



School of Nursing

Magnitude of Postoperative Lung Decortication Complications and Associated Factors at Public Hospitals of Addis Ababa, Ethiopia, 2024

By: Kumeshi Soressa

A Research thesis Submitted to Saint Paul's Millennium Medical College School of Nursing Department of Operating Theatre in Partial Fulfillment of the Requirements for the Degree of Masters in Cardiothoracic Surgery Nursing

July, 2024

Addis Ababa, Ethiopia

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Academic Research Thesis Submission Guide

Name of investigator	Kumeshi Soressa
Full title of the research project	The magnitude of postoperative lung decortication complications and associated factors in selected public specialized hospitals in Addis Ababa, Ethiopia, 2024
Duration of the project	May to June 2024
Study Area	Selected specialized public hospitals in Addis Ababa
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Abstract

Introduction: Decortication is a surgical procedure, which involves a peeling off of a restrictive fibrous layer that overlies and entraps the lung. There is no research conducted on the postoperative complication and associated factors of lung decortication in Addis Ababa, Ethiopia.

Objectives: To assess the magnitude of postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia.

Methods: Hospital-based cross-sectional study was conducted among 254 post-operative lung decortication patients who were admitted to surgical units of public hospitals in Addis Ababa, Ethiopia from May to June 2024. Data was collected through a chart review of lung decortication patients from March 2021 to February 2024 with a systematic random sampling method. Data was entered and analyzed with Epi-data 4.6.0.6 and SPSS version 27 software respectively. Descriptive statistics was used to describe the characteristics of the post-decortication patients. Crude odds ratio and adjusted odds ratio, with 95% CI and p-value were used to assess the strength of association and statistical significance. Then the variables with a p-value of < 0.05 with multivariable logistic regression were considered to show significant association. Finally, the data is presented with narratives, tables, and figures.

Result: About 254 post-operative lung decortication patient records from the surgical unit were reviewed and analyzed in this study with a response rate of 100%. The overall post-operative lung decortication complication in this study is 48 % (95% CI: 43.1-53.9). American society of anesthesiologists status of III [AOR; 95% CI: 6.95(2.55-18.91)], smoking history [AOR; 95% CI: 3.43(1.04-11.28)], preoperative infection [AOR; 95%CI: 2.01(1.08-3.74)], reoperation [AOR; 95% CI: 6.6(2.39-18.17)], and being operated with thoracotomy or Sternotomy [AOR; 95% CI: 4.88(1.34-17.74)] were the factors significantly associated with post decortication complication.

Conclusion and recommendation: Post-operative decortication complication in this study is high. Surgical site infections should be prevented with proper and timely chest tube and wound care and The Ethiopian ministry of health in collaboration with hospitals in Addis Ababa better to promote Video-assisted Thoracoscopic surgery procedure.

Keywords: Associated factors, Decortication, Ethiopia, postoperative complication.

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Acronyms and Abbreviations

AAAPHs	Addis Ababa Public Hospitals
ACCP	American College of Clinical Pharmacology
BPF	Broncho pleural Fistula
CCRS	Child Contact Registers Service
CPE	Chronic Pleural Empyema
DPS 2	District Planning Scheme Number 2
FEV	Forced Expiratory Volume
FMOH	Federal Ministry of Health
PDC	Pleurectomy Decortication Complication
MIICSH	Menilik II Comprehensive Specialized Hospital
SPCSH	Saint Peter Comprehensive Specialized Hospital
SPHMMC	Saint Paul's Hospital Millennium Medical College
TASH	Tikur Anbesa Specialized Hospital
VATS	Video-Assisted Thoracoscopic Surgery
VC	Vital Capacity

1. Introduction

1.1. Background

Lung decortication is a surgical procedure, which involves a peeling off of a restrictive fibrous layer that overlies and entraps the lung(1). A decortication is required when patients are symptomatic due to un-expandable lung(2). It was first described by Delorme et al. in 1894 and can be performed either by a minimally invasive approach or an open approach. Lung decortication can be used in either benign complex pleural fluid collections (from either infectious or inflammatory etiology) or malignant pleural disease(3).

Empyema thoracic is one of the main causes of morbidity and mortality in developing countries(4). It should be treated early to avoid complications, extensive operations, and lengthy hospital stays(5). Lung decortication aims to increase the lung volume by freeing the trapped lung with surgical removal of the thickened pleura. Its benefits focus mostly on the improvement of lung volume, lung perfusion, and diffusion capacities(6).

There are various surgical techniques used to treat chronic empyema. As technology and medical science develop, in the last decades video-assisted thoracic surgery (VATS) has been demonstrated as an effective procedure, allowing an optimal debridement of early organized pleural effusions(7). Nowadays it has been recognized that Pleurectomy decortication has the intent of removing all macroscopic diseases, to prolong survival. It is a total parietal and visceral Pleurectomy, sparing the pericardium and the hemi diaphragm, while extended Pleurectomy/decortication (EPD) is the above plus the resection of the pericardium and the hemi diaphragm, when required, and to remove all the macroscopic disease. Extra-pleural pneumonectomy (EPP) is the removal of the visceral and parietal pleura, lung, hemi diaphragm, and pericardium of the affected hemi thorax(8). The patients who undergo extended Pleurectomy/decortication with preservation of the lung appear to have more favorable outcomes compared with patients undergoing extra-pleural pneumonectomy(9). patients with empyema thoracic undergoing open decortications when managed with a digital chest drainage system experienced a faster reduction in air leak, a shorter duration of chest tube placement, and in hospital stay(10).

Lung decortication is a challenging and time-consuming procedure. Meticulous dissection is mandatory to peel the thickened fibrotic cortex off the visceral pleura without causing too many lesions that may consequently lead to prolonged air leak (11).

Decortication for the removal of the thickened pleura is still a common surgery performed. The etiologies of post lung decortication complication have changed over time from infections to trauma in developed countries but majority are still caused by infections particularly in developing countries. The common etiology is development of empyema thoracic secondary to pulmonary diseases like pulmonary tuberculosis, pneumonia, bronchiectasis, lung abscess and chest wall diseases like thoracic wall abscess, penetrating wounds, osteomyelitis of ribs, thoracic vertebrae(12).

The most frequent cause of pleural empyema is pneumonia, when a pre-existing par pneumonic effusion gets superinfected by bacteria, often due to perforation of a sub pleural pulmonary abscess. Other common causes are tuberculosis, previous thoracic surgery or other invasive thoracic intervention, esophageal disease, trauma, sub-diaphragmatic infection, and sepsis(13). With the increasing popularity of minimally invasive techniques, video Thoracoscopic/decortication has been proposed for the treatment of empyema(4,14), despite patients are becoming ill and dying because of decortication complications.

1.2. Statement Problem

Decortication of the lung, either by video Thoracoscopic or thoracotomy, is potentially a morbid procedure and postoperative mortality can approach 9%. This mortality rate is significantly higher than that of other major thoracic procedures such as anatomic lung resection(3).

The number of patients with empyema is increasing in both children and adults. Empyema has a 10–20% mortality rate, long hospital stays, and a heavy financial burden. One-third of patients being treated require surgical treatments(15).

Pulmonary vasoconstriction leads to a significant reduction of perfusion of the underlying lung. Chronic empyema thoracic is a very difficult disease to manage especially in developing countries like ours, where patients present very late and the requisite facilities are inadequate. (16). Postoperative procedure might cause a reduction of lung capacity (forced vital capacity and forced expiratory volume in one second. It might also impair gas exchange, cough, and mucociliary clearance, eventually developing micro-atelectasis and postoperative hypoxemia(17).

The most common clinical findings after decortication were fever (90%), pleural dull pain (80%), productive cough (73%), and dyspnea (70%)in Iran (18). According to a study at Tikur Anbessa specialized Referral Hospitals, decortication complication was 58% and the major complications encountered during surgery and post-operatively were, bleeding (9.7%), lung laceration (24.2%), Diaphragm injury (4.8%), phrenic nerve injury 1(1.6%), thoracic duct injury 1(1.6%), Broncho-pleural fistula (12.9%), pneumonia (3.2%), wound infection (6.3%), recurrent empyema (16.1%) and persistent air space (22.6%)(19).

Limited research has been conducted on the postoperative complication and its associated factors of lung decortication specifically in the context of Ethiopia and public hospitals in Addis Ababa, Ethiopia. Any post-operative decortication complications results in cost burden for health facilities and client dissatisfaction with surgical care. As result it is associated with morbidity, mortality, prolonged length of hospital stay and a high economic burden. It increases burden on patients and the healthcare system. Following complication of decortication; most post-operative patient's health and quality of life affected because of stress, cost for treatments, discomfort related to complication's poor prognosis.

The rates of this serious postoperative complication might decrease by developing better strategies to avoid prolonged air leaks after PDC. Video-assisted Thoracoscopic surgery is the recommended procedure for evacuation and decortication in pleural empyema(20,21). Even though there are recent advances in anesthesia and perioperative care, complications such as myocardial ischemia, thromboembolism, infection, hemorrhage, and death still occur(22).

The ability to determine decortication complications and factors associated with it is important for clinical physicians to execute plan interventions for these risky populations. The reason to conduct this study is that in my daily professional work area observation; there are high magnitude of mortality and morbidity among post decortication patients because of complications. Available studies regarding decortication complications in Ethiopia are scarce. Few previous studies were done only in a single hospital; as a result, it could not be possible to generalize for other hospitals. Therefore this study aimed to assess the magnitude of lung decortication complications and factors associated at public specialized hospitals in Addis Ababa, Ethiopia.

1.3. **Rationale of the Study**

Pleural empyema is a serious health issue with potentially life-threatening consequences if not managed effectively. Decortication is a surgical intervention commonly used to treat pleural empyema, and understanding postoperative complications and associated factors in this procedure is crucial for patients decreasing post operation complication by increasing fast recovery with cost effective treatment and for facilities increase quality of health care.

This study will provide valuable local data that can contribute to evidence-based decision-making and improve patient outcomes. The finding of the research will help policy makers to design a system through policy formulation on post-operative complication of lung decortication. Finally, the finding of this study will also help as a reference for researchers conduct study on the same subject matter.

2. Literature Review

2.1. Magnitude of post-operative complication of decortication

General Thoracic Surgeons' Database shows Postoperative complications occurred on (39.3%), with major morbidity occurring (30.2%). The most common major complications were the need for blood transfusion intra-operatively or postoperatively (26.3%). Mortality occurred (3.1%). and major morbidity occurred in (15.6%). Readmission within 30 days occurred (8.7%). Compared with video-assisted Thoracoscopic surgery, mortality, major morbidity, prolonged length of stay, and discharge to other than home were higher with thoracotomy(23).

In another study in Italy in 2018 Gc by Ambrogi MC Postoperative complications appeared in 23 patients (46.9%). The most common cause of morbidity was anemia, which occurred in 17 cases (34.7%), of whom 13 required a blood transfusion 1 of those patients required reoperation to check hemostasis. Only 4 patients were affected by prolonged air leaking (more than 5 days, 8.1%); only one case of postoperative empyema was observed (24).

Another study done in India by Kumari in 2020 shows the common postoperative complications we encountered were pleural air leak (37.5%) bleeding (25%) infection (25%) and recurrence (2%). Overall morbidity from pleural decortication was seen in 16 patients, and there was no mortality Only one patient had a prolonged air leak for 6 days and early postoperative bleeding (n=4). Patients whose bleeding exceeded more than one litter in 24 hours were taken as complications of bleeding (12).

There were 3 postoperative complications [13%]: wound infection [n = 1], persistent space [n = 1] and recurrent infection [n = 1]. VATS debridement and decortication is a safe and effective treatment in the management of stage II and stage III empyema thoracic.(25).

The study done on the safety and efficacy of decortication for stage III drug-resistant tuberculosis empyema in China The rate of complications was significantly higher in the drug-resistant group (23; 76.7%) than in the drug-sensitive group (53; 50.5%) ($P = 0.01$). Recurrence was not reported in any of the patients. Twenty-three (76.7%) patients in the drug-resistant group and 90 (85.7%) patients in the drug-sensitive group recovered to an “excellent” level, and 3 cases in each group recovered to a “poor” level; there was no significant difference between the 2 groups in surgical effects ($P = 0.21$). Decortication is a safe, effective and feasible option for patients with stage III

drug-resistant TE, although the operation is difficult and risky. (26). Among the patients who underwent pleural decortication, 107(35.2%) patients underwent VATS, and 197 (64.8%) patients underwent open surgery. Two hundred twenty-nine patients were TB empyema according to the CCRS (accounting for 75.3%), and 75 patients with no tuberculosis empyema (27.7%): 33 patients with lung cancer (10.8%), 20 patients with bacterial empyema (6.6%), 13 patients with pleural mesothelioma (4.3%), and another nine patients with other conditions (3.0). over 85% of patients under 65 years old. the average age of participants was 45.55 ± 16.74 years old, ranging from 6 to 75 years (27).

Most empyema was caused by par pneumonic effusions (73 patients, 65.8%), but tuberculosis empyema also was common (33 patients, 29.7%). Four remaining cases (3.6%) resulted from postoperative complications, and 1 case (0.9%) was caused by a parasite infection(28).

In another study in Nigeria in 2021 tells us that Twenty-one patients (35%) had complications with persistent drainage accounting for 13.33%, this was closely followed by persistent air leaks (11.67%). The average duration of drainage was 18.87 days and that of hospital stay was 36.74 days. There were 3 mortalities (5%). One died intra-op while the remaining two died in the intensive care unit(29). Post decortications empyema constituted the highest (n = 4, 36.4%), closely followed by diaphragmatic perforation (n = 3, 27.3%). There was no recorded mortality. Two cases (18.2%) of cardiac arrest encountered were successfully resuscitated (16). The presence of complications was a determinant of the need for decortication. Adolescents and adults had 2.1 times increased probability of requiring a decortication for successful management(30). Postoperative pulmonary complications are the main cause of morbidity and mortality after surgery. A likely explanation is dysfunction of the respiratory muscles, in particular the diaphragm, which results in rapid, shallow breathing and ultimately closing of the airways, atelectasis, and hypoxemia. Breathing exercises in the perioperative period, despite a good rationale, were in general not found to be effective. A promising new approach is specific training of inspiratory muscles (31).

2.2. Factors associated with postoperative complications of lung decortication

In the United State black patients had the highest rate of postoperative morbidity (6.1%) compared to White patients with the lowest (4.2%). More specifically, race was significantly associated with infectious, pulmonary, gastrointestinal, cardiovascular, and systemic complications, with Black patients having the highest rate of all of these complications except for systemic complications, of which Hispanics had the highest rate (32). The significant predictors of respiratory complications were chronic obstructive pulmonary disease, American Society of Anesthesiologists physical status ≥ 3 , right-sided surgery, duration of surgery longer than 180 min, preoperative arterial oxygen saturation on room air $< 96\%$, and open thoracotomy (33).

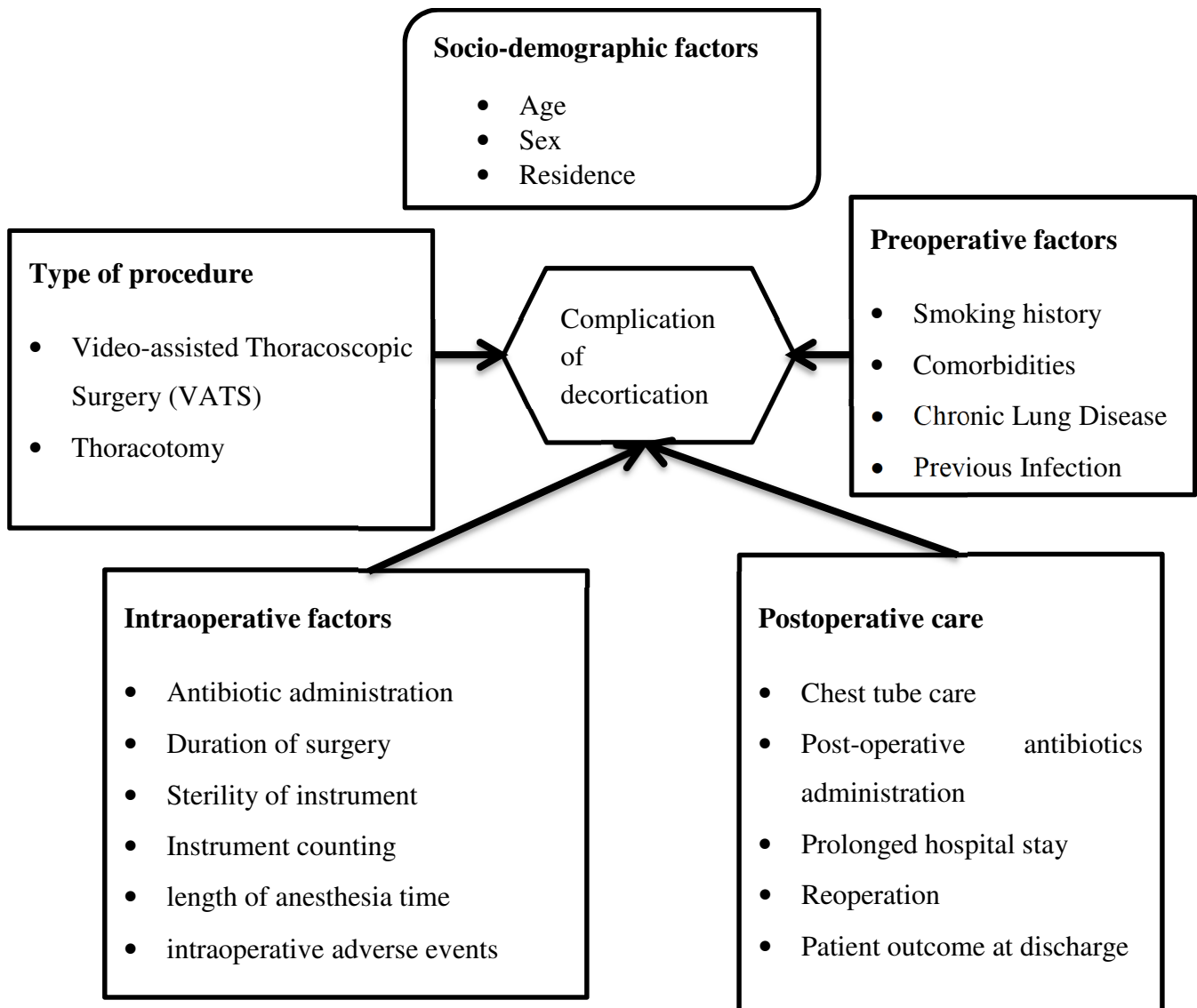
Another study done by Lapidot M. in 2021 shows Decortication by VATS decreases postsurgical complications, and results in decreased disease recurrence. Of the 274 patients, 262 were followed up for 12 months; 26 (9.9%) patients showed complications, including incomplete lung re-expansion (11 patients) and persistent air leak (6 patients). While early disease recurrence was observed in 3 (1.1%) patients after surgery, late recurrence was reported for 6 (2.3%) individuals. Interestingly, the complication rate was much higher in patients with chronic empyema (15/34, 44.1%) than in subjects with acute empyema (11/228, 4.8%)(20) Most patients in their study were male (80%) and had a history of infection with tuberculosis (42%) and pyogenic (28%) infection. A few patients had a history of trauma (12%). Most of the patients suffered from cough (88%), dyspnea (74%), fever (82%), and hemoptysis (22%)(12).

There were increased frequencies of complication in the secondary decortication group, though without a statistically significant difference (45.6%). The patients who underwent secondary decortication had poor nutritional status compared to those who had primary decortication, with a significant statistical difference ($P=0.0370$)(1).. The most frequent disease processes resulting in decortication were pneumonia (60%), trauma (13%), malignancy (8%), and procedural complications (5%). Performing a decortication for an infectious vs a non-infectious etiology was associated with a higher rate of the composite postoperative outcome of myocardial infarction, acute kidney injury, and need of vasopressors (26).

2.3. Conceptual Frame Work

Conceptual framework that shows factors associated with complications of post-operative lung decortication, socio-economic factors, type of procedure, preoperative factors, intraoperative factors, and post-operative factors Adapted from review of literatures(3,17–19).

Figure 1: Conceptual framework that shows factors associated with complications of post-operative lung decortication



3. Objectives

3.1. General objective

- To assess the magnitude of Postoperative lung decortication complications and the associated factors at public specialized hospitals in Addis Ababa, Ethiopia, 2024

3.2. Specific objectives

- To determine the magnitude of postoperative lung decortication complications at public specialized hospitals in Addis Ababa, Ethiopia, 2024
- To identify the factors associated with postoperative lung decortication complications at public specialized hospitals in Addis Ababa, Ethiopia, 2024

4. Method

4.1. Study area

The study was conducted at public hospitals in Addis Ababa, Ethiopia. In the city, twelve sub-cities have their own health offices. Addis Ababa covers an area of 534 square kilometers with a total population of 3,384,569(34). From twelve governmental hospitals in Addis Ababa; five of which are owned by the federal government and six of which are within the Addis Ababa city administration. All hospitals that provide thoracic surgical service are selected for these studies; which are St. Paul's Millennium Medical College (SPHMMC), Tikur Anbesa Specialized Hospital (TASH), St Peter Specialized Hospital (SPCSH), and Menilik II Compressive Specialized Hospital (MIICSH).

St. Paul's Hospital Millennium Medical College is the second largest hospital in Ethiopia. It was built by Emperor Haile Selassie in 1969 with the help of the German evangelical church. It aimed to serve the poor. A medical college was formed in 2007. The hospital has more than 700 beds, cases seen an annual average of 200,000. It has a catchment population of more than 5 million. The hospital has 1300 clinical and non-clinical staff. There are over 13 departments. The Department of Thoracic Surgery is one of the thirteen departments.

Black Lion Specialized Hospital was established in 1961 by Emperor Haile Selassie I as "Prince Mekonnen Memorial Hospital" and got its current name in 1976. The hospital was built with funds from the entire Ethiopian people and has been providing services for all communities. It has now been treating over 500 thousand outpatients and more than 21 thousand inpatients annually.

St. Peter Specialized Hospital is one of the referral hospitals in Addis Ababa, Ethiopia. The hospital was founded in 1953. It is managed by Ethiopia's Federal Ministry of Health (FMoH). In April 2009, it became Ethiopia's first national hospital to offer MDR-TB treatment. It is one of the thoracic surgery specialized referral hospitals in Ethiopia. It also served as a training center and a center of excellence. Patients come from all across the country to get treated at this hospital and,

Menilik II Referral Hospital was established in 1909 and named after Emperor Menilik II, becoming one of oldest modern hospitals in Ethiopia. Built in 1908, it has initial 30 beds only. It is a tertiary care hospital with specialized provision with capacity over 800 beds and offering specialties. Menilik II hosts 15,000 patients each day with over 2,300 staff. Those public

specialized hospitals are selected purposively because of the high numbers of lung decortication surgeries done other than public hospitals in Addis Ababa

4.2. Study period

The study was conducted from May to June 2024

4.3. Study Design

Hospital-based cross-sectional was conducted.

4.4. Source and Study Population

Patient admission records at public hospitals of Addis Ababa were the source population.

All admission records of postoperative lung decortication patients at the surgical ward in SPHMMC, BLH, SPCSH, and MIICSH from March 2021 to February 2024 were the study population.

4.4.1. Inclusion Criteria

All post-operative patient records that underwent lung decortication procedures from March 2021 to February 2024 were included in this study.

4.4.2. Exclusion criteria

Patient records that have lost major variables were excluded from the study and replaced with the next record.

4.5. Sample size determination

The sample size for this study was determined by using a single population proportion formula: assuming a 95% confidence interval, 5% degree of precision, and 50% prevalence or 0.5 proportion of postoperative lung decortication complication as there is no previous study conducted.

$$n = \frac{(z^{\alpha/2})^2 P(1 - p)}{d^2}$$

$$n = \frac{(1.96)^2 0.5(1 - 0.5)}{0.05^2}$$

$$n = 384$$

Since the number of patients undergoing lung decortication within three years at four selected hospitals was less than 10,000 (576) I used the sample correction formula.

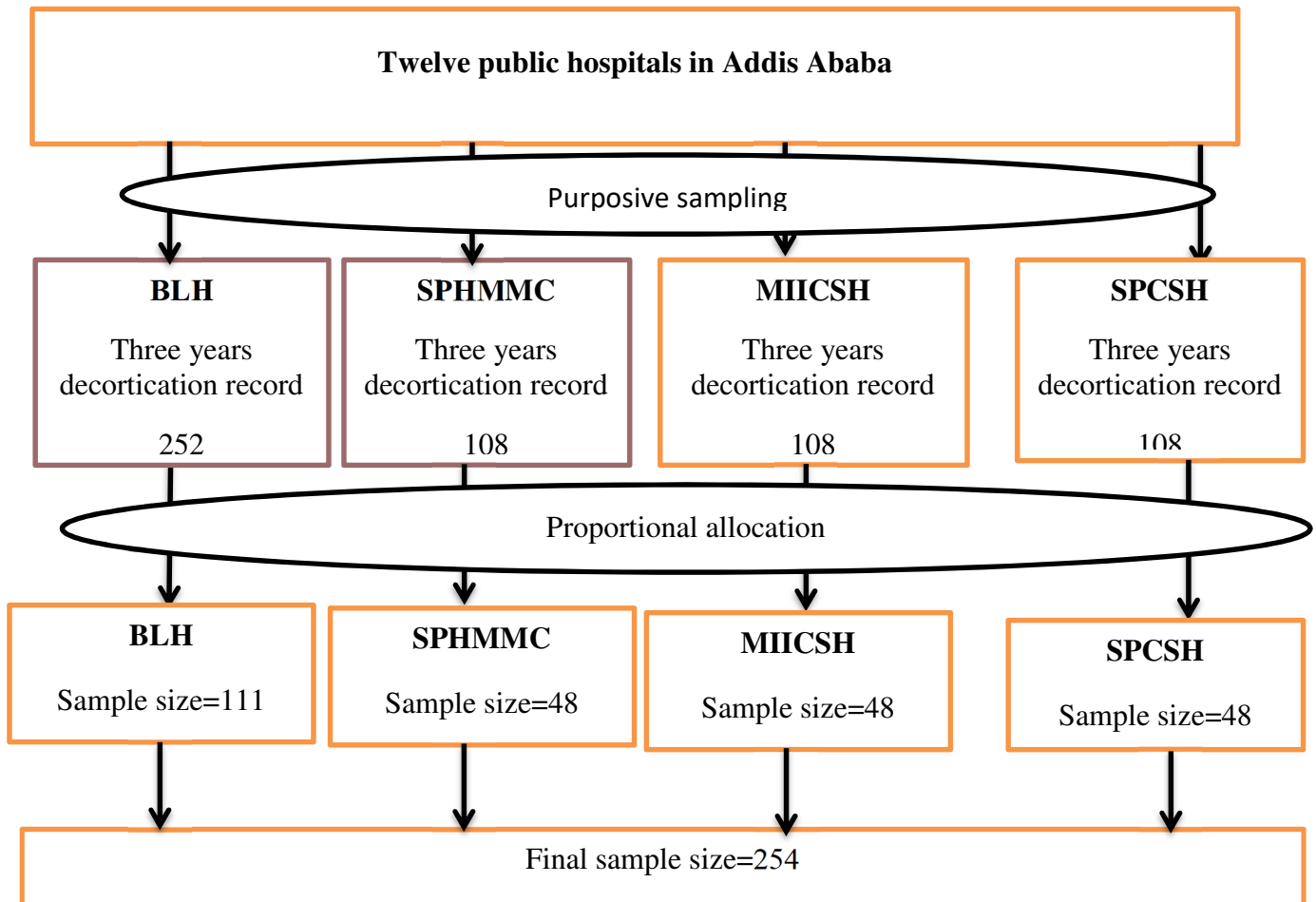
$$n = \frac{n^{\circ}}{1 + \left(\frac{n^{\circ}}{N}\right)}, \quad n = \frac{384}{1 + \left(\frac{384}{576}\right)} \quad n = 231$$

$n = 254$ With a 10% non-response rate

4.6. Sampling procedure

The study was conducted at public hospitals found in Addis Ababa. From the total eleven public hospitals in AA, four of which SPHMMC, BLH, MIICSH and SPCSH are selected with purposive sampling method as which are the only public hospitals providing thoracic surgery. Then sample size is allocated proportional to the number of patient's records admitted with decortication at each hospital. The numbers of patient records with decortication in the previous three years were 252, 108, 108 and 108 at BLH, SPHMMC, MIICSH and SPCSH respectively. The study unit was selected with systematic sampling method with sampling interval. The sampling interval for all hospitals in this study is approximately two. The first participant was selected randomly from the first two records.

Figure 2: Schematic presentation of sampling procedure for the study to be done at AAPHs on post-operative complications of lung decortication and its associated factors, 2024



4.7. Measurement

4.7.1. Study Variables

Dependent variable: Post-operative lung decortication complication

Independent variable;

- **Socioeconomic characteristics:** Sex, age, and residence
- **Preoperative factors:** Smoking history, Comorbidities, Chronic Lung Disease, Previous Infection
- **Type of procedure:** Video-assisted Thoracoscopic Surgery (VATS), thoracotomy and Sternotomy
- **Intraoperative factors:** Antibiotic administration, Duration of surgery, Sterility of instrument, Instrument counting, length of anesthesia time, type of anesthesia used, and occurrences of intraoperative adverse events
- **Postoperative care:** chest tube care, number of chest tubes placed, types of complications, length of hospital stay, reoperation, antibiotics administration, and patient outcome at discharge.

4.8. Operational definition and definition of terms

Decortication- a type of surgical procedure performed to remove a fibrous tissue that has abnormally formed on the surface of the lung, chest wall or diaphragm

Postoperative complications: problems that can happen after having surgery but which were not intended which include immediate complications (up to three days after the surgery), early complications (most likely in the few weeks after your surgery), and late complications (up to years afterward).

Post-operative lung decortication complications present: The participant was classified as post-lung decortication complications present if they develop/diagnosed one of the following complications after surgery(1,2,18,35,36)

- **Persistent Air Leak-** is an abnormal collection of air in the pleural space between the lung and the chest wall. Symptoms typically include sudden onset of sharp, one-sided chest pain and shortness of breath.
- **Postoperative bleeding:** The bleeding may start immediately, or several days after surgery

- Surgical site infection: Any causes on surgical site that may cause redness, delayed healing, fever, pain, tenderness, warmth, or swelling within the first 30 days of surgery
- Pneumonia: Infections can occur postoperatively, leading to pneumonia. This risk is higher in individuals with weakened immune systems or those who have had prolonged anesthesia and mechanical ventilation.
- Pleural effusion: Accumulation of fluid in the pleural space can occur after surgery, which may require drainage or additional intervention.
- Hemothorax: This refers to bleeding into the pleural space, which can lead to chest pain, shortness of breath, and may require drainage or surgical intervention.
- Empyema: In some cases, an infection in the pleural space can lead to the accumulation of pus, known as empyema. This requires drainage and antibiotic treatment.
- Respiratory complications: This can include problems such as atelectasis (collapsed lung), pneumothorax (air in the pleural space), or respiratory failure, especially in patients with pre-existing lung disease.
- Cardiovascular complications: Surgical procedures involving the chest can sometimes affect cardiovascular function, leading to issues such as arrhythmias or heart failure.
- Blood clots: Patients undergoing lung surgery are at risk of developing blood clots, particularly deep vein thrombosis (DVT) or pulmonary embolism (PE), which can be life-threatening if not promptly treated.

4.9. Data collection Instruments procedure

Data was collected on a data collection checklist prepared in the English language by reviewing the post-decortication patient's admission record and medical record chart from each selected hospital. This study was secondary data in which the data was collected using a structured data extraction checklist adapted from different previous similar studies and surgical patient registration books. It is adapted from the international surgical outcome study and by reviewing other relevant literature with modifications to the study setup.

The tool was divided into different parts, including socio-demographic characteristics, patient underlying medical or surgical conditions, intraoperative factors (length of surgical procedure, length of anesthesia time, type of anesthesia used, and occurrences of intraoperative adverse events), and the postoperative course was followed for the development of complications

(infectious and noninfectious), types of complications, intensive care unit admission, reoperation, and patient outcome at discharge.

The data was collected with four professional female nurses from May to June 2024 and was supervised by principal investigator. The checklist was pretested on five percent (13) of sampling charts at SPHMMC before the actual data collection to test the validity and consistency of the questionnaires and to make updates on the tool. In addition the checklist was reviewed by experts and peers.

4.10. Data Quality Control and Management

To ensure the quality of data; one day of data training was given to data collectors before data collection by principal investigators on how to extract the data from the individual charts. The data collectors were supervised by the principal investigator daily on how to conduct the data collection process. Data completeness was assessed daily for any incompleteness and possible corrections with PI. During data entry attention was given to avoiding errors and data cleaning was considered.

4.11. Data analysis plan and procedures

After data collection, the data was checked manually for completeness, coded, and entered into Epi-data version 4.6 and then exported to SPSS (version 27.0) statistical software for analysis. Descriptive statistics such as frequencies, proportions, means, and medians, and corresponding dispersion measures, standard deviation, and interquartile range, were computed after checking for normality. The model fitness test /goodness of fit test was also checked with the Kolmogorov-Smirnov test to check the normal distribution of the data. A binary logistic regression was performed to investigate the association between predictors and the outcome variable. To control confounders, multivariable logistic regression analysis was also processed. The variable with a p-value less than 0.25 in bivariate logistic regression was the candidate variable for multivariable logistic regression. P-value < 0.05 at a 95% confidence interval with multivariable logistic regression was taken as statistically significant. Finally, the data was presented with words, tables and figures.

4.12. Ethical Consideration

An ethical clearance letter was obtained from the IRB of SPHMMC, BLH, SPCSH, and Addis Ababa Public Health and Emergency Management Directorate. Letters of permission and support was provided to the heads of each concerned unit heads of each hospital. Before starting data collection, the objectives of the study was explained to the concerned heads of each hospital.

4.13. Dissemination of Results

The result of this study will be submitted to SPHMMC School of Nursing and it will also be disseminated to BLH, SPCSH, and Addis Ababa Public Health and Emergency Management Directorate as it helps for health service quality improvement where they will be used for intervention plans and strategies. In addition, it will be presented at various workshops and published in peer-reviewed journals.

5. Result

5.1. Socio-demographic characteristics of the participants

About 254 patient records were reviewed and analyzed in this study with a response rate of 100%. The mean age of the participants in this study was 35 years (± 13.649 SD) and majority 171(67.3%) of the patients were in the age group ≥ 40 years and were males 187(73.6%). Regarding residence, 168(66.1%) of the patients were from urban.

Table 1: Socio-demographic characteristics of the participants for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024(n=254)

Variables	Category	Frequency	Percent
Age in years	<40	83	32.7
	≥ 40	171	67.3
Sex	Male	187	73.6
	Female	67	26.4
Residence	Urban	168	66.1
	Rural	86	33.9

5.2. Preoperative patient characteristics of the participants

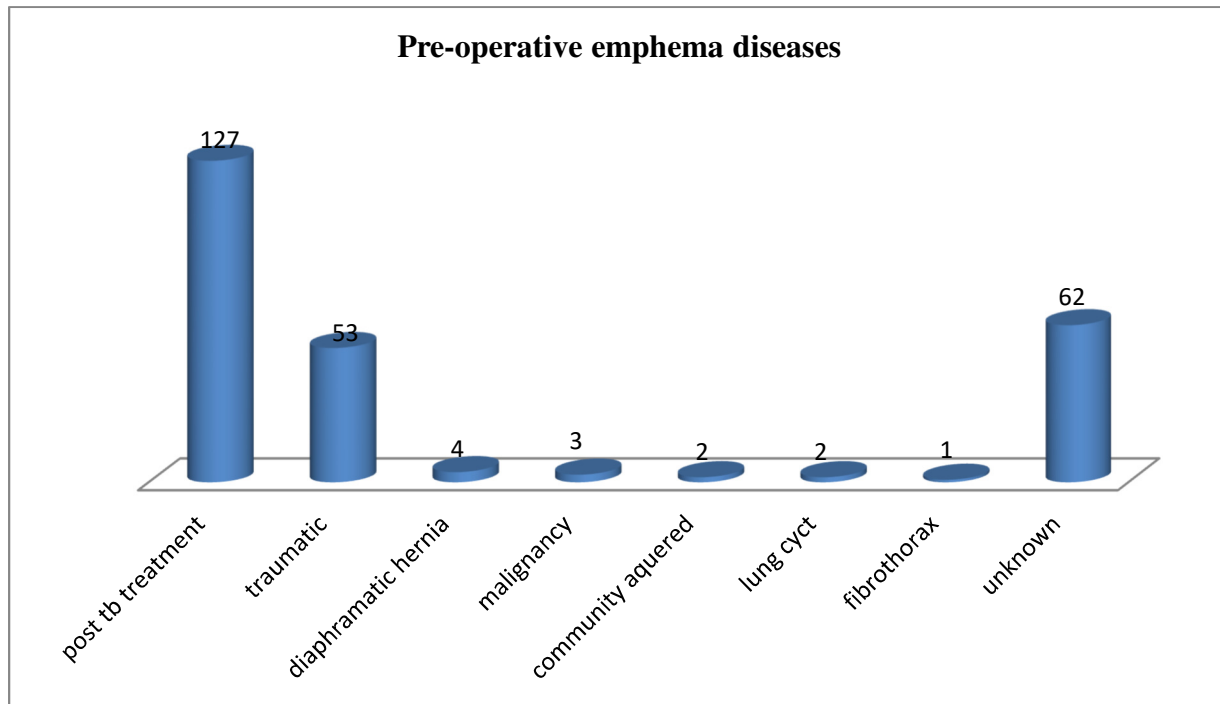
Half, 128 (50.4%), of the participants in this study were with ASA (American society of anesthesiologists) status of ASAII. All patients in this study had operation with general anesthesia. Nearly three fourth, 187(73.6%) of the participants in this study were operated with electively. Thirty five (13.8%) were alcoholic and anemic preoperatively and 39(15.4%) of the participants were smokers. The preoperative saturation of the participants was $\geq 94\%$ among 92(36.2%) of the participants. Twenty three (9.1%) of the participants had malignancy preoperatively. Hundred thirty nine (54.7%) of the participants had previous infection preoperatively.

Table 2: Preoperative patient characteristics of the participants for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024(n=254)

Variables	Category	Frequency	Percent
ASA(American society of anesthesiologists) status	ASAI	89	35.0
	ASAII	128	50.4
	ASAIII and above	37	14.6
Types of Anesthesia	General	254	100
Type of operation	Elective	187	73.6
	Emergency	67	26.4
Alcoholic	Yes	35	13.8
	No	219	86.2
Smoking history	Yes	39	15.4
	No	215	84.6
Preoperative anemia	Yes	32	12.6
	No	222	87.4
Preoperative saturation	<94%	162	63.8
	≥94%	92	36.2
Malignancy	Yes	23	9.1
	No	231	90.9
Previous Infection	Yes	139	54.7
	No	115	45.3
Comorbidities	Yes	54	21.3
	No	200	78.7

Pre-operative cause of empyema disease

Figure 3: Pre-operative empyema disease for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024(n=254)



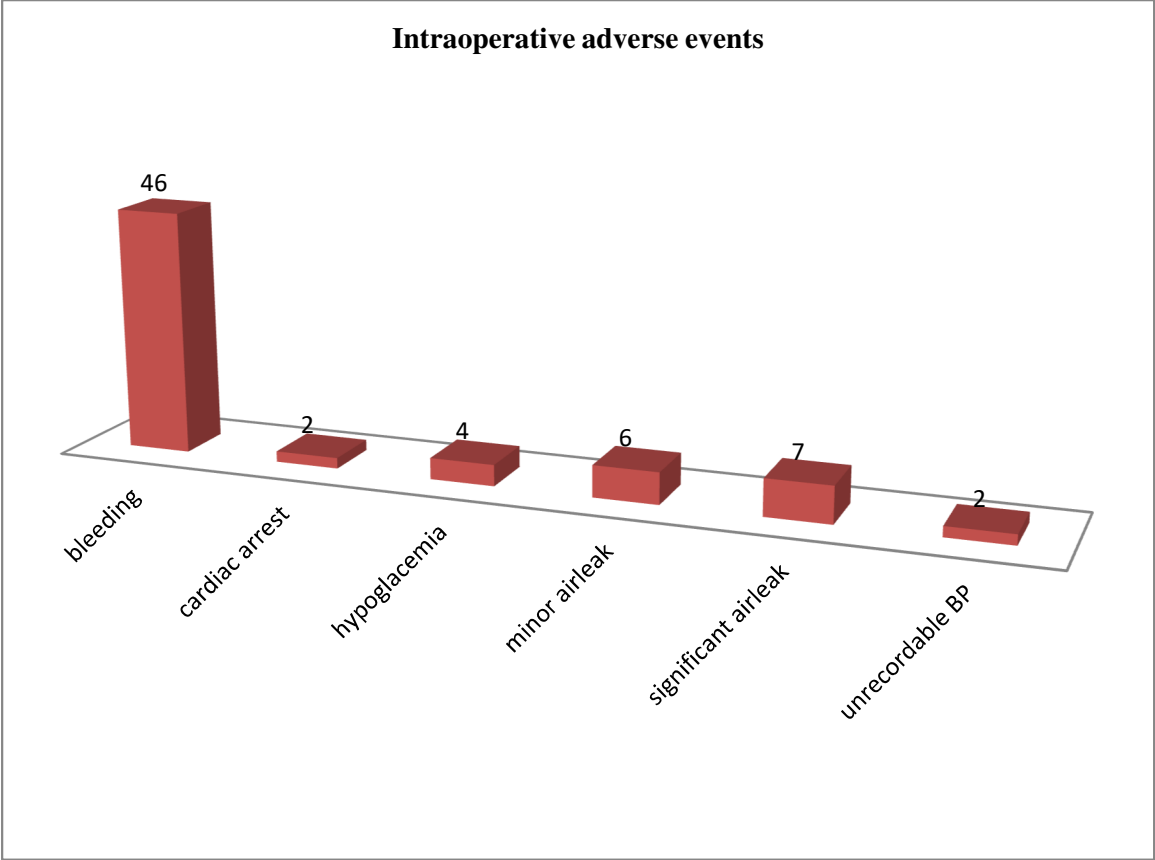
5.3. Intraoperative characteristics

In this study, 18 (7.1%) of the operation was video-assisted Thoracoscopic surgery and 236(92.9%) was Thoracotomy Sternotomy. Antibiotic was administered for 249(98.0%) of the participants intra-operatively. The duration of surgery was less than 120 minutes for 119(46.9%) of the participants. Sterility of instrument and instrument counting was not correct for 6 (2.4%) and 9(3.5%) of the participants respectively. Intraoperative adverse events was happened among 68(26.8%) of the participants (Table 3).

Table 3: Intraoperative characteristics for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024

Variables	Category	Frequency	Percent
Type of procedure	Video-assisted Thoracoscopic Surgery	22	8.7
	Thoracotomy Sternotomy	232	91.3
Antibiotic administration	Yes	249	98.0
	No	5	2.0
Duration of Surgery in minute	≤120	119	46.9
	121-180	86	33.9
	>180	49	19.3
Sterility of instrument	Yes	248	97.6
	No	6	2.4
Instrument Counting	Correct	245	96.5
	Incorrect	9	3.5
Occurrences of intraoperative adverse events	Yes	68	26.8
	No	186	73.2

Figure 4: Intraoperative adverse events for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024 n=254



5.4. Postoperative characteristics of the participants

All 254(100%) of the participants provided chest tube care and post-operative antibiotics. Sixty five (25.6%) admitted at ICU and 48 (18.9%) of the participants had reoperation.

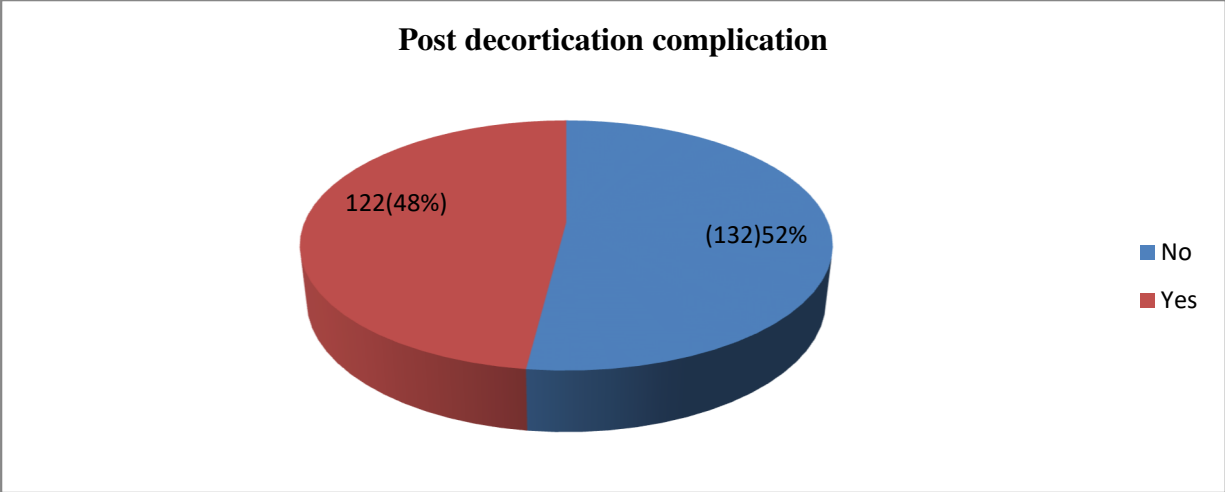
Table 4: Postoperative characteristics of the participants for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024

Variables	Category	Frequency	Percent
Chest tube care	Yes	254	100.0
Post-op antibiotics administration	Yes	254	100.0
ICU admission	Yes	65	25.6
	No	189	74.4
Re-operation	Yes	48	18.9
	No	206	81.1
Final outcome of the patients	Improved	221	87.0
	Not improved	27	10.6
	Died	6	2.4

5.5. Post-operative decortication complication

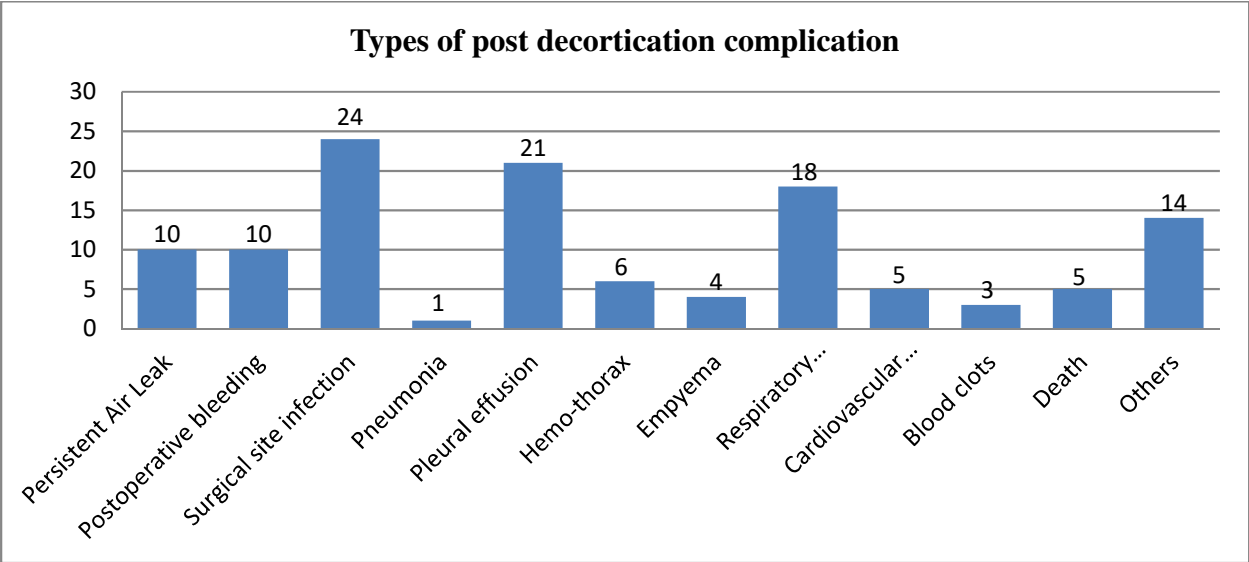
The overall post-operative decortication complication in this study is 48 % (95% CI: 43.1-53.9). Surgical site infection, plural effusion and respiratory complication were happened among 24(9.4%), 21(8.3%) and 18(7.1%) of the participants (Figure).

Figure 5: Post-operative decortication complication for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024



Types of post decortication complication

Figure 6: Types of post decortication complication for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024



5.6. Factors associated with Post decortication complication

In bi-variable logistic regression; Age of the participant, ASA(American society of anesthesiologists) status, being alcoholic, being smoker, preoperative anemia, previous infection comorbidities re-operation, occurrences of intraoperative adverse events and type of surgical

procedure were showed associations with outcome variable at $p < 0.25$ and were selected as candidate variables for multivariable logistic regression analysis.

But, in multivariable analysis; age of the participant, ASA (American society of anesthesiologists) status, being alcoholic, being smoker, preoperative anemia, preoperative saturation, malignancy, previous infection, comorbidities, re-operation, occurrences of intraoperative adverse events and type of surgical procedure were the factors significantly associated with post decortication complication.

In the present study, participants with ASA (American society of anesthesiologists) status of III were 5 times more likely develop post decortication complication than ASA (American society of anesthesiologists) status I [AOR; 95% CI: 5.42(2.08-14.09)]. Those participants with smoking history were 4 times more likely to had post decortication complication than the non-smokers [AOR; 95% CI: 4.03 (1.33-12.21)]. Similarly participants with preoperative infection were 2.3 times more likely to develop post decortication complication than the counterparts [AOR; 95% CI: 2.34(1.28-4.29)]. Participants who had reoperation were 2.9 times more likely to had post decortication complication as compared with who hadn't [AOR; 95% CI: 2.87(1.18 -6.97)]. On the other hand participants with occurrence of intraoperative adverse events were 2.3 times more likely to develop post decortication complication (AOR; 95% CI: 2.36(1.19-4.68)]. Participants operated with TS were 5 times more likely to had post decortication complication than operated with VAT [AOR; 95% CI: 4.20(1.20 -14.01)].

Table 5: Bi-variable and multivariable logistic regression for the study of Postoperative lung decortication complications and the associated factors at public hospitals in Addis Ababa, Ethiopia, 2024

Variables	Category	Post decortication complication		COR(95% CI)			AOR(95% CI)			P-value
		No	Yes							
Age in years	<40	49	34	1						
	≥40	83	88	1.53	0.90	2.60	1.38	0.74	2.57	0.308
ASA	ASAI	58	31	1						
	ASAI	64	64	1.87	1.07	3.27	1.78	0.94	3.371	0.079
	ASAI	10	27	5.05	2.17	11.78	5.42	2.08	14.09	0.001*
Alcoholic	No	122	97	1						
	Yes	10	25	3.14	1.44	6.86	1.25	0.44	3.58	0.677
Smoking history	No	125	90	1						
	Yes	7	32	6.35	2.68	15.03	4.03	1.33	12.21	0.014*
Preoperative anemia	No	124	98	1						
	Yes	8	24	3.79	1.63	8.82	2.28	0.87	6.01	0.095
Previous Infection	No	70	45	1						
	Yes	62	77	1.93	1.17	3.19	2.34	1.28	4.29	0.006*
Comorbidities	No	109	91	1						
	Yes	23	31	1.61	0.88	2.96	1.32	0.63	2.76	0.470
Re-operation	No	121	91	1						
	Yes	11	31	3.75	1.79	7.85	2.87	1.18	6.97	0.020*
Occurrences of intraoperative AE	No	110	76	1						
	Yes	22	46	3.03	1.68	5.44	2.36	1.19	4.68	0.014*
Type of surgical procedure	VAT	15	7	1						
	TS	117	115	2.11	0.83	5.36	4.20	1.20	14.01	0.024*

Key VAT: Video Assisted Thoracotomy, TS: Thoracoscopic Surgery

6. Discussion

The overall post-operative decortication complication in this study is 48 % (95% CI: 43.1-53.9). Which is consistent with the study done in US (46.9%)(24). But the present finding is higher than the studies done in Bosnia Hergovinia (13%) (25), southern India (32%)(12), another study in US (39.3%)(23) and In Nigeria (35%)(26). The reason for this discrepancy could be because of the type of procedures done in which the majority of the procedure was done with VAT which is considered as less invasive and safe procedure. The other reason might be that the hospital environment and the health care service provided in developed countries could be better than the developing countries.

Patients with ASA (American society of anesthesiologists) status of III were 5 times more likely develop post decortication complication than ASA (American society of anesthesiologists) status I. Which is consistent with the study done in New Delhi, India(37) and Asia(33). The reason behind could be that the participants with American society of anesthesiologists status II and III are expected to be with preoperative chronic disease and comorbidities as a result it might increase the post-operative complication.

Those participants with smoking history were 4 times more likely to have post decortication complication than the non-smokers. This finding is similar with the studies done in Brazil, England and US (38–40). Tobacco smokers are at significantly higher risk than non-smokers for post-surgical complications including impaired heart and lung functions, infections and delayed or impaired wound healing(41). This might be because of smoking increase pulmonary and circulatory morbidity after various types of surgery, which is caused by chronic bronchitis and atherosclerosis of coronary vessels induced by tobacco smoke.

Similarly, participants with preoperative infection were 2 times more likely to develop post decortication complication than the counterparts respectively. Which is consistent with the study done in US(24). Participants who had reoperation were 2.8 times more likely to have post decortication complication as compared with who hadn't. This is consistent with the study done in china (26). On the other hand, participants with occurrence of intraoperative adverse events were 2.4 times more likely to develop post decortication complication.

Participants operated with thoracotomy and Sternotomy were 5 times more likely to have post decortication complication than operated with video-assisted Thoracoscopic surgery. This finding is similar with the study done in India(12), Bosnia Hergovinia(25) and US (23,37). The reason behind could be that those participants undergo with VAT may have less complication as the procedure is less invasive and safe procedure.

7. Strength and limitation of the study

7.1. Strength

Including four hospitals that provide decortication service is strength of this study as it helps to generalize the finding to all hospitals

7.2. Limitation

As the study uses secondary data, some important variables were missed. It is also difficult to determine the temporal relationship between post-operative lung decortication complications and the associated factors due to the cross-sectional nature of the study.

The discussion is framed around various socioeconomic characteristics due to the limited research that has been conducted in this area.

7. Conclusion and recommendation

7.1. Conclusion

Post-operative decortication complications in this study is high which is 48 %. Bleeding and significant air leak was the major intraoperative adverse events. Surgical site infection, pleural effusion and respiratory complications were the major post-operative decortication complications in our study. In the present study, participants with the American Society of anesthesiologist's status of III, smoking history, preoperative infection, reoperation, and occurrence of intraoperative adverse events, being operated with thoracotomy were the factors associated with Post-operative lung decortication complications.

7.2. Recommendation

For the ministry of health and hospitals

- The Ethiopian Ministry of Health in collaboration with hospitals in Addis Ababa better to promote Video-assisted Thoracoscopic surgery procedures.

For health professionals

- Surgeons and Anesthetists better assess and evaluate patient's American Society of Anesthesiologists status level properly before surgery
- Clinicians/surgeons should evaluate, investigate and treat preoperative infections before going to surgery.
- The OR team better to prevent and manage adverse events than could happen intra-operatively

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Annexes

Annex I: Information Sheet

My Name: _____ . I'm A trained data collector this questioners is prepared to which filled out by data collectors as designated by the student researcher to gather data for this research project required in partial fulfillment of MSc in Cardiothoracic Surgery Nursing in Saint Paulos Hospital Millenium Medical College, School of Nursing. The research title is Magnitude of Post-operative Lung Decortication Complication and Associated Factors in Public Specialized Hospital Addis Ababa, Ethiopia 2024.

Confidentiality

All data collected during the research process will be handled at most confidentiality and safety in a manner only the researcher and the most relevant persons linked to this research will have responsible access.

Annex II: Data abstraction checklist

Socio-demographic and preoperative patient characteristics of data

S.n.	Questions	Answers	Skip
101	Age	-----	
102	Sex	1. Male 2. Female	
103	Residence	1. Urban 2. Rural	
104	ASA(American society of anesthesiologists) status	1. ASA I 2. ASA II 3. ASA III 4. ASA IV 5. ASA V 6. ASA VI	
105	Types of anesthesia	1. General 2. Regional	
106	Type of operation	1. Elective 2. Emergency	
107	Alcoholic	1. Yes 2. No	
108	Smoking history	1. Yes 2. No	
109	Preoperative anemia	1. Yes 2. No	
110	Preoperative saturation	_____	
111	Malignancy	1. Yes 2. No	
112	Previous Infection	1. Yes 2. No	

113 Comorbidities

1. Yes

2. No

114 What are the comorbidities

1. DM

2. COPD

3. Hypertension

4. Other _____

115 Cause of the disease (Empyema)

Question related to Intraoperative Factors

- 201. Type of procedure
 - 1. Video-assisted thoracoscopic Surgery(VAT)
 - 2. Thoracotomy
- 202. Antibiotic administration
 - 1. Yes
 - 2. No
 - 3. Unknown
- 203. Duration of Surgery in minute

- 204. Sterility of instrument
 - 1. Yes
 - 2. No
 - 3. Unknown
- 205. Instrument Counting
 - 1. Correct
 - 2. Incorrect
 - 3. Unknown
- 206. Length of anesthesia time in minute

- 207. Occurrences of intraoperative adverse events
 - 1. Yes
 - 2. No
- 208. If 207 is yes, specify

Question related to postoperative care

- 301. Chest tube care
 - 1. Yes
 - 2. No
- 302. Number of chest tube
 - 1. 1
 - 2. 2
- 303. Post-op antibiotics administration
 - 1. Yes
 - 2. No
- 304. Length of stay in the hospital in days

Post decortication complication questions

305. Presence of post decortication complication
1. Yes
 2. No
306. If yes to what is the complication?
1. Persistent Air Leak
 2. Postoperative bleeding
 3. Surgical site infection
 4. Pneumonia
 5. Pleural effusion
 6. Hemo-thorax
 7. Empyema
 8. Respiratory complications
 9. Cardiovascular complications
 10. Blood clots
 11. Death
 12. Others _____
307. Post-operative admission of ICU
- 1 Yes
 - 2 No
308. Post-operative reoperation
- 1 Yes
 - 2 No

309. Post-operative outcome of patient

1 improved

2 not improved

3 unknow

Annex III: Approval sheet
Assurance of Principal Investigator

I the undersigned agree to accept all responsibilities for the scientific and ethical conduct of the research project. I provide timely progress reports to my advisor and seek the necessary advice and approval from my primary advisors in the course of the research. I communicated timely to my advisors all stakeholders involved in the study

Declaration

I declare that this Research proposal entitled "Magnitude of postoperative lung decortication complications and its associated factors in selected public specialized hospital Addis Ababa, Ethiopia, 2024" is my work that has not been addressed in the study area as far as my knowledge touched and all the sources I used has been indicated and acknowledged as a complete reference.

Name of the student: _____

Signature: _____

Date: _____

Approval of the Primary Advisor

Name of the primary advisor: _____

Signature: _____

Date: _____

Approval of the Co-Advisor

Name of the co- advisor: _____

Signature: _____

Date: _____

Approval of the examiner

Name of the primary examiner: _____

Signature: _____

Date: _____

