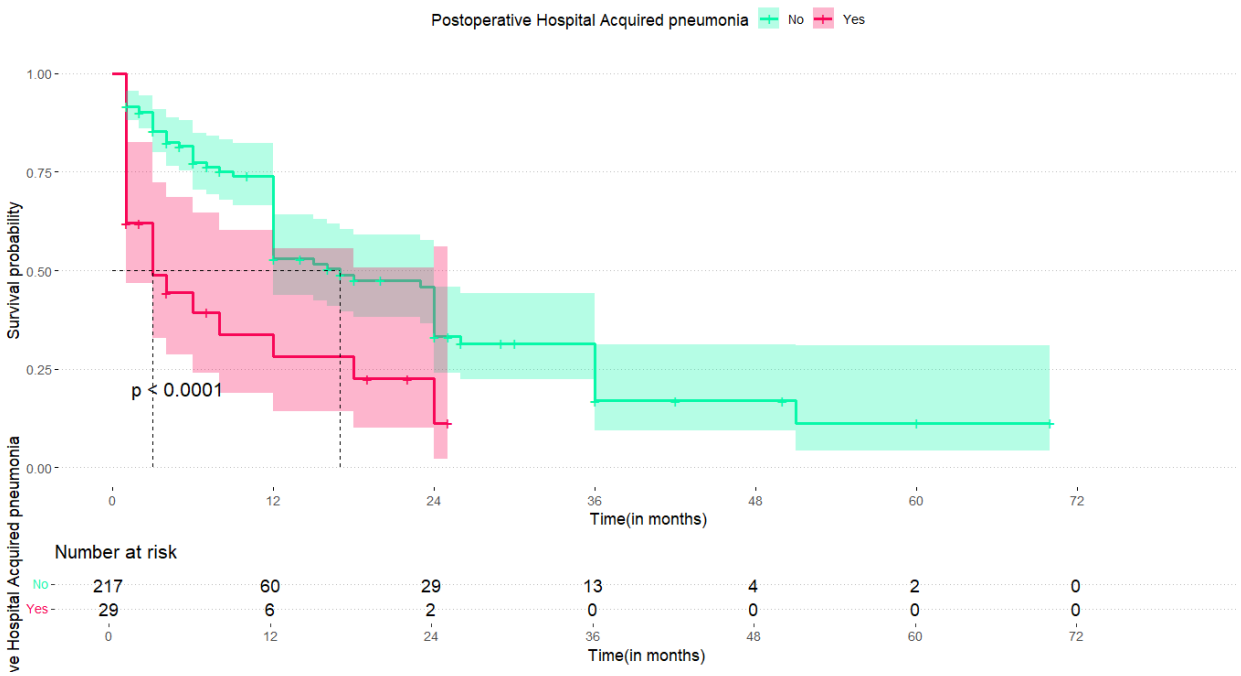

Figure 7: The Difference in overall survival based on Postoperative Hospital Acquired Pneumonia in patients who underwent esophageal surgeries for esophageal malignancy, Addis Ababa, Ethiopia (Log-rank test, p<0.0001)

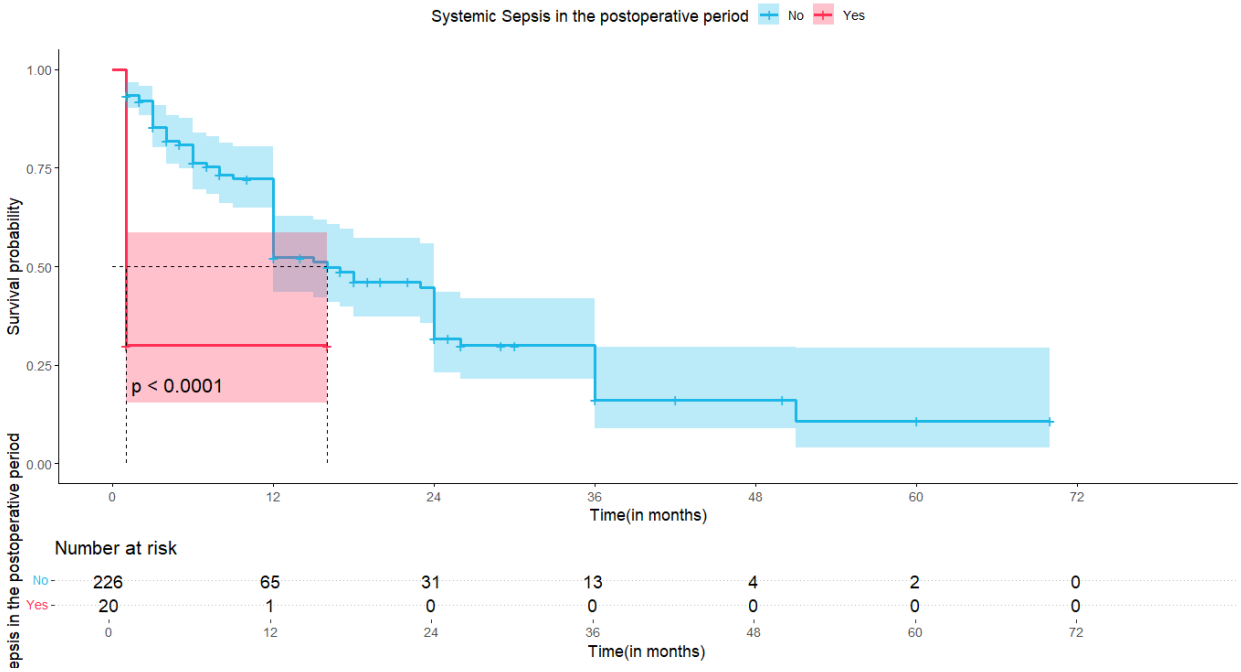

Figure 8: The difference in overall survival based on Postoperative Systemic Sepsis in patients who underwent esophageal surgeries for esophageal malignancy, Addis Ababa, Ethiopia (Log-rank test, p<0.0001)

5.11. Predictors Of Survival Among Esophageal Cancer Patients

ASA Physical Status classification, Postoperative Systemic Sepsis, Postoperative Hospital Acquired Pneumonia (HAP), Postoperative Cervical Anastomotic Leak, and Preoperative Hypertension were found as Predictors of Survival in Multivariate Cox Regression Analysis adjusting for Induction Therapy, Length of tumor, Pulmonary Hypertension, Calcium Channel Blocker use, Diabetes Mellitus, Postoperative Inotropic Support, Postoperative Empyema, Renal Failure, Postoperative Pleural Effusion, Reoperation and Intraoperative Blood Loss.

The overall Regression model was a better fit than the null model as shown by the Log-rank test($P<0.001$), Wald test($P<0.001$), and likelihood ratio test($P<0.001$)

Goodness-of-fit was also tested using the C-Index (concordance = 0.758)

The Hazard of death is increased by 93% at any given point in time in Patients with an ASA PS score of more than III in the preoperative period compared to their counterparts adjusting for other covariates in the multivariate regression model. (AHR = 1.93, 95%CI 1.10-3.38).

The death rate increased by 95% for patients who develop HAP in the postoperative period compared to those who don't. (AHR = 1.95, 95%CI: 1.06-3.59).

At a given instant in time, the probability of death for patients with preoperative Hypertension is increased by a factor of 2.22 than those who do not have Hypertension (AHR = 2.22, 95%CI: 1.04-4.73).

Clients who develop Cervical anastomotic Leak in the postoperative period are 2.17 times as likely to die as compared to the other group. (AHR = 2.17, 95%CI: 1.00-4.67).

The Hazard of death is increased by a factor of 3.69 for patients who developed systemic sepsis in the postoperative period compared with their counterparts. (AHR = 3.69, 95%CI: 1.49– 9.11).

Table 9: Predictors of Postoperative Mortality in patients who underwent esophageal surgeries for esophageal malignancies

Predictors	CHR (95%CI)	AHR (95%CI)
ASA PS Classification		
>III	2.14(1.30-3.49)**	1.93(1.10-3.38)*
<III	Reference	
Postop HAP		
Yes	2.80(1.67-4.62)***	1.95(1.06-3.59)*
No	Reference	
Postop Sepsis		
Yes	8.25(4.48-15.19)***	3.69(1.49-9.11)**
No	Reference	
Postop Cervical Anastomotic Leak		
Yes	3.66(1.96-6.86)***	2.17(1.00-4.67)*
No	Reference	
Preop Hypertension		
Yes	2.38(1.34-4.24)**	2.22(1.04-4.73)*
No	Reference	

*P < 0.05; ** P < 0.01, *** P < 0.001

DISCUSSION

In this multicenter cohort study, the overall survival status of patients who underwent esophageal surgeries for esophageal malignancy at the 4 selected hospitals was assessed Moreover the predictors of postoperative mortality were also identified.

The overall 2,3- and 5-year survival of esophageal cancer patients who underwent surgery at the 4 selected hospitals was low and the results are supported by a study done in South Africa where the 5-year survival rate was 13.2% [19].

In contrast, the 3 and 5-year survival rates are very low compared to Upper-middle income countries like Brazil 5-year survival rate of 56.6% for squamous cell carcinoma and 58% for adenocarcinoma [24], and China 3-year and 5-year survival rates of 43.7% and 26.2% respectively. [25], this could be explained by the differences in the accessibility of health care centers with the required equipment and professionals required for early diagnosis and treatment further more than half of the patients in this study had a Grade T4 Esophageal cancer during the preoperative period this shows the poor preventive screening habits in Ethiopia and maybe the potential cause for the decreased survival rate.

The overall survival rate was also lower than Lower-middle income countries such as Iran 3 year and 5-year survival rates of 30.6% and 21.3% respectively [26] and Low-income countries like Egypt with a 3-year survival of 79.6% [20] and Sudan's 5-year survival rate 21% [18]. Genetic susceptibility and nutritional habits could be the reason for these differences.

In this study the median survival time was 12 months in a study conducted in Maputo Hospital South Africa it was 3.5 months. Conversely, the median survival time in this study was lower in Sudan where the median survival time was 720 days (24 months).

The 30-day post-operative mortality rate in this study was 8.5%. which is close to the mortality rate reported in Sudan at 10% [18]. However, it is higher than the perioperative mortality rate of 6.5% in a study conducted in Cairo. this difference may be the result of delayed admission of patients to the hospital after the disease has reached an advanced stage and long-term nutritional deficiency.

In this study patients' likelihood of death is increased by 93% at any given point in time in Patients with an ASA PS score of more than III in the preoperative period compared to the other group. (AHR = 1.93, 95%CI 1.10-3.38).Coherently in two studies conducted in Japan ASA-PS class was an independent prognostic factor for overall survival(HR= 3.259, 95%CI = 1.588–6.685 p<0.001). i.e. ASAIII compared to I and II.,)[33] and ASA physical status (*P* = 0.039, AHR 1.877 95%CI 1.032-3.413) ASA 3 compared to ASA 1 or 2) [34]. furthermore, research conducted in Germany is also consistent with our results ASA physical status IV (P < .0001, AHR=1.88,95% CI (1.37–2.57) [28]. since higher ASA physical status classification shows a higher number of systemic diseases in a patient, creating an awareness of identification and early screening and treatment of non-communicable and communicable diseases as well as the deleterious effects of excessive drug use (alcohol, smoking, and other recreational drugs) habits on health is important as this could potentially improve survival after esophageal surgery.

In addition, the rate of death is increased by 95% for patients who develop HAP in the postoperative period compared to those who don't. (AHR = 1.95, 95%CI: 1.06-3.59). Similarly, The development of postoperative pneumonia was found to be a risk factor for decreased overall survival after esophageal surgery in a study conducted in Yokohama, Japan (AHR)=1.52, (95%CI)=1.00-2.31, *p*=0.048)[32] and Tokyo (*P* = 0.039, AHR: 1.456, 95%CI 1.020–2.079)[33] the decreased survival rate could be explained by the effect of pneumonia on impairment of the immunological system which may adversely affect esophageal cancer recurrence this is because of the relation of pneumonia to tumor progression through the development of inflammatory cytokines such as IL-8 [43]. Hence strategies to prevent pneumonia following surgeries should be implemented to improve overall survival.

This study also showed at a given instant in time, the Hazard of death for patients with preoperative Hypertension is increased by a factor of 2.22 than those who do not have Hypertension (AHR = 2.22, 95%CI: 1.04-4.73). likewise, Hypertension was an independent risk factor and resulted in an inferior prognosis for patients who had undergone esophagectomy in a study conducted in China (HR: 1.315, 95% CI: 1.039, 1.664) [35]. the biological mechanisms linking hypertension with cancer are scarce however based on previous studies increased expression of cytosolic calcium and inositol triphosphate involved in the pathogenesis of hypertension has been hypothesized to be involved in the early events of cell proliferation that may activate the endogenous oncogenes

[44]. Thus, to decrease mortality after esophageal resection it is critical to decrease the overall prevalence of hypertension by creating awareness and promotion of screening and treatment of the disease as well as early initiation of postoperative chemotherapy in affected patients.

Furthermore, clients who develop Cervical anastomotic Leak in the postoperative period are 2.17 times as likely to die as compared to the other group. (AHR = 2.17, 95%CI: 1.00-4.67). which is supported by studies conducted in Denmark(AHR = 2.37, 95% CI (1.17–4.81), P=0.016)[30] and Germany (P = .001, HR=2.29,95% CI(1.43–3.69))[28] The lower survival may be due to the probable immune suppression generated in the context of anastomotic insufficiency and subsequent local infection.[45]The resultant systemic inflammation may damage the cell-mediated immunity and notably the function of natural killer cells and cytotoxic T lymphocytes, encouraging the development and proliferation of micrometastases [46]. Hence, Timely initiation of postoperative Chemotherapy is beneficial to decrease tumor progression and improve survival however, our results contradict the findings of a study conducted in Amsterdam [29] and Japan [33] where Anastomotic Leakage did not affect long-term survival. This difference may be explained by Advanced surgical techniques and access to early postoperative systemic management in these areas.

Finally, The Hazard of death is increased by a factor of 3.69 for patients who developed systemic sepsis in the postoperative period compared with their counterparts. (AHR = 3.69, 95%CI: 1.49–9.11). In a Danish study, sepsis/septic shock significantly decreased long-term survival (AHR=3.84, 95%CI= (1.69-8.75), p<0.001). This could be attributable to the individuals' heightened immunological vulnerability after surgery, as well as the activation of pathways including IL-32 [47]. Hence, it is beneficial to cultivate the practice of early initiation of empirical antibiotics to improve survival.

It has often been proposed that tumor size is a key indicator of cancer survival. However, the ideal cut-off value of the tumor size is currently still under discussion. In this study Using a cutoff point of 3.3cm patients with a tumor size of more than 3.3 cm had a lower survival rate this is supported by a study conducted in China Tenjin City which used a log-rank test to evaluate the prognostic value of tumor size. patients presented with large-size tumors had significantly worse prognoses than patients with small-size tumors (23.9% vs. 43.2%, P < 0.001) this study used a cutoff point of 3.5cm [37].

However, tumor size was not found to be an independent predictor in the multivariate Cox proportional hazards model in this study which is against Zhang et al.'s study in which a larger tumor size, at ≥3.30 cm, was associated with a nearly two-fold-higher risk of overall mortality [36].

STRENGTH AND LIMITATION OF THE STUDY

This study was conducted across 4 governmental hospitals in Addis Ababa as a result the findings of this study will provide a better picture of the survival status of patients in the country. Another strength of this study is that a temporal relationship was established between the outcome (Death) and predictor variables. Furthermore, the study participants were followed for a long period in addition a phone call was made to check for event status and information that could not be found on medical records. In addition, the inclusion of all patients who fulfilled the eligibility criteria allowed us to Avoid/minimize sampling error.

One of the limitations of this study is the inability to locate many medical records which could potentially undermine the conclusions' representativeness, Selection bias is also a potential problem as patients with incomplete records were excluded during secondary data collection which might under or overestimate the magnitude of death. In addition, the event status of some patients was not known with certainty because their relatives were not willing to provide information or the phone number acquired from medical charts was not in service anymore. Finally, the small sample size of the study could decrease the power of the study.

CONCLUSION

In conclusion, the current study showed that the overall 5-year survival rate of patients who underwent esophageal surgeries for esophageal malignancy was 10.3% and the median survival time was 12 months. Patients had a mean age of 51 years. The predominant histologic type of esophageal cancer was Squamous cell carcinoma. Esophageal cancer commonly occurs on the lower third region of the esophagus in addition the trans hiatal esophagectomy was the most commonly performed surgical procedure. during the preoperative period, most patients had a T4 stage esophageal cancer.

Preoperative Hypertension, ASA physical Status Classification of more than III, the occurrence of Postoperative HAP, Cervical anastomotic leak, and septic shock were identified as predictors in multivariate Cox regression analysis.

A difference in survival was observed between groups in the covariates such as Tracheostomy, Chylothorax, Induction Therapy, Postoperative Cardiac Arrest, Postoperative MI, Postoperative Hospital Acquired Pneumonia, Pulmonary Embolism, Postoperative Renal Failure, Postoperative Inotropic Support, Reoperation, Anasarca, Postoperative Anastomotic Leak, ASA Physical Status Classification, Hypertension, Systemic Sepsis and Length of Tumor.

RECOMMENDATION

The survival rate of patients who developed complications in the postoperative period such as Hospital Acquired Pneumonia, Cervical anastomotic leak, and septic shock was low. Thus, screening, prevention, and early management of postoperative complications is recommended. In addition, Health professionals from various disciplines should work together to devise and implement strategies to increase awareness of prevention and early detection and timely as well as appropriate management of postoperative complications.

Patients with preoperative non-communicable diseases such as Hypertension, and diabetes had a lower survival rate the same is true for patients with ASA physical status of more than 3 as a result it is important to create public awareness of early symptoms and prevention strategies for these diseases to familiarize the habit of an early visit to a health care center.

To improve the usability of data for further research and policy, healthcare professionals who work in oncology and operating rooms should focus more on accurately recording all pertinent patient data in medical records and the cancer registry.

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ANNEXES

Annex 1: Information Sheet English version

Title of the Research proposal: Survival Status and Predictors of Postoperative Mortality in Patients Who Underwent Esophageal Surgeries for Esophageal Malignancies at Selected Governmental Hospitals from 2018-2022 GC, Ethiopia, Addis Ababa: A Retrospective Cohort Study

Name of Investigator: Mintesinot Birhanu (BSc in Anesthesia)

Name of the Organization: Addis Ababa University, College of Health Science, Department of Anesthesia

Name of the Sponsor: Addis Ababa University

Purpose of the Research Project: To assess the survival status and predictors of postoperative mortality in patients who underwent esophageal surgeries for esophageal malignancies at selected governmental hospitals from 2018-2022 GC Ethiopia, Addis Ababa

Procedure: To achieve the above objective, information that is necessary for the study will be collected from medical records of patients who underwent esophageal surgery for esophageal malignancies between January 1, 2018- December 30, 2022, GC with the help of a data extraction tool and will be followed up to December 30th, 2023.

Risk and /or Discomfort: The Study won't hurt the patients because it will be carried out using the relevant data from the medical chart. The inquiry will not ask for a name or any other identifying information, and all the data gathered from the chart will be kept completely private and secure. Only research purposes would be served by the information retrieved.

Benefits: Those whose documents or records are included in this research will not directly benefit from it However, the research's indirect benefits to the participant and other esophageal cancer clients particularly those scheduled for surgery are evident. This is due to the fact that clients with esophageal cancer who are scheduled for surgery will benefit from receiving adequate care and treatment services. First and foremost, the study effort directly benefits healthcare planners and managers, particularly those involved in the development and management of esophageal cancer programs.

Confidentiality: The client names will not be included in the data collected from the chart, and the information gathered for this research project will be kept private. Furthermore, it will be maintained in a computer pass-word-protected system and it will only be disclosed to the investigator and advisors.

Person to contact: This research project was reviewed and approved by the institutional review board of the Department of Anesthesia, College of Health Sciences, Addis Ababa University. If you have any questions, you can contact the principal investigator and you might ask at any time you want.

Mintesinot Birhanu Phone no: +251943980007, email: mintesinotbirhanu@gmail.com

Annex 2: Information Sheet Amharic Version

የጥናቱ ርዕስ፡ ከ 2018-2022 በተመረጡ የመንግስት ሆስፒታሎች በምግብ ቧንቧ(ጉሮሮ) ካንሰር ምክንያት የምግብ ቧንቧ ቀዶ ጥገና የተደረገላቸው ታካሚዎች የመዳን ሁኔታ እና ከቀዶ ህክምና በኋላ የሚከሰት ሞትን የሚተነብዩ ባህሪያት። ኢትዮጵያ፣ አዲስ አበባ፡ የኋልኞሽ ጥናት

የአጥኚው ስም: ምንተስኖት ብርሃኑ (የመጀመሪያ ድግሪ በ አንስቴዥዮያ)

የድርጅቱ ስም: የአዲስ አበባ ዩኒቨርሲቲ፣ ጤና ሳይንስ ኮሌጅ፣ አንስቴዥዮያ ትምህርት ክፍል

የድጋፍ አድራጊ ስም፡ አዲስ አበባ ዩኒቨርስቲ

የጥናቱ ዓላማ፡ በተመረጡት የመንግስት ሆስፒታሎች ከ2018 መጀመሪያ እስከ 2022 መጨረሻ ባሉት ዓመታት የተመዘገቡትን በምግብ ቧንቧ ካንሰር ምክንያት የምግብ ቧንቧ ቀዶ ጥገና የተደረገላቸው ታካሚዎችን በመዉሰድ እስከ 2023 መጨረሻ የኋልኞሽ ምልከታ በማድረግ የቆይታ ሁኔታ እና የሟችነትን አመላካቾችን ለማወቅ

የአሠራር ሂደት: ከላይ የተጠቀሰውን ግብ ለማሳካት ከ2018 መጀመሪያ እስከ 2022 መጨረሻ ድረስ በምግብ ቧንቧ ካንሰር ምክንያት የምግብ ቧንቧ ቀዶ ጥገና የተደረገላቸው ታካሚዎችን መዝገብ በማየት ለጥናቱ አስፈላጊ መረጃዎች ይሰበሰባሉ።

አስፈላጊ መረጃዎች የሚሰበሰቡት የመረጃ መሰብሰቢያ መጠይቅ በመጠቀም ሲሆን ከላይ በተጠቀሰው ጊዜ የተመዘገቡ ታካሚዎችን በመዉሰድ እስከ 2023 መጨረሻ የኋልኞሽ ምልከታ ይደረጋል።

ጥናቱ ሊያስከትለው የሚችለው ጉዳት: ጥናቱ የሚካሄደው ከሕክምና ሰነድ ላይ ተገቢውን መረጃ በመውሰድ ስለሆነ በታካሚዎች ላይ ምንም ዓይነት ቀጥተኛ ጉዳት አያስከትልም፣ በተጨማሪም የታካሚዎች ስም ወይም ሌላ ማንነትን የሚገልጽ መረጃ በመጠይቅ ላይ አይመዘገብም እና ሁሉም መረጃ በጥብቅ ሚስጥራዊ እና ደህንነቱ በተጠበቀ ሁኔታ ይወሰድና በሚያስተማምን ቦታ ይቀመጣል። የተወሰደው መረጃ ለጥናት ዓላማ ብቻ የሚዉል ይሆናል።

ጥቅማ ጥቅሞች : ይህ ጥናት በጥናቱ ውስጥ ለተካተቱት ታካሚዎች ቀጥተኛ የሆነ ጥቅም የለዉም።ይሁን እንጂ በፕሮግራሙ ውስጥ ለተሳተፉ እና ለሌሎች ታካሚዎች የምርምሩ ተዘዋዋሪ ጥቅም ግልጽ ነው።

ምክንያቱም የዕቅድ አውጪዎች አዲስ እቅድ እያዘጋጁ ከሆነ የዚህ ጥናት ውጤት ለምግብ ቧንቧ(ጉሮሮ) ካንሰር ታካሚዎች ተገቢ የሆነ እንክብካቤ እና ህክምና አገልግሎት እንዲደርስ ያድርጋል። በዋነኛነት ይህ የምርምር ሥራ ለጤና አጠባበቅ እቅድ አውጪዎች እና ሃላፊዎች በተለይም የምግብ ቧንቧ(ጉሮሮ) ካንሰር መርሃ ግብር እቅድ ለሚንድፉ ሰዎች ከፍተኛ አስተዋጽኦ ያደርጋል።

ሚስጢራዊነት፡ሚስጢራዊነት ለማረጋገጥ በታካሚዎች ካርድ ላይ ያለው መረጃ የታካሚዎችን ስም ሳይገልጽ በመጠይቁ ላይ ይሰበሰባል፣ከዚህ የምርምር ፕሮጀክት የተሰበሰበው መረጃ በምስጢር የሚጠበቅ ሲሆን በተጨማሪም ከአጥኚው በቀር ለማንም ተደራሽ አይሆንም መረጃው ወደ ኮምፒውተር በሚገለበጥበት ጊዜ በሌሎች ሰዎች እጅ እንዳይገባ በአስተማማኝ ምስጢራዊ ቁጥር በተዘጋ አቃፊ ውስጥ እንዲቀመጥ ይደረጋል።

መገኛኘት ያለበት ግለሰብ፡ ይህ የምርምር ፕሮጀክት በአዲስ አበባ ዩንቨርሲቲ፣ጤና ሳይንስ ኮሌጅ፣ አንስቴሽዮያ ትምህርት ክፍል ተቋማዊ ግምገማ ቦርድ ተገምግሞ የሚጸድቅ ይሆናል። የትኛውም ጥያቄ ካልዎት በፈለጉት ጊዜ ከታች በተቀመጡት አድራሻዎች ተመራማሪውን በማግኘት መጠየቅ ይችላሉ።

ምንተስኖት ብርሃኑ ስልክ ቁጥር፡ +251943980007 ኢሜል፡mintesinotbirhanu@gmail.com

Annex 3: Consent Form English Version

My name is _____, I'm an Anesthetist, and I am collecting data from our patients' Medical Records for the research being conducted to assess the survival status and predictors of postoperative mortality in patients who underwent esophageal surgeries for esophageal malignancies at selected governmental hospitals from 2018-2022 GC Ethiopia, Addis Ababa, by Mr. Mintesinot Birhanu who is the MSc in Anesthesia student at Addis Ababa University. You are selected as one of the study subjects by chance. We anticipate that the outcomes of this study will offer proof and details for governmental and non-governmental institutions that operate in the domain of non-communicable illnesses primarily on esophageal cancer who underwent esophageal surgery at national, regional, and district levels by delivering basic data on survival status and postoperative mortality predictors: the information you provide will be kept private. We will obtain additional data from your medical record that is required for the study. Regarding confidentiality, there will be no harm because the research will only involve a review of your medical information. Your consent will be required before any information is collected; participation is entirely voluntary.

Your consent to the study's use of your medical record data will enable us to fulfill the study's promised advantages. We guarantee that the information you provide will be kept private and used exclusively for this study. Your name and other personal identifiers will not be included on the data collection form. You have the absolute right to say no to the use of any information from your medical records in this study. That said, the data that is collected will be very beneficial for the research. If you refuse to enable the information to be extracted from your records, you won't have any issues and you won't be turned down for any hospital medical treatments.

If you have any questions about this study, you may ask me or the principal investigator Mintesinot Birhanu: Tel: 0943980007 E-mail:mintesinotbirhanu@gmail.com

Are you willing to let your information be used for this study? 1. Yes 2. No

Signature of the interviewer which shows that the respondent has consented (verbally) to take part in the study _____

Annex 4: Consent Form Amharic Version

ስሜ _____ እባላለሁ፣ እኔ ማደንዘዣ ባለሙያ ነኝ፣ ከ 2018-2022 በተመረጡ የመንግስት ሆስፒታሎች በምግብ ቧንቧ(ጉሮሮ) ካንሰር ምክንያት የምግብ ቧንቧ ቀዶ ጥገና የተደረገላቸው ታካሚዎች የመዳን ሁኔታ እና ከቀዶ ህክምና በኋላ የሚከሰት ሞትን የሚተነብዩ ባህሪያት። ኢትዮጵያ፣ አዲስ አበባ፡ ለማጥናት እየተካሄደ ላለው ምርምር ከታካሚዎቻችን የሕክምና መዝገብ መረጃ እየሰበሰብኩ ነው። የዚህ ምርምር አጥኚ ምንተስኖት ብርሃኑ ይባላል በአዲስ አበባ ዩኒቨርሲቲ በአንስቴዥያ የሁለተኛ ድግሪ ተማሪ ነው። እርሶ በአጋጣሚ የጥናቱ አካል እንዲሆኑ ተመርጠዋል።

የዚህ ጥናት ግኝቶች ተላላፊ ባልሆኑ በሽታዎች ዙሪያ ለሚሰሩ መንግስታዊ እና መንግስታዊ ያልሆኑ ድርጅቶች በተለይም በጉሮሮ ካንሰር ላይ መሰረታዊ የሆኑ መረጃዎችን በማቅረብ የጉሮሮ ቀዶ ጥገና ለተደረገላቸው በአገር አቀፍ፣ በክልል እና በወረዳ ደረጃ ማስረጃ እና መረጃ ይሰጣል ብለን እናምናለን። እና መረጃዎ በሚስጥር ይጠበቃል። ለጥናቱ አስፈላጊ የሆነ ተጨማሪ መረጃ ከህክምና መዝግብዎ ላይ ይወሰዳል። ጥናቱ የሚካሄደው የሕክምና መዛግብትዎን በመገምገም ብቻ ስለሆነ፣ ሚስጥራዊነቱ እስከተጠበቀ ድረስ ምንም ዓይነት ጉዳት አያስከትልም። ሆኖም ግን መረጃው የሚሰበሰብው እርስዎ ፈቃድ ሲሰጡ ብቻ ፣ ተሳትፎ ሙሉ በሙሉ በእርስዎ ፈቃደኝነት ላይ የተመሰረተ ነው።

በዚህ ጥናት ውስጥ የእርስዎ የህክምና መረጃ መረጃ ጥቅም ላይ እንዲውል ፈቃደኛ መሆንዎ የተገለጹትን የጥናቱ ጥቅሞች እንድናሳካ ይረዳናል። የእርስዎ ስም እና ሌሎች የግል መለያዎች በመረጃ መሰብሰቢያ ቅጽ ላይ አይመዘገቡም እና እርስዎ የሚሰጡን መረጃ በሚስጥር ይጠበቃል እና ለዚህ ጥናት ዓላማ ብቻ ጥቅም ላይ ይውላል። በሕክምና መዝገብ ላይ ያለዎት መረጃ ለዚህ ጥናት ጥቅም ላይ እንዲውል ላለመፍቀድ ሙሉ መብት አለዎት። ነገር ግን የሚወሰደው መረጃ ለጥናቱ በጣም ጠቃሚ ይሆናል። መረጃው ከመዝገቦችዎ ውስጥ እንዲወሰድ ካልፈቀዱ ምንም አይነት ችግር አይገጥምዎትም እና እንዲሁም ከሆስፒታል ምንም አይነት የህክምና አገልግሎት እንዳያገኙ አይከለከሉም።

የትኛውም ጥያቄ ካልዎት በፈለጉት ጊዜ ከታች በተቀመጡት አድራሻዎች ተመራማሪውን በማግኘት መጠየቅ ይችላሉ።

ምንተስኖት ብርሃኑ ስልክ ቁጥር፡ +251943980007 ኢሜል፡mintesinotbirhanu@gmail.com

መረጃዎ ለዚህ ጥናት እንዲውል ለመፍቀድ ፈቃደኛ ነዎት? 1. አዎ 2. አይደለም

በጥናቱ ውስጥ ለመሳተፍ ምላሽ ሰጪው (በቃል) መስማማቱን የሚያሳይ የቃለ-መጠይቅ አድራጊው ፊርማ _____

Annex 5: Consent form Afan Oromoo

Maqaan koo _____ jedhama, Ani Ogeessa Anesthetist Jireenyaa fi tilmaamtoota du'a baqaqsanii hodhuu boodaa dhukkubsattoota kaansarii ujummoo nyaataatiin hospitaalota mootummaa filatamoo ta'an keessatti bara 2018-2022tti ujummoo nyaataa irraa ciccirame. Itoophiyaa, Addis Ababa: Qorannoo itti fufiinsa qabuuf galmee yaalaa dhukkubsattoota keenyaa irraa odeeffannoo walitti qabaa jira. Qorataan qorannoo kanaa Yunivarsiitii Addis Ababaatti barataa digrii lammaffaa Anesthesia kan taate Miintasinot Birhanu dha. Qaama qorannichaa akka taatuuf akka tasaa filatamteetta.

Argannoon qorannoo kanaa dhaabbilee mootummaa fi miti mootummaa damee dhukkuboota daddarboo hin taane, keessumaa dhukkubsattoota kaansarii qoonqoo sadarkaa biyyaatti, naannoo fi aanaatti hojjetaniif ragaa fi odeeffannoo ni kenna jennee amanna. Odeeffannoon keessanis iccitii ta'ee eegama. Odeeffannoon dabalataa qorannichaaf barbaachisu galmee yaalaa keessan irraa ni fudhatama. Qorannoon kun galmee yaalaa keessan ilaaluu qofaan waan ta'eef, hanga iccitiin eegamutti miidhaa tokkollee hin jiru. Haa ta'u malee, odeeffannoon kan walitti qabamu yeroo hayyama kennitu qofa, hirmaannaan guutummaatti hayyama kee irratti hundaa'a.

Odeeffannoo yaalaa keessan qorannoo kana keessatti akka itti fayyadamnu hayyamni keessan kaayyoo qorannichaa ibsame galmaan ga'uuf nu gargaara. Maqaan kee fi adda baastonni dhuunfaa biroo unka odeeffannoo walitti qabuu irratti kan hin galmaa'in yoo ta'u odeeffannoon ati nuuf kennitu iccitii ta'ee kan eegamu yoo ta'u, kaayyoo qorannoo kanaa qofaaf kan itti fayyadamnu ta'a. Odeeffannoon galmee yaalaa kee keessa jiru qorannoo kanaaf akka hin fayyadamne hayyamuuf mirga guutuu qabda. Garuu odeeffannoon fudhatamu qorannichaaf faayidaa guddaa qaba. Odeeffannoon galmee keessan irraa akka fudhatamu yoo hin hayyamne rakkoon isin mudata, tajaajila yaalaa hospitaala irraas isin hin dhowwamu.

Gaaffii yoo qabaattan teessoo armaan gadii kanaan qorataa qunnamuu dandeessu.

Miintasnot Birhanu Lakkoofsa Bilbilaa: +251943980007 Imeelii: mintesinotbirhanu@gmail.com

Odeeffannoon kee qo'annaa kanaaf akka oolu hayyamuuf fedhii qabdaa? 1. Eeyyee 2. Lakki

Mallattoo gaafataa kan deebii kennaan qorannicha keessatti hirmaachuuf (afaaniin) hayyamuu isaa agarsiisu _____ .

Annex 6: Data Collection Tool

Disease Characteristics

Variable		
MRN		
Date of Esophageal Surgery(Operation)		
Age		
Sex	☐ Male ☐ Female	
Residency	☐ Urban ☐ Rural	
ASA Class	☐ I ☐ II ☐ III ☐ IV ☐ V	
History of Alcohol Abuse	☐ Yes ☐ NO	
History of Cigarette Smoking	☐ Yes ☐ NO	
Functional Capacity (Metabolic equivalent)	☐ <4Mets ☐ >4Mets	
Clinical Stage at presentation	☐ I ☐ II ☐ III ☐ IV	
Site of Cancer	☐ Upper third ☐ Middle Third ☐ Lower Third ☐ Gastroesophageal junction	
Histology of esophageal cancer	☐ Adenocarcinoma ☐ Squamous Cell carcinoma	
Surgical approach	☐ Ivor Lewis ☐ Trans Hiatal (Orringer) ☐ Left Thoracoabdominal (Sweet) ☐ Three Hole (McKeown)	
Induction Therapy	☐ Chemotherapy ☐ Radiotherapy ☐ Chemotherapy or Radiotherapy	
Size of Tumor	☐ <3.3cm ☐ >3.3cm	

Preoperative Comorbidities

Cardiovascular		
Hypertension	☐ Yes ☐ No	
Prior MI	☐ Yes ☐ No	
Beta Blocker Use	☐ Yes ☐ No	
Calcium Channel Blocker use	☐ Yes ☐ No	
NYHA Class	☐ I ☐ II ☐ III ☐ IV	
CHF	☐ Yes ☐ No	
ECG	☐ Normal ☐ Abnormal	
Echocardiography	☐ Grade I diastolic Dysfunction ☐ Grade II diastolic Dysfunction ☐ Grade III diastolic Dysfunction ☐ Normal ☐ Mild Pulmonary Hypertension ☐ Moderate Pulmonary Hypertension ☐ Severe Pulmonary Hypertension	
Ejection Fraction on Echocardiography	☐ <40% ☐ 41-49% ☐ >50%	
Valvular Heart Disease	☐ Yes ☐ No	
Preoperative HGB/HCT, anemia	☐ Normal ☐ Low ☐ High	
Nutritional, Hepatic Fun		
Dysphagia Grade	☐ I ☐ II ☐ III ☐ IV ☐ V ☐ VI	
Weight loss during the previous 6 months	☐ <10% body weight ☐ >10% body weight	
Serum Albumin	☐ <3.5mg/dl	

	☐ >3.5mg/dl	
Renal Function(Serum Creatinine)	☐ Normal ☐ Low ☐ High	
Serum Total bilirubin	☐ Normal ☐ High	
Pulmonary		
History of Cigarette Smocking	☐ Yes ☐ No	
Bronchodilator use	☐ Yes ☐ No	
Preoperative URTI	☐ Yes ☐ No	
COPD	☐ Yes ☐ No	
Pneumonia	☐ Yes ☐ No	
Pulmonary TB	☐ Yes ☐ No	
Empyema	☐ Yes ☐ No	
Bronchiectasis	☐ Yes ☐ No	
Lung Abscess	☐ Yes ☐ No	
Prior Cardiothoracic operation	☐ Yes ☐ No	
Diabetes	☐ Yes ☐ No	
Corticosteroid use	☐ Yes ☐ No	
HIV/AIDS, Retroviral Infection	☐ Yes ☐ No	

Postoperative Complications

Cardiovascular		
Myocardial Infarction	☐ Yes ☐ No	
Arrhythmia	☐ Yes ☐ No	
New Beta Blocker use	☐ Yes ☐ No	
Inotropic Support	☐ Yes ☐ No	
Cardiac Arrest	☐ Yes ☐ No	
Pulmonary Edema	☐ Yes ☐ No	

Pulmonary		
Prolonged Ventilation	☐ Yes ☐ No	
Respiratory Failure	☐ Yes ☐ No	
Pneumonia	☐ Yes ☐ No	
Lobar Collapse	☐ Yes ☐ No	
New bronchodilator use	☐ Yes ☐ No	
Reintubation	☐ Yes ☐ No	
Pulmonary Embolism	☐ Yes ☐ No	
Failure to wean >48 hr.	☐ Yes ☐ No	
Aspiration Pneumonia	☐ Yes ☐ No	
Surgical		
Wound Dehiscence	☐ Yes ☐ No	
Cervical Anastomotic Leak	☐ Yes ☐ No	
Intrathoracic Anastomotic Leak	☐ Yes ☐ No	
Feeding Tube complication	☐ Yes ☐ No	
Chylothorax	☐ Yes ☐ No	
Necrosis of Interposition	☐ Yes ☐ No	
Gangrene of Conduit	☐ Yes ☐ No	
Intra-Abdominal Sepsis	☐ Yes ☐ No	
	☐	
Infectious		
Wound Infection	☐ Yes ☐ No	
Empyema	☐ Yes ☐ No	
Subphrenic Abscess	☐ Yes ☐ No	
Urinary Tract Infection	☐ Yes ☐ No	
	☐	
CNS Complications		
Coma >24hr	☐ Yes ☐ No	

Peripheral Nerve Injury	☐ Yes ☐ No	
	☐	
Other Complications		
Prolonged Ileus	☐ Yes ☐ No	
DVT	☐ Yes ☐ No	
Anasarca	☐ Yes ☐ NO	
Systemic Sepsis	☐ Yes ☐ No	
Hepatic Failure	☐ Yes ☐ No	
Renal Failure	☐ Yes ☐ No	
Recurrent Laryngeal Nerve Injury	☐ Yes ☐ No	
Reintubation	☐ Yes ☐ No	
ARDS	☐ Yes ☐ No	
Reoperation	☐ Yes ☐ No	
Tracheostomy	☐ Yes ☐ No	
Intraoperative Blood Loss	☐ <1000ml ☐ >1000ml	
Epidural Analgesia	☐ Yes ☐ No	
Erector Spinae Plane Block	☐ Yes ☐ No	
Paravertebral Block	☐ Yes ☐ No	
Subcostal Block	☐ Yes ☐ No	
Rectus Sheath Block	☐ Yes ☐ No	
Local Anesthesia Infiltration	☐ Yes ☐ No	
Mortality		
Death within 30 Days	☐ Yes ☐ No	
Status of the patient during the last contact	☐ Censored ☐ Dead	
Date of last contact	☐	