

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF ANESTHESIA



MAGNITUDE AND ASSOCIATED FACTORS OF INTRAOPERATIVE
HEMODYNAMIC CHANGE IN PATIENTS UNDERGOING ELECTIVE THORACIC
SURGERY IN SELECTED GOVERNMENT HOSPITALS: INSTITUTIONS BASED
MULTI-CENTER CROSS-SECTIONAL STUDY IN ADDIS ABABA, ETHIOPIA, 2023.

BY; YISEHAK WOLDE (BSC IN ANESTHESIA)

June, 2023.

ADDIS ABABA, ETHIOPIA

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH
SCIENCES, DEPARTMENT OF ANAESTHESIA IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR A MASTER OF SCIENCE DEGREE IN CLINICAL
ANESTHESIA.

Name of investigator	Yisehak Wolde (Bsc In Anesthesia)
Name of Advisor(s)	Mr Hirbo Samuel (MSc Lecturer In Anaesthesia Department) Mr Adugna Argawi (Assistant Professor in Anaesthesia)
The full title of the research project.	The magnitude and associated factors of intra operative hemodynamic change in patients undergoing elective thoracic surgery in selected government hospitals: the institutions-based multi-centre cross-sectional study in Ethiopia, 2023
Duration of project	1/2/ 2023, to April 30/ 2023
Study area	Tikur Anbessa Specialized Hospital (TASH), Menilik II referral hospital Saint Peter Specialized Hospital.
Total Cost of Project	25000 Ethiopian Birr
Address of investigator	Tel: +251967711907. Mail yisehak140@gmail.com

ADDIS ABEBA UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCE

DEPARTMENT OF ANESTHESIA.

THE MAGNITUDE AND ASSOCIATED FACTORS OF INTRAOPERATIVE HEMODYNAMIC CHANGE IN PATIENTS UNDERGOING ELECTIVE THORACIC SURGERY IN SELECTED GOVERNMENT HOSPITALS: THE INSTITUTIONS-BASED MULTI-CENTRE CROSS-SECTIONAL STUDY IN ETHIOPIA, 2023.

NAME OF INVESTIGATOR: YISEHAK WOLDE

ADDRESS; PHONE: +251967711907.

EMAIL: yisehakwolde140@GMAIL.COM

APPROVED BY THE EXAMINING BOARD _____

HEAD, DEPARTMENT OF ANESTHESIA.

1. External Examiner. _____ Signature _____ Date _____

2. Internal Examiner. _____ Signature _____ Date _____

1. ADVISORS 1. _____

2. _____

Declaration

I, the undersigned, declare that this thesis is my original work in partial fulfilment of the requirements for the Master of Science degree in Anaesthesia. I understand that plagiarism will not be tolerated and all directly quoted material has been appropriately referenced

Name: Yisehak Wolde _____

Signature; _____

Submitted to; MSc Tutor, Department of Anaesthesia Addis Ababa University.

Date of Submission: _____

This thesis work has been submitted for examination with my/our approval as Advisor and Tutors

on the Master of Science degree in Anaesthesia

Name Signature

1. _____

2. _____

ACKNOWLEDGEMENT

First of all, I would like to thank you the Almighty God, for everything. Next, I would like to express my heart-full gratitude and thanks to my advisors Mr Hirbo Samuel (MSc Lecturer In Anaesthesia Department) and Mr Adugna Argawi (Assistant Professor in Anaesthesia) for their continuous comments and valuable advice to develop this research. I would also like to thank the Addis Ababa University Department of Anesthesia for allowing me to conduct this study. Last but not least I would like to extend and my gratitude to those authors and researchers of articles for the valuable work I have read and cited.

Contents

Declaration.....V

ACKNOWLEDGEMENT..... I

List of TablesIV

LIST OF FIGURES..... V

ABBREVIATIONS/AcronymVI

ABSTRACT..... 1

CHAPTER ONE2

 INTRODUCTION2

 BACKGROUND:2

 1.2 STATEMENT OF THE PROBLEM.4

 1.3 SIGNIFICANCE OF THE STUDY.....6

CHAPTER TWO7

 LITERATURE REVIEW7

 2.1 Definition and Mechanisms of Hemodynamic Change.....7

 2.2. Magnitude of hemodynamic change.7

 2.3 Associated Factors of intraoperative hemodynamic change9

CHAPTER THREE: OBJECTIVE.....12

 1.1 General Objective.....12

 1.2 Specific Objective12

CHAPTER FOUR: METHODOLOGY13

 4.1 Study Area13

4.2 study design and Period	13
4.4.1 Inclusion Criteria.	14
4.4.2 Exclusion Criteria.....	14
4.5 Sample Size and Sampling Technique	14
4.6 Study Variable	16
4.6.1 Dependent variable.....	16
4.6.2 Independent variable.....	16
4.7 Data Collection Tool and Procedure.....	17
4.8 Data Processing and Analysis.....	18
4.8.1 Data Quality Assurance	18
4.9 Ethical Consideration.....	18
4.10 Dissemination and Utilization of the Result.....	19
4.11 Operational definitions.....	19
5. RESULTS.....	20
5.1 Socio-Democratic and Preoperative clinical characteristics of Patients.....	20
5.2 Intraoperative Anaesthetic and Surgically- Characteristics Patients.....	21
5.3 Magnitude of Hemodynamic Change.....	25
5.4 Factors associated with Intraoperative hemodynamic change.....	27
5.4.1 Result of Bivariate Analysis.....	28
5.4.2 Result of Multi-variable Analysis:.....	29
6. Discussion.....	37
7 Strength and Limitations of Study.....	40
7.1 Strength.....	40
7.2 Limitations of the study.....	40
8:Conclusion.....	41
9:Recommendations.....	42

REFERENCES:.....	43
Annexe 1: Information Sheet.....	Error! Bookmark not defined.
Annexe II: Questionnaires and check-list.....	48

List of Tables

Table 1:Socio-Democratic and preoperative clinical Characteristics of patients who underwent elective thoracic surgery at TASH , Menilik II Referral Hospital and Saint peter specialized hospital 2023.....	20
Table 2: Intra-operative Characteristics of patients who underwent elective thoracic surgery at TASH, Menilik II Refferal Hospital and SPSH.....	22
Table 3:Intraoperative Characteristics of Patients who underwent elective thoracic surgery at TASH,Menilik II Refferal Hospital and SPSH.....	24
Table 4: Preoperative and intraoperative factors associated with IOH in TASH MenilikII Referral Hospital, and Saint Peter Specialized Hospital.....	29
Table 5:Preoperative and intraoperative factors that was associated with intraoperative hypertension in TASH, MenilikII Referral Hospital, and Saint Peter Specialized Hospital. ...	31
Table 6:Preoperative and intraoperative factors associated with intraoperative bradycardia in TASH, Menilik II Referral Hospital and Saint Peter Specialized Hospital.	33
Table 7: Preoperative and intraoperative factors associated with IOT in TASH,Menilik II Referral Hospital and Saint Peter Specialized Hospital.....	34

LIST OF FIGURES

Figure 1 A conceptual framework for assessing the factors associated with IHD, was developed-after the Literature

Review(22,25,35)..... 11

Figure 2: Magnitude of Hemodynamic change of patients who underwent elective thoracic surgery at TASH, Menilik II Referral Hospital and Saint peter special specialized Hospital.26

Figure 3: Treatment of intraoperative hypotension for patients who underwent elective thoracic surgery at TASH, MenilikII Referral Hospital and SPSH.27

ABBREVIATIONS/Acronym

ASA	American Society of Anaesthesiology
ABL	Allowable blood lose.
BMC	British Medical College
CABG	Coronary artery by-pass Grafting
IOH	Intra-operative hypo/hypertension.
IOB	Intra-operative Bradycardia.
IOT	Intra-operative Tachycardia.
MAP	Mean Air way pressure.
PEEP	Positive End Expiratory pressure.
PAP	Peak Air way Pressure.
SPSS	Statistical Package for Social Science.
SBP	Systolic Blood pressure.
TASH	Tikur Anbessa Specialized Hospital .
TIVA	Total Intravenous Anaesthesia.
TEA	Thoracic Epidural Anesthesia.
TV	Tidal volume.

ABSTRACT.

Background: Hemodynamic instability, which is an independent predictor of long-term patient morbidity and duration of stay in the hospital. Multiple factors contribute to the development of intraoperative hemodynamic instability. Prevention and treatment of these factors may reduce patients' hemodynamic change, and its associated morbidity and mortality. Associated factors were blood loss, co-existing disease, type of procedure, age and duration of surgery.

Objectives: This study aims to assess the magnitude and associated factors of intra-operative hemodynamic change in patients undergoing elective thoracic surgery in TASH, Menilik II referral hospital, and SPSH 2023.

Methods: The Institutions-based multicenter cross-sectional study was conducted from 1/2/2023/ to April 30/2023, using pre-tested, Interviewer questionnaires for 185 patients. This study used a systematic random sampling technique to select the appropriate participant which selects the sample the regular intervals based on sampling fraction (K). The data was entered into Info 7.2.1 and analysed by SPSS version 26 software performed descriptive statistics and, bivariate and multivariate logistic regression.

Result: According to this study, there is a higher magnitude of Intra-operative hypotension which was found to be 40.8% (95%CI: 33.8%-48.2%). Intra-operative blood loss, type of procedure, and pre-existing co-morbidity were positively associated with intra-operative hypotension. The pre-existing co-morbidity like hypertension associated with intra-operative hypertension, the magnitude was found to be 14.4%(95%CI: 8.9%-19.1%). The age and the duration of surgery were associated with intra-operative tachycardia. Overall, the prevalence was 16.6%(95%CI:10.67%-21.33%). The type of procedure were strongly associated with intra-operative bradycardia. Overall, the magnitude was found to be 14.4%(95%CI:8.9%-19.1%).

Conclusion and recommendation: The magnitude of intra-operative hypotension is high. Some of the identified factors were Blood loss > ABL and the type of diagnosis. Therefore early anticipation and preparation for intraoperative hypotension especially for patient undergoing lung resection and risk of increased blood loss can improve patient outcome.

Keywords: ,hypotension/hypertension, bradycardia,tachycardia and thoracic surgery.

CHAPTER ONE

INTRODUCTION

BACKGROUND:

Thoracic surgery is a field of medicine that deals with the diagnosis and surgical treatment of inside the chest (1). This includes surgery for emphysema, swallowing difficulties, gastroesophageal reflux disease, tracheal anomalies, diaphragm disease, end-stage heart or lung disease requiring transplantation, and benign chest wall abnormalities (2).

Thoracic surgical patients typically have the co-existent disease, and because of the nature and extent of their surgery are at risk of numerous complications. Common complications include atelectasis haemorrhage, pulmonary oedema, atrial fibrillation (AF), wound infection, pneumonia, persistent air leak, and respiratory failure, less frequent complications include bronchiole-fistula, emphysema, cardiac herniation, pulmonary torsion, chylothorax, thromboembolism, right ventricular (RV) failure, and neurological injury (2,3).

Roughly 20% of people who have their lungs removed experience difficulties after surgery; of those, about 2% die (4–6). Following pneumonectomy, these risks are more than doubled whereas they are much less frequent following limited wedge resection (7). Risk factors include patient age, current smoking, underlying carcinoma and chronic obstructive pulmonary disease. (4,6,8 9). Procedural chemotherapy and radiotherapy -additional risks (8,10).

Thoracic surgery is an independent risk factor for perioperative complications, especially in patients with common- morbidities before surgery (11,12). A thorough careful preoperative evaluation, smoking cessation, selection of the appropriate surgical procedure, and routine pre- and postoperative physiotherapy, can reduce mortality and major morbidity after lung resection(4,6,9). Clinicians and team experts should help to better prevent, detect, and treat problems, as evidenced by research showing the impact of hospital case-load on patient outcomes (13,14).

The type of lung resection, either a lobectomy or a pneumonectomy influence resultant hemodynamic changes. Compared to preoperative values, both surgical approaches influence hemodynamics by increasing heart rate, mean pulmonary artery pressure, pulmonary capillary wedge pressure, and pulmonary vascular resistance as well as decreasing right ventricular ejection fraction. It was reported that patients undergoing pneumonectomy had higher mean pulmonary artery pressures, pulmonary vascular resistance, and pulmonary capillary wedge pressures compared to patients undergoing lobectomy. The patients who underwent pneumonectomy had a higher degree of right ventricular dilation, a higher incidence of postoperative arrhythmias, and a greater reduction in right ventricular ejection fraction than lobectomy patients. This suggests that the amount of parenchymal resection may-proportional to the subsequent increase in right ventricular after-load and degree of right ventricular systolic dysfunction (15,16).

1.2 STATEMENT OF THE PROBLEM.

High prevalence of thoracic- surgical patients hemodynamic change in developed countries, 58.3%,76.76.%, and 43.5% hypotension,hypertension,both hypotension and hypertension respectively(17).

There are different definitions given to intraoperative hypotension and hypertension during surgery with incidences and complications varying accordingly (18,19). The main causes of vasovagal syncope, which is loss of consciousness as a result of inadequate blood flow to the brain and a mortality rate of 5–10%, are bradycardia and hypotension(20).

The risk factors were age, smoking history, preoperative co-morbidity, coronary heart disease, anaesthetic agents use and ASA status of a patient and intraoperative blood loss (17,21).

Evidence shows that: the definition of intraoperative hyper-/hypotension varied widely in the literature. It is generally accepted that SBP > 160 mm-Hg during surgery is defined as intraoperative hypertension, and SBP < 80 mm-Hg as hypotension. Applying an absolute mean arterial pressure threshold of 65 mm Hg yielded an incidence hypotension,65% for a greater than or equal to 1-min exposure, 49% for a greater than or equal to 5-min exposure, and 31% for a greater than or equal to 10-min exposure respectively(22).

Other research discovered that the exact mechanisms of how intraoperative hemodynamic change affects long-term survival are yet unknown. Intraoperative hemodynamic change occurs despite frequent or even continuous intraoperative hemodynamic monitoring, avoiding perioperative hypotension is a physiologically complex challenge for health professionals. Evidence currently available suggests that MAP below 60 mm Hg sustained for 5 Min or more may be related to organ dysfunction and higher mortality(23).

A retrospective study was done at Shanghai Chest Hospital, on 62,571 thoracic cases was analysed. From the adverse events reported, Cardiac-arrest (33%) and Surgical massive haemorrhage (22%) was significant cause of mortality, the risk factors were an Anaesthesia - related and surgery-related events(12,24).

A recent study showed that individualized intraoperative blood pressure management reduced systemic inflammatory response syndrome and organ dysfunction after surgery although its long-term impact on surgical outcome has not been reported yet (17,22).

With this background in mind, the present study aimed to investigate the hemodynamic changes during and after lung resection and the associated clinical implications.

1.3 SIGNIFICANCE OF THE STUDY.

The study aimed magnitude and associated factors of intraoperative hemodynamic change during elective thoracic surgery Selected government hospitals in Addis Ababa, Ethiopia.

Thoracic surgery is a delicate and time-consuming surgery with life-threatening complications.the incidence of hemodynamic change is alarming even with the highest monitoring and standard developed countries.

It will add new knowledge to develop highest monitoring and standard drug, regarding to detect and management of patients during surgery.

It will identify the major gaps of our service delivery to manage hemodynamic instability.

It will help to discover predictors associated with intraoperative hemodynamic change.

Some institutions have developed guideline to treat intra -operative hemodynamic change with respective of none cardioid-thoracic-surgery.French Guidelines advise keeping intraoperative MAP between 60 and 70 mm Hg to especially prevent acute renal damage.

It'll have a direct impact on the satisfaction and outcome of patients which is the main content of upholding the standard of safe surgery and anaesthesia that will decrease patients' hospital stay and expense.

The results from this study may assist in identifying factors that place a patient at risk for high intra-operative hemodynamic fluctuation during surgery, thus allowing targeted steps to be taken to improve the quality of care delivered to surgical patients.

It will help responsible stake-holders to develop a protocol to manage intraoperative hemodynamics adopt guidelines from other countries and develop the local protocol.

To the best of our search published research which can be used as a reference could not be found in this country, which will make this study be used as a baseline for the further country-wide study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition and Mechanisms of Hemodynamic change.

Hemodynamic change is abnormality of the heart, blood vessels or other organs which leads to insufficient blood or fluid to the heart to receive and pump to the rest of organs against systemic pressure. Hemodynamic change is at least one of the physiologic parameters including systemic hypertension, hypotension, tachycardia or bradycardia, alone or combination, then patient had experienced hemodynamic change (25).

Hemodynamic change is one of the complications of thoracic surgery with an incidence differing with multiple factors. Hemodynamic change during surgery may occur due to blood loss, drugs used and the patient's previous cardiovascular and hydration states, diagnosis, and electrolyte imbalance. The highest incidence of cardiovascular disturbance during thoracic surgery occurred during pneumonectomy (26).

Hemodynamic changes occurring during surgery are associated with cardiovascular status changes and can lead to cardiac death or stroke even in the postoperative period (19).

2.2. Magnitude of hemodynamic change.

Intraoperative hypotension was found to be high (n=73, 65%) in a retrospective cohort analysis of 113 patients who were 18 years of age or older conducted by D. Sharma et. Al, in 2015 GC, the length of anaesthesia was identified as an independent risk factor (AOR 1.1 [95% CI:1.01-1.30]; p=0.009). The risk factors were age, smoking history, preoperative comorbidity, coronary heart disease, anaesthetic agents used and ASA status of the patient and intraoperative blood loss (27,28).

After studying the experience of the same surgeon, Gyaninder P, Singh in India medical college, for 7 years on 298 patients, Ganjoo P. et.al noted the incidence of tachycardia as (57 patients, 20.1%), bradycardia (35 patients, 12.4%) and hypertension (23 patients, 8.3%). Other research done by G. Singh et.al reported the incidence of tachycardia as 18.8%, bradycardia at 11.3%, hypertension at 16.1%, and intraoperative hypotension at 16.6% after conducting a retrospective analysis of 223 patients of whom 119 were paediatrics (29,30).

The retrospective study was done at Shanghai Chest Hospital in 2019, on 62,571 thoracic surgery cases was analysed, and adverse events were reported, Cardiac arrest (33%, 50/150) was the major contributing factor to adverse events, but all cardiac arrest cases were successfully resuscitated. Surgical massive haemorrhage (22%, 33/150) was a significant cause of mortality, the risk factors were an Anaesthesia -related and surgery-related events (12,24)

According to Research findings, in a descriptive cross-sectional study, 288 patients underwent coronary artery bypass grafting (CABG) and were admitted to the post-cardiac intensive care unit. After surgery, 36% of patients experienced changes in systolic blood pressure that was outside of the normal range, 49% experienced changes in diastolic blood pressure, 65% experienced changes in heart rate, and 34% experienced changes in central venous pressure that was outside of the normal range. A significant relationship was observed between interfering factors such as Body Mass Index, ejection fraction, history of Myocardial-infraction, number of grafts, duration of the connection to a ventilator, duration of cardiopulmonary machine use, duration of aorta clamp, hypothermia, and level of haemoglobin and haematocrit with hemodynamic variables (31).

Another retrospective study of a single institution's experience with intraoperative and postoperative hemodynamic problems related to SCT was conducted. From this study, 11 sessions (31%) resulted in severe bradycardia or hypotension, the most likely cause was pulmonary gas emboli entering the right heart, the coronary arteries and systemic circulation (32).

Another study was done in the Germany department of anaesthesiology and intensive care in 2021 in perioperative blood pressure management, a retrospective cohort of more than 15,000 adults who had non-cardiac surgery showed that the incidence of intraoperative hypotension varies substantially depending on the selected definition. For instance, taking a 20% drop in systolic blood pressure into account led to incidences of intraoperative hypotension of 93% for exposures lasting more than or equal to one minute, and 88% for exposures lasting 5-minutes. Applying an absolute mean arterial pressure threshold of 65 mm Hg yielded an incidence of 65% for a greater than or equal to 1-min exposure, 49% for a greater than or equal to 5-min exposure, and 31% for a greater than or equal to 10-min exposure (22,23).

An institution-based prospective follow-up study was conducted in Ethiopia at the University Gonder, in College medicine and health science at the Department of anaesthesia from April 20, 2021, to June 28, 2021. Study aimed to determine the incidence and factors associated with hemodynamic instability among Adult surgical patients in the PACU. Four hundred and seventeen (417) adult surgical patients were involved in the study. The overall incidence of hemodynamic instability was 59.47% (CI: 0.55, 0.64). The incidence of tachycardia, bradycardia, hypotension, and hypertension was 27.34%, 21.82%, 13.67%, and 15.35% respectively (25).

2.3 Associated factors of intraoperative hemodynamic change

The prospective study was conducted on 60 adults who underwent elective thoracic surgery in Egypt at the Cardiac-thoracic surgery department between October 2017 and April 2019, requiring one-lung ventilation with a posterior–lateral thoracotomy, the main aim study was the effect of Positive end-expiratory pressure during one-lung ventilation has an impact on a patient's hemodynamic during thoracic surgery. Mechanical breathing with PEEP 0, 5, or 10 cmH₂O during open thoracic surgery in adult patients has little impact on hemodynamics. but in two-lung ventilation, aggressive mechanical ventilation using high levels of PEEP exceeding 10 cmH₂O can restrict venous return and elevate the right ventricular (RV) after-load leading to limited left ventricular (LV) diastolic filling and decreased cardiac output (33).

Another multi-centre retrospective study was done in Canada Toronto Hospital from 2015 to 2020 to explore common etiologies of hypertension during the perioperative period. They analysed 174 patients retrospectively. The common etiologies of perioperative hypertension were poorly controlled hypertension (21.8%), excessive fluid therapy (19.5%), excessive vasopressor (18.4%), and medication withdrawal (13.7%). Regarding each period separately, the most common reasons were poorly controlled hypertension for the pre (42.9%) and intraoperative period (22.7%) and fluid overload for the postoperative period (20.1%) (34).

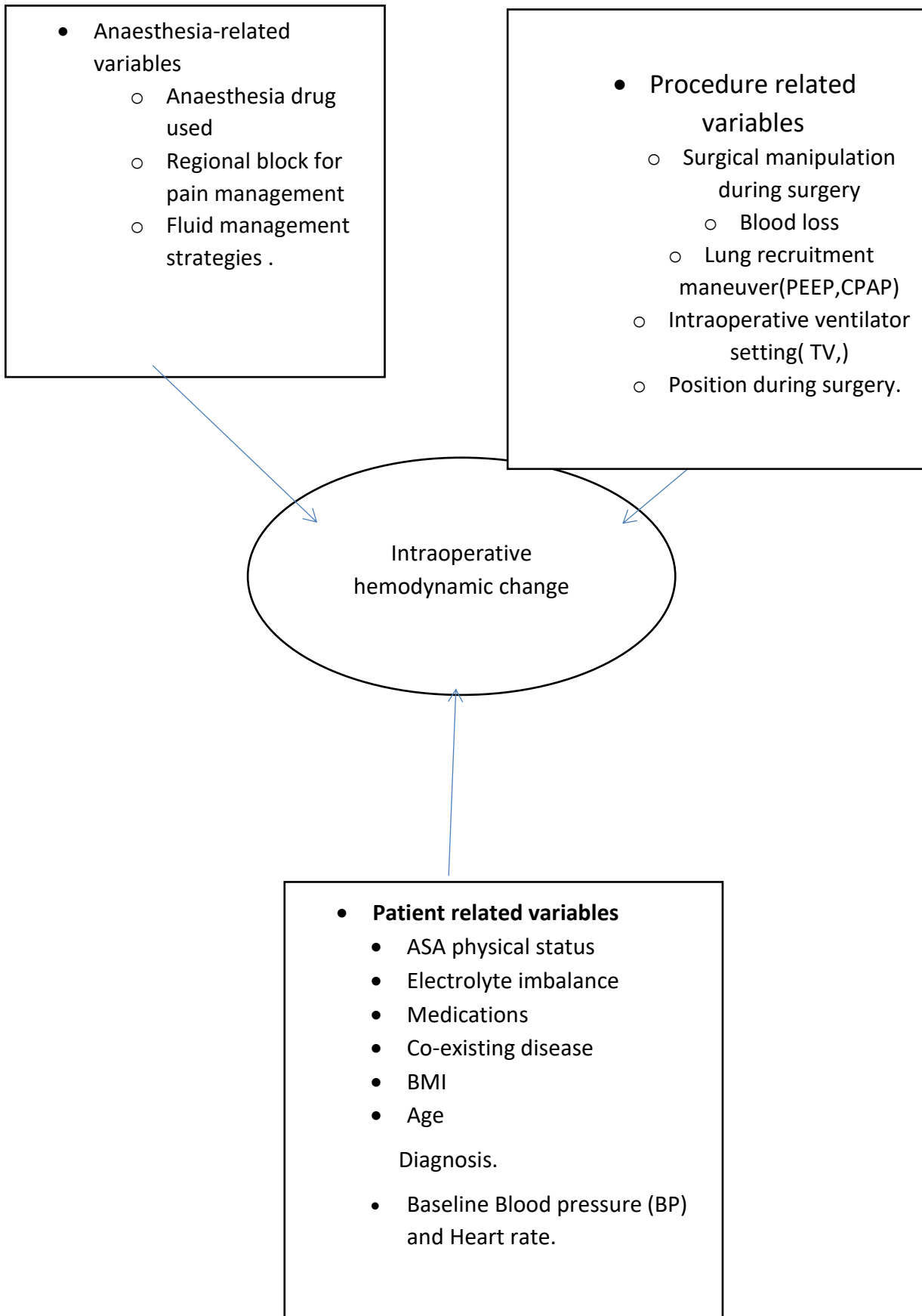
The study was done at the University of British Columbia in 2015. Prospective data were collected from 193 patients who underwent elective, non-cardiac surgery, to evaluate predictors of intraoperative hypotension and bradycardia. From this total surgical patients 127(65.8%) had developed hypotension or bradycardia. A final five risk factors score was developed, such as preoperative Heart rate (<60 beats/Min), preoperative hypotension (<110/60 mm Hg), Elderly, preoperative renin-Angiotensin blockade (angiotensin-converting

enzyme inhibitors, angiotensin receptor blockers, or beta-blockers), Revised cardiac risk index(>3points), and Type of surgery (35).

Although other research discovered that the exact mechanisms of how intraoperative hemodynamic change affects long-term survival are yet unknown. Intraoperative hemodynamic change occurs despite frequent or even continuous intraoperative hemodynamic monitoring, Avoiding is a physiologically complex challenge for anaesthesiologists. Evidence currently available suggests that MAP below 60 mm Hg sustained for 5 Min or more may be related to organ dysfunction and higher mortality.

A recent study showed that individualized intraoperative blood pressure management reduced systemic inflammatory response syndrome and organ dysfunction after surgery, although its long-term impact on surgical outcomes has not been reported yet. With this background in mind, the present study aimed to investigate the magnitude of hemodynamic changes and associated factors for intraoperative hemodynamic change in thoracic-operated patients.

FIGURE 1 A CONCEPTUAL FRAMEWORK FOR ASSESSING THE FACTORS ASSOCIATED WITH IHD, WAS DEVELOPED AFTER THE LITERATURE REVIEW(22,25,35).



CHAPTER THREE: OBJECTIVE

1.1 General objective

To assess the magnitude and associated factors of intraoperative hemodynamic change during elective thoracic surgery at selected public hospital in Addis Ababa ,Ethiopia, 2023.

1.2 Specific objective

1. To determine the magnitude of hemodynamic changes during elective thoracic surgery at selected public hospital in Addis Ababa,Ethiopia 2023.

2. To identify factors associated with intraoperative hemodynamic change during elective thoracic surgery at selected public hospital in Addis Ababa2023.

Research Hypothesis.

Null hypothesis(HO):

There is no difference in hemodynamic change from a baseline value opatients' intra-operatively during elective thoracic surgery.

Alternative hypothesis(HA):

There is a difference in hemodynamic change from baseline value of patients' intra-operatively during elective surgery.

CHAPTER FOUR: METHODOLOGY

4.1 Study Area

The study was conducted at public hospitals in Addis Ababa, the capital city of Ethiopia. With an area of 527 square kilometres and 10 sub-cities, it is the largest city in the country. The city has 12 government hospitals. Three governmental hospitals were used for this study. They are TASH, Menilik II memorial hospital and SP Hospital. The three hospitals were chosen for this study because they are the only government hospitals in Addis Ababa in which thoracic surgery is performed. TASH, located in the nation's capital Addis Ababa, is Ethiopia's largest referral hospital. It offers diagnosis and treatment for approximately 370,000- 400,000 patients yearly, with nearly 8000 surgeries performed annually with 14 operation rooms. Menilik Hospital is Established in 1909 after which Russia ties to Ethiopia after the Italian invasion in 1896. Today Menilik Hospital is operated by Addis Ababa Health bureau and has 6 major operating theatres. Approximately 150 thoracic surgeries are performed annually. Saint peter specialized hospital, one of the government hospitals in Addis Ababa, has five operation tables, from this one operation table thoracic surgery is performed.

4.2 study design and Period

The institutions-based multi-centre cross-sectional study was conducted from 1/2/2023 to April 30/ 2023.

4.3 Population

4.3.1 Source population.

All patients who undergo elective- surgery in TASH, Menilik II referral and saint peter specialized hospitals at Addis Ababa in 2023.

4.4 Study population

All eligible adult patients who undergo elective thoracic surgery in TASH Menilik II referral and saint peter specialized hospitals at Addis Ababa from 1/2/2023 to April 30/2023.

Eligibility Criteria

4.4.1 Inclusion Criteria.

Elective patients of the adult age group who undergo elective thoracic surgery.

4.4.2 Exclusion Criteria

- Patient whose ASA Status >IV.
- Patient refusal.
- Patient with history of dementia.

4.5 Sample Size and Sampling Technique

The sample size (n) was determined based on a single population proportion by assuming that 50% of the patients' experience hemodynamic change during thoracic surgery (to obtain the minimum representative sample size since no similar study was found in the area) with 95% confidence interval (CI) and 5% margin of error. Population correction used since the source population is <10,000. Situational analysis of thoracic surgeries was done the 3 months before the start of the study and an average of 60 procedures is done per month.

The sample size is calculated as follows.

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

Since this study is new in Ethiopia, this study use a P-value is 50%.

Where;

n= the minimum sample size required

z= The critical value for a given confidence interval, z=1.96

p= Expected proportion of the event to be studied (to be estimated based on previous studies or pilot study)

d= desired degree of precision or margin of error tolerated (5%)

Therefore: p=0.5, q=1-p, 1- 0.5=0.5

$$n = (1.96)^2 \times (0.5) (0.5) / (0.05)^2 = 384$$

Since the size of the population is less than 10,000 this study uses a correction formula.

$$\text{Corrected sample size} = \frac{n \times N}{n + N}$$

N = the total number of surgical patients who are undergoing surgery by general Anaesthesia which is 300.

$$n=384 \text{ and } N=300 \quad nf = \frac{384 \times 300}{384+300}$$

$$384+300$$

$$nf = 168.$$

The sample size is 168 and with 10% contingency, the final sample size is equal to 185.

This study uses a systematic random sampling technique to select the appropriate participant Which Select samples at a regular intervals based on sampling fraction (K).

K= sampling interval, N= total study population and n= sample number

According to hospital analysis 330, elective surgery was performed within five months.

$$N=330, n=168$$

$K=N/n \dots \dots \dots 330/168=1.964 \approx 2$ The sampling fraction was two and the first participant was taken by using the lottery method for daily elective patients

For the second objective sample size determination(factors affecting intra-operative change)

	The ratio of unex. To Exposed. % of outcome unexposed	% Of outcome exposed	Sample size	
Total10No	Ref			
Co-existing disease 1. (35)	32%	68%	70	77
preop medication 1. (35)	35%	65%	98	107
type of procedure 1. (35)	31%	69%	64	71
ASA status (25)	1. 25%	75%	38	42

SS =sample size

NR =None respondent rate 10% added.

4.6 Study variable

4.6.1 Dependent variable.

Intraoperative hemodynamic change .

- Blood pressure change(SBP,MAP)
- Heart rate change.

4.6.2 Independent variable.

Patient-related variables

ASA physical status

Electrolyte imbalance

Medications

Co-existing disease

BMI

Age

Diagnosis.

Baseline Blood pressure (BP) and

Heart rate.

Anaesthesia-related variables.

Anaesthesia drugs used

Fluid management strategies

Procedure-related variables.

Blood loss during surgery

Lung recruitment manoeuvre(PEEP)

Intraoperative ventilator setting(pap,map).

Position during surgery.

4.7 Data Collection Tool and Procedure.

After Briefing the data collectors who were anaesthetists (2nd-year MSc students and Anaesthesiology residents) data was collected from all eligible patients after informed consent is obtained. Medication, Co-morbidity and medical history were extracted from patients medical records. Immediately, after the patient entered to operation room, the data collector records baseline blood pressure and heart rate, before induction and records blood pressure and heart rate post-induction. Air way pressure value record was taken immediately after securing the air way. The intra-operative blood loss, type of drug used, amount of fluid

or blood took and urine out-put, were obtained from anaesthesia record sheet. Airway pressure(PAP,MAP) and PEEP,was monitored by integrated airway pressure monitors on the anaesthesia machines. Blood pressure was monitored using an automatic non-invasive blood pressure monitor and an invasive Arterial Blood pressure monitoring system. A pulse oximeter and electrocardiograph were used to measure the pulse rate .

4.8 Data Processing and Analysis.

4.8.1 Data Quality Assurance

Pretest was carried out on 5% of the sample before the actual data collection started.

one day training was given for data collectors under the established format, all gathered data was checked once a week for its completeness, clarity, consistency and accuracy by the principal investigator.

4.8.2 Data analysis:

Epi Info version 7.2 was used to code,clear and enter data, Then exported to Statistical Package for Social Sciences (SPSS) software version 26.0 Using SPSS basic descriptive statistics like frequency of preoperative and intraoperative factors, socio-demographic variables and prevalence of Hemodynamic change was done. Bivariate and multi variable logistic regression analysis were done to determine presence of associations between dependent and independent variables, and odds ratio with 95% confidence intervals were used to determine the degree of association between dependent and independent variables.

On bivariate logistic regression analysis, a P-value of ≤ 0.2 was used as a candidate for multi-variable logistic regression analysis. For both Crude Odds Ratio (COR) and Adjusted Odds Ratio (AOR), a P value of < 0.05 is statically significant.

4.9 Ethical Consideration.

Permission was obtained from Addis Ababa University's ethical committee and Ethical clearance was obtained from Addis Ababa Public Health Research and Emergency Management directorate before the start of the research. The hospital administrators receive letters containing the objective and purpose of the research. Data collectors took informed consent orally from each patient to collect data. During the data collection process. The norms, values and morals of patients were respected by data collectors.

4.10 Dissemination and Utilization of the Result.

The result of the research will be given to Addis Ababa University, college of health science, department of Anaesthesia and in the form of a thesis. After the result defence at the department level it will be submitted to appropriate stakeholders and disseminated to Addis Ababa Public Health Research and Emergency Management Directorate. A different activity will be taken to publish the paper as public journal.

4.11 Operational definitions.

1. American Society of Anaesthesiologists (ASA) physical status classification: developed by the ASA task force which classifies patients according to their physical status (systemic well-being).

ASA class I: normal healthy patient except for the surgical complaint he had.

ASA class II: a patient with a mild systemic disease without substantive functional limitation.

ASA class III: a patient with a severe systemic disease with substantive functional limitation.

ASA class IV: a patient with severe systemic disease that constantly threatens life.

ASA class V: the moribund patient who is not expected to survive without the operation

2. Baseline value is the value taken before induction.

3. hemodynamic change : patient has experience at least one of the physiologic parameters including systemic hypertension, hypotension, tachycardia, bradycardia, alone or combination.

1. Hypotension: a decrease in $\geq 30\%$ from baseline value or for adult $SBP < 80$ mmHg.

2 For Hypertensive adult patients a increase in $\geq 30\%$ from base line or $SBP > 160$ mmHg.

3. Tachycardia: an increase, in heart rate, $\geq 20\%$ from, the base line value.

4. Bradycardia: a decrease in heart rate, $\geq 30\%$ from the baseline value.

5. RESULTS

5.1 Socio-Democratic and Preoperative clinical characteristics of patients.

The total of 185 Patients data were collected during the study period, from this number of male and female respondents was 102(56.4%),79(43.6%) respectively. The median age of patients were 39 ± 12 . With regard to American Society of Anaesthesiology, Most of the patients were ASA II 84(46.4%). Concerning Co-morbidities 14(7.7%) patients had hypertension, 10 (5.5%) patient had pulmonary infection, 9(5%) was with asthma and 14 (7.7%) had Malignancy Cancer and 6(3.3%) had a history of DM.

TABLE 1: SOCIO-DEMOCRATIC AND PREOPERATIVE CLINICAL CHARACTERISTICS OF PATIENTS WHO UNDERWENT ELECTIVE THORACIC SURGERY AT TASH , MENILIK II REFERRAL HOSPITAL AND SAINT PETER SPECIALIZED HOSPITAL 2023.

Variables	Category	Frequency
Gender	Male	102(56.4%)
	Female	79(43.6%)
Age	Group 1. <20	24(13.3%)
	Group 2. 20-59	114(63%)
	Group 3 >60	43(23.75%)
ASA Status	Class 1	52(28.73%)
	Class 2	84(45.6%)
	Class 3	34(18.5%)
	Class 4	11(5.97%)
BMI	<25	129(71.3%)
	25-29	41(22.65%)
	>30	11(6.1%)
Co-existing Disease	History of hypertension	14(7.7%)

	History of Astma	8(4.4%)
	History of DM	6(3.3%)
	History of cancer	14(7.7%)
	History of pulmonary TB	10(5.512%)
Medication history(n=45)	Anti- hypertensive	14(7.7%)
	Ant-TB	7(3.8%)
	Chemotherapy	11(6.1%)
	Anti- asthmatic	7(3.8%)
	Glycemic control	6(3.2%)
Eletroyte Imbalance	Hypokalemic	13(7.4%)
	Hyperkalemic	8(4.4%)
	Hyponatremia	14(7.7%)
	Hypocalemic	7(3.86%)

5.2 Intraoperative Anaesthetic and Surgically- Characteristics patients

All of the (181) patients-underwent their surgeries under General Anaesthesia with tracheal intubation 99(54.7%) with Double lumen tube) and 82(45.3%) with single lumen tube. Intra-

operative anaesthesia was maintained with volatile anaesthesia with halo-thane and Isoflurane, and with long acting muscle relaxant.

Epidural anaesthesia technique was used for intraoperative pain for 98(54.1%) and paravertebral block was done for 13(7.2%) and erector spinae block was used 18(9.94%) patients, 82(45%) patients were given both Fentanyl and morphine. The majority of Procedure took more than two hour duration 132(72.9%).

TABLE 2: INTRA-OPERATIVE CHARACTERISTICS OF PATIENTS WHO UNDERWENT ELECTIVE THORACIC SURGERY AT TASH, MENILIK II REFFERAL HOSPITAL AND SPSH.

Type-procedure (n=181)	Frequency	Percent
Esophagotomy	56	30.94%
Pneumonectomy	28	15.22%
Decortication	43	23.4%
Cystectomy	35	19.02%
Others	19	10.5%
Position-of patient	Frequency	Percent
Supine	70	38.7%
Lateral	99	54.7%
Both(lateral and supine)	12	6.6%
Pain management	Frequency	Percent
TEA technique	98	54.1%
PVB	13	7.1%
ESB	18	9.94%
Fentanyl-and morphine	82	45.3%

Anaesthesia induction-and maintenance	Frequency	Percent
Propofol	131	72.3%
Ketamin-and propofol	45	24.86%
Thiopental	5	2.7%
Halo-thane	108	59.66%
Isoflurane	73	40.33%
Duration-of surgery	Group 1. 1-2 hr	11(6.1%)
	Group 2. 2-4 hr	132(72.9%)
	Group 3. ≥4hr	38(20.65%)
Intra-operative blood-pressure value (SBP)	1. <80 mmhg	74(40.8%)
	2. 80-160mmgh	81(44.8%)
	3. >160mmhg	26(14.4%)
Mean-arterial pressure(MAP)	1.<60mmhg	74(40.8%)
	2.60-120mmhg	81(44.8%)
	3.>120mmhg	26(14.4%)
Heart heart value	1. <60	26(14.4%)
	2. 60-100	125(69.1%)
	3. >100	30(16.6%)

Invasive monitoring with the arterial catheter was used on 69(38.1%) patients for blood pressure monitoring.

TABLE 3:INTRAOPERATIVE CHARACTERISTICS OF PATIENTS WHO UNDERWENT ELECTIVE THORACIC SURGERY AT TASH,MENILIK II REFFERAL HOSPITAL AND SPSH.

Variables.	Median and Interquartile Range
Fluid given (n=181)	2.5±1.5
Urine out put(L)	0.9±0.5
Blood lose(L)	1.5±0.9
Blood given(unit)	3±1
Anesthesia duration(hr)	4±2

5.3 Magnitude of Hemodynamic Change.

The baseline median systolic blood pressure of patients were 119 ± 6 and post-induction median systolic blood pressure value of patients were 105 ± 40 . From this value 74(40.8%) patients had developed intra-operative hypotension which were $\geq 30\%$ decrease from baseline, and lowest intra-operative median systolic blood pressure value of patients were 70 ± 9 . From this post induction systolic blood pressure value 16(8.8%) patients decrease $< 30\%$ from base line value of patients which were not considered as hypotension according to our operational tool.

From post-induction systolic blood pressure 26(14.4%) patients had developed intra-operative hypertension which was increased $\geq 30\%$ from baseline, and highest intra-operative median systolic blood pressure value were 159 ± 10 . From this post-induction systolic blood pressure value 8(4.4%) patients increase $< 30\%$ from base line systolic blood pressure which was relative threshold value to detect intra-operative hypertension.

The baseline median heart rate value of patients were 74 ± 13 and post-induction median heart rate value of patients were 80 ± 30 . From this heart rate value 30(16.6%) patients had developed intra-operative tachycardia which increased $\geq 20\%$ from base line, and highest intra-operative median heart rate value was 130 ± 25 . From this post-induction heart rate 5(2.8%) patients increased $< 20\%$ from baseline heart rate value, which was not fulfil our operational definition.

From post-induction heart rate value 26(14.4%) had developed intra-operative bradycardia which was increased $\geq 30\%$ from baseline, and the lowest intra-operative median heart rate value was 50 ± 7 . From post-induction heart rate 11(6.1%) patients decreased $< 30\%$ from baseline heart rate value, which was relative threshold criteria to detect intra-operative bradycardia.

Of, the total 181 patients the 74(40.8%) had developed intra-operative hypotension, 26(14.4%), hypertension, 30(16.6%), tachycardia and 26(14.4%) intraoperative

bradycardia respectively. The intra-operative median systolic blood pressure of patients were $\pm 109 \pm 11$. The lowest intraoperative median mean arterial blood pressure 49 ± 7 . The highest intraoperative median mean arterial blood pressure was 68 ± 13 . The lowest intraoperative median mean arterial blood pressure 49 ± 7 .

Treatment of intraoperative hemodynamic change is according to the attending anaesthetist or anaesthesiologist. Noradrenaline was used on 29 (16%) and Adrenaline was used on 10 (5.5%) patients for treatment of intraoperative hypotension and atropine was given to 17 (9.4%) patients to treat intraoperative bradycardia.

Frequencies and percentages of Hemodynamic change are presented on pie-chart, below.

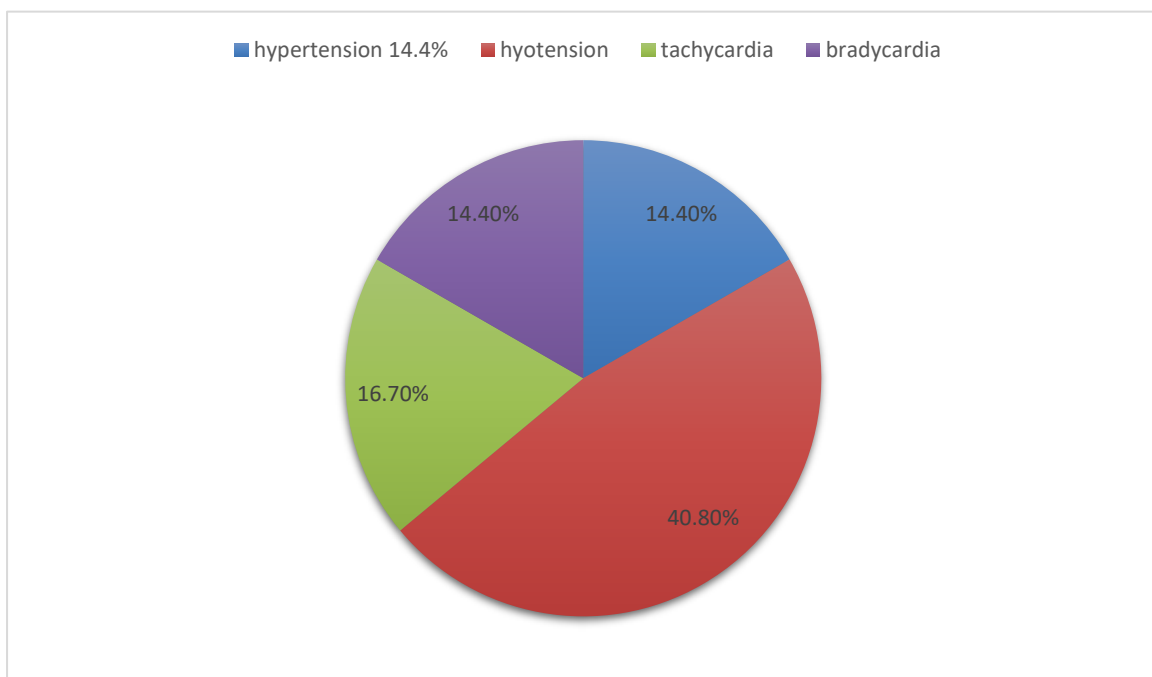


FIGURE 2: MAGNITUDE OF HEMODYNAMIC CHANGE OF PATIENTS WHO UNDERWENT ELECTIVE THORACIC SURGERY AT TASH, MENILIK II REFERRAL HOSPITAL AND SAINT PETER SPECIAL SPECIALIZED HOSPITAL.

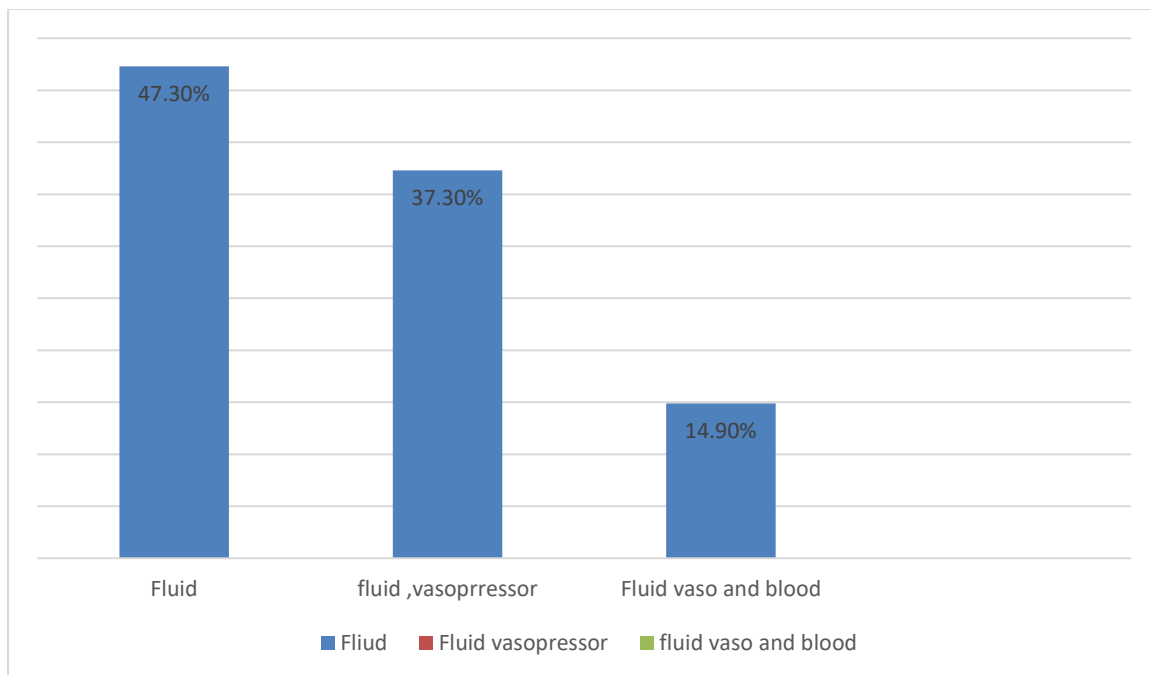


FIGURE 3:TREATMENT OF INTRAOPERATIVE HYPOTENSION FOR PATIENTS WHO UNDERWENT ELECTIVE THORACIC SURGERY AT TASH,MENILIKII REFERRAL HOSPITAL AND SPSH.

5.4 Factors associated with Intraoperative hemodynamic change.

5.4.1 Result of Bivariate Analysis.

Binary logistic regression analysis was conducted to see the association between independent variables and intraoperative hemodynamic change.

5.4.2 Intra-operative Hypotension

According to bivariate analysis, presence of intraoperative blood loss with greater than allowable loss ($\geq 10\text{ml/kg}$ of estimated blood volume of patient) increase likelihood of exhibiting intraoperative hypotension [(COR=5.46: 95%CI(0.5-7.89)), compared with patients less than allowable blood lose ($<10\text{ml/kg}$ of estimated blood volume of patients).

Pre-existing co-morbidity like asthma was associated with an increase in the likelihood of exhibiting intraoperative hypotension [(COR=7.6: 95%CI(0.1-9.91) in reference to patients with no history of asthma.

5.4.3 Intra-operative Hypertension.

Patient having poorly controlled pre-operative hypertension, susceptible to intra-operative hypertension [(COR=5.4; 95% CI:(0.03-7.63)], compared with patients who don't have pre-operative hypertension.

5.4.3 Intra-operative Tachycardia.

Duration of surgery, and age of patients was significantly associated with intra-operative tachycardia. Intra-operative Tachycardia was 2 times more likely occur duration of surgery longer than 2 hr, compared with duration [COR=2.4 95% CI:(1.-5.68)] of surgery that took less or equal to 2 hr. In comparison to age group, patients with increasing age, were associated with intraoperative Tachycardia. The likelihood of developing intra-operative tachycardia were 2 times [COR=2.57; 95% CI : (1.119-5.91)] higher among patients who were younger ages.

5.4.4 Intra-operative Bradycardia.

The type of procedure such as pneumonectomy was strongly associated with Intra-operative Bradycardia [COR=3.8: 95%CI(0.5-7.7)], compared with procedure other than pneumonectomy.

The result of the bivariate analysis presented in a table below showed.

5.4.2 Result of Multi-variable Analysis :

According to results of bi-variable binary logistic regression analysis, type of procedure, patients with history of asthma, intraoperative blood loss, were associated with intra-operative hypotension.

After excluding variables which doesn't fit for the model using P-value ≥ 0.2 in Likelihood ratio test, multi-variable analysis was performed, for those selected variables; intraoperative blood loss, type of diagnosis like lung emphysema, and patients having hypertension and asthma as a co-existing disease were associated with intra-operative hypotension. Patients with intra-operative blood loss greater than allowable blood loss (≥ 10 ml/kg of total estimated blood volume) were 9 times (AOR=9.584.; 95%CI :(2.57-35.8), more likely of developing intra-operative hypotension compared to patients with less than allowable blood loss (< 10 ml/kg of estimated blood volume of patients).

TABLE 4: PREOPERATIVE AND INTRAOPERATIVE FACTORS ASSOCIATED WITH IOH IN TASH MENILIKII REFERRAL HOSPITAL, AND SAINT PETER SPECIALIZED HOSPITAL.

Variables	Category	Hypotension		COR 95%CI	AOR95%CI	P-value
		Yes	No			
BMI	Group 1 <25	53(42.1%)	76(57.9%)	1	1	
	Group 2. 25-29	17(41.5%)	24(58.5%)	1.01(0.16-1.47)	0.25(0.1-3.1)	0.11
	Group 3. >30	4(36.4%)	7(63.6%)	0.81(0.35-11.6)	0.04(0.01-0.2)	0.17
ASA Status	Class I	13(25%)	39(75%)	1		
	ClassII	40(47.6%)	44(52.4%)	2.73(0.5-5.4)	1.03(1.196-5.42)	0.97
	ClassIII	15(44.11%)	19(55.88%)	0.86(0.166-1.173)	1.23(0.71-3.42)	0.16

	Class IV	6(54.54%)	5(45.64%)	1.52(0.73- 3.5)	2.31(0.45-15.52)	0.38
Type of Diagnosis						
Oesophageal cancer	No	60(48%)	65(52%)	1.	1	
	Yes	14(39.3%)	34(60.7%)	0.446(0.2-2.71)	0.33(0.095-1.15)	0.05
Lung Emphysema	NO	61(37.6%)	101(62.4%)	1.0	1	
	Yes	13(68.42%)	6(31.6%)	3.58(0.3-5.7)	0.15(0.03-3.2)	0.02
Lung empyema	No	68(28%)	92(71.8%)	1	1	
	Yes	6(28.6%)	15(71.4%)	0.54(0.2-38.3)	1.81(0.44-7.4)	0.41
Mediastinal mass	NO	69(42.8%)	92(57.1%)	1	1	
	YES	5(25%)	15(75%)	0.44(0.15-7.03)	0.075(0.02-1.92)	0.23
Hydatic cyst	No	70(41.9%)	97(58.1%)	1.	1	
	Yes	4(28.6%)	10(71.4%)	0.55(0.1-31.1)	0.6(0.3-2.912)	0.7
Pre-existing co-morbidity						

Hypertension	NO	68(40.7%)	99(59.3%)	1	1	
	YES	6(42.6%)	8(57.4%)	1.1(0.33-5.4)	5.48(0.98-9.09)	0.05
Asthma	No	69(20%)	106(80%)	1	1	
	Yes	5(90%)	1(10%)	7.68(0.1-9.91)	0.05(0.003-0.8)	0.04
Total blood lose	1.Less than ABL(<10ml/kg of EBV).	56(35.4%)	102(64.5%)	1	1	
	2.Greater than ABL (≥10ml/kg of EBV).	18(75%)	6(25%)	5.46(0.5-7.89)	9.58(2.57-35.8)	0.001

From this study result, patients having pre-operative- poorly controlled hypertension were likely to develop intra-operative hypertension(AOR=5.48:95%CI(0.9-9.1),in reference with patient who have no pre-operative hypertension.

Table 5:Preoperative and intraoperative factors that was associated with intraoperative hypertension in TASH, MenilikII Referral Hospital, and Saint Peter Specialized Hospital.

Variables	Category	Hypertension		COR 95%CI	AOR 95%CI	P- value
		Yes	No			

Age	Group 1. <20	4(10%)	20(90%)	1	1	
	Group.2. 20-59	13(16.6%)	101(83.3%)	0.64(0.02-1.5)	0.3(0.0-1-0.5)	0.5
	Group >60	9(25.6%)	35(75.4%)	1.99(0.3-2.8)	0.3(0.1-2.9)	0.1
BMI	Group 1<25	15(17.8%)	107(82.2%)	1	1	
	Group 2. 25-29	7(41.5%)	24(58.5%)	2.1(0.16-4.5)	0.9(0.2-4.56)	0.2
	Group 3. >30	4(36.4%)	7(63.6%)	1.96(0.35-11.6)	0.89(0.3-5.46)	0.5
ASA Status	Class I	5(13.5%)	45(86.5%)	1	1	
	ClassII	13(17.8%)	69(82.%)	1.7(0.172-2.5)	0.76(0.3-3.5)	0.2
	ClassIII	5(14.7%)	29(85.3%)	0.91(0.166-1.173)	2.125(0.365-12.4)	0.38
	Class IV	3(54.54%)	8(36.4%)	2.2(0.7-6.5)	0.4(0.7-5.46)	0.12
Pre-existing Co-morbidity						
Hypertension	NO	20(12.6%)	146(87.4%)	1	1.	

	Yes	6(42.6%)	8(57.3.4%)	5.4(0.03-7.63)	5.48(0.9-9.1)	0.001
Asthma	NO	23(13.1%)	15(87.9%)	1	1	
	Yes	3(30%)	6(60%)	0.32(0.08-0.6)	0.05(0.003-0.8)	0.14
PTB	NO	20(11.7%)	151(88.3%)	1		
	YES	6(60%)	4(40%)	11.3(0.4-15.12)	0.45(0.01-2.51)	0.19
DM	No	23(13%)	152(86.8%)	1	1	
	Yes	3(50%)	3(50%)	6.6(0.5-8.1)	0.056(0.01-1.7)	0.12

According to this study finding, type of procedure was higher risk of developing intra-operative,bradycardia. The nature of the procedure,like pneumonectomy or lobectomy ,was 2.55 times(AOR=2.55;95%CI:(0.310-20.96) more likely of developing intra-operative bradycardia than patients with another type of procedure-cystectomy(AOR=0.388;95%CI:(0.038-3.92).

TABLE 6:PREOPERATIVE AND INTRAOPERATIVE FACTORS ASSOCIATED WITH INTRAOPERATIVE BRADYCARDIA IN TASH, MENILIK II REFERRAL HOSPITAL AND SAINT PETER SPECIALIZED HOSPITAL.

Variable	Category	Bradycardia N(%)		COR95%CI	AOR95%CI	P-value
		YES	NO			
Type- of procedure						
Esophagectomy	NO	20(10.7%)	106(89.3%)	1.0	1.0	

	Yes	6(10.7%)	50(89.3%)	0.64(0.072-2.73)	2.3(0.1-38.1)	0.56
Pneumonectomy	NO	17(8.5%)	136(91.5%)	1		
	Yes	9(32.14%)	19(67.86%)	3.8(0.5-7.7)	2.55(0.310-20.96)	0.012
Decortication	No	21(7.9%)	117(93.3%)	1	1	
	Yes	5(13.95%)	38(86.4%)	0.73(0.1-3.9)	0.34(0.03-2.1)	0.15
Cystectomy	No	19(4.8%)	131(95.2%)	1	1	0.6
	Yes	7((14.2%)	28(85.7%)	1.72(0.038-3.92)	0.388(0.038-3.92)	0.4
	Propofol	16(17.6%)	92(82.4%)	0.78(0.338-1.965)	2.883(0.53-15.70)	0.22
Induction agent	Thiopental	4(18.2%)	18(81.8%).	1.66(0.224-62.7)	1.204(0.097-14.90)	0.391
	Ketofol	6(13.73%)	45(86.27%)	1.00	1.00	
amount of TV used	1. 3-5ml/kg	14(17.95%)	64(82.1%)	1.65(0.262-2.6)	0.75(0.260-1.58)	0.23
	2. above 5ml/kg	12(11.65%)	91(88.35%)	1	1	

According to this study result, the age patient and the duration of surgery increase, the higher chance of developing intra-operative tachycardia, so the duration of a procedure longer than two hours was 2.4 times (AOR=2.4;95%CI:(1.03-5.68) more risk of developing intra-operative tachycardia with the procedure, that took less than two hours.

TABLE 7: PREOPERATIVE AND INTRAOPERATIVE FACTORS ASSOCIATED WITH IOT IN TASH, MENILIK II REFERRAL HOSPITAL AND SAINT PETER SPECIALIZED HOSPITAL.

Variable	Category	Tachycardia N(%)		AOR	
----------	----------	------------------	--	-----	--

				COR 95% CI		P- value
		YES	NO			
Age	Group 1. <20	4(16.67%)	20(83.33%)	1.00	1.0	
	Group 2 20-59	17(16.67%)	98(83.33%).	0.86(0.5- 5.91)	2.572(1.1- 5.91)	0.026
	Group 3. >60	9(16.3%)	34 (83.7%).	1.52(0.66- 2.153)	0.37(0.099- 1.4)	0.078
ASA Class	ASA Class 1	6(11.54%)	47(88.46%).	1.00	1.0	
	ASA Class 2	14(17.86%).	69(82.14%)	1.58(0.22- 1.7)	0.5(0.17-1.66)	0.14
	ASA Class 3	7(17.65%).	28(82.35%).	1.23(0.2- 2.073)	0.53(0.2- 2.073)	0.16
	ASA Class 4	3(27.27%).	8(72.72%).	1.5(0.072- 1.682)	0.45(0.072- 1.682)	0.14
Total Blood loss	Less-than ABL(<10ml/kg)	24(15.3%)	133(84.7%)	1.00		
	Greater-than ABL(\geq 10ml/kg)	6(25%).	18(75%)	1.84(0.195- 3.5)	0.41(0.195- 2.5)	0.115

Duration of Surgery	Group 1. 1-2	3(27.3%)	8(72.7%)	1.00	1.00	
	Group 2. 2-4 hr	17(14.4%)	115(85.6%)	0.39(0.1-5.68)	2.593(1.04-6.5)	0.042
	Group 3. ≥4hr	10(28.95%)	28(71.05%)	2.4(0.25-6.75)	0.56(0.36-5.451)	0.027
Electrolyte Imbalance						
Hypokalemia	NO	25(15.15%)	140(84.83%)	1.		
	Yes	5(38.46%)	8(61.54%)	3.5(0.074-4.1)	0.23(0.074-4.1)	0.14
Hyperkalemia	No	27(15.6%)	146(84.4%)	1.		
	Yes	3(37.5%)	5(62.5%)	3.2(0.4-5.61)	1.773(0.751-4.724)	0.16
Hyponatremia	No	25(15.4%)	137(84.6%)	1	1	
	Yes	5(35.7%)	9(64.3%)	3.0(0.2-7.12)	1.24(0.02-2.1)	0.1
Hypocalermia	NO	27(15.6%)	145(84.3%)	1	1	
	Yes	3(42.86%)	4(57.14%)	4.03(0.1-6.15)	1.44(0.46-4.5)	0.45

6. Discussion.

According to this study, there is a higher magnitude of Intra-operative hypotension who have underwent elective thoracic surgery. The prevalence of intraoperative hypotension was obtained to be 40.8% (95% CI: 33.8%-48.2%). This magnitude is lower than a study done by D. Sharma et al in India where 65% (n=73) of the patients had at least one episode of hypotension(27,36). But it is greater than the result of research conducted by G.Singh et.al in college of India which the magnitude of hypotension was reported as 16.6%, which was none cardio-thoracic surgery performed with endoscopic, therefore, magnitude of intra-operative hypotension is lower than our study result. This study finding, nearly in-line to the study done by Korkomaz et.al, who stated an IOH incidence of 37.6% in adults and, 18.6% in paediatrics (29,30).

Our study result, similar to a cross-sectional study conducted by Dr Heshmat, in Iran, After surgery, 36% of patients experienced changes in systolic blood pressure 49% shows diastolic blood pressure changes and 65% experienced changes in heart rate from the normal range (37).

The magnitude of the result of this study is lower than a prospective study done at the University of British Columbia, study was conducted on 193 Elective surgical patients. The prevalence of hypotension or bradycardia was 127(65.8%). A final five risk factors were developed such as, pre-operative rate (<60 Min), preoperative hypotension (<110/60mmhg), Elderly, pre-operative, ACE inhibitors or beta blocker, Revised cardiac risk index (>3 points), and type of surgery(35).

Our Study finding is lower than a retrospective cohort study conducted by Zhang, Mu et al.in Shanghai Chest Hospital, in 676 patients was done lung cancer surgery. An overall magnitude, intraoperative hypotension, 160(58.3%), hypertensive 167(76.9%), and both hypotension and hypertensive 119 (43.5%). A higher incidence of both hypotension and hypertension in this

study may be attributed to the frequent use of intra-arterial invasive monitoring which has a better detection ability of intra-operative blood pressure change. The also used systolic blood pressure threshold greater than 140-mmHg for ≥ 5 -minute exposure, and systolic blood pressure less than 100-mmHg for hypertension and hypotension respectively (22,27). The risk factors for a study conducted above were age, smoking history, preoperative co-morbidity, coronary heart disease, anaesthetic agents used and ASA status of the patient and intraoperative blood loss (17,21). Our study result, risk factors were age, pre-operative co-morbidity, ASA status of the patient, intra-operative blood loss, and type of surgery, which was nearly similar, to this finding.

It was also observed, in the study conducted in, Germany in perioperative blood pressure management. For instance, in this study, the incidence of intraoperative hypotension varies substantially depending on the selected definition, taking a 20% drop in systolic blood pressure, into account led to incidences of intra-operative hypotension of 93% for exposure lasting more than or equal to one minute, 88% for exposure lasting 5 minutes. Applying an absolute mean arterial pressure threshold of 65 mm Hg yielded an incidence of intra-operative hypotension of 65% for a greater than or equal to 1-min exposure, 49% for a greater than or equal to 5-min exposure, and 31% for a greater than or equal to 10-min exposure (22,38). Our study also applied an absolute mean arterial pressure threshold of 60 mm Hg for a greater than or equal to 5 -min exposure, to detect the incidences of intra-operative hypotension, so the finding is nearly close to our study result.

According to our research findings, the prevalence of intra-operative hemodynamic change was 74(40.8%), hypotension, 26(14.4%), hypertension, 30(16.6%) tachycardia, and 26(14.4%) intra-operative bradycardia, respectively. This study result was nearly in line with the study done by, Gyaninder P, Singh in India Medical College, on 298 patients, Ganjoo P. et.al found the incidence of tachycardia as (57 patients, 20.1%), bradycardia (35 patients, 12.4%) and hypertension (23 patients, 8.3%). In another research done by G. Singh et.al on 223 patients were analysed, and reported incidences of tachycardia at 18.8%, bradycardia at 11.3%, hypertension at 16.1%, and intra-operative hypotension at 16.6% (29,30).

In this study result, intra-operative blood loss is strongly associated with intra-operative hypotension. Patients with intra-operative blood loss greater than allowable blood loss (≥ 10 ml/kg of estimated blood volume) were 9 times (AOR=9.584.; 95%CI:(2.57-35.8),

more likely of developing intra-operative hypotension compared to patients with less than allowable blood loss(<10ml/kg of estimated blood volume).

This study result is consistent with the study conducted in England, on 676 patients who underwent lung cancer surgery (17,21).

It was also observed in our study that, the type of procedure and type of diagnosis were higher risk of developing intra-operative bradycardia. The nature of the procedure, like pneumonectomy or lobectomy, was 2.5 times(AOR=2.55;95%CI:(0.310-20.96) more likely of developing intra-operative bradycardia than patients with other type of procedure, like cystectomy(AOR=0.388;95%CI: (0.038-3.92). This finding also nearly close to, the study was done by Brodsky JB. Review anaesthesia in thoracic surgery, and Etienne J.Coulture Current challenge in thoracic surgery(16,39).

The pre-operative co-morbidity like hypertension was strongly associated with intra-operative hypertension. The study of our result showed, patients having pre-hypertension were prone to develop hypertension than patients without pre operative hypertension. This finding is in line with the study done in Canada Toronto hospital, to identify the common ethologies of hypertension during the perioperative period. From this research finding (22.7%) intra-operative hypertension was poorly controlled pre-hypertension(34).

According to this study result, age and the duration of surgery were factors associated with tachycardia. So, the duration of the procedure longer than two hours was 2.4 times more risk of developing intra-operative tachycardia with the procedure, which took less than two hours. This finding is consistent with the study conducted by Dr Heshmat educational-therapeutic hospital in Rasht in the province of Iran. The study aimed to determine the level of hemodynamic changes after coronary ar-artery bypass grafting and its related factors in patients undergoing, CABG, interfering factors such as Body Mass Index, ejection fraction, history of Myocardial- infraction, duration of the connection to the ventilator, duration of cardiopulmonary machine use, duration of aorta clamp, hypothermia, and level of haemoglobin and haematocrit with hemodynamic variables(24,26,37).

7 Strengths and Limitations of Study.

7.1 Strength

- Studies weren't done on this title, this will make the study to be used as a baseline for further country-wide study.
- It assessed the magnitude of multiple variables together with associated factor.

7.2 Limitations of the study.

- Representative samples are all thoracic procedure. these might affect outcome variable ,so the finding of this study interpreted with these limitations.

8:Conclusion

The finding of this study, had high intra-operative hypotension episodes which was found to be 40.8%, in patients who underwent elective thoracic at TASH, Menilik II referral Hospital and Saint Peter Specialized Hospital. Hypertension, Tachycardia and Bradycardia had a magnitude of 14.4%, 16.6% and 14.4% respectively. age, ASA class, type of diagnosis, intra-operative blood loss, type of procedure, pre-existing co-morbidity and duration of surgery were predictors of intra-operative hemodynamic change of patients who underwent elective thoracic surgery at Tikur Anbessa specialized hospital, Menilik II referral hospital, and Saint Peter specialized hospital from 1/2/2023/30/4/2023 .

9:Recommendations.

- ✓ Based on the findings of the present study, the following recommendations are forwarded: for both anaesthesia and surgical team.
- ✓ **For Anesthetist:**
 - Precaution for estimated blood loss greater than Allowable blood loss during the intra-operative period.
 - Early preparation for Patients who has a history of co-morbidity and for those patients undergoing lung resection surgery like pneumonectomy or lobectomy.
 - Adopt guidelines or develop local protocols that will help to treat intra-operative hemodynamic instability.
 - Patients with, higher ASA class, aged and pre-existing co-morbidity patients should be identified pre-operative period and all the necessary precautions should be taken.
- ✓ **For researchers.**
 - In some study groups representative samples are small, so researchers are recommended to increase sample size and conduct cohort study using this study as a baseline.

REFERENCES:

1. B. J, J. P. Lung, Chest Wall, Pleura, and Mediastinum _ Thoracic Key refernce pdf 1. 2015. p. 47–60.
2. Byrd CT, Williams KM, Backhus LM. A brief overview of thoracic surgery in the United States. 2022;2021(l):218–26.
3. Cabo D, Alarza FH, Rodriguez AMC, Delgado MCM, Mu C. Perioperative management in thoracic surgery. 2020;44(3):185–91.
4. Textbook O. Cardiothoracic Anaesthesia. 2015. 415–422 p.
5. Roy E, Rheault J, Pigeon MA, Ugalde PA, Racine C, Simard S, et al. Lung cancer resection and postoperative outcomes in COPD: A single-centre experience. *Chron Respir Dis*. 2020;17:1–8.
6. Powell ES, Cook D, Pearce AC, Davies P, Bowler GMR, Naidu B, et al. Lung cancer resection and postoperative outcomes in COPD: A single-center experience. *Br J Anaesth* [Internet]. 2011;106(3):364–70. Available from: <http://dx.doi.org/10.1093/bja/aeq379>
7. Fernandes EO, Teixeira C, da Silva LCC. Lung cancer resection and postoperative outcomes in COPD: A single-center experience. *Rev Assoc Med Bras*. 2011;57(3):292–8.
8. Guerra M, Neves P, Miranda J. Surgical treatment of non-small-cell lung cancer in octogenarians. *Interact Cardiovasc Thorac Surg*. 2013;16(5):673–80.
9. Lugg ST, Tikka T, Agostini PJ, Kerr A, Adams K, Kalkat MS, et al. Smoking and timing of cessation on postoperative pulmonary complications after curative-intent lung cancer surgery. *J Cardiothorac Surg*. 2017;12(1):1–8.
10. Weksler B. After neoadjuvant chemoradiation therapy, predicted pulmonary function may be reduced by 10%. *J Thorac Cardiovasc Surg* [Internet]. 2018;155(5):2127–8. Available from: <https://doi.org/10.1016/j.jtcvs.2018.01.024>

11. Esaic IC, Barbato E, Hert S De, Mansmann UR, Mcgreavy P, Kingdom U, et al. 2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery Developed by the task force for cardiovascular assessment and European Society of Cardiology (ESC) Endorsed by the European Society of Anaesthesio. 2022;3826–924.
12. Li Q, Zhang X, Xu M, Wu J. A retrospective analysis of 62 , 571 cases of perioperative adverse events in thoracic surgery at a tertiary care teaching hospital in a developing country. 2019;1–7.
13. Maffezzini M. Re: Trends in hospital volume and operative mortality for high-risk surgery. *Eur Urol* [Internet]. 2013;63(3):582. Available from: <http://dx.doi.org/10.1016/j.eururo.2012.12.010>
14. Caillet P, Payet C, Polazzi S, Carty MJ, Lifante JC, Duclos A. Increased mortality for elective surgery during summer vacation: A longitudinal analysis of nationwide data. *PLoS One*. 2015;10(9):1–14.
15. Brodsky JB. Preoperative assessment Anesthesia for thoracic surgery. In: review anesthesia for thoracic surgery pdf.
16. Etienne J.Couture. Pulmonary hemodynamics and lung surgery :Narative Review. *Curr Challenges Thorac Surg*. 2022;21–33.
17. Huang WW, Zhu WZ, Mu DL, Ji XQ, Li XY, Ma D, et al. Intraoperative hypotension is associated with shortened overall survival after lung cancer surgery. *BMC Anesthesiol*. 2020;20(1):1–10.
18. Soto-ruiz KM, Peacock WF, Varon J. “ Perioperative hypertension : Diagnosis and Treatment .” *Netherlands journal Crit care*. 2011;15(3):143–8.
19. Foe P. Intraoperative Hypotension Is Associated With Adverse Clinical Outcomes After Noncardiac Surgery. 2004;4(5):139–43.
20. Hirsch J, DePalma G, Tsai TT, Sands LP, Leung JM. Impact of intraoperative hypotension and blood pressure fluctuations on early postoperative delirium after non-cardiac surgery. *Br J Anaesth*. 2015;115(3):418–26.
21. Article R. Intraoperative hypotension : Pathophysiology , clinical relevance , and

- therapeutic approaches. 2020;(12):12–8.
22. Id C, Poteet S, Burniol-garcia A, Lizano-di I. The burden of perioperative hypertension / hypotension : A systematic review. 2022. 1–33 p.
 23. Saugel B, Sessler DI. Perioperative Blood Pressure Management. *Anesthesiology*. 2021;(2):250–61.
 24. Sirlak suksompong, sarawut thamtanavit. Thoracic surgery mortality and morbidity in A university hospital. *Asian cardiovascular Thorac Annu*. 2012;20(2):927–35.
 25. Mulugeta M, Risky N, Mollalign M, Adie B. Incidence and predictive factors associated with hemodynamic instability among adult surgical patients in the post-anesthesia care unit , 2021 : A prospective follow up study. *Ann Med Surg [Internet]*. 2022;74(December 2021):103321. Available from: <https://doi.org/10.1016/j.amsu.2022.103321>
 26. Abid Saleem, wahid Syed. change in blood gases and hemodynamic parameters patients undergoing lung resection surgery and it implicationg go lung resection surgery. *J Cardio- Thorac Med*. 2019;(7):406–12.
 27. Sessler DI, Bloomstone JA, Aronson S, Berry C, Gan TJ, Kellum JA, et al. Perioperative Quality Initiative consensus statement on intraoperative blood pressure , risk and outcomes for elective surgery. 2019;122(July 2017):563–74.
 28. Alfonso Fiorechi. Relationship between Intraoperative Mean. *Free PMC*. 2020;565–73.
 29. Singh GP, Prabhakar H, Bithal PK, Dash HH. A retrospective analysis of perioperative complications during intracranial neuroendoscopic procedures: Our institutional experience. Vol. 59, *Neurology India*. 2011. p. 874–8.
 30. Hirsch J, DePalma G SL. Impact of intraoperative hypotension and blood pressure fluctuations on early postoperative delirium after non-cardiac surgery - PubMed impact of hypotension. 2015. p. 418–28.
 31. Ahmadi N, Reza Masouleh S, Shekani Z, Kazem Nezhad Leili E. Hemodynamic changes and related factors in patients undergoing coronary artery bypass grafting surgery. *J Holist Nurs Midwifery [Internet]*. 2012 Oct 10 [cited 2022 Sep 10];22(2):1–10.

Available from: <https://hnmj.gums.ac.ir/article-1-153-en.html>

32. Pedoto A, Desiderio DP, Amar D, Downey RJ. Hemodynamic Instability Following Airway Spray Cryotherapy. *Anesth Analg*. 2016;123(5):1302–6.
33. Mubarak. Effect of positive End expiratory pressure during one lung ventilation in hemodynamics on thoracic surgery in adult patients. In: *SVU-IJMS. QENA: Mubarak*; 2020. p. 37–41.
34. Mohseni S, Behnam-roudsari S, Tarbiat M, Shaker P. Perioperative Hypertension Etiologies in Patients Undergoing Noncardiac Surgery in University Health Network Hospitals – Canada from 2015 – 2020. 2022;(March):23–32.
35. Cheung CC, Martyn A, Campbell N, Frost S. Predictors of Intraoperative Hypotension and Bradycardia. *Am J Med [Internet]*. 2015;128(5):532–8. Available from: <http://dx.doi.org/10.1016/j.amjmed.2014.11.030>
36. Medicine P. Relationship between Intraoperative Mean. 2013;119(3):507–15.
37. Ahmadi N, Reza Masouleh S, Shekani Z, Kazem Nezhad Leili E. Hemodynamic changes and related factors in patients undergoing coronary artery bypass grafting surgery. *J Holist Nurs Midwifery [Internet]*. 2012 Oct 10 [cited 2022 Sep 3];22(2):1–10. Available from: <https://hnmj.gums.ac.ir/article-1-153-en.html>
38. Koli PG, Shetty Y, Salgaonkar S, Dongre M, Arora S. Cross-sectional study about perioperative management of Blood Pressure and effects of anaesthesia in hypertensive patients undergoing general & orthopaedic surgery and effects of anaesthesia in hypertensive patients undergoing general &. *Egypt J Anaesth [Internet]*. 2019;34(3):89–93. Available from: <https://doi.org/10.1016/j.egja.2018.05.002>
39. Boisen ML, Schisler T, Kolarczyk L, Melnyk V, Rolleri N, Bollinger B, et al. The Year in Thoracic Anesthesia : Selected Highlights from 2019. *J Cardiothorac Vasc Anesth [Internet]*. 2020;000:1–12. Available from: <https://doi.org/10.1053/j.jvca.2020.03.016>

Annexe 1: Information Sheet

Addis Ababa University College of Health Sciences

School of medicine

Department of Anaesthesia.

Consent form

Hello, my name is _____ and I am a data collector for research aimed at assessing the incidence of hemodynamic change and factors associated with Intraoperative hemodynamic change during elective thoracic surgery. Since the study is not linked with any financial aid there are no direct incentives paid as a result of your taking part in the study.

However, your legitimate participation in filling the questionnaire with real information is very important and highly appreciated.

I would like to assure you, that your name will not be written on this form and all the information gathered will be kept strictly confidential. You can also contact the principal investigator at the addr Yisehakwolde140@gmail.com phone number: +251967711907.

Annexe II: Questionnaires and check-list.

Table 3: Questionnaires and check-list

A questionnaire for research proposal on the magnitude of hemodynamic change and factors associated with hemodynamic changes during elective thoracic surgery at the black lion and Menilik ii Referral hospital and saint peter specialized hospital from 1/2/2023 to 30/4/2023.

Socio-demographic Data.

Age _____ Sex _____ Weight _____ Height-----

2. Associated Factors.

1. ASA _____

2. Diagnosis _____

3. Name of Procedure _____

4. Position of the patient Supine Lateral Sitting Prone

NO	Question	Answer	If "No" skip to the question
5	Does the patient have co-morbidity?	YES	NO.
6	What is the disease?		

7	Is the patient taking any medication?		
8	What is the drug/s?		
9	Is there an electrolyte imbalance?	YES	NO
10	What is the electrolyte imbalance?		

11. Amount of pre-loading fluid given _____ ml

12. Pre-medication drugs given _____

13. blood pressure Monitoring invasive Non-invasive

14. Drugs -Induction Ketamin-and _____mg Thiopentone _____mg Propofol _____mg

-Relaxant Sux Atracurium Vecuronium Pancuroni

-Maintenance Halo-thane ____MAC Isoflurane ____MAC -Other _____mg

- Opioid _____mg - Other Analgesic _____mg

15. Ventilation Spontaneous Controlled

16. Tidal volume _____ ml

Vital sign

Vital sign	Baseline	Post induction	1 st hr	2nd hr	3 r d	4 th hr	5 th hr	6 th hr
Mean arterial pressure								
BP								
PR								
Blood loss								
Fluids								
Urine output.								

Airway pressure.

Parameter	Baseline	Immediately after securing the airway	Immediately after Position change	30 minutes after position change
Peak airway Pressure				
Mean airway Pressure				
Mean Arterial pressure				
BP				

Incidence

I. hypotension

- Number of episodes: _____

- Blood pressure values: _____

- Duration of each episode: _____

- Intervention done: _____

II. Hypertension

- Number of episodes: _____

- Blood pressure values: _____

- Duration of each episode: _____

- Intervention done: _____

III. Bradycardia

- Number of episodes: _____

- Heart rate values: _____

- Duration of each episode: _____

- Intervention done: _____

IV. Tachycardia

- Number of episodes: _____

- Heart rate values: _____

- Duration of each episode: _____

- Intervention done: _____

12. Duration of the Anaesthesia _____ minutes and surgery
_____ minutes.

13. Total amount of intravenous fluids given in intra-operative period _____ ml

14. Total urine output _____ ml

15. Allowable blood loss _____ ml

16. Total amount of blood given _____ ml

Name of Data collector _____ Sign

Name-of Supervisor _____

Sign _____