



School of Nursing

*Time to recovery and its predictors after thoracic surgery in
selected government hospitals in Addis Ababa, Ethiopia
2024.*

By: Mariza Abebe

A Research thesis submitted to the Department of Cardio thoracic
surgery nursing ; Presented in Partial fulfillment of the Requirements
for the Degree of Master in cardio thoracic surgery nursing ; St. Paul
Hospital Millennium Medical College.

July, 2024
Addis Ababa, Ethiopia

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ABSTRACT

Back ground: Thoracic surgery is one of the most common surgical procedures performed on patients globally and locally. It requires substantial medical attention. It is the main cause of mortality and morbidity, with detrimental effects on longevity, healthcare costs, and quality of life. Developing countries are concerned about this as one of their main surgical issues. Thoracic surgery is common, and both its incidence and prevalence are rising in developing countries.

Objectives: Assess time to recovery and its predictors after thoracic surgery in selected government hospitals in Addis Ababa, Ethiopia.

Methods: A multi-institutional retrospective cohort study was conducted on 440 adult patients in selected government hospitals; from January 2021 up to December 2023. The collected data was entered into Epi-data version 4.4.3.1 and was exported to SPSS version 26, and coding, clean and analysis was done accordingly. Descriptive analysis frequencies with percentages and median survival times were used to characterize the study population. To compare the median time to post thoracotomy recovery between groups, the Kaplan-Meier survival plot together with the Log-rank test were used. The Cox proportional hazard survival model was used to identify significant predictors. All variable with a $p \leq 0.05$ in the bivariable analysis was candidate variables to be included in a multivariable analysis. Cox proportional hazard model assumption was checked using a formal statistical test, the GLOBAL test. In the final model, hazard ratio with 95% confidence interval and p- value (< 0.05) was used to declare statistically significant predictors.

Result: Of the 440 patients, 371 (84.3%) fully recovered, and the remaining 69 (15.6%) were censored. Among the censored observations, 62 (14.1%) have recovered from complications, and 7 (1.4%) have died. The overall median time to post-thoracotomy recovery was 10 days (95% CI: 9.31–10.69). Significant predictors of major complication, death and delayed recovery were decrease in younger age (AHR= 0.243, 95% CI=0.137, 0.430, P=0.000) and taking of TPVB during surgery (AHR= 2.324, 95% CI=1.719, 3.140, P=0.00). Other factors being (AHR=1.501,

95% CI=1.129, 1.994, P=0.005), open thoracotomy (AHR=0.252, 95% CI= 0.419, 0.425, P=0.000), smokers(AHR=0.462, 95% CI=0.263, 0.811, P=0.007), history of previous surgery(AHR= 0.575, 95% CI = 0.344, 0.962, P=0.035, experience IOC (AHR=0.348, 95% CI= 0.209, 0.580 P=0.00)and comorbidities (hypertension(AHR=0.129, 95% CI=0.070, 0.237, P=0.000, DM(AHR=0.129, 95% CI=0.070, 0.237, P=0.00, CVD(AHR=0.283, 95% CI=0.160, 0.503, P=0.000 and HIV(AHR=0.079, 95% CI=0.011, 0.574, P=0.012).

Keywords: Post-thoracotomy outcomes, time to post-thoracotomy recovery, censor, Cox proportional Hazard survival model.

Conclusion: The study population's post-thoracotomy morbidity and mortality are comparable to prior reports, and the median recovery time is within the expected range for a good outcome. As a result, risk mitigation during the perioperative period and close monitoring and management of high-risk patients during the postoperative period are crucial.

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Acronyms

ASA	American Societies of Anesthesiologists
ARR	Adjusted Relative Risk
CAD	Coronary Artery Disease
COPD	Chronic Obstructive Pulmonary Disease
CRR	Crude Relative Risk
HMIS	Hospital Management Information System
IQR	Inter quartile Range
IV	Intravenous
LOS	Length of Stay
MIS	Minimally Invasive Surgery
NSCLC	Non-Small Cell Lung Cancer
NSAIDS	Non-Steroid Anti-Inflammatory Drugs
PACU	Post Anesthesia Care Unit
PCM IV	Paracetamol Intravenous
PPC	Post-operative Pulmonary Complication
VATs	Video Assisted Thoracic Surgery
WHO-PS	World Health Organization Performance Score

CHAPTER-ONE

INTRODUCTION

1.1 Background

Thoracic surgery is a field of surgery that focuses on the treatment of conditions that affect organs of the chest but extend to the esophagus (tube between mouth and stomach), the trachea (airway), and the chest wall (rib cage and breastbone) (1).

Approximately 530,000 general thoracic surgery cases are performed annually in the United States. Thoracic surgeons perform an average of 135 operations per year, which address diseases of the lungs, trachea, esophagus, chest wall, mediastinum, and diaphragm(2). In underdeveloped nations, 1.50 million out of 5.9 million people needed surgery; 7.5% and 7.4% of patients had encountered a chest issue involving the heart, lungs, and mediastinum that required surgical consultation(3). Comparable results were observed among the 14,130 general surgery patients thoracic operations made up 6.88% of the procedures (4).

Several factors can contribute to a shorten recovery period, including quit smoking, encourage secretion, enhance bronchodilator treatment, manage bronchitis, determine and reduce additional morbidity, utilize narcotics, fast-acting sedatives, or inhalation medications, Prevent aspiration episodes and airway injuries, multi modal pain management without overusing sedatives or opioids, Patient mobilization and lung volume(5).

Enhancing the physical and emotional health of patients can be achieved through reducing risks during the preoperative period, making sure that procedures are safe and proper, and actively monitoring and managing high-risk patients after surgery. This study aims to assess time to recovery and its predictors after thoracic surgery at selected hospitals.

1.2. Statement of the problem

Thoracic surgery is a surgical procedure that is performed to treat and diagnose specific cardiac and pulmonary disorders by performing treatments on the organs located in the chest, such as the heart, lungs, and esophagus(1). Postoperative recovery is intricate and multifaceted process that encompassing several aspects and characterized by the attainment of mastery over physical, psychological, social, and habitual processes(6). The goals of this recovery reduce patient mortality, morbidity and length of stay and therefore saving cost and resource(7).

According to studies done in New York in Non-small cell lung cancer accounts for the majority of all lung cancer cases and its risk factors for developing NSCLC have been identified, with cigarette smoking being a major factor along with other environmental and genetic risk factors(8). According to a report from the New York Lung Cancer Foundation 2020, during the preceding five years, 95.7% of cases that required surgery had the major etiology of thoracic malignancies, which includes lung cancer(9).

A retrospective study done in Zimbabwe revealed that majority of thoracic surgeries (89.1%) done due to disease condition whereas minimal (10.9) was following trauma among those surgeries 76.1% done for emergency while 23.9% for elective(6).

Following thoracic surgery, the mean hospital costs associated with postoperative complications after esophagectomy and lobectomy followed by anastomotic leak (\$40 037), sepsis (\$31 671) and recurrent nerve palsy (\$27 517). Sepsis was the most expensive condition for lobectomy patients (\$36 2930), followed by venous thrombosis (\$28 474), emphysema (\$31 296), and cerebrovascular respectively (\$33 322)(10).

United States Preventive Service Task Force update its screening recommendations expanded to include a larger age range, reduce the lower limit of the screening age from 55 to 50 years, and increase the minimum smoking history of current and former smokers from 30 to 20 pack-years, including more high-risk women and racial minorities in screening. This dramatically increased the number of women and black individuals who are considered at high risk for lung cancer(11).

According to the USA State of Lung Cancer 2023 report, surgery is frequently used to treat lung cancer if it is discovered early and has not spread. It was performed in 20.8% of cases nationwide, a 4% increase over the previous five years(9).

Video-assisted thoracic surgery has become the primary surgical approach for lung cancer(12)(13). With a lower risk of complications like less blood loss, less postoperative pain, fewer complications, quicker recovery, shorter hospital stays, and lower mortality rates, VATS has recently gained recognition in recent years as a better treatment option than traditional thoracotomy(14)(15).

Subsequent smoking cessation, not screening patients for malnutrition and not providing preoperative carbohydrate, using inadequate thoracotomy nerve sparing techniques, staff members implementing physio therapeutic assessments differently, a lack of teamwork and consistency, procedure-specific resource limitations, and decreased access to smoking cessation services are factors that worsen the problem(16).

In Ethiopia there are no adequate studies regarding on the recovery time after thoracic surgery, there are no previous conducted studies regarding the area of interest in this specific population, thus this study aims to determine the impact of co-morbidities and factors on recovery time after thoracic surgery, Addis Ababa, Ethiopia, 2024.

1.3 Significance of the study

Thoracic surgery is a serious surgical concern both around the world and in underdeveloped countries. It has an impact on the patient's physical, psychological, social, and financial well-being. Patients who undergo thoracic surgery require specific care before, during, and after the procedure. Health care providers have an important role in reducing recovery time and complications, as well as improving patients' physical, emotional, and physiological well-being.

The findings of this study will benefit health care workers by improving the quality of care and decreasing the patient's pain level, intraoperative and post-operative complications, recovery time, and prolonged hospital stay.

The findings of this study will benefit patients by enhancing their physical, mental, and social well-being and quality of life, increasing productivity, and lowering health costs. The results of this investigation will serve as a body of knowledge for developing a standard of care for the treatment of thoracotomy patients and the avoidance of complications.

The findings of this study will benefit legislators in addressing health policy challenges. It will also be useful to researchers as an extra resource for more extensive and in-depth studies on this topic.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Proportion of time to recovery

The majority of thoracic procedures are performed for lung and esophageal cancers, which have a high incidence. It is one of the most challenging surgical incisions to treat during the recuperation phase. Patients who undergo thoracic surgery are far more likely to experience postoperative complications, which increase their length of stay and death, including a significant risk of pulmonary problems, increased inflammation, a severe stress reaction, impaired immunological function, increased pain, and death(17).

A prospective cohort study conducted in USA revealed that patients underwent major general thoracic surgery their postoperative length of stay on average was $(7.4 \pm 9.4 \text{ days})$ (18). A similar study conducted in the United States found that the five most severe post-operative symptoms were pain, fatigue, drowsiness, shortness of breath, and disturbed sleep, on the third post-operative day, 51.6% of patients had moderate-to-severe symptoms, followed by fatigue (56.7%), drowsiness (54.8%), shortness of breath (33.9%), and disrupted sleep (56.5%), fatigue recovered more slowly than the other four symptoms (median: 22 days vs. 10–15 days)(19).

A prospective cohort study conducted in a referral center in the United Kingdom stated that the median length of stay in the hospital after thoracic surgery was 5 days(20). A retrospective observational study conducted in America found that the median post-operative length of stay after thoracic surgery was four days ([IQR] 2–6)(21).

Based on retrospective cohort study conducted in Ethiopia Addis Ababa University discovered that LOS in the minimal invasive surgery patients group was 5.2 days versus 11.0 days in the open group ($P < .001$). LOS subgroup analysis for major procedures was 6.4 days in the MIS group versus 10.8 days in the open group, LOS subgroup analysis of minor procedures was 4.8 days in the MIS group versus 11.0 days in the open group(22).

An additional study also conducted in Ethiopia Tikur Anbassa Specialized Hospital revealed that the overall mean time to post thoracotomy recovery was 13.2 days(23).

2.2 Predictors of time to recovery

2.2.1. Patient related factors

Reduced recovery time following thoracic surgery has been linked to a number of factors, including young age, quitting smoking, preoperative alcohol cessation and taking a preoperative carbohydrate supplement(5)(24)(25).

A prospective cohort study conducted in the United States found that, of 1646 patients who underwent major general thoracic surgery, 4.1% were sent to a skilled nursing facility or rehabilitation center. These patients stayed there for an average of six days longer than patients who were discharged home (13.9 ± 11.5 days) (7.4 ± 9.4 days) due to factors such as advanced age, poor preoperative performance status, and poor preoperative nutritional status(18).

A study conducted in Ethiopia Tikur Anebassa Specialized Hospital showed that delayed post-operative recovery was observed for patients who were 40 years and older (10.1 Vs. 18.1 days), male (10.8 Vs. 14.9 days), WHO-PS score of 2 and above (10.1 Vs. 14.4 Vs. 13.2 days and Intraoperative complication (11.5 Vs. 18.6 days)(23).

2.2.2. Procedure related factors

A prospective cohort study conducted in China showed that the use of Thoracic Para-vertebral Block was a protective factor that reduced the length of stay however advanced age, non-minimally invasive surgery, and ASA III in lung cancer patients have been linked to an increased risk of a protracted recovery period(17).

A prospective cohort study done in the United Kingdom stated that the VATS approach, and early patient mobilization are factors that reduce the length of stay, but more than 1 resection, lobectomy or pneumonectomy, and age were associated with delayed discharge from the

hospitals(20). Similar study also conducted in the United Kingdom found that the use of VATS and MIS techniques, along with muscle sparing thoracotomy incisions, are factors that expedite post-operative recovery and reduce hospital stays(5).

A prospective cohort study conducted in USA revealed that patients using the VATS approach had a shorter median length of stay than patients using the open approach (4 days, IQR: 3 to 5 days versus 5, IQR: 5 to 6 days)(25). Compatible retrospective observational study conducted in America found that the median LOS for VATS wedge resection groups was three days and five days for VATS lobectomy groups(21).

Another study conducted in thoracic surgical clinics in USA showed that thoracic epidural anesthesia has long been the gold standard of procedural multi modal analgesia for thoracotomy patients as pain management and decrease recovery time(26).

According to an Ethiopian retrospective cohort analysis, the complication rate for the MIS group was much lower than that of the open group (18% vs. 39%, respectively). The rate of minor complication varied significantly between the MIS and open groups as well, with the MIS group having less minor complications at 10.7% and 26.8%, respectively(27).

According to a study done in Ethiopia, 24.5% of patients experienced post-operative pulmonary complications. Respiratory infections (4.2%), respiratory failure (3.1%), and pneumonia (9.9%) account for the majority of consequences. The majority of complications happened within the first three days after the procedure. People who had surgeries lasting more than two hours (>2 h) were 2.5 times more likely to develop PPC than people who had surgeries lasting less than two hours. Patients who lost more than 500 milliliters of blood after surgery had a 2.6-fold increased risk of developing PPC compared to those who lost less than 500 milliliters(28).

A study done in Ethiopia Tikur Anbessa Specialized Hospital showed that the commonest indication for thoracotomy was empyema thoracis 25.7%, followed by esophageal cancer in 13.5%, lung hydatid cyst 12.8% and mediastinal tumor 8.8%. The commonest surgical approach was posterolateral thoracotomy performed in 79.1% patients and axillary thoracotomies in 20.9% patients. Males were nearly twice as likely as females to experience major complications and/or death; patients with preoperative WHO-PS scores of 3 or 4 had a 2.56-fold higher risk of major complications and/or death compared to those with a score of 0; additionally, intraoperative

complications and the use of systemic analgesia during the post-operative period were linked to increased risk of developing major complication and/or death by 2.29 times and 4.13 times as compared with those with no complication and were taking epidural analgesic, respectively(23).

2.2.3. Post-operative factors

A prospective cohort study conducted in USA revealed that patients who underwent a standard open thoracotomy patients have higher pain score and recovered from pain more slowly than patients who underwent a VATS thoracotomy (8 days vs. 18 days)(25).

A prospective study conducted in Japan showed that patients with pain trajectory three have a mean postoperative length of stay of $(13.41 \pm 10.3 \text{ days})$, pain trajectory two $(11.85 \pm 9.4 \text{ days})$, compared to trajectory one $(8.38 \pm 8.8 \text{ days})$ (29). Another study also done in Japan supported that decreased preoperative albumin level and high postoperative pain score as predictors of prolonged recovery time among thoracotomy patients(30).

According to a research conducted in Ethiopia Tikur Anbessa Specialized Hospital, using IV narcotics, NSAIDS, and tramadol $\pm$ epidural analgesia throughout the post-operative period reduced recovery time to 7.2 days, compared to 14.9 days for patients who did not use those medications(23).

2.2.4. Co-morbidities

The American Association of Thoracic Surgery found that patients who disclosed any co-morbid diseases before surgery reported feeling higher pain. Increased sleepiness was linked to postoperative cardiovascular issues. Compared to patients who underwent a VATS lobectomy, patients who underwent a standard open thoracotomy recovered from pain more slowly (8 days vs. 18 days)(25).

According to a research conducted in Japan showed that the risk of lung cancer in patients with chronic obstructive pulmonary disease is approximately five-fold greater than that in smokers without COPD. Patients with COPD who underwent thoracoscopic surgery had prolonged recovery time and a poorer survival than patients without COPD(31).

A study conducted in Spain showed that patients with coronary artery disease who experience major cardiac complications after video assisted thoracoscopic lobectomy have a 5-fold higher risk of 30-day mortality compared with patients without CAD(32).

2.3 Conceptual framework

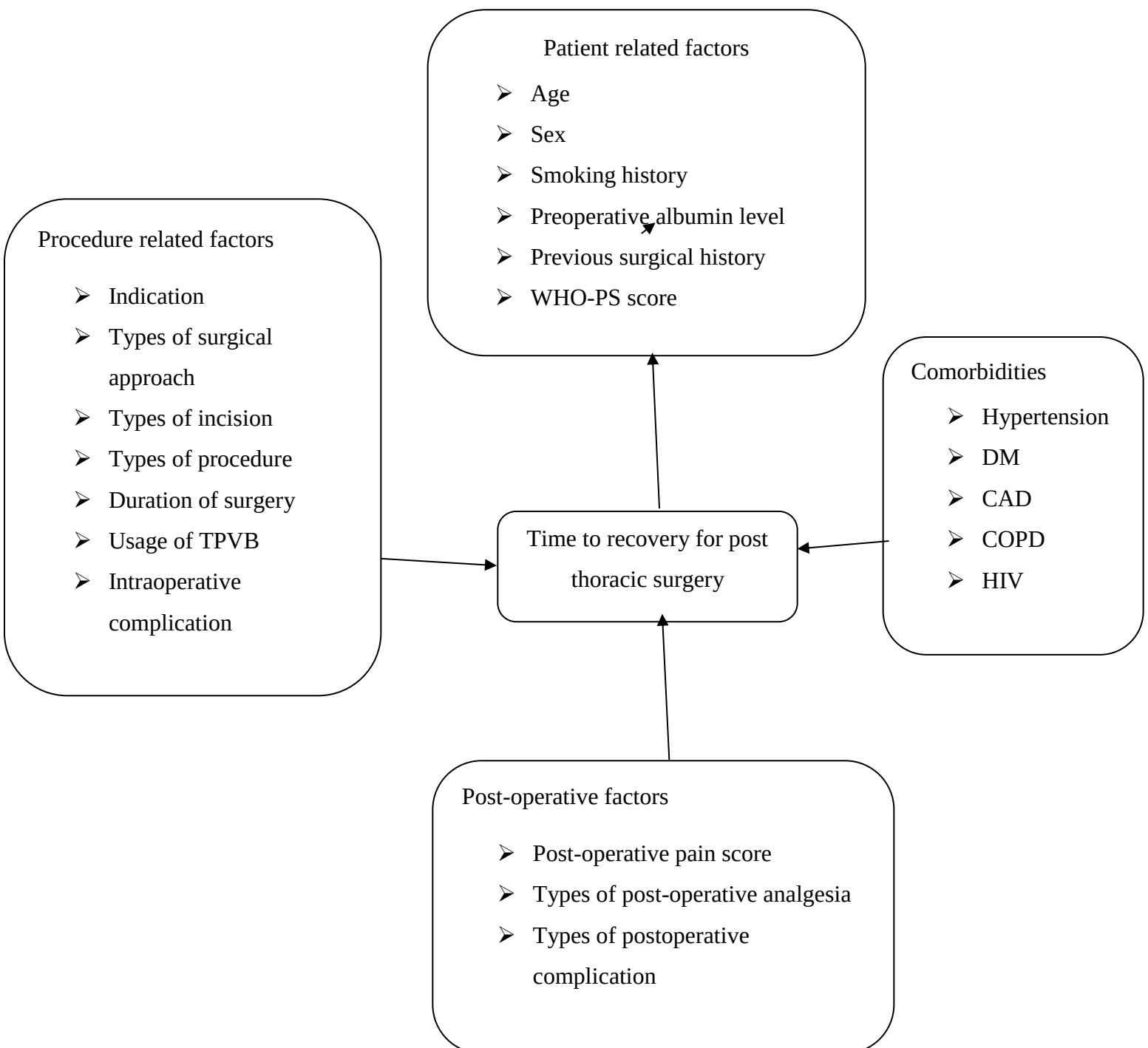


Figure 1: Adapted conceptual framework of predictive factors associated with time to recovery after thoracic surgery in selected public hospitals in Addis Ababa ,Ethiopia, 2024(5),(17),(20),(21),(23),(24),(25),(29),(32).

CHAPTER THREE

3. OBJECTIVES

3.1. General objective

- To assess time to recovery and its predictors after thoracic surgery in selected government hospitals of Addis Ababa, Ethiopia 2024.

3.2. Specific objective

- To determine time to recovery after thoracic surgery in selected government hospitals of Addis Ababa, Ethiopia 2024.
- To identify predictor of time to recovery for patients who underwent thoracic surgery in selected government hospitals of Addis Ababa, Ethiopia 2024.

CHAPTER-FOUR

4. METHODS

4.1. Study Area and period

The study was conducted in four public hospitals of Addis Ababa, namely Tikur Anebassa Specialized Hospital, St. Pauls Hospitals Millennium Medical College, St. Peter Specialized Hospital, and Minilik II Comprehensive Specialized Hospital. These hospitals were selected based on the availability of higher thoracic surgery cases.

St. Paul Hospital is a referral teaching hospital that is managed by the Federal Ministry of Health (FMOH) and has been working since 1969 E.C. The hospital has more than 700 beds. There are two cardiothoracic surgeons who started thoracic surgeries in 2013 E.C., performed thoracic surgeries in one thoracic operation theater room, and performed thoracic surgeries two days per week with a maximum of two cases and a maximum of four cases per week.

Tikur Anebassa Specialized Hospital is referral teaching hospital that is managed by Addis Ababa University and was established in 1964 E.C. The hospital has more than 700 beds. There are six cardiothoracic surgeons who started thoracic surgery in 2011 E.C. and performed thoracic surgeries in one thoracic operation theater room. They performed thoracic surgeries three days per week, with a maximum of two cases and a maximum of six cases per week.

St. Peter Specialized Hospital, which is managed by FMOH, started working in 1990 E.C. The hospital has more than 400 beds. There are 2 cardiothoracic surgeons who started thoracic surgeries in 2013 E.C., performed thoracic surgeries in one thoracic operation theater room, and performed thoracic surgeries two days per week, with a maximum of two cases per day and a maximum of four cases per week.

Minilik II Comprehensive Specialized Hospital, which is managed by the Addis Ababa city administration, has been working since 1902 E.C. The hospital has more than 800 beds. There are 3 cardiothoracic surgeons who started thoracic surgery in 2013 E.C. and performed thoracic

surgeries in one thoracic operation theater room. They performed thoracic surgeries two days per week, with a maximum two cases per day and a maximum of four cases per week.

Data were collected from April 15 to May 15 2024.

4.2. Study Design

An institution-based retrospective cohort study was conducted. Three years from January 2021 up to December 2023, patient's medical records with thoracic surgery was reviewed in selected government hospitals in Addis Ababa, Ethiopia

4.3. Population

4.3.1. Source population

- ✓ All thoracotomy Patient's charts in Addis Ababa public hospitals.

4.3.2. Study population

- ✓ All thoracotomy Patient's charts of the selected public hospitals in Addis Ababa during the study period.

4.3.3. Sampling unit

- ✓ All thoracotomy patients' charts which met the inclusion criteria at selected government hospitals during the study period were included in the study.

4.3.4. Inclusion and Exclusion Criteria

Inclusion criteria

- ✓ All adult patients' chart that was underwent thoracic surgery at selected government hospitals during the study period was included.

Exclusion Criteria

- ✓ All thoracic surgery patients' charts that was incomplete documentation (50% of the information lost).

4.4. Sample Size determination and sampling technique

4.4.1. Sample Size determination

Sample size determination for recovery time: according to the data collected from the selected hospitals, the total number of patients who underwent thoracic surgery was 3600 in the selected hospitals from the start time to take this data. Sample size determination for time to recovery the Yamane method is used. Under the Yamane method, the sample size determination depends on known population and specified precision or level of error(33).

$$n = \frac{N}{1+N(e^2)}$$

Where N= population size, e= level of error

$$n = \frac{3600}{1+3600(0.05^2)}$$

$$= \frac{3600}{3601(0.0025)}$$

$$= \frac{3600}{9.0025}$$

$$= 400$$

400 with 10% withdrawal the final sample size will be 440.

Sample size for predictors after thoracic surgery the study was estimated by Epi. Info version 7. By considering 95% confidence interval, two sided level of significance at 0.05, 80% power, 0.777 probability of an event(recovery time) and adjusted hazard ratio of 4.13, 2.56 and 2.29 which was taken from a study done in Addis Ababa Ethiopia(23). 0.33 probability and 1.878 adjusted hazard ratio which was taken from a study done in Japan(31).

To determine the required sample size for both specific objectives by calculated on open Epi software using determination for recovery time with the following assumption, 95% confidence interval, 5% margin of error and power of 80% by taking study finding from (table 1).

Table 1:- Sample size calculation with different variable determination for recovery time:

Factors	Authors	Study area	%of non-exposed	%of exposed	CI %	Power	Ratio	Sample size	References
Taking systemic analgesia	Moges et al, 2023	Ethiopia	77.7%	93.5%	95%	80%	1	178	(23)
WHOPS	Moges et al, 2023	Ethiopia	77.7%	89.9%	95%	80%	1	316	(23)
Preoperative albumin level	Shibazaki et al, 2018	Japan	33%	48.1%	95%	80%	1	358	(31)
Having intraoperative complication	Moges et al, 2023	Ethiopia	77.7%	88.9%	95%	80%	1	384	(23)

From the above sample sizes, take the large one (384), and by considering 10% withdrawal probability, the minimum sample size required for the study will be 422 thoracotomy patients.

By comparing the two samples, the sample size of time to recovery is greater than the sample size of predictors, so take the larger sample size; the final sample size is 440.

4.4.2. Sampling technique

From the 12 public hospitals in Addis Ababa four public hospitals was selected by their number of high thoracic surgery cases and 440 thoracic surgery patients 'charts were selected proportionally allocated from those four selected public hospitals and simple random sampling method was used for selected patient's charts.

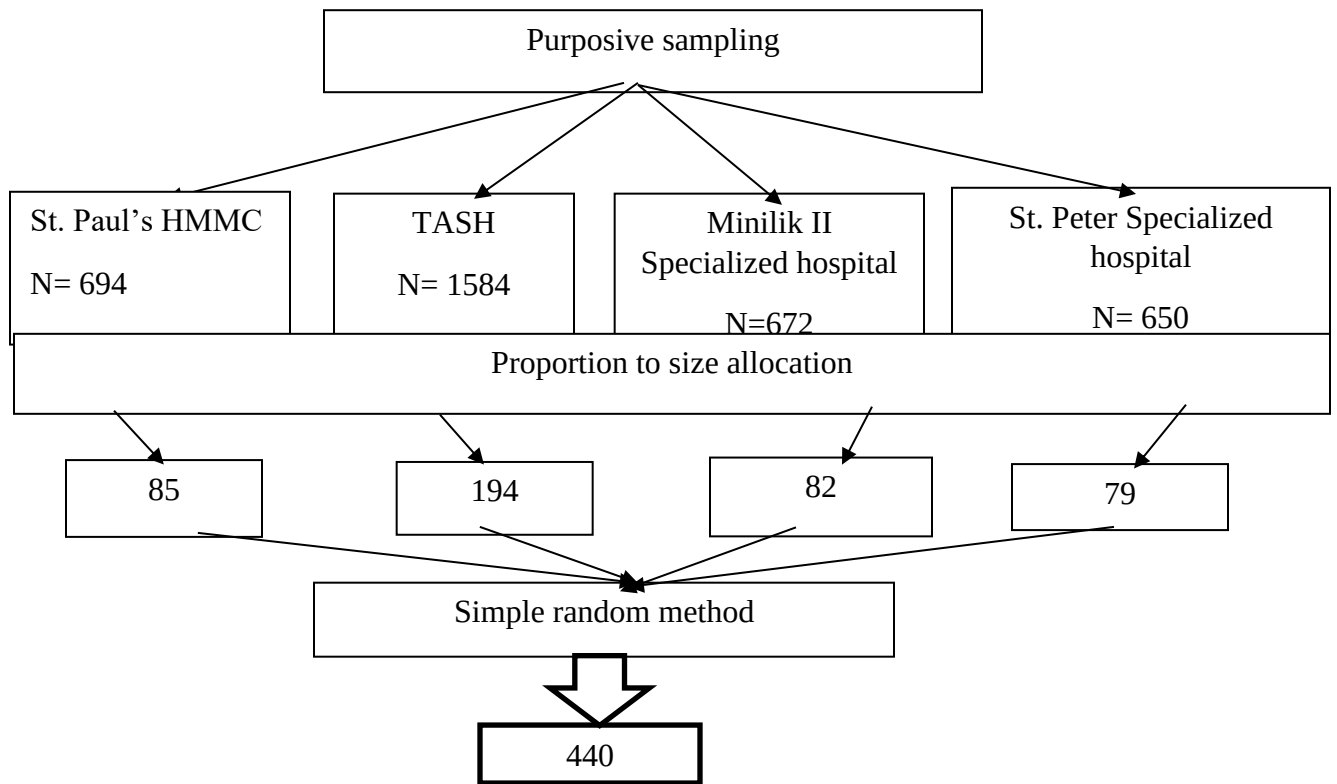


Figure 2: Schematic presentation of the sampling procedure for the study time to recovery and its predictors among thoracic surgery patients in selected public hospitals in Addis Ababa, Ethiopia, 2024.

4.5. Variables

4.5.1. Dependent variables

- Time to recovery of post thoracic surgery.

4.5.2. Independent variables

Patient related factors

- Age
- Sex
- Smoking history
- Preoperative albumin level
- Previous surgical history

- WHO-PS

Procedure related factors

- Types of surgery
- Types of incision
- Types of post-operative analgesia
- Duration of surgery
- Intraoperative complication
- Usage of TPVB

Post-operative Factors

- Post-operative pain score
- Types of post-operative analgesia
- Types of postoperative complication

Comorbidity

- Hypertension
- Diabetes Mellitus
- Coronary Artery Disease
- Chronic Pulmonary Obstructive Disease
- HIV

4.6. Operational Definitions and definition of terms

Full Post-thoracotomy Recovery: Is the lack of significant, non-fatal, life threatening occurrences within the first 30 days following surgery or the absence of fatalities within the first 30 post-thoracotomy days(23).

Major complication: Events that are neither deadly nor life-threatening and fall into the category of respiratory or non-respiratory complications that happen within the first 30 days following surgery, require pharmacological or technical support, result in permanent disability, or endanger life expectancy(23).

Operative mortality: Any death occurring within 30 days of surgery patients before discharge(34).

Event: Full post-thoracotomy recovery.

Censoring: Includes patients who were lost to follow-up, transferred out, died or completed the follow-up period before achieving full recovery.

Time to event: Time between thoracotomy to recovery or censoring (in days).

WHO-PS: is a score that estimates the patient's ability to perform certain activities of daily living without the help of others(35).

Co morbidity: The co-occurrence of more than one disorder in the same individual(36).

4.7. Data Collection tool and technique

A data collection tool/data abstraction format is adapted based on previous literature and the study objectives. The form is divided into six parts. The first portion contains socio-demographic information about the thoracotomy patient: age and gender. The second portion deals with patient related questions: preoperative WHO performance score, preoperative albumin, smoking history, previous surgical history. The third portion deals with procedure related data: indication of the surgery, types of surgical procedure, types of incision, types of approach, duration of surgery, availability of TPB and intraoperative complications. The fourth portion contains post-operative related questions: types of post-operative analgesia, postoperative pain score and types of postoperative complication. The fifth portion deals with comorbidities: Hypertension, Diabetes Mellitus, CAD, COPD and HIV. The six portion contains outcome related questions.

The data were collected by four trained BSc nurses by using a data abstraction form to assess the available information on the patient chart, patient registration book, and hospital HMIS data. The data was collected from the patients' register for the previous three years from January 2021 up to December 2023. After obtaining the card numbers of thoracotomy cases from the operation room registration logs, and clinical data was collected from patient medical records using a pre-tested and prepared data gathering checklist. The data collectors were used this card number to

filter the patient's chart from the medical record room. The checklist was completed by looking through the patient's charts for relevant information.

4.8. Data Quality Control and Management

Data quality was managed by adequately training data collectors. Also, the quality of data was managed by using properly designed and pretested checklists. Pretest was be done on 5% of the total sample size in St. Paul's HMMC. Charts of the study population were assessed for completeness, and also filled checklists were checked for completeness daily by the supervisor and principal investigator.

4.9. Data Analysis

The collected data was entered into Epi-data version 4.4.3.1 and was exported to SPSS version 26 and coding, clean and analysis was done accordingly. Descriptive analysis frequencies with percentages and median survival times were used to characterize the study population. Kaplan-Meier survival plot together with Log-rank test was used to compare the median time to post thoracotomy recovery between groups, to identify significant predictors of post thoracotomy outcomes and time to post-thoracotomy recovery, Cox proportional hazard survival model was be run at a 5% level of statistical significance.

4.10. Ethical and legal Consideration

A letter of support was obtained from the school of medicine and ethical clearance was obtained from the institutional review board of SPHMMC. The information gathered was handled with confidentiality and were not be used for any other purpose.

4.11. Dissemination of Results

The final report will be presented as partial fulfillment of the requirement for the postgraduate specialty program of Nursing at SPHMMC. The finding will be released to SPHMMC community as well, and attempts will be made to publish the final paper in peer reviewed journals.

CHAPTER FIVE

5. RESULT

5.1. Base line (pre-operative) characteristics

Out of the 440 post-thoracotomy patients, 56.3% of the study participants were under 45 years of age. There was an 18-year-old minimum and an 80-year-old maximum age limit. Two hundred fifty-nine (58.9%) were male and 111(25.5%) patients were smokers. At the time of presentation, nearly half of them (44.8%) had one or more concomitant diseases. There were 99/197 patients with hypertension, 63/197 with diabetes mellitus, 15/197 with cardiovascular disease, 10/197 with chronic obstructive pulmonary disease, and 10/197 with HIV. Of the patients, sixty-six (15%) had undergone previous surgery.

Table 2: Baseline characteristics of the participants who underwent thoracotomy (n=44)

Variable	Frequency (%)	Variable	Frequency
Age		WHO-PS	
Below 25	49 (11.1%)	0 (Asymptomatic)	11 (2.5%)
26-35	115 (26.15)	1(Symptomatic but ambulatory)	6 (14.5%)
36-45	84 (19.1%)	2 (<50%in bed during the day)	20 (4.5%)
46-55	99 (22.5%)	3 (>50%in bed during the day)	36 (8.2%)
56-65	55 (12.5%)	4 (Bed bound)	28 (6.4%)
Above 65	38 (8.6%)		
Sex		Comorbidities	
Male	259 (58.9%)	Yes	197(44.8%)
Female	181 (41.1%)	No	243(53.2%)
Smoking history		Previous surgical history	
Yes	111(25.2%)	Yes	66 (15.0%)
No	329 (74.2%)	No	374 (85.0%)

5.2. Operative and post-operative characteristics

Empyema thoracis, which affected 168 patients (38.2%), had the highest frequency of thoracotomy indications, followed by esophageal cancer in 136 patients (30.9%), lung tumor and lung cancer in 33 patients (7.5%), hydatid cysts in the lung in 28 patients (6.4%), lung masses in 22 patients (5.0%), achalasia in 17 patients (3.9%), gastric cancer in 6 patients (1.4%), and other 30 patients (6.8%). Posterolateral thoracotomy was the most frequently used surgical technique, with 399 (90.7%) patients undergoing it and 41 (9.3%) undergoing a midline incision. 136 (30.9%).

With 167 patients (38.0%), decortication was the most prevalent surgical operation. Patients with esophagectomy (31.1%), lobectomy (17.3%), and pneumonectomy (4.8%) were the next most common surgical procedures. The operation lasted 1-2 hours in 138 (31.3%) patients, 3-4 hours in 227 (51.6%) and 5-6 hours in 75 (17%) respectively.

Intraoperative complications occurred in 113 (25.7%) patients. The commonest intraoperative complication was bleeding, which occurred in 81 (18.4%) and cardiac arrest in 26 (5.9%) patients. NSAIDs, PCM IV, and IV opioids were the most often used forms of analgesia during the recovery period.

During the procedure, 214 patients, or 48.8%, had a paravertebral block. Out of all the patients, only 22 patients (5%) had minimally invasive surgery performed; the remaining patients had an open thoracotomy. 73 patients (16.6%) experienced postoperative complications.

Post-operative complication occurred in 74 (16.8%) patients among this the most common complications were respiratory arrest (38.6%), pneumonia (12.7%) and infection (5.2%). 263 patients (59.8%) reported moderate pain, while 117 patients (26.6%) reported severe pain. The most common post-operative symptom was pain 256 (58.2%) followed by pain with SOB 80 (18.2%) and pain with fatigue 63(14.3%).

Table 3: operative and postoperative characteristics of the participants who underwent thoracotomy (n=440)

Variables	Frequency (%)	Variables	Frequency (%)
Operative procedure done		Post operative pain score	
Fundoplication	17 (3.9%)	1-3 mild pain	60 (13.5%)
Gastrectomy	22 (5.0%)	4-6 moderate pain	263 (59.3%)
Other	30 (6.8%)	7-10 severe pain	117 (26.6%)
Postoperative analgesia used		Types of postoperative symptoms	
Epidural	4 (0.9%)	Pain	256 (58.2%)
IV narcotics	69 (15.7%)	pain and SOB	80 (18.2%)
NSAIDS	10 (2.3%)	pain, drowsiness and SOB	26 (5.9%)
PCM IV	11 (2.55)	pain and fatigue	63 (14.3%)
IV narcotics and NSAIDS	148 (33.6%)	pain and drowsiness	9 (2.0%)
IV narcotics and PCM IV	155 (35.2%)	pain, fatigue and drowsiness	6 (1.4%)
epidural and IV narcotics	15 (3.4%)		
epidural and PCM IV	19 (4.3%)		
NSAIDS and PCM IV	9 (2.0%)		
Postoperative pain score		Types of incision	
1-3 mild discomfort	60 (13.6%)	open	418 (95%)
4-6 moderate pain	263 (59.8%)	MIS	22 (5.0%)
7-10 severe pain	117 (26.6%)		
Occurrence day of postoperative complications			
Day 1	42 (9.5%)		
Day 2	2 (0.5%)		
Day 4	2 (0.5%)		
Day 5	10 (2.3%)		
Day 6	17 (3.9%)		

5.3. Post thoracotomy outcome, censoring status and median recovery time

Of the 440 patients, 371 (84.3%) fully recovered, and the remaining 69 (15.6%) were censored. Among the censored observations, 62 (14.1%) have recovered from complications, and 7 (1.4%) have died. The overall median time to post-thoracotomy recovery was 10 days (95% CI: 9.31–10.69). A comparison of the median recovery time was made between the groups.

Accordingly, a significant delay in postoperative recovery was observed for patients who were older than 66 than age below 25 years old (27 vs. 6 days), male (23 vs. 14 days), with open surgical incision (10 vs. 5 days), have previous surgical history (27 vs. 8 days), smoking history (30 vs. 7 days), usage of paravertebral block (7 vs. 22 days), comorbidities CVD (22 vs. 9 days), HTN (43 vs. 9 days), DM (35 vs. 14 days), HIV (35 vs. 18 days), occurrence of intraoperative complications (40 vs. 9 days), and duration of surgery 1-2 hours (6 days), 3-4 hours (10 days), and 5-6 hours (38 days), respectively.

Table 4: Censoring status and comparison of mean time to recovery between groups among patients who underwent thoracotomy (n= 440).

Variables	Time to recovery		Median time to recovery (in days)	Log-rank estimate
	Event	Censored		
Age				$X^2 = 74.304$ P value = 0.000*
Below 25	49	0	6	
26 – 35	98	17	8	
36 – 45	78	2	8	
46 – 55	74	25	10	
56 – 66	47	8	10	
Above 66	25	10	27	
Sex				

Male	208	46	10	$X^2 = 12.008$ P value = 0.001*
Female	163	16	10	
WHOPS				$X^2 = 142.459$ P value = 0.000*
Asymptomatic	11	0	6	
Symptomatic but ambulatory	62	2	10	
<50%in bed during the day	14	6	24	
(>50%in bed during the day	23	13	27	
Bed bound	14	9	45	
Albumin				$X^2 = 96.116$ P value = 0.000*
2 – 3	29	18	27	
3 – 4	218	35	10	
> 4	122	9	7	
Smoking				$X^2 = 193.045$ P value = 0.000*
Yes	57	47	30	
No	314	15	7	
Previous Surgical history				$X^2 = 45.457$ P value = 0.000*
Yes	37	24	27	
No	334	38	8	
Indication				$X^2 = 118.529$ P value = 0.000*
Empyema	158	8	7	
Esophageal cancer	103	30	17	
Lung cancer	28	3	10	
Gastric cancer	6	0	6	

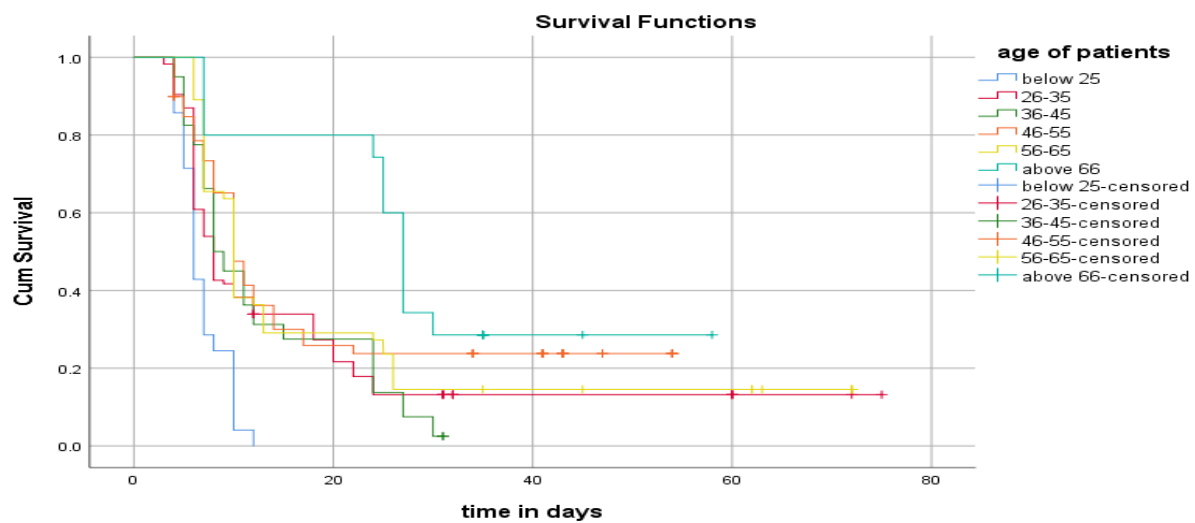
Hydatid cyst	18	10	12	
Achalasia	16	1	8	
Lung mass	18	4	12	
Others	24	6	10	
Operative procedure done				X ² = 114.504 P value = 0.000*
Decortication	157	8	7	
Esophagectomy	104	30	17	
Lobectomy	56	20	10	
Pneumonectomy	16	3	10	
Fundoplication	16	1	6	
Gastrectomy	6	0	8	
Others	16	0	18	
Duration				X ² = 359.711 P value = 0.000*
1 -2 hr	142	3	6	
3 – 4 hr	195	19	10	
5 – 6 hr	34	40	20	
Para vertebral block used				X ² = 175.209 P value = 0.000*
Yes	205	7	7	
No	166	55	22	
Intraoperative complication				X ² = 235.295 P value = 0.000*
Yes	51	55	45	
No	320	7	7	
Types of intraoperative complication				

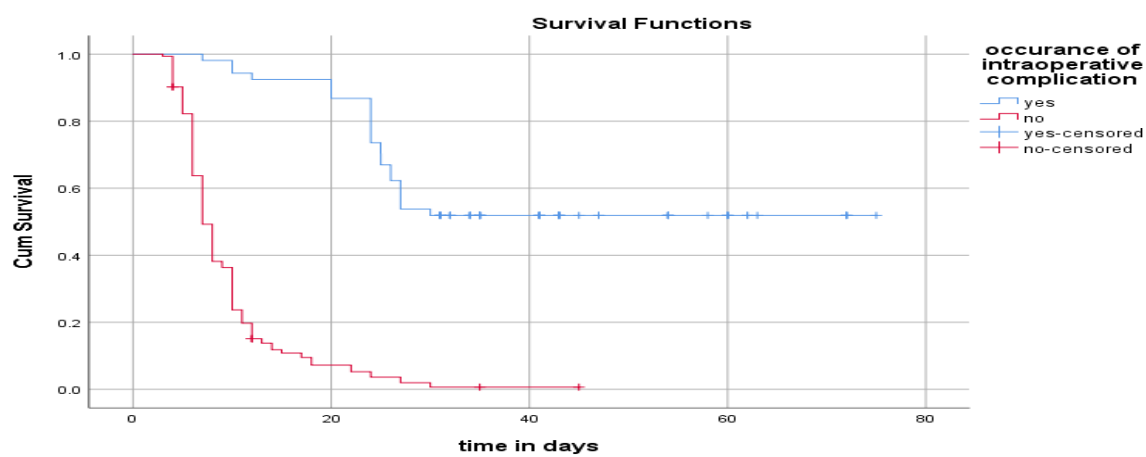
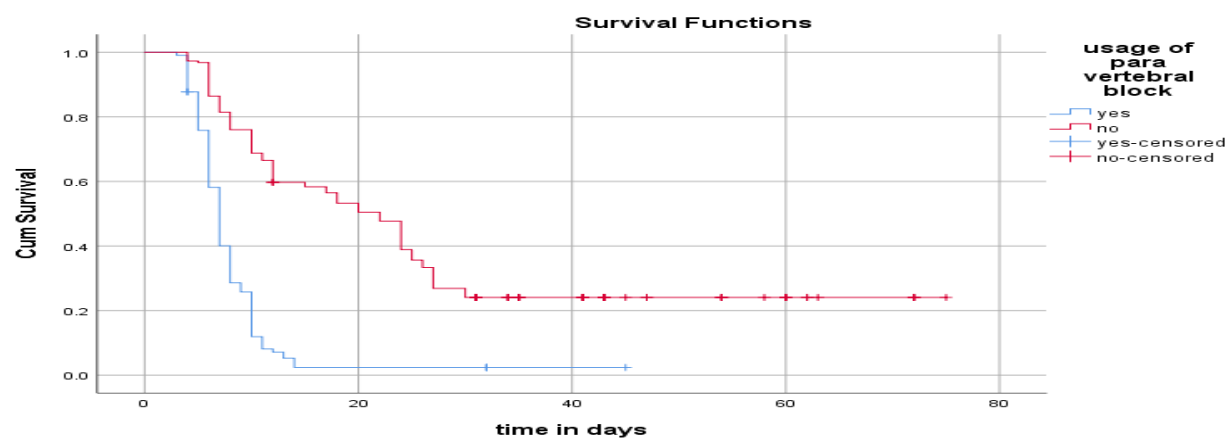
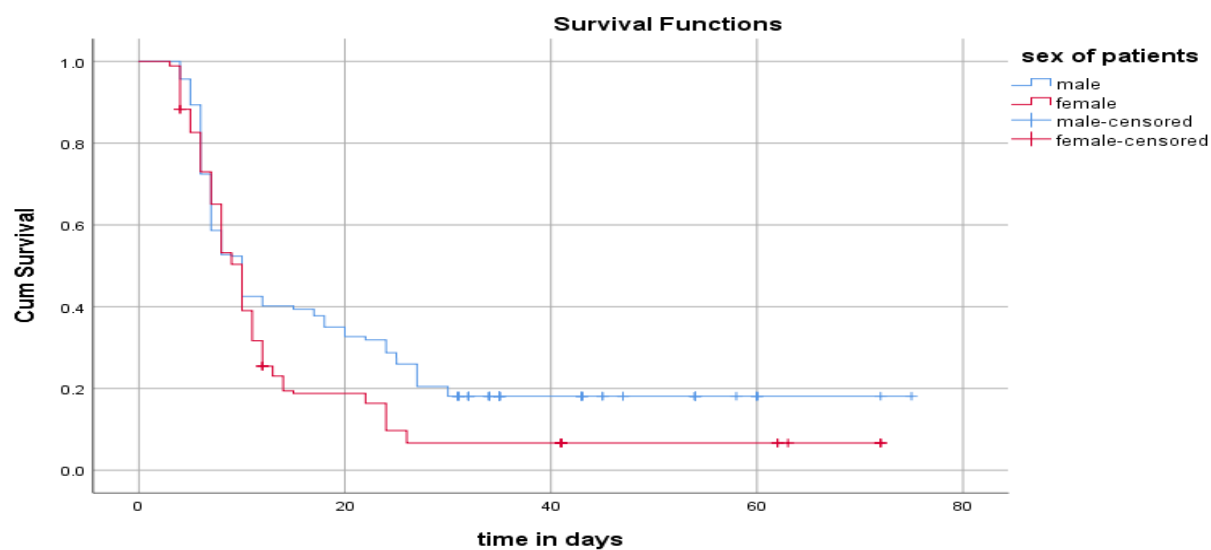
Bleeding				$X^2 = 2.880$ P value = 0.237
Cardiac arrest				
Bleeding and cardiac arrest				
Post-operative analgesia				$X^2 = 57.811$ P value = 0.000*
Epidural	4	0	7	
IV narcotics	62	7	8	
NSAIDS	10	0	4	
PCM IV	11	0	5	
IV narcotics and NSAIDS	116	26	10	
IV narcotics and PCM IV	154	133	10	
epidural and IV narcotics	7	8	7	
epidural and PCM IV	19	0	5	
NSAIDS and PCM IV	9	0	8	
Surgical Approach				$X^2 = 75.525$ P value = 0.000*
Posterolateral thoracotomy	331	61	10	
Mid – line thoracotomy	40	1	5	
Incision				$X^2 = 44.379$ P value = 0.000*
Open	349	62	10	
MIS	22	0	5	
Post-operative complication				$X^2 = 127.330$ P value = 0.000*
Yes	39	31	35	
No	340	23	8	
Type of post-operative complication				

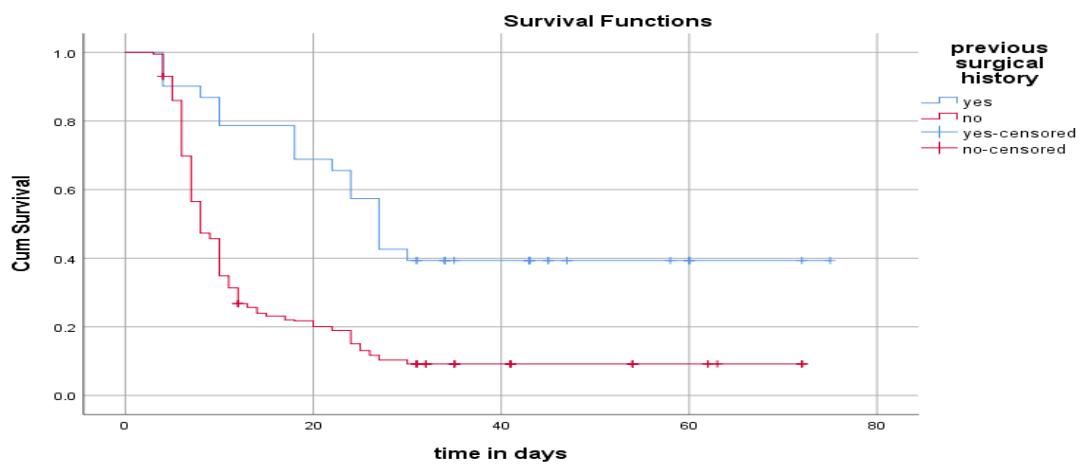
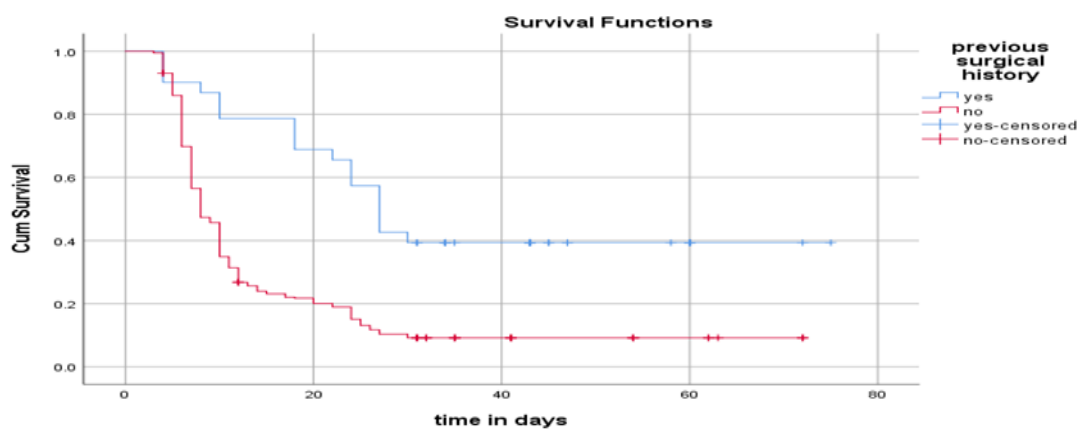
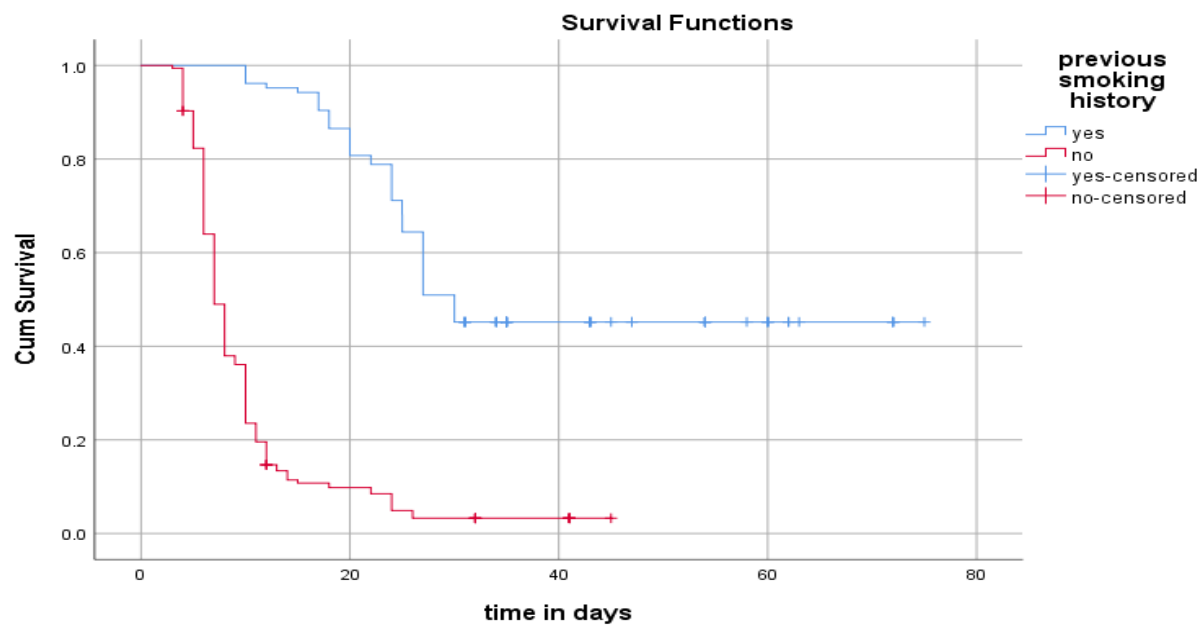
Infection	9	11	32	$X^2 = 0.136$ P value = 0.934
Respiratory	16	20	34	
Pneumonia	4	8	30	
Post-operative symptoms				$X^2 = 260.018$ P value = 0.000*
Pain	249	7	7	
Pain and SOB	49	27	27	
Pain, drowsiness and SOB	6	18	35	
Pain and fatigue	63	0	10	
Pain, drowsiness	1	8	15	
Pain, fatigue and drowsiness	4	2	30	
Day of post-operative complication				$X^2 = 19.492$ P value = 0.001*
< Day 3	15	26	20	
> Day 3	14	13	30	
Comorbidities				$X^2 = 221.618$ P value = 0.000*
Hypertension				
Yes	1	7	23	
No	370	55	10	
Diabetes mellitus				$X^2 = 97.418$ P value = 0.000*
Yes	28	32	17	
No	343	30	8	
COPD				$X^2 = 0.013$ P value = 0.908
Yes	10	0	22	
No	361	62	9	

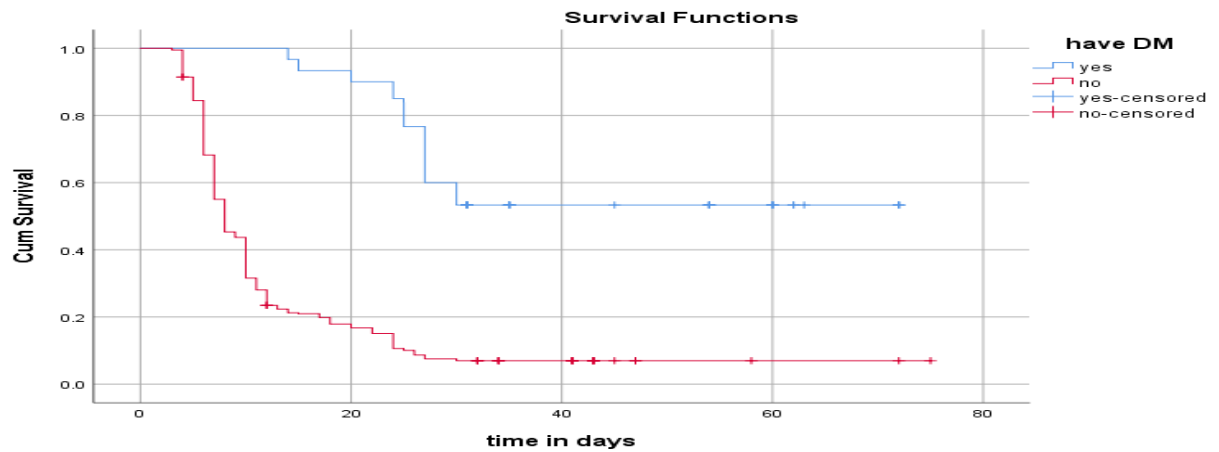
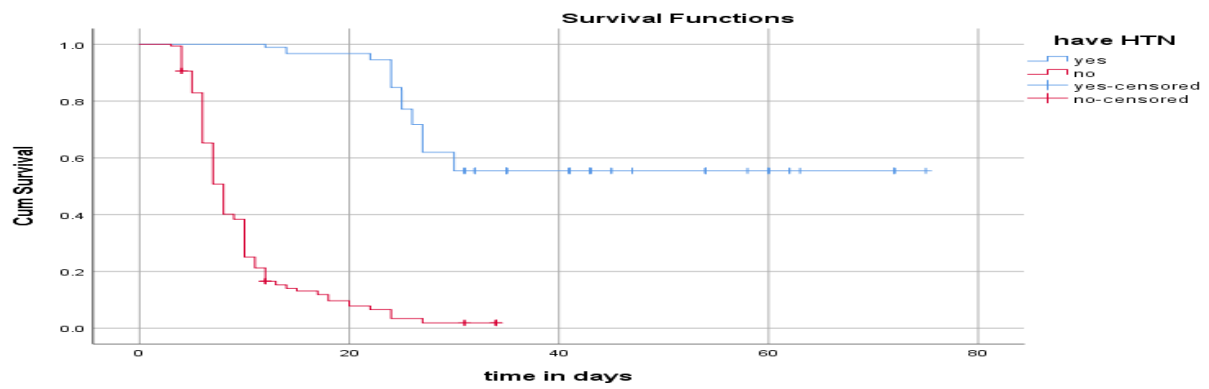
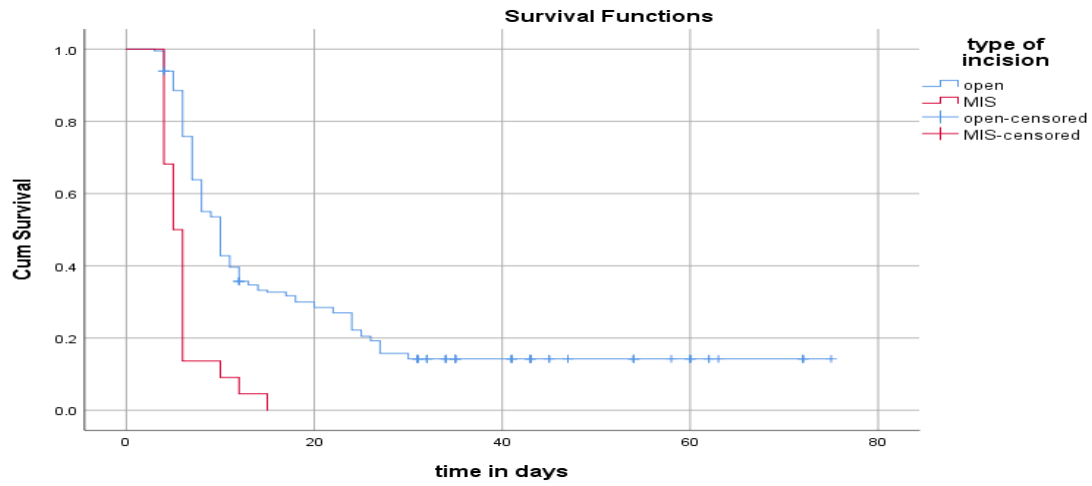
HIV				$X^2 = 15.113$ P value = 0.000*
Yes	1	7	35	
No	370	55	10	
CVD				$X^2 = 8.849$ P value = 0.003*
Yes	9	6	22	
No	362	56	9	
Blood loss				$X^2 = 96.116$ P value = 0.000*
< 500ml				
500-900 ml				
> 900				
Pain score				$X^2 = 363.411$ P value = 0.000*
1 – 3 mild discomforts	60	0	6	
4 – 6 moderate discomforts	255	8	8	
7 – 10 severe pains	56	54	30	

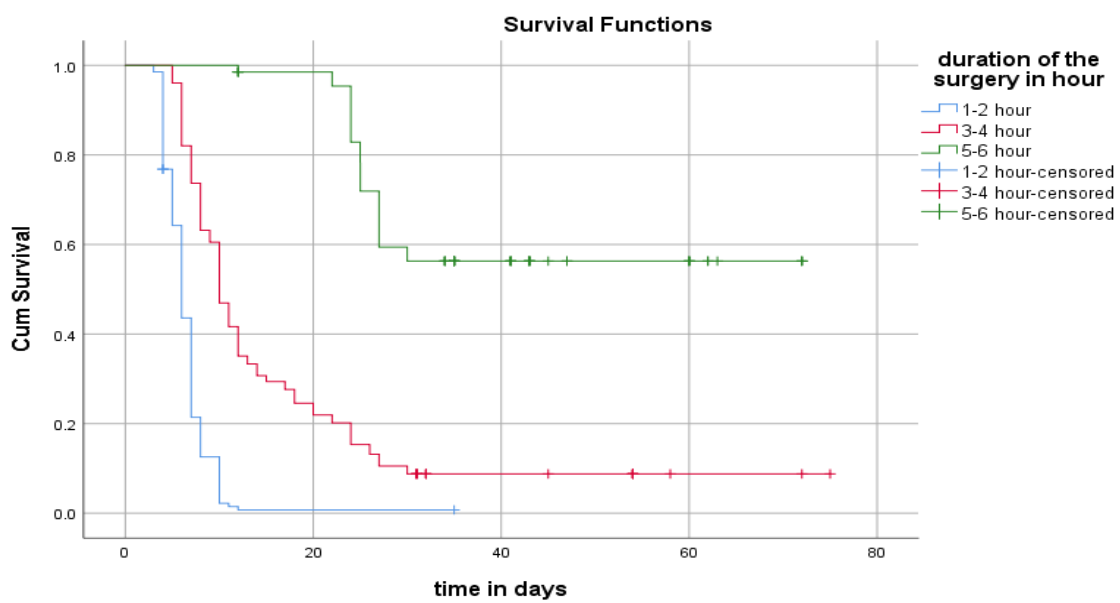
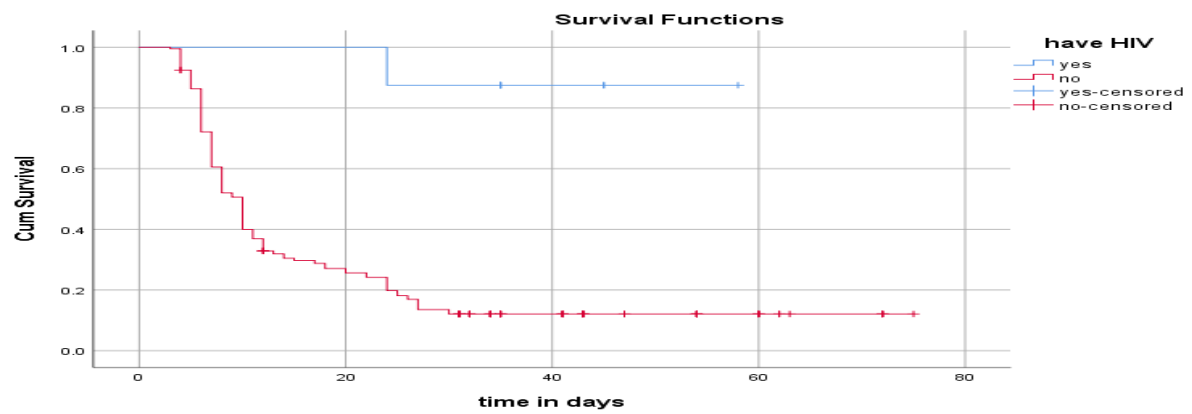
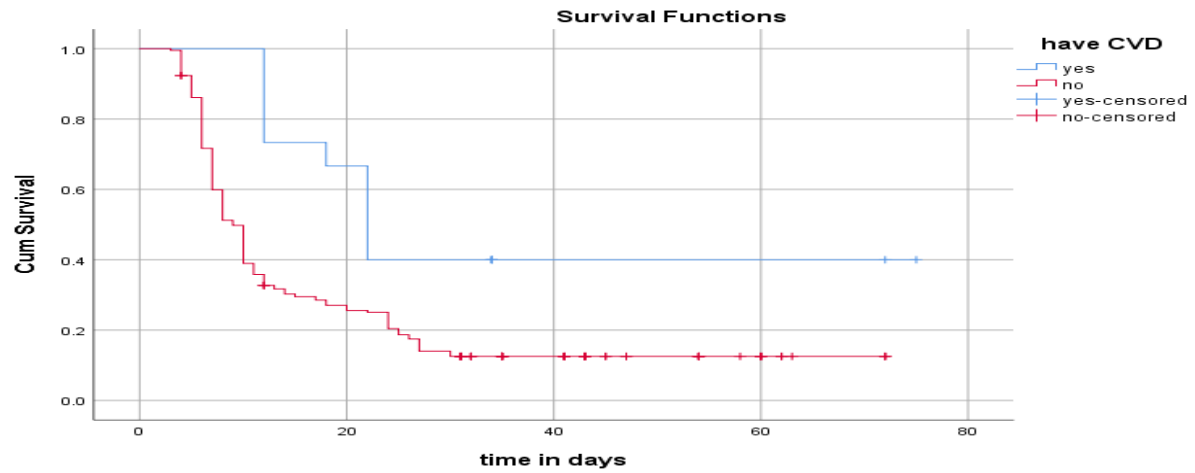
This difference is also demonstrated on the KM survival plot of these groups where a shorter recovery time for the above group is observed. (figure1)











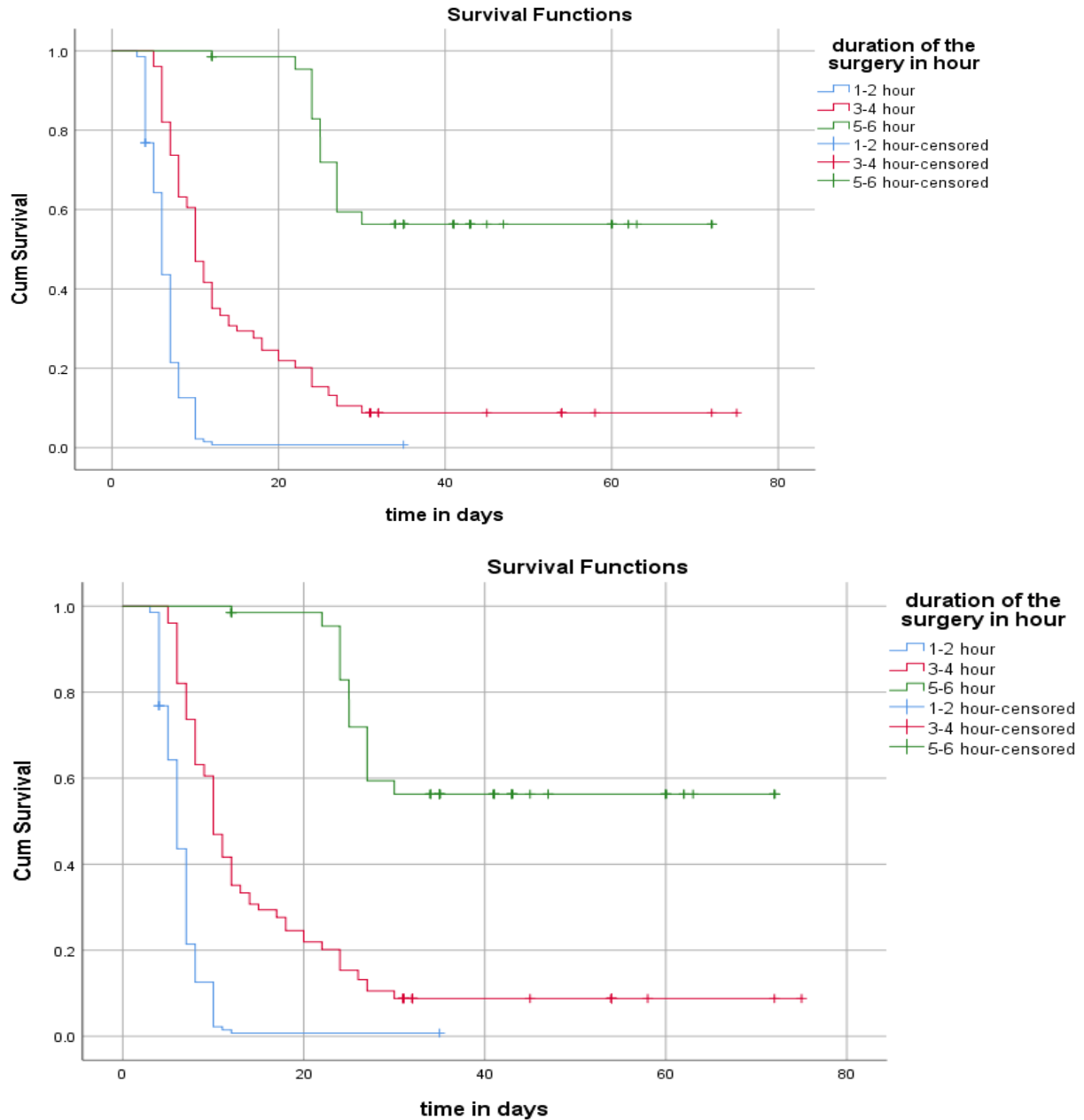


Figure 3: Kaplan -Meier survival graph of time to post thoracotomy recovery stratified by age, sex, para vertebral block, intraoperative complication, smoking, previous surgical history, incisional type, surgical approach, comorbidities and duration of the surgery.

5.4. Predictors of post thoracotomy outcomes

To identify the predictors of post-thoracotomy outcomes, a multivariable Cox regression model was run: age, sex, WHO-PS, smoking history, previous surgical history, preoperative albumin level, indication for the surgery, operative procedure done, duration of the surgery, usage of the paravertebral block during surgery, the occurrence of intraoperative complications, postoperative analgesia used, surgical approach, types of incision, occurrence of postoperative complications, types of postoperative symptoms, comorbidities, postoperative pain score, and amount of blood loss during surgery, which were found to be significantly associated on bivariate analysis. From these, paravertebral block, age, sex occurrence of intraoperative complications, surgical incision type, duration of surgery, smoking history, previous surgical history, and comorbidities (HTN, DM, CVD, and HIV) were found to be significantly associated with the outcome.

Table 5: predictors of post thoracotomy outcome among patients who underwent thoracotomy (n=440)

Variables	CRR (95% CI)	ARR (95% CI)	P- value
Age			
Above 66	1	1	
56-66	1.962(1.117, 2.780)	0.282(0.158, 0.505)	0.000
46-55	1.762(1.117, 2.780)	0.188(0.111, 0.320)	0.000
36-45	2.559(1.626, 4.029)	0.267(0.157, 0.454)	0.000
26-35	2.460(1.579, 3.832)	0.274(0.158, 0.475)	0.000
Below 25	5.691(3.455, 9.377)	0.243(0.137, 0.430)	0.000
Usage of para vertebral block			
No	1	1	
Yes	4.001(3.174, 5.042)	2.324 (1.719, 3.140)	0.000
Sex			
Female	1	1	

Male	0.709(0.576, 0.874)	1.501(1.129, 1.994)	0.005
Comorbidities			
HTN			
No	1	1	
Yes	0.105(0.074, 0.150)	0.129(0.070, 0.237)	0.000
DM			
No	1	1	
Yes	0.186(0.125, 0.275)	0.283(0.160, 0.503)	0.000
HIV			
No	1	1	
Yes	0.065(0.009, 0.465)	0.079(0.011, 0.574)	0.012
CVD			
No	1	1	
Yes	0.402(0.207, 0.779)	0.218(0.106, 0.447)	0.000
Occurrence of intraoperative complications			
No	1	1	
Yes	0.112(0.080, 0.155)	0.348(0.209, 0.580)	0.000
Types of surgical incision			
Open	1	1	
MIS	0.269(0.173, 0.417)	0.252(0.419, 0.425)	0.000
Duration			
5-6 hr	1	1	
3-4 hr	0.278(0.232, 0.333)	0.567(0.365, 0.831)	0.000
1-2 hr			

Smoking			
No	1	1	
Yes	0.157(0.116, 0.212)	0.462(0.263, 0.811)	0.007
Previous surgical history			
No	1	1	
Yes	0.345(0.245, 0.487)	0.575(0.344, 0.962)	0.035

Accordingly, after adjusting for other variables, the risk of delayed recovery is 75.7% lower for patients under 25 years old compared to patients above 66 years old (AHR= 0.243, 95% CI=0.137, 0.430, P=0.000), the risk of delayed recovery is 73.3%% lower for patients above 45 years old compared to patients above 66 years old (AHR= 0.267, 95% CI= 0.157, 0.454, P=0.000).

The hazard of delayed recovery has been reduced 23.7% for patients those receive TPVB during surgery compared to those who didn't receive (AHR= 2.324, 95% CI=1.719, 3.140, P=0.00)

The risk of delayed recovery is 85% lower for female patients compared to male patients (AHR=1.501, 95% CI=1.129, 1.994, P=0.005)

The risk of delayed recovery is 74.8% higher for patients who underwent open thoracotomy compared to those patients underwent MIS (AHR=.0252, 95% CI= 0.419, 0.425, P=0.000).

The hazard of delayed recovery has been reduced by 53.8% for non-smokers compared to smokers (AHR=0.462, 95% CI=0.263, 0.811, P=0.007)

The risk of delayed recovery is 42.5% lower for patients without a history of previous surgery compared to patients with a history of previous surgery (AHR= 0.575, 95% CI = 0.344, 0.962, P=0.035.

The risk of delayed recovery is 43.3% lower for patients undergoing surgery that lasts 1 to 2 hours compared to patients undergoing surgery that lasts 5 to 6 hours(AHR=0.567, 95% CI=0.365, 0.831, P=0.00)

The risk of delayed recovery is 75.7% lower for patients under 25 years old compared to patients above 65 years old(AHR=0.243, 95% CI=0.137, 0.430, P= 0.000).

Patients without hypertension have an 87.1% lower risk of delayed recovery compared to patients with hypertension (AHR=0.129, 95% CI=0.070, 0.237, P=0.000)

Patients without DM have an 71.7% lower risk of delayed recovery compared to patients with DM (AHR=0.129, 95% CI=0.070, 0.237, P=0.00).

Patients without CVD have an 78.2% lower risk of delayed recovery compared to patients with CVD (AHR=0.283, 95% CI=0.160, 0.503, P=0.000)

The risk delayed recovery is 62.2% higher for patients who experience IOC compared to those who don't experience complication during surgery (AHR=0.348, 95% CI= 0.209, 0.580 P=0.00)

Patients without HIV have an 87.1% lower risk of delayed recovery compared to patients with HIV (AHR=0.079, 95% CI=0.011, 0.574, P=0.012).

CHAPTER SIX

6. DISCUSSION

This institutional based retrospective cohort study has attempted to assess the median time to full post-operative recovery and identified predictors associated with these outcomes among 440 eligible patients who underwent thoracotomy at Tikur Anebassa Specialized Hospital, St. Pauls Hospitals Millennium Medical College, St. Peter Specialized Hospital, and Minilik II Comprehensive Specialized Hospital January 2021 up to December 2023.

From the 440 patients, 371 (84.3%) fully recovered, and the remaining 69 (15.6%) were censored. Among the censored observations, 62 (14.1) have recovered with complications, and 7 (1.4%) have died, These findings are fairly similar to a study conducted at the Tikur Anbassa specialized hospital in Ethiopia; nevertheless, the study discovered a marginally higher rate of patient recovery, which might have been brought on by the young age of the study participants, the use of MIS, and the use of TPVB during surgery

This research revealed 10 days was the total median time to recover following a thoracotomy; this finding is in line with prospective research done in the United States (18) but slightly higher than another prospective study done in the United Kingdom (20). It was slightly shorter than a study done in Ethiopia at Tikur Anbassa specialized hospital, which lasted 13.2 days (23). Although this can vary based on the type of surgery, the patient's overall health condition, and other factors (34, 36). Because a smaller percentage of participants in this research had higher risk factors like advanced age, a history of smoking, a history of prior surgery, and comorbidities, the median time to recovery was slightly shorter than in previous studies.

The study demonstrated that older patients had a higher risk of major complications and a significantly longer recovery period following a thoracotomy. This could be attributed to the fact that older patients are more likely to have chronic health conditions, which raise the risk of intraoperative complications and unfavourable postoperative outcomes. Another study found that getting older was a risk factor for poor surgical results (17, 24, 29).

Male patients showed significantly delayed recovery after thoracotomy; this elevated risk associated with male sex may be due to the fact that many males also had additional comorbidities and were smokers. This higher risk has also been demonstrated by another research (23, 34).

This study found a strong correlation between long surgical recovery times and the presence of chronic comorbidities. This result was consistent with several investigations (6, 20, and 34)

Intraoperative complications can lead to several negative consequences, including increased length of stay in the hospital and increased risk of infection, which leads to further complications and death. Such increased risk is also demonstrated in another study conducted in Ethiopia in Tikur Anbassa Hospita(23).

Our results indicated that smokers recover more slowly. Smoking affects lung function, wound healing, and the risk of complications—all of which can add to a longer recovery period. These findings are consistent with retrospective research carried out in Australia (36).

Compared to people without a history of prior surgery, those with a history of surgery may require a longer recovery period following surgery. Another important variable that was highly correlated with the length of hospital stay following thoracic surgery was the type of incision. MIS requires less time to recover from than an open thoracotomy. This result was consistent with previous research (9, 24, 33, 34 , 35, 36).

Additionally, this study demonstrated that the use of paravertebral blocks was a protective factor that shortened the duration of hospital stay following thoracic surgery. This outcome was consistent with research done in China (17).

In addition, longer hospital stays were also linked to the length of the procedure, which was another risk factor. This finding is in line with prior research done in the Amhara area of Ethiopia.(28).

6.1. *Strength and limitation of the study*

6.1.1 *Strength*

- To our knowledge, this is the first study conducted in the country to assess recovery time after thoracic surgery and its predictor factors after thoracic surgery.
- The study involves all governmental hospitals in Addis Ababa those done thoracic surgery and tried to make the result representative.
- Standard and valid questionnaire for this studies used in the other study was adopted and adapted
- Pretest was done before actual administration of the prepared tool at actual subjects.

6.1.2 *Limitation*

- This study had used retrospective chart review, therefore some variables like body mass index, nursing post-operative chest physiotherapy, chest tube management and post-operative pain management not include in this study. Therefore, the result may not reflect the actual effect of post-operative factors regarding patients after thoracic surgery.

CHAPTER SEVEN

7. CONCLUSION AND RECOMMENDATION

7.1. Conclusion

The study revealed that close to 85% patients have fully recovered. The post thoracotomy morbidity and mortality in the study population are similar to previous reports and the median recovery time is within the expected range for a good outcome. being male, older age, smoking history, previous surgical history, occurrence of intraoperative complications, prolonged surgery duration and comorbidities were significant predictors of increased risk of major post-operative complications, death and prolonged recovery. Other variables like usage of para vertebral block during surgery and MIS were significant predictors of decreased risk of major post-operative complications, death and prolonged recovery. Therefore, mitigating risks during the perioperative period and closely monitoring and managing high risk patients during the post-operative period is essential.

7.2. Recommendation

To FMOH and policy makers

- I. The FMOH should give training for health professionals about MIS to enhance their knowledge and practice for thoracotomy surgeries.
- II. Policy makers should prepare policies and national guidelines based on evidence based global guidelines within the latest recommendations to prevent post operative thoracotomy complications.
- III. The FMOH should build smoking rehabilitation centers to decrease number of smokers.

To researchers

- I. Conducting a prospective cohort study to investigate additional risk factors in a large patient population and including private hospitals.

CHAPTER EIGHT

8. REFERENCE

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9. APPENDIX

I declare that this research thesis time to recovery and its predictors after thoracic surgery in selected public hospitals in Addis Ababa Ethiopia, 2024 is my own work that have not been addressed in the study area as far as my knowledge touched and all the sources has been indicated and acknowledge as complete reference.

Name of investigator	signature	date
Mariza Abebe		
Name of adviser/s		
1. Rahel Mezemir		
2. Assefa Abdisa		
Name of invigilators		
1. Dr. Dereje Bayisa		
2. Fatuma Arega		

Questionnaires

Dear data collectors, I appreciate your time, efforts and willingness to participate in this study. All data will be obtained from patient registries and patient cards. The data collected must be rational and based solely information from records not arbitrarily, so please collect the genuine data from the patient card honestly. The data extraction form is divided into five sections, beginning with Socio-demographic information and ending with the existence of co co-morbidities. The choice form should be chosen by encircling. Other information should be entered exactly as it appears on the information card. A pencil should be used to enter the data.

Annex II: Questionnaire

Medical record number.....

Code.....

Date of data collection.....

Name of data collector.....

Part I: Patient's demographic data

S, no	Questions	Response
101	Age in year	
102	Sex	a. Male b. Female

Part II: patient related questions

201	Pre-operative WHO performance score	a. asymptomatic b. symptomatic but ambulatory c. < 50% in bed during the day d. > 50% in bed during the day e. bed bound
203	Pre-operative albumin level	
204	Smoking history	a. yes b. no

205	Does the patient have a history of previous surgery?	a. yes b. no
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Part III: procedural related questions

301	Indication for the surgery	
302	Types of surgical approach	a. Posterolateral thoracotomy b. sternotomy c. axillary thoracotomy d. hemi clamshell
303	Types of incision	a. open thoracotomy b. MIS
304	Types of surgery	
305	Duration of surgery in hour	
306	Does the patient taken thoracic TPVB during surgery?	a. Yes b. no
307	Intraoperative complication	a. yes b. no
308	Types of intraoperative complications?	

Part IV: post-operative care related questions

401	Types of post-operative analgesia	a. Epidural b. Iv narcotics c. NSAIDS d. tramadol e. other.....
402	Post-operative pain score	a. 0 relaxed and comfortable b. 1-3 mild discomfort c. 4-6 moderate pain d. 7-10 severe pain
403	Post-operative complication	a. Yes b. no
404	If yes, what type of complication	

Part V: co-morbidities

501	Hypertension	a. Yes b. no
502	Diabetes Mellitus	
503	Cardio vascular disease	a. Yes b. no
504	Chronic obstructive pulmonary disease	a. Yes b. no
505	HIV	a. Yes b. no

Part VI: outcome related questions

601	Which postoperative symptoms occur?	a. Pain b. Fatigue c. Drowsiness d. SOB e. Disturbed sleep f. Others.....
602	On which day do those symptoms occur?	------(in days)
603	When does the patient develop postoperative complication?	------(in days)
604	Recover time from postoperative complication?	------(in days)
605	Recovery time patients with intraoperative complication	------(in days)
606	Recovery time in age	------(in days)
607	Recovery time in sex	------(in days)
608	Recovery time in smoking history	------(in days)
609	Recovery time in without smoking history	------(in days)

610	Days of recovery time in WHO-PS	-----
611	Days of recovery in indication of the surgery	-----
612	Days of recovery in previous surgical history	-----
613	Days of recovery in type of surgery	-----
614	Days of recovery in type of surgical incision	-----
615	Days of recovery in types of surgical approach	-----
616	Recovery time in duration of surgery	-----
617	Recovery time in the use of PVB	-----
618	Recovery time without the use of PVB	-----
619	Days of recovery time in WHO-PS	-----
620	Days of recovery time in types of postoperative analgesia	-----
621	Days of recovery time in the presence of comorbidities	-----
622	Days of recovery time in the absence of comorbidities	-----
623	Days of recovery in type of surgery	-----
624	On which postoperative day did the patient die?	-----
625	In which post-operative day did the patient fully recover	-----