Addis Ababa University

አዲስ፡አበባ፡ዩኒቨርሲቲ

Seek Wisdom, Elevate your Intellect and Serve Humanity

INCIDENCE OF MAJOR INTRAOPERATIVE ADVERSE EVENTS AND ASSOCIATED FACTORS AMMONG PATIENTS UNDERGOING SURGERY AT TIKUR ANBESA SPECIALIZED HOSPITAL,ADDIS ABABA ,ETHIOPIA,2025

A Research presented to school of medicine

College of Health science

In partial fulfilment of the requirement for speciality certificate in Anesthesiology educational research and Ethical standards.

By

Dr- Ayalew Libmogn

INCIDENCE OF MAJOR INTRAOPERATIVE ADVERSE EVENTS AND ASSOCIATED FACTORS AMMONG PATIENTS UNDERGOING SURGERY AT TIKUR ANBESA SPECIALIZED HOSPITAL,ADDIS ABABA,ETHIOPIA, A PROSPECTIVE OBSERVATIONAL STUDY,JANUARY-MARCH, 2025

Dr –Ayalew Libmogn-Anesthesiology critical care and pain medicine year 3 resident

Advisors- Dr- Getachew Jiregna , MD,Assistant professor of Anesthesiology, critical care and pain medicine

Dr Anania Abate ,MD,Assistant professor of Anesthesiology critical care and pain medicine

Statement of declaration

I hereby declare and affirm that this research is my own original work as a partial fulfillment of the requirement for the speciality certificate training in Anesthesiology, Critical Care and Pain Medicine. I have followed all the ethical consideration in the preparation, data collection, data analysis and completion of this research. All the sources of the material used for this research and all people and institution who gave support for this work are fully acknowledged.I have sited and referenced all the sources used in this research document.

INVESTIGATOR

Dr Ayalew Libmogn signature______________ date________________

ADVISORS

Dr Getachew Jiregna signature_______________ date_________________

Dr Anania Abate signature_______________ date________________

DEPARTMENT HEAD

Dr Fetiya Alferid signature______________ date________________

Acknowledgment

First I would like to thank the scholl of medicine, department of anesthesiology, critical care and pain medicine for the chance given to me to work on this study. my heartfelt gratitude goes to my advisors ,Dr Anania abate and Dr Getachew Jiregna for their day to day support, invaluable suggestions and eagerness to evaluate me .finaly my special thanks goes to the anesthesiology residents working at TASH whose cooperation was of paramount importance for the completion of this study.

Table of Contents

Abbreviations and acronyms

ASA---------------------------American Society of Anesthesiologists

BMI----------------------------Body mass Index

CKD----------------------------chronic kidney disease

DM------------------------------Diabetes mellitus

ETT------------------------------endotracheal tube

GA-------------------------------General Anesthesia

IAES----------------------------intraoperative adverse events

ICU------------------------------- Intensive care Unit

LMA------------------------------ Laryngeal Mask Airway

OR------------------------------operation room

SLE----------------------------- systemic lupes erthematose

SPSS-----------------------------Stastical package for social science

TASH--------------------------- Tikur Anbesa Secialised Hospital

List of figures

List of tables

Summary

Background: Surgery is a critical condition associated with potential complications. Adverse intraoperative events (AIEs) can significantly impact patient outcomes and increase healthcare costs. While several studies have explored AIEs in different settings, data from developing countries like Ethiopia remains limited. Understanding the incidence and associated factors of AIEs in such settings is crucial for improving patient safety and quality of care.

Objectives: This study aims to determine the incidence of AIEs among patients undergoing surgery at Tikur Anbesa specialised Hospital in Addis Ababa, Ethiopia. Additionally, it seeks to identify factors associated with these events.

Methods: A prospective observational study was conducted . Structured questionnaire and medical record was used to collect data. Descriptive statistics was used to describe the study population and the incidence of IAES. Bivariate and multivariable analyses was performed to identify factors associated with IAEs.

Results-the incidence of major intraoperative adverse event is 12.6%(n=32). The most common adverse event was cardiovascular (hypotension), 46.8% (n=15) followed by bleeding 31%(n=10). Patients having comorbidity are 5.4times more likely to get adverse event than their counter parts (AOR=5.404, 95% CI=2.402-12.157).Likwise, absence of ASA standard monitor was associated to IAEs 5.4 times(AOR=5.461,95%, CI-2.471-12.089)

Conclusion and recommendation- preoperative patient comorbidity is the independent risk factor for the occurrence of adverse intraoperative events. Proper preanesthetic evaluation and management of comorbidities is of paramount importance to reduce IAEs.

Keywords: Adverse intraoperative events, Tikur Anbesa specialised Hospital, patient safety.

1.Introduction

1.1 Background

Intraoperative adverse events (IAEs) are critical events during surgery, cardiovascular and respiratory issues being leading, succeded by regional anesthesia events [1]. Despite their global burden there is no structured reporting system and lack of strata for the classification of these events leading to limited understanding of their effect on patient well being [2-5]. Many Studies underlie the role of classification systems like ClassIntra to predict patient outcome and identify patients at higher risk for adverse events after surgery [6, 7]. Eventhough ther had been multitude of trials to set standard for stratifiying auch events the success is yet come leading to affected patient safety [5, 6, 8-12].Retrospective summary of studies emphasise scarcity of complete data on incidence of adverse event as well as poor grading of these event geoparadising patient safety [13].

There is a large range of variability of incidence of (IAEs)[14-16], where one study revield that 24% of patients had at least one IAEs [14]. Determinat factors for the occurrence of such events were preexisting disease,surgical duration and surgeons proficiency [9, 14, 15, 17]. Other attributable factors were patient characterstics and status of institution providing the care [1, 9, 14]. Awreness on these adverse events plays invaluable role for the promotion of quality health environment [12].

Researches in Ethiopia underlie   female sex, preoperative hypertension and long duration of surgery as determinants for intraoperative adverse events [18]. The other determinants identified were preoperative ST segment elevation,being hypertensive,geriatric age and long duration of surgery [18, 19].

Even though TASH is the largest hospital surving patients across the country, there is no data quantifing the incidence of adverse events.This study aims to fill this gap by investigating the incidence of IAES and major factors affecting these events.

1.2 Statement of the Problem

IAEs pose worldwide burden resulting in affected ptient safety, higher economic burden and prolonged in hospital stay [1]. more than 300 million surgeries annually experience adverse event [4]. Studies in Ethiopia revield higehr burden of IAES especially among geriatric patients undergoing noncardiaac surgery [18]. Efforts to address these challenges are crucial for improving patient outcomes and reducing healthcare burdens in both developed and developing nations.

TASH, as one of the largest hospitals in Ethiopia, plays a crucial role in providing surgical care to a diverse patient population. However, there is a paucity of data on the incidence and associated factors of iAEs at this institution.

This study aims to address this gap by identifying the incidence and associated factors of these events, the study seeks to inform evidence-based strategies to reduce these risks.

1.3. Significance of the Study

This study holds significant importance for several reasons:

Improving Patient Safety: Understanding the incidence and factors associated with adverse intraoperative events is crucial for enhancing patient safety. By identifying the common intraoperative complications and their risk factors, healthcare providers can develop targeted interventions to mitigate these risks.

Enhancing Surgical Outcomes: Adverse intraoperative events can lead to prolonged hospital stays, increased healthcare costs, and poorer postoperative outcomes. This study aims to provide valuable insights into the prevalence and causes of these events.

Guiding Policy and Practice: The findings from this study can inform hospital policies and clinical guidelines. By highlighting specific risk factors and the frequency of adverse events, the study can help in the formulation of protocols and training programs aimed at minimizing intraoperative complications.

Contributing to Local and Global Knowledge: While there is extensive literature on intraoperative events in high-income countries, there is a paucity of data from low- and middle-income countries, including Ethiopia. This study will fill this gap by providing context-specific data that can be used for comparative studies.

Supporting Future Research: The study's findings can serve as a foundation for future research on surgical safety and quality improvement in Ethiopia.

2.Litrature Review

2.1 Incidence of Intraoperative Adverse Events

Intraoperative adverse events (iAEs) are critical events happening during surgery leading to increased morbidity.

A prospective cohort study on 422 adult patients undergoing neurosurgery revield 40% incidence of IAES [7]. a study analysing 2520 patients undergoing different procedure showed 24% of patients had a total of 778 intraoperative adverse events. Events of surgical origin were the most important, accounting for 54% of the cases.[14] the results were comparable to a study done on 2520 patientswhich reported 24% incidence of IAES [9].

A study done on patients undergoing abdominal surgrgry reported 43-44% incidence of IAES, bleeding and iatrogenic organ injury secondary to adhesion were the two most common adverseevents [20].a research done on patients undergoing electroporation surgery revield 47% IAES, cardiac events (90%), hypertension (77%) and arrhythmia (16%) were the most prevalent [21].A retrospective population-based cohort study done on patients undergoing rectal cancer surgery reported 53% of IAES . Of those patients who developed local recurrence, 79% had experienced such adverse events during the surgery[22].In a large retrospective analysis of gynecological surgeries, the incidence of intraoperative complications was reported to be 5.6%[23].

2.2 Factors Associated with Intraoperative Adverse Events

2.2.1 Patient Related Factors

patient-related factors play pivotal role in determining the incidence of IAEs.age, pre-existing medical conditions like hypertension and diabetes, and the functional status before surgery are important factors. Studies revield geriatric age with preexisting disease are at an increased risk of developing adverse events [1, 24, 25].other studies highlighted the importance of low body mass index, and preexisting ischemic heart disease as determinant factors affecting the occurrence of adverse intraoperative events [26].

2.2.2 Surgery Related Factors

Surgery-related factors contributing to adverse intraoperative events include prolonged surgery duration, increased blood loss [27]. Furthermore the type of surgery undergone such as, open flap debridement, and surgically facilitated orthodontic therapy play pivotal role to adverse intraoperative events during periodontal surgeries[28] . studies also point out organ injuries as the most prevalent surgery-related adverse event in abdominal surgery[20].type of surgery (extracranial procedures and emergency cases) determinant surgery-related factors affecting the incidence of IAES[7].

2.2.3 Anesthesia Related Factors

A retrospective observational study identified general anesthesia as the single most independent factor for the occurence of adverse intraoperative event [29].

Mistakes during drug provision and side effects were observed in increased frequency during general anesthesia [5]. These factors highlight the importance of tailored anesthesia management strategies, vigilant monitoring, and preventive protocols to mitigate risks and improve patient outcomes during surgery.

2.2.4 Organizational Factors

Organizational factors playpivotal role in determining the the incidence of adverse events. These factors encompass regulatory and management institutions, such as health funds, hospitals, and clinics, which contribute to creating a safe work environment in complex healthcare systems [3]. Studies have shown that organizational factors, along with technology design, organizational policies, and physical environments, interact with other work system factors to either amplify or dampen patient safety risks in the operating room [1]. Furthermore, the quality of intraoperative handoffs, which are embedded in the systems and culture of operating rooms, is impacted by broader organizational logistics, teamwork dynamics, and scheduling practices, highlighting the importance of organizational considerations in improving the quality of intraoperative handoffs [2]. Analyzing the type and origin of intraoperative adverse events provides valuable information for targeted surveillance of intra- and postoperative care, emphasizing the significance of detailed organizational information in enhancing patient safety outcomes [5].

2.3 Intraoperative Adverse Events in Ethiopia

In Ethiopia, there is a paucity of data on the incidence and associated factors of iAEs. Understanding the incidence and associated factors of iAEs at this hospital can provide valuable insights into the challenges faced in the Ethiopian healthcare context and inform strategies to improve surgical care.

3. Objectives

3.1 General Objective

To determine the incidence and associated factors of adverse intraoperative events (AIEs) among patients undergoing surgery at Tikur Anbesa Specialised Hospital Addis Ababa, Ethiopia from January-march 2025.

3.2 Specific Objectives

- To determine the incidence of adverse intraoperative events among patients undergoing surgery at TASH
- To identify the associated factors of AIEs among patients undergoing surgery at TASH.

4. **Methods**

4.1 Study Design

A Prospective observational study was used to assess the incidence and associated factors of adverse intraoperative events among patients undergoing surgery at TASH from January to march 2025.

4.2 Study Setting

The study was conducted at Tikur Anbesa specilised Hospital, a tertiary care hospital in Addis Ababa, Ethiopia. The hospital provides a wide range of surgical services and maintains comprehensive patient records.

4.3 Population

4.3.1 Source Population

The source population comprised all patients undergoing surgical procedures at Tikur Anbesa specialised Hospital during the specified study period.

4.3.2 Study Population

The study population consisted of a representative sample of patients who undergo surgery during the study period and for whom complete data on intraoperative events and relevant variables were available and who fulfilled the inclusion criteria.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion Criteria.

- Patients undergoing elective surgical procedures
- Patients with available medical records including preanesthetic evaluation and preoperative laboratory and imaging investigations.

4.4.2 Exclusion Criteria

- Patients undergoing minor procedures (non operative room anesthesia).

4.5 Sample Size Determination and Techniques

4.5.1 Sample Size Determination

The sample size was determined using a single population proportion formula

$$n= \frac{\left(z.\frac{a}{2}\right)^2.p(1-p)}{d^2}$$

using p value of 32%, from previous study done and 95% CI and 5% margin of error. Where: n = sample size, Z = Z value at 95% confidence level (standard 1.96) and d = tolerance of error 5% or (0.05). Therefore, based on the formula, n = 1.96 2*0.32*(1-0.32)/ (0.05)2= 334. Taking 5% non response the final sample size was 351.since the population number is less than 10,000 , the sample size was adjusted using finite population correction formula, n= $\frac{n_0}{\left(1+n_{0/N}\right)}$. where,n-corrected sample size,n0-initial sample size,N-total population size.In the previous 2 months a total of 923 patients were operated electivly using the logbook as a reference, the final sample size is -254.

4.5.2 Sampling Techniques

A stratified random sampling technique was used to select patients from the surgical records. Using the previous 2 month surgical record on the log book as a reference,923 patients were operated.the population was divided into 11 strata depending on the operating department.sample size was calculated based on proportionate stratified random sampling –

nh=n(Nh/N) where nh-sample size from stratum h, n-total sample size, Nh-population size of stratum h, N- total population size.

Dept	Cardio-thoracic	ENT	endocrine	vascular	orthopedic	Pediatrics	Ur0 surg	Gastrointestinal surgery	Obstetrics	Neurosurgery	gynecology
No ofcase/3 month	86	117	64	85	172	197	175	117	117	67	97
Sample.s	19	23	13	17	33	38	33	23	23	13	19

The sampling interval was 923/254=4. The first case of the the day was selected by simple randomization and every 4th case was selected next till the desired sample size reached.

4.6 Study Variables

4.6.1 Dependent Variable

Occurrence of intraoperative adverse events (yes/no)

4.6.2 Independent Variables

Patient-related factors: age, sex, nutritional status, comorbidities (hypertension, diabetes, cardiovascular disease, respiratory disease), ASA physical status, history of previous surgery

Surgical-related factors: unit deparment of surgery, duration of surgery.

Anesthesia-related factors: type of anesthesia.

Organizational factors: availability of essential equipment and monitor.

4.7 Operational Definitions

Major Adverse Event: an untoward medical event that deemed life threathing and lead to unanticipated admission to ICU or lead to patient death, that include, classintra garde IV and above. Where , grade 0-no deviation from the ideal intraoperative course.

Grade 1-any deviation without the need for additional treatment.

Grade II-any deviation requiring minor treatment

Grade III- Any deviation requiring moderate treatment

Grade IV-Any deviation requiring major and urgent treatment.

Grade V- Intraoperative death

Intraoperative: defined as the period from patient entry to the operation room up to patient transfer to post anesthesia care unit.

failed intubation: Inability to secure the airway by experienced provider despite more than 3 trials.

desaturation/hypoxia :oxygen saturation < 90% for > 3 minutes measured by pulseoximetry without artifact on its tracing.

hypotension : drop in mean arterial blood pressure > 30% below the patients baseline .

hypertension: increament in mean arterial blood pressure >40% above patients baseline.

Arrhythmia: a heartbeat which is abnormal interms of rate or rhythm that the provider deemed to be treated.

Cardiac arrest: the absence of cardiac activity witnesd by the physician which necessitate chest compression.

total spinal block: high spinal block with cranial nerve involvement or loss of

consciousnes

Bleeding: bleeding beyond the maximium allowable level leading to hymodynamic instability.

Anaphylaxis- sever life threatening systemic hypersensitivity reaction leading to sudden airway, breathing and circulatory problems.

4.8 Data Collection Tools

Data was collected using a structured questionnaire specifically designed for this study. The questionnaire included sections of demographic information, intraoperative course and management and information related to adverse intraoperative events. Data was collected by trained data collectors through observation and review of patient chart.

4.9 Data Quality Assurance

To ensure data quality, data collectors received training on the study objectives, data collection tools, and ethical considerations. The questionnaire was pretested on a small sample of patients to identify any ambiguities or issues with the tool. Regular supervision and monitoring was conducted throughout the data collection process to address any concerns and ensure consistency and accuracy.

4.10 Data Processing and Analysis

Data was entered into a computer database for analysis. Descriptive statistics was used to summarize patient characteristics and the frequency of IAEs. Bivariate analysis was conducted to assess the association between independent variables and the occurrence of IAEs. Logistic regression was used to identify factors independently associated with IAEs.

4.11 Ethical Considerations

The study adhered to ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) of Tikur Anbesa specialised Hospital. Patient confidentiality was maintained throughout the study.

5. Result

5.1 Sociodemographic characteristics of the study participants

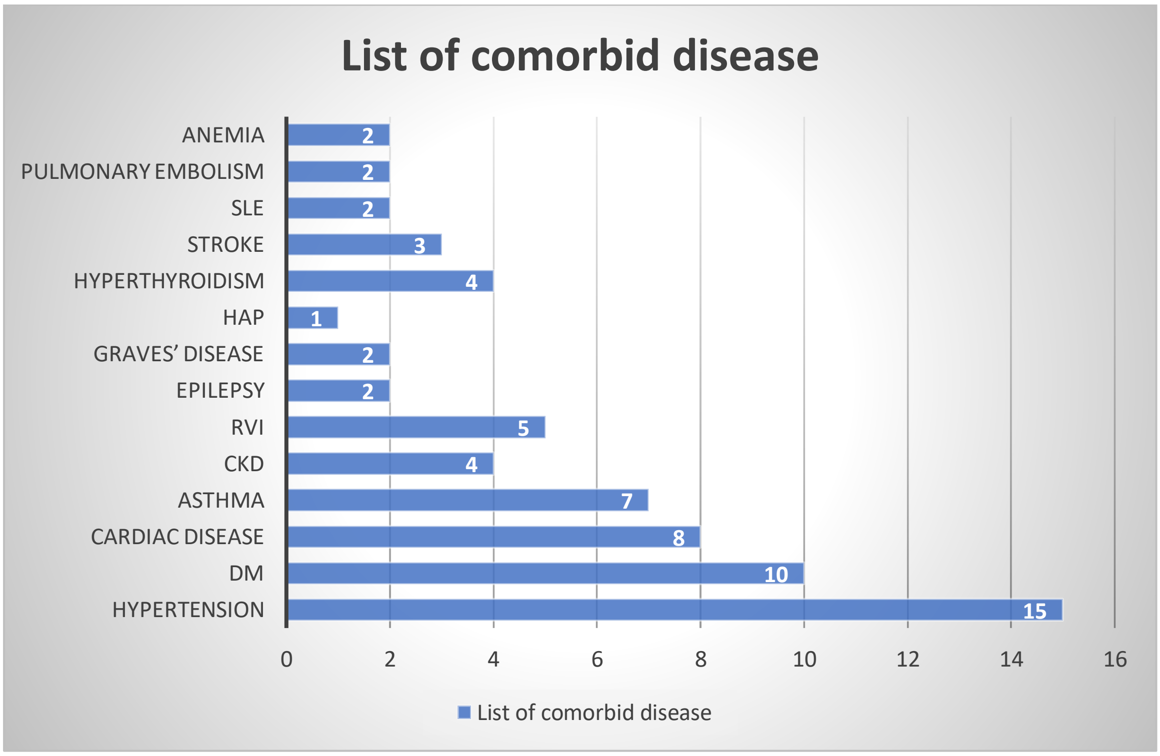
Out of the 254 patients included in the study, 71.7% aged between 19 and 64years. Females made up 53.1% of the total. Approximately 22.4% of the patients had a history of previous surgery, and 26% had comorbid conditions. In terms of ASA physical status classification, 50.4% were classified as ASA I, 36.2% as ASA II, and 10.6% as ASA IIIand 2.8% as ASA IV

Variables		frequency	Percent
Age(yrs)	<=18yr	51	20.1
	19-64yr	182	71.7
	>=65yr	21	8.3
Sex	Male	119	46.9
	Female	135	53.1
Nutritional status	Undernutrition	42	16.5
	Normal	159	62.6
	Overweight	53	20.9
History of previous surgery	Yes	57	22.4
	No	197	77.6
History of comorbidity	Yes	66	26
	No	186	74
ASA class	ASA I	128	50.4
	ASAII	92	36.2
	ASAIII	27	10.6
	ASA IV	7	2.8

Table 1. The sociodemographic characteristics of the study participants ammong patients undergoing surgery at tikur anbesa specialized referal hospital,2024/5

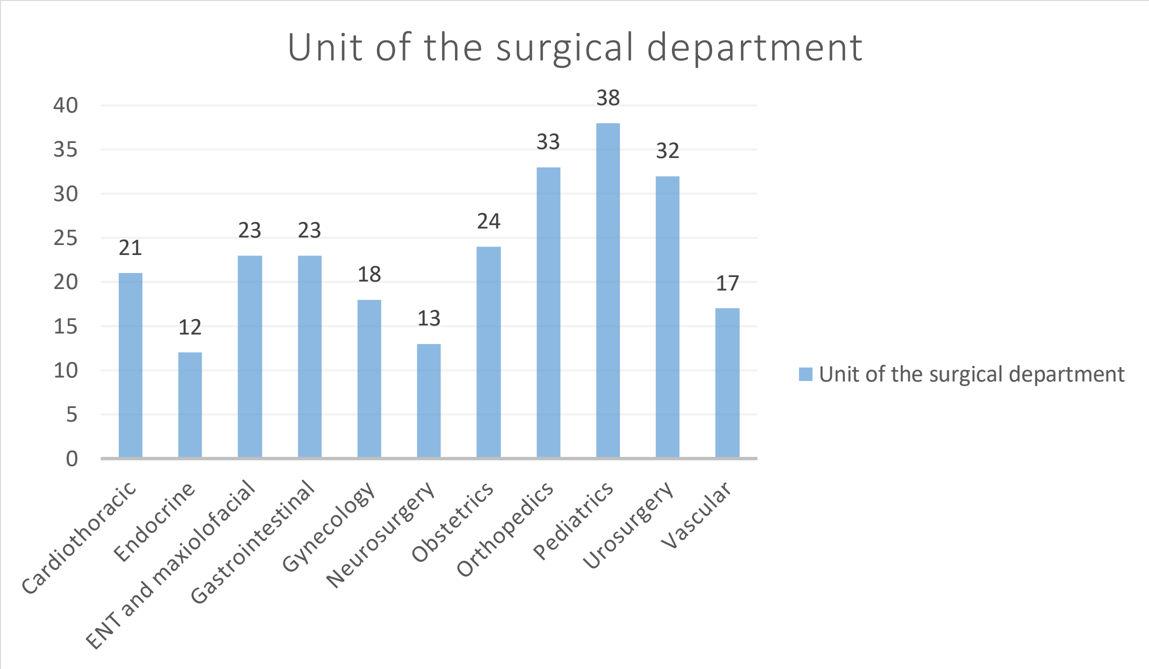
5.2 The list of comorbid disease ammong the study paricipants

Among the 67 patients with comorbidities, hypertension was the most common, occurring in 15 cases, followed by diabetes mellitus in 10 cases, cardiac diseases in 8 cases, and asthma in 7 cases



5.3 Unit of the department performing surgical procedure

With respect to the type of procedures performed, pediatric surgeries were the most common, accounting for 38 cases, followed by orthopedic (33 cases), urologic (32), obstetric (24), gastrointestinal (23), ENT (23), and cardiothoracic surgeries (21 cases)



5.4 Intraoperative related characteristics of the study participants

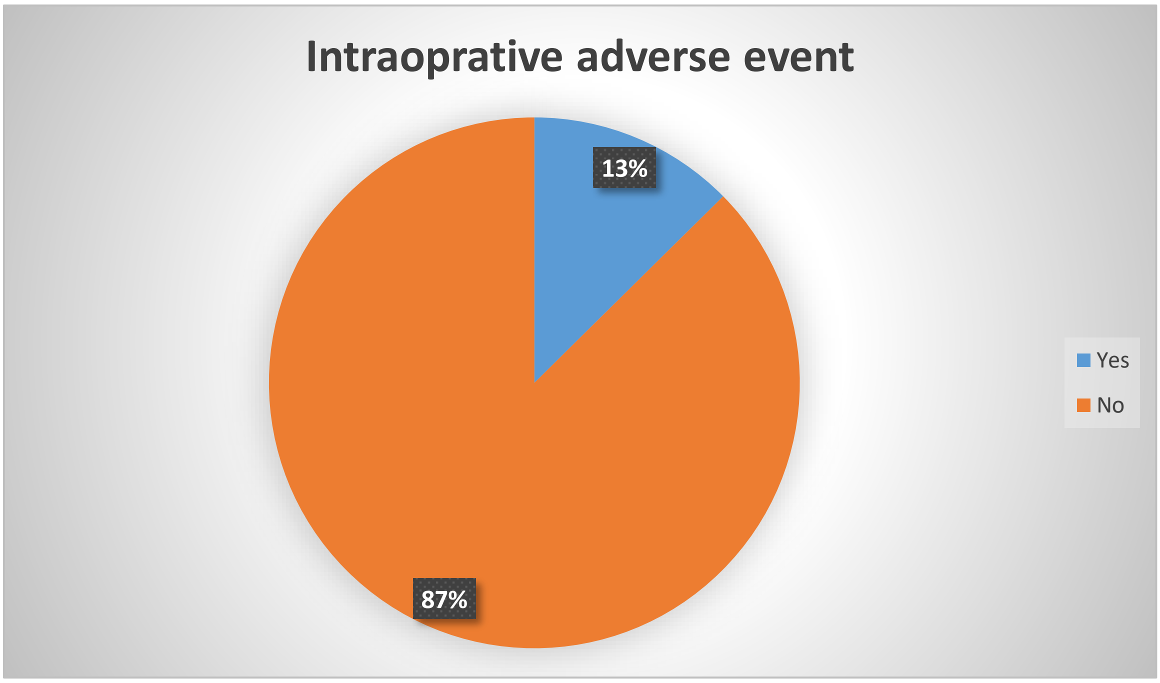
In this study, out of 254 patients, general anesthesia was administered to 168 patients (66.1%), while regional anesthesiawas used in 86 patients (33.9%). Premedication was given to 69 patients (27.2%). In 46 cases (18.1%), standard ASA monitoring equipment was not available. The duration of surgery ranged between 2 to 4 hours in 139 cases (54.7%)

Variable		frequency	Percent
Anesthetic technique	General	168	66.1
	Regional	86	33.9
Premedication given	Yes	69	27.2
	No	185	72.8
Was ASA standard monitor available ?	Yes	208	81.9
	No	46	18.1
Duration of surgery	<2hr	70	27.6
	2-4hr	139	54.7
	>4hr	45	17.7

Table 3.. Intraoperative related characteristics of the study participants

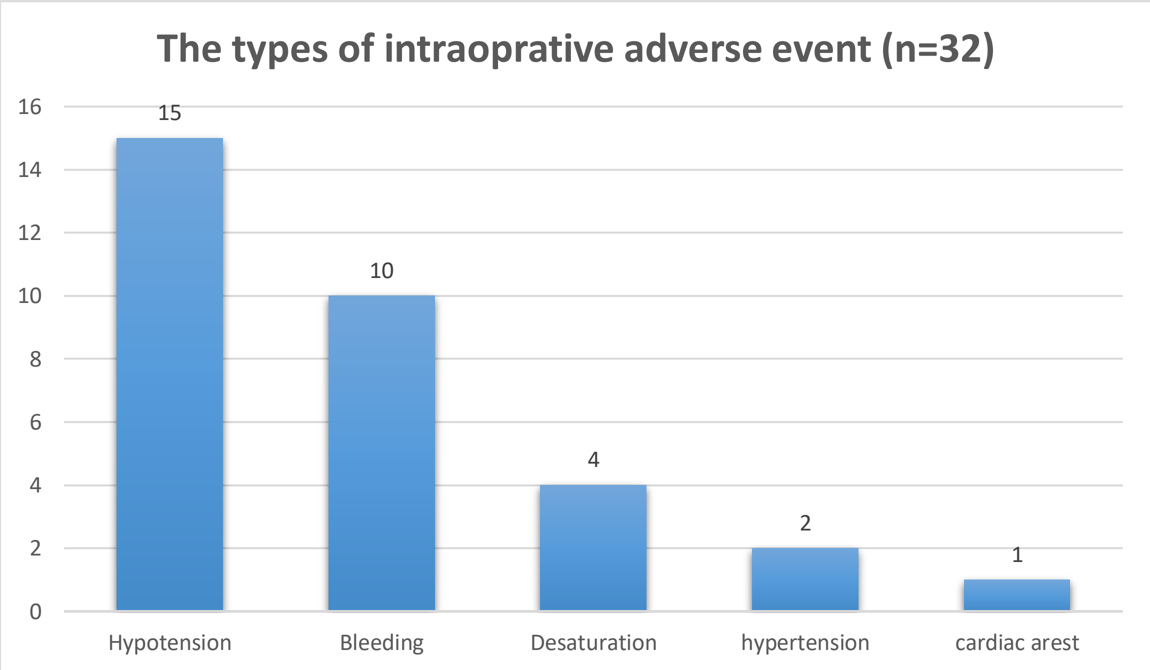
5.5 The incidence of intraoperative adverse event

The study found that 32 patients (12.6% of the participants) experienced an intraoperative adverse event, as illustrated in the figure below.



5.The list of intraoperative adverse event

Among the 32 patients who experienced intraoperative adverse events, hypotension occurred in 15 cases, bleeding in 10 cases, desaturation in 4 cases and hypertension in 2cases



5.6. The determinant factors of intraoperative adverse event

The association between various factors—including age, sex, history of previous surgery, comorbidity, ASA classification, premedication, and the presence of ASA standard monitoring—and the occurrence of intraoperative adverse events was analyzed using both bivariable and multivariable logistic regression. Multivariable logistic regression analysis revealed the following key findings: Undernourished patients had three times higher odds of developing intraoperative adverse events compared to those with normal nutritional status (AOR = 3.190; 95% CI: 1.084–9.386). Patients with a history of previous surgery had 3.6 times higher odds of experiencing intraoperative adverse events than those without such a history (AOR = 3.645; 95% CI: 1.594-8.338). The presence of comorbid conditions was associated with a 5.4 times increase in the likelihood of intraoperative adverse events (AOR = 5.404;

95% CI: 2.402–12.157). The absence of ASA standard monitoring was associated with a dramatically increased risk—about 5.5 times higher—of intraoperative adverse events compared to cases where standard monitoring was present (AOR = **5.461; 95% CI (2.471-12.089)**). Additionally the type of anesthetic technique used General anesthesia had the odd ratio of 3 times more likely to develop intraop adverse event when it is compared to the regional anesthesia(AOR=**2.887; 95% CI 1.014-8.221)**) . prolonged duration of surgery >4 hrs has 4.5 times increased risk of intraop edverse events compared to others less than 4 hrs (AOR:**4.483(1.121-17.921)**)

Variables		Intraop adverse events		COR(95% CI)	P-value	AOR(95% CI)
		No	Yes			
Age(yrs)	<=18yr	44	7	1.157(0.464-2.885)	0.754	
	>=65yr	18	3	1.212(0.330-4.452)	0.772	
	19-64yr	160	22	1		
Sex	Male	107	12	0.645(0.0.301-1.382)	0.259	
	Female	115	20			
Nutritional status	Undernutrition	30	12	2.629(0.930-7.433)	0.035	3.190(1.084-9.386)
	Normal	146	13	0.585(0.220-1.554)	0.332	
	Over weight	46	7	1		
Previous surgery	Yes	42	15	3.782(1.749-8.178)	0.002	3.645(1.594-8.338)
	No	180	17	1		1
Comorbidities	Yes	47	19	5.442(2.506-11.818)	0.001	5.404(2.402-12.157)
	No	175	13	1		
Premedication	Yes	54	15	2.745(1.285-5.864)	0.357	
	No	168	17	1		
ASA classes	ASA I	114	14	0.307(0.054-1.1734)	0.181	
	ASA II	81	11	0.340(0.059-1.967)	0.228	
	ASA III	22	5	0.568(0.084-3.821)	0.561	
	ASA IV	5	2	1		
ASA monitor available	Yes	191	17	1	0.001	1
	No	31	15	5.436(2.464-11.994)		5.461(2.471-12.089)
Anesthetic technique	General	141	27	3.102(1.150-8.370)	0.047	2.887(1.014-8.221)
	Regional	81	5			
Duration of surgery	<2hr	62	8	1		1
	2-4hr	133	6	0.350(0.116-1.051)	0.003	0.115(0.028-0.473)

	>4hr	**27**	**18**	**5.167(2.003-13.327)**	**0.034**	**4.483(1.121-17.921)**

Table 2. The bivariate and multivariate association between intraoprative adverse event and independent variable among surgical patients in TASH 2024.5.

6.Discussion

The study found that 32 patients (12.6% of the participants) experienced intraoperative adverse events. Among these cases, hypotension was the most common, occurring in 15 patients, followed by bleeding in 10 cases, desaturation in 4 cases, and hypertension 2 cases. Statistical analysis revealed that longer duration of surgery, presence of comorbidities, history of previous surgery, under-nutrition, the use of General anesthesia and absence of standard ASA monitoring were all significantly associated with the occurrence of intraoperative adverse events

The current study reported a lower incidence of intraoperative adverse events (12.6%) compared to a prospective observational study conducted in Bahir Dar, which found a 32% (n=16) incidence [29]. This difference may be attributed to the availability of better anesthesia monitoring systems and the presence of more experienced anesthesia providers at Tikur Anbessa Specialized Hospital (TASH). In this study, cardiovascular events were the most common adverse events, whereas in the Bahir Dar study, respiratory events—particularly desaturation—were more frequently observed.[29]

The incidence of major intraoperative adverse events in this study was 12% (n=32), which is higher than the 6.1% (n=42) reported in a study conducted at a teaching hospital in Nigeria. Cardiovascular complications—particularly hypotension—were the most frequently observed adverse events in both studies, accounting for 41% of the cases in the Nigerian study, which aligns with the findings in our study. Additionally, patient with comorbidity has significant association with the occurrence of intraoperative adverse events in our study, consistent with the Nigerian study, A retrospective analysis conducted at a tertiary care center in India investigated adverse events occurring during the intraoperative and postoperative periods in patients who received anesthesia. Cardiovascular and respiratory complications were the most commonly reported, followed by miscellaneous events and those related to regional anesthesia, while drug-related adverse events were relatively rare. These findings align with the results of our study, where cardiovascular complications were also the most frequent. Notably, the majority of patients who experienced adverse events in the Indian study were classified as ASA grade I or II, indicating no strong correlation between ASA physical status and the risk of adverse events

7. Limitation-

This study was conducted at a single institution, which may limit the generalizability of the findings to other settings

Data collection was based on existing medical records and intraoperative documentation, which may be incomplete or subject to reporting bias, especially regarding adverse event detection and classification

8. conclusion and recommendation

8.1. Conclusion-

The study found that 32 patients (12.6% of the participants) experienced intraoperative adverse events. Among these cases, hypotension was the most common, occurring in 15 patients, followed by bleeding in 10 cases, desaturation in 4 cases, and hypertension in 2 cases. Statistical analysis revealed that longer duration of surgery, presence of comorbidities, history of previous surgery, undernutrition, and absence of standard ASA monitoring were all significantly associated with the occurrence of intraoperative adverse events

8.2- Recommendation

Proper evaluation of elective surgical patients preoperatively is one of the intervations to prevent occurrence of major intraoperative adverse event. The result of this study call multicenter study to further elaborate the burden of intraoperative adverse event in Ethiopia so that the information will be used for guideline development.

9.References

1. Singh, S.A., et al., *Retrospective analysis of post-operative coagulopathy after major hepatic resection at a tertiary care centre in Northern India.* Indian journal of anaesthesia, 2017. **61**(7): p. 575-580.
2. Cacciamani, G., et al., *A protocol for the development of the intraoperative complications assessment and reporting with universal standards criteria: the ICARUS Project.* International Journal of Surgery Protocols, 2021. **25**(1): p. 160-164.
3. Cacciamani, G.E., *Intraoperative adverse events grading tools and their role in honest and accurate reporting of surgical outcomes.* Surgery, 2022. **172**(3): p. 1035-1036.
4. Cacciamani, G.E., et al., *Study protocol for the Intraoperative Complications Assessment and Reporting with Universal Standards (ICARUS) global cross-specialty surveys and consensus.* Plos one, 2024. **19**(4): p. e0297799.
5. I, I.C.S.W.G.C.G.g.c.m.u.e.S.T.D.-K.S.B.C.F.N.K.H.D.M.S.R.G., *Assessing, grading, and reporting intraoperative adverse events during and after surgery.* BJS, 2022. **109**(4): p. 301-302.
6. Al Saiegh, F., et al., *Developing standardized titles to classify the adverse events in 7,418 cranial and spinal neurosurgical procedures.* Clinical Neurology and Neurosurgery, 2020. **198**: p. 106121.
7. Drexler, R., et al., *Association of the classification of intraoperative adverse events (ClassIntra) with complications and neurological outcome after neurosurgical procedures: a prospective cohort study.* Acta Neurochirurgica, 2023. **165**(8): p. 2015-2027.
8. Balvardi, S., et al., *Systematic review of grading systems for adverse surgical outcomes.* Canadian Journal of Surgery, 2021. **64**(2): p. E196.
9. Dell-Kuster, S., et al., *Prospective validation of classification of intraoperative adverse events (ClassIntra): international, multicentre cohort study.* bmj, 2020. **370**.
10. Giddins, G., *Surgical complications: errors and adverse events.* Journal of Hand Surgery (European Volume), 2024. **49**(2): p. 142-148.
11. Sayegh, A.S., et al., *Severity grading Systems for Intraoperative Adverse Events. A systematic review of the literature and citation analysis.* Annals of Surgery, 2023. **278**(5): p. e973-e980.
12. Wojcik, B.M., et al., *Impact of intra-operative adverse events on the risk of surgical site infection in abdominal surgery.* Surgical Infections, 2019. **20**(3): p. 174-183.

13. Cohen, T.N., et al., *Understanding ultrarare adverse events-Lessons learned from a twelve-year review of intraoperative deaths at an academic medical center.* The American Journal of Surgery, 2023. **226**(3): p. 315-321.
14. Gawria, L., et al., *Appraisal of intraoperative adverse events to improve postoperative care.* Journal of Clinical Medicine, 2023. **12**(7): p. 2546.
15. Jung, J.J., et al., *Adverse events in the operating room: definitions, prevalence, and characteristics. A systematic review.* World journal of surgery, 2019. **43**: p. 2379-2392.
16. Kawa, N., et al., *A Narrative Review on Intraoperative Adverse Events: Risks, Prevention, and Mitigation.* Journal of Surgical Research, 2024. **295**: p. 468-476.
17. Gawria, L., et al., *Classification of intraoperative adverse events in visceral surgery.* Surgery, 2022. **171**(6): p. 1570-1579.
18. Abdulmelik, A., et al., *Magnitude and associated factors of intraoperative cardiac complications among geriatric patients who undergo non-cardiac surgery at public hospitals in the southern region of Ethiopia: a multi-center cross-sectional study in 2022/2023.* Frontiers in Medicine, 2024. **11**: p. 1325358.
19. Admassie, B.M., B.A. Admass, and D. Yaregal Melesse, *Incidence and Associated Factors of Postoperative Undesirable Anesthetic Outcomes Among Surgical Patients at Referral Hospitals in Amhara Region, Ethiopia: A Multi-Center Study.* Patient Related Outcome Measures, 2023: p. 137-152.
20. Krielen, P., et al., *Inter-rater agreement of the classification of intraoperative adverse events (ClassIntra) in abdominal surgery.* Annals of surgery, 2023. **277**(2): p. e273-e279.
21. Kambakamba, P., et al., *Intraoperative adverse events during irreversible electroporation–a call for caution.* The American Journal of Surgery, 2016. **212**(4): p. 715-721.
22. Waldenstedt, S., et al., *Intraoperative adverse events as a risk factor for local recurrence of rectal cancer after resection surgery.* Colorectal Disease, 2022. **24**(4): p. 449-460.
23. Kaya, A., et al., *Intraoperative and postoperative complications of gynecological laparoscopic interventions: incidence and risk factors.* Archives of Gynecology and Obstetrics, 2021. **304**(5): p. 1259-1269.
24. Peng, X., Y. Xiao, and J. He, *Risk Factors of Intraoperative Pressure Injury in Adult Patients Undergoing Neurologic Surgery.* Advances in Skin & Wound Care, 2024. **37**(5): p. 238-242.
25. Tura, İ., et al., *Assessment of the risk factors for intraoperative pressure injuries in patients.* Journal of Tissue Viability, 2023. **32**(3): p. 349-354.
26. Li, X., C. Wang, and Y. Jin, *Temporal trends and risk factors of perioperative cardiac events in patients over 80 years old with coronary artery disease undergoing noncardiac surgery: a high-volume single-center experience, 2014–2022.* Postgraduate Medical Journal, 2024. **100**(1182): p. 252-261.
27. Wang, X.-J., et al., *Risk factors associated with intraoperative persistent hypotension in pancreaticoduodenectomy.* World Journal of Gastrointestinal Surgery, 2024. **16**(6): p. 1582.
28. Blyleven, G.M., et al., *Factors influencing intraoperative and postoperative complication occurrence: A series of 1135 periodontal and implant-related surgeries.* Clinical and Experimental Dental Research, 2024. **10**(1): p. e849.
29. Burgess, J., G. Asfaw, and J. Moore, *Adverse events during anaesthesia at an Ethiopian referral hospital: a prospective observational study.* Pan Afr Med J, 2021. **38**: p. 375.

10.-Annexes

10.1.Annex 1- information sheet.

Hello , my name is______________ I am collecting data on behalf of Dr Ayalew Libmogn , a resident at Addis Ababa university school of medicine department of Anesthesiology , critical care and pain medicine.he is working on incidence of adverse intraoperative events among surgical patients and the associated factors. He get permission from the department to undergo this study.

Your involvement in this study is based on yourinterst and you have the right to stop participation at any time if you wish. you will not be subjected to any mistreatment.there will not be direct benefit from participating in this research but the information gathered from this study will help to know the incidence of adverse intraopreative events , the factors involved and help policy makers to understand and solve the major factors responsible for these adverse events.

The information you provided in this study will be kept confidential and codes will be used to collect data. The data obtained from you will be implemented for study purposes only..

Your participation is strongly required for the success of this study. Based on the information provided are you willing to participate in this study?

Yes-----------------no--------------

If yes, signature____________date__________

Data collector ,Name___________signiture__________

Date of data collection_______________

10.2 ,Annex 2-questionnaire

Addis Ababa University College of Health Science

Department of Anesthesiology,Critical care and Pain medicine

Part one

Sociodemographic characterstices.

1-Age (yrs)___

2-sex, A- male B- female

3-wt__

4- Ht __

5- BMI___

6-does the patient has any known allergy-A-yes B-no

7-was the patient taking medication preoperatively ? A-yes B-no

8-if yes to the above question state the medication-------------------

9-does the patient has history of previous surgery? A-yes B-no

10-does the patient has any comorbidity ? A-yes B-no

11- if yes to the above question, state the comorbidity------------------

12- ASA physical status classification

A- ASA1 B-ASA2 C-ASA3 D-ASA4 E- ASA5

13 -unit department of the surgery

A- urosurgery B-vascular C-orthopedics

D-gyne G- neurosurgery J-obstetrcs

E-pediatrics H-cardiothoracic K-endocrine surgery

F- GI I-.ENT

Part two- Intraoperative management and course

14- Anesthetic technique used-

A-general anesthesia

B-Spinal anesthesia

C – epidural anesthesia

D- combined spinal

E- Nerve block

F-GA+Epidural

If general anesthesia is used,

15-what was airway equipment used?

A-ETT B-LMA C-facemask

16- intubation equipment used-

A-direct laryngoscopy B- video laryngoscopy C-fiberoptic bronchoscopy

17-state the premedication used------------------

18-what was the induction agent used------------------

19- what was the maintenance agent used--------------------

If spinal anesthesia is used,

20- the dose of spinal anesthesia given in mg-----------

21-level of vertebral colummon where needle was inserted--------------

22-patient position immidatly after spinal anesthesia given---------------

23- Were ASA standard monitors available?

A-yes B- no

24-if no to the above question which monitors were not available-----------------

25- duration of surgery (hr)

Part 3 . intraoperative adverse event

26--are there any observed intraoperative adverse event ? A-yes B –no

27 . if yes , to the above question what was the adverse event-

A-- failed intubation

B- desaturation

C-hypotension

D-hypertension

E-cardiac arrest

F-Arrhythemia

G-total spinal anesthesia

H-Bleeding

I-Anaphylaxis

J-equipment failure/Power supply failure